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Effect of self-care nursing instructions on reducing specific potential local complications among patients with limbs plaster cast

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Abstract

Orthopedic casting is a routine procedure used for managing fractures in all age groups. Patient counseling is considered as the most valuable tool to ensure proper cast maintenance and improve patient outcomes.

Aim of the study: To investigate the effect of self-care nursing instructions on reducing specific potential local complications among patients with limbs plaster cast.

Research design: Quazi experimental research design (pre-posttest) was utilized.

Setting: Orthopedic clinic and department of Minia university hospital, Egypt.

Sample: The purposive sample technique was used to select 60 patients with a newly applied upper or lower limb plaster cast.

Tools: Three tools were utilized for collecting data of this study.

First tool: A structured interview questionnaire was developed and filled by the researchers to assess sociodemographic, medical data and cast patient's knowledge and practice about cast care.

Second tool: Pain numerical rating Scale.

The third tool: Was a Post-applied cast assessment tool used to assess the incidence of any signs and symptoms of potential local complications.

Results: There was a highly statistically significant improvement of the patients' knowledge and self-care practices about cast care which consequently leads to a low incidence of specific potential cast complications among them.

Conclusion: Implementation of self- care nursing instructions was effective in improving knowledge and practice about cast care as well as reflected low incidence of potential local complications among patients with limb plaster casts.

Recommendations: Applying nursing interventions regarding cast care on a large sample and other different types and locations of the orthopedic cast and measuring the effect of nursing intervention on reducing both local and systemic complications. Designing and implementing an educational training program for orthopedic nurses to improve the quality of care before, during, and after casting.

Keywords: Fracture, orthopedic plaster cast, self-care, local complication, compartment syndrome, nursing instructions

1. Introduction

Fracture is a common health problem affecting all age groups, described as a break in bone continuity when there is more strain on the bone than the bone can withstand. (Ebnezar and John, 2018) [7]. The incidence of fractures is 22 cases/10,000 each year. Lower limb fractures are more common than any other fractures accounts46.3% of all fractures. Over 60% of the overall fractures occur for elders related to osteoporosis and falls, and one-third of them were upper extremity fractures, predominantly proximal humerus and distal radius fractures (Karl *et al*., 2017) [15].

Most patients with skeletal injuries can be treated by immobilization without the need for surgical intervention, which results in orthopedic casting that supports, relieves muscle spasm, corrects deformation and facilitates fracture union. (Eiff and Derby, 2018) [8]. Different types, shapes, sizes of casts and splints are available, depending on the reason for the immobilization, the type of fracture, and on

what body part needed to be protected (Dehn *et al*., 2013) [5]. The cast is a routine orthopedic procedure usually made of either a moist roll of plaster of Paris or fiberglass used to stabilize and hold anatomical structures; primarily a broken bone in place until healing is confirmed (Ebnezar and John, 2018) [7]. The plaster of Paris cast is a fast-setting plaster that contains white powder and calcium sulfate hemihydrates which becomes hard when it has been made wet and is allowed to dry up. It is fixed around a wounded body part after having been reconstructed into the right physical structure by the experienced practitioners (Nguyen *et al*., 2016) [20].

The safety of orthopedic plaster casts mainly depends on competence in casting application, proper cast care and patient education (Ebnezar and John, 2018) [7]. Failure to observe the principles of casting and provide cast care may predispose patients to a number of complications that can be divided into systemic such as deep venous thrombosis

(DVT) or local complications affects limb where plaster cast has been applied and can be further classified into immediate and delayed complications such as severe pain, edema, compartment syndrome, tissue necrosis, pressure ulcer, and contracture (Szostakowski *et al*., 2017) [22]. A study in Sweden reported that 25% of patients with plaster cast experienced cast complications (Ekwall *et al*., 2018) [9]. Compartment syndrome (CS) is one of the most extreme local complications that can occur as a result of a tight cast or a rigid cast that restricts and interferes with the movement and function of tissues in that area (Schreiber, 2016) [21]. It is more common to occur with extremities casts and the delay in recognizing neurovascular compromise can lead to permanent deficits or even loss of a limb. CS manifested by (severe pain, numbness or tingling, cold, pale, or blue-color of skin, difficulty in moving the joint or fingers and toes below the affected area). The patient should be aware of these manifestations to be discovered, reported and managed as early as possible (Halanski and Noonan, 2019) [12].

Because nurses are considered to be the primary providers of health care, they play a major role in avoiding serious plaster casting complications, promoting early recovery and ensuring patient safety (Esoga and Seidl, 2018) [11]. Once a plastic cast was applied, nurses must provide patients with written and verbal instructions for self-cast care. These nursing interventions focusing on; (how to monitor neurovascular status for first 48 hours, maintaining dryness of cast, positioning, pain-relieving methods, continuous motions of fingers, hygiene and skin care, care of swelling and itching, proper nutrition, exercise of the unaffected joints, the warning signs that should be reported immediately such as (skin discoloration, tingling sensation, cool skin, delayed capillary refill, wet or Soaked cast, a foul odor from the cast, cracks or breaks in the cast, or the cast feels too tight or too loose), in addition to the importance of follow up until the casts have been relieved. (Hall and Gregory, 2016 & Esoga and Seidl, 2018) [13, 11].

During the first few days, mild swelling of the injured area is normal. To reduce swelling the victim advised keeping the cast above the level of your heart for 24 to 48 hours. Also, gently move the fingers or toes of the affected limb frequently. Ice helps keep the swelling down. Apply a bag of ice covered with a thin towel to the cast for 20 minutes every two hours while awake. Do not apply ice directly to the skin (Hall and Gregory, 2016) [13].

Also, patients should be instructed to keep the cast dry and clean and avoid getting dirt or sand inside the cast. Do not place anything inside the cast, even for itchy areas. Sticking items inside the cast can cause injuries to the skin and lead to infection. Using a hairdryer on the cool setting may help soothe itching. As well as Encourage patients to intake fluids and foods rich with fiber, vitamin D, C and calcium, protein and limit carbonated drinks, and smoking to ensure optimal soft tissue and bone healing is very important (Adib-Hajbaghery and Mokhtari, 2018) [1].

1.1 Significance of the study
Orthopedic fractures are common acute health issues in all age groups especially among elderly people related to falls and osteoporosis. It was reported that more than 35% of all bone fractures are managed with orthopedic plaster cast

without the need for surgical intervention. Although orthopedic casting is more effective and widely used for managing most of the orthopedic fractures, many potential and avoidable complications can occur related to it. Patient education is considered the most valuable tool to ensure proper cast maintenance, preventing potential complications and improve patient outcomes. Furthermore, results of previous studies conducted in Egypt revealed significance correlation between incidence of local complication of plaster cast and improper cast care (Eldosoky and Ahmad, 2016) [10], also the study of (Mersal, 2014) [19] that conducted in Demerdash Hospital Cairo, Egypt, and founded that there was low level of knowledge and performance of casted patients and their caregivers about cast care and prevention of immobilization complications.

Researchers found that many patients managed with orthopedic plaster casts in Minia University suffering from local complications as a result of knowledge and practice deficiency regarding self-care management while working in the orthopedic ward. Therefore our study considered the first study in our geographical area that addressed this important health issue and intended to investigate the effect of self-care nursing instructions on reducing specific potential local complications among patients with limbs plaster cast.

1.2 Aim of the study
This study aimed to investigate the effect of self-care nursing instructions on reducing specific potential local complications among patients with limbs plaster cast.

1.3 Research hypothesis
a. There will be a significant difference between pretest and posttest of knowledge and practices score about cast care among the studied sample.
b. There will be a relationship between the mean score of knowledge and practice with selected demographic data.
c. Implementation of self-care nursing instruction will reduce the incidence of selected potential local complications (pain, impaired skin integrity, edema, itching, and infection).

2. Subjects and Methods
2.1 Study design
The quazi-experimental research design was utilized to fulfill the purpose of this study.

2.2 Setting
The study was carried out at the orthopedic clinic and department of Minia university hospital.

2.3 Sampling technique and sample size
A sample of 60 patients with immediately upper and lower limb plaster cast was selected by purposive sampling technique.

2.3.1 Inclusion criteria
- Patients aged ≥ 18 yrs. of both sexes.
- Patients with newly limbs plaster of Paris cast.
- Patients agree to participate.

2.3.2 Exclusion criteria
- Patients who are unable to communicate.
- Open fractures and complicated cases

2.4 Study duration
Data collection for this study was carried out through 6 months, from the beginning of March 2018 till the end of August 2018.

2.5 Tools of data collection
Books, journals, articles, published and unpublished research studies and internet search were used to develop these three study tools in order to collect the data:

2.5.1 Tool I: modified interview questionnaire sheet: was developed and filled by the researchers consisted of three parts:

Part 1: Covered socio-demographic characteristics of patients under the study such as (age, sex, level of education, occupation, marital status………etc.).

Part 2: Involved medical data (diagnosis, affected site, allergy history, and medical history).

Part 3: Structured knowledge & practice questionnaire regarding self-care management of plaster cast. This part used twice as a pretest and posttest after 7 days for the studied sample.

A) Knowledge
About cast care was measured by these items (purpose of orthopedic cast and time needed for its dryness, safety measures, diet, exercise, time of follow up, potential local complications of plaster casts, the meaning of compartment syndrome and its warning signs that should be reported immediately.

2.5.2 Scoring system for knowledge about cast care
The portion of knowledge consists of (9items) following these score criteria: 1 point for a known answer and 0 point for unknown or an incorrect answer. If the patients have scored less than 60% was considered as unsatisfactory level of knowledge, 60% and more were considered as a satisfactory level of Knowledge

B) Self-care practices for orthopedic limbs cast
This part covered the following items; dryness of cast, performing neurovascular assessment, positioning, safety measures as (protect cast against wetting, avoid weight bearing on casted limb, avoid inserting sharp objects into cast, avoiding nail polish to discover any skin discoloration), actions to control edema, pain, itching, exercise of unaffected parts, and skin care.

2.5.3 Scoring system for practices
Responses of the studied sample were classified into positive and negative practices. If respondents answered yes or done, they were classified as having a positive practice, and if their answer was no or don't know or didn't do, they were classified as having a negative practice. The maximum score for practices was (20 grades), Participants who got more than 60% ($\geq$ 12 grades) categorized as having positive practices.

2.5.4 Tool II: Pain numerical rating scale adopted from (McCaffery, and Beebe 1989) [18]:
It was used 24 hrs after application of a cast, after one week, and after 3 weeks by a questionnaire/telephonic conversation for cases. The rating scale scored as the following; from 0 to 10 (11 point scale) with the understanding that 0 is equal to no pain and 10 is equal to worst possible pain.

2.5.5 Tool III: Post-applied cast assessment tool developed by (Adib-Hajbaghery and Mokhtari. 2018) [1].
This evaluation tool was used to assess the incidence of any signs and symptoms of local cast complications. It was applied three times for the studied sample after application of plaster cast through the three observations (after 24hrs.after one week and three weeks) using 10 closed-end questions.

2.6 Validity and reliability
Content validity of the tools was established by giving it to 5 experts from Medical-Surgical Nursing and orthopedic departments to ascertain their content validity and it was 97.6%. The questionnaire's reliability was assessed using Cronbach's Alpha, and it was reliable as indicated by the value of 0.825, 0.743, 0.617 and 0.98 for knowledge, practice, pain rating scale, and cast assessment tool respectively.

2.7 Pilot study
A pilot study was carried out on 10% of the total sample to test feasibility, objectivity, and applicability of the data collection tools as well as the time is taken for filling. The pilot study sample was excluded from the study sample as a result of some modifications was done.

2.8 Ethical issues
Official permission to conduct the study was obtained from the ethical committee of the faculty of nursing, dean of nursing faculty, Minia University Hospital director, and head of orthopedic department. Subject's participation in this study was voluntary after they were informed about the nature and the purpose of the study. Oral consent was obtained from participants and informed them that all data obtained used only for a scientific reason. Patients had the right to withdraw from the study at any time without any rationale as well as confidentiality and anonymity of each participant was ensured.

2.9 Fieldwork
The present study was carried out through three phases:

2.9.1 Phase One: Preparatory phase
A review of the past, current Arabic and English related literature covering various aspects of the problem was done, using available books, articles, periodicals, and magazines to get acquainted with the research problem and develop the study tools.

2.9.2 Administrative Approval: Written official

permission and approvals for conducting this study has been obtained from the authorized persons (Dean of Faculty of Nursing Minia University to the director of Minia university hospital). The researchers introduced themselves to patients, the purpose of the study was explained and informed consent was taken from the study participants.

2.9.3 Phase Two: Implementation phase
The research was carried out in the above-mentioned settings; a collection of data took 6months from the beginning of March 2018 to the end of August 2019. The collection of study data was done through 2 days weekly (about 2-3 patients weekly) during the morning shift. Each patient was interviewed individually for about 10 minutes to collect personal data and medical profile after explaining the purpose of the study and getting approval to participate in the research, then pretest using the third part of tool I concerning knowledge and practice about self-cast care was carried out which took about 20-30 minutes to be fulfilled by the researchers after that nursing instructions about plaster cast care with adequate explanation through using an educational brochure rich with figures were given individualized by the investigators which took about 20-30 minutes and handout was given to each patient.
The educational brochure which formulated by investigators in the Arabic language based on patients need after reviewing related literature included: (nursing textbook, journals, internet resources, etc.) about self-management of a plaster cast.
- Knowledge about purposes, recommended diet, exercise, safety measures, follow up, potential complications, and warning signs of plaster pair cast.
- Practice including (dryness of cast, limb elevation, monitoring neurovascular status for affected limb which includes assessment of (Pain, Sensation, Motor function, Perfusion, color, temperature, capillary refill, swelling, and pulses), positioning, safety measures (protect cast against water, avoid weight bearing on casted limb, avoid inserting sharp objects into cast, avoiding nail polish to discover any skin discoloration), actions to control edema, pain, itching, exercise, and skin care).

2.9.4 The third phase
Follow-up was done by investigators for a studied sample within the first 24 hours, one week and three weeks after application of orthopedic cast while the patients admitted to an orthopedic clinic for follow up. Post-test for knowledge and practice for the studied sample about cast care was done after 7 days using the same tool as used for pre-test, as well as the second and third tools were used three times during follow up periods (after 48hours, after one week, after 3weeks), during each visit patient was assessed for incidence of any potential complications.
The researchers encourage patients to come for follow up by

calling them by telephone weekly for three months to make follow up and assess their compliance with the study instructions.

2.10 Statistical analysis of data
Statistical analysis was done by using the Statistical Package for Social Science (SPSS 20.0). Quality control was done at the stages of coding and data entry. Data were presented by using descriptive statistics in the form of frequencies and percentages for qualitative variables and mean & standard deviation (SD) for a quantitative variable. Chi-square was used to test the association between two qualitative variables and the sample size large. Fisher's exact test used to test the association between two qualitative variables and the sample size is small. The correlation coefficient test was also used between two variables and statistical significance was considered at $p \leq 0.05$.

3. Results

Table 1: Illustrated percentage distribution of personal data among studied sample (N=60)

Personal data	(No= 60)	%
Gender		
Male	42	70
Female	18	30
Marital status		
Single	18	30
Married	34	56.7
Widow	8	13.3
Age		
18-30yrs	18	30
31-43yrs	15	25
44-56yrs	13	21.7
≥57yrs	14	23.3
Mean ± SD	41.63±16.8	
Education		
Uneducated	24	40
Secondary school	21	35
High education	15	25
Occupation		
Employee	10	16.7
Farmer	8	13.3
Housewife	18	30
Student	12	20
Skilled worker	12	20
Location		
Rural	32	53.3
Urban	28	46.7
Total	60	100

Table (1): Showed percentage distribution of personal data among the studied sample. It reflected that male, married, and uneducated patients took the highest percentages of (70%, 58.3, and 40%) respectively with a mean age of (41.63±16).

Table 2: Showed a percentage distribution of the studied sample according to medical data (n=60).

Medical data					Short cast		Long cast	
					N	%	N	%
Type of orthopedic plaster cast					23	38.3	37	61.7
Location of cast	Upper right limb		Upper left limb		lower right limb		lower left limb	
	N	%	N	%	N	%	N	%

	12	20	23	38.3	10	16.7	15	25
					No		yes	
History of allergy					N	%	N	%
					46	76.7	14	23.3
History of medical disease								
History of DM					43	71.7	17	28.3
Renal disease					55	91.7	5	8.3
Hypertension					45	75	15	25
Respiratory disease					54	90	6	10
Musculoskeletal disorder					49	81.7	11	18.3

Table (2): Revealed percentage distribution of the studied sample according to medical data. It displayed that 61.7% of the studied sample had long orthopedic plaster cast that located in upper limbs more than lower limbs. As regards the history of chronic disease, diabetes mellitus took the highest percentage followed by hypertension with percentages of (28.3% and 25%) respectively.

Table 3: Comparison between the mean score of knowledge and practice about orthopedic cast care in pre and post-intervention among the studies sample (n=60).

Level of knowledge about cast care	N= (60)					
	Pre-intervention		Post-intervention		X2	P
	N	%	N	%		
Un satisfactory ≤ 60%	51	85	14	23.3	27.88	0.0001**
Satisfactory ≥ 60%	9	15	46	76.7		
Mean ±SD	8.50±7.12		23.3±4.80			
Self-reported practices for cast care	Pre-intervention		Post-intervention		X2	P
Not done≤ 60%(negative practice)	60	100	18	30	46.94	0.0001**
Done ≥ 60% (positive practice)	0	0.00	42	70		
Mean ±SD	4.58±3.95		15.6±3.09			

Table (3): Displayed comparison between the mean score of knowledge and practice about orthopedic cast care in pre and post-intervention among the studies sample. It was founded that the patients' knowledge after gaining instruction was satisfactory (76.7%) with Mean ±SD 23.3+4.80 versus only 15% of the studied sample had a satisfactory level of knowledge in pretest with Mean±SD (8.50±7.12) With a high significance p-value (0.0001**). Also, the table illustrated a high statistical difference in self-reported practices about cast care between pre and posttest in which 70% of the studied sample had positive self-reported practices in posttest compared to pretest.

Table 4: Comparison between the mean score of presented local cast complications throughout the 3 times of observation for the studied sample (N=60)

Signs and symptoms of local complications associated with an orthopedic plaster cast.	Three times of observation				
	First day	After one week	After 3 weeks	Anova Test	P-value
	Mean±SD	Mean ±SD	Mean ±SD		
1-Edema of the affected part	0.65±0.481	0.33±0.475	0.00±0.00	41.58	0.0001**
2-Impaired skin integrity	0.000±0.00	0.116±0.32	0.166±0.37	5.35	0.006*
3-Itching and rash	0.066±0.251	0.483±0.503	0.183±0.390	17.7	0.0001**
4-Infection (Bad odor, drainage on cast)	0.000±0.00	0.000±0.00	0.50±0.219	3.10	0.047*
5-Pain	0.966±0.181	0.233±0.426	0.100±0.302	128.1	0.0001**

Table (4): Showed a comparison between the mean score of presented local cast complications throughout the 3 times of observation for the studied sample. It revealed that the common appeared local complications associated with orthopedic limbs cast among the studied sample were pain, edema, itching and impaired skin integrity that declined throughout the three observation times post-intervention, with a highly statistically significant difference P-value (0.0001**).

Table 5: The relation between post mean score of knowledge and practice about cast care and personal data among the studied sample (n=60)

Personal data	Patients' knowledge about cast care			Patients' Practice		
Age	Mean±SD	ANOVA test	P-value	Mean±SD	Anova test	P
18-30yrs	26.61±1.31	68.2	.0001**	17.88±1.02	76.5	.0001**
31-43yrs	26.82±1.01			17.70±0.77		
44-56yrs	21.09±4.41			14.09±2.54		
<57yrs	16.71±1.97			11.28±1.20		
Level of education	Mean±SD	ANOVA test	P	Mean±SD	ANOVA test	P
-High education	26.64±1.51	61.1	.0001**	18.23±1.01	65.9	.0001**

-Secondary education	26.84±1.51			17.56±0.72		
-Illiterate	17.40±3.74			12.25±1.50		
Gender	Mean±SD	T-test	P value	Mean±SD	T-test	P
-Male	24.66±3.97	3.54	.001**	16,42±2,62	3.44	.001**
-Female	20.27±5.26			13.55±3.32		
Residence	Mean±SD	T-test	P-value	Mean±SD	T-test	P
Urban	26.90±1.14	10.1	.0001**	17.90±0.89	10.24	.0001**
Rural	19.28±4.09			12.96±2.56		

*: Significant difference in between departments (p-value ≤ 0.05)
**: highly significant difference (p-value ≤ 0.001)

Table (5): Illustrated the relation between post mean score of knowledge and practice about cast care and personal data among the studied sample. It was founded that there was a significant differences association between patients' mean score of knowledge and practice about self-cast care with their (age, educational level, gender and place of residence) in which young adults, male, educated, and who came from urban areas shown high improvement in their knowledge and practice regarding cast care than elderly, female, illiterate and came from rural areas.

Table 6: The correlation between knowledge& practice about cast care and the presented local cast complications among the studied sample (N=60)

Variable		Neurovascular impairment			Edema			Impaired skin integrity		
		1st day	First week	3 weeks	1st day	First week	3 weeks	1st day	First week	3 weeks
Knowledge	R	.612-**	-	-	.533-**	.074-	-	-	.484-**	.540-**
	p	.0001			.0001	.573			.0001	.0001
Practice	R	.522-**	-	-	.607-**	.058-	-	-	.544-**	.539-**
	P	.0001			.0001	.662			.0001	.0001
Variable		Itching			Infection			Pain		
		1st day	First week	3 weeks	1st day	First week	3 weeks	1st day	First week	3 weeks
Knowledge	R	.244-	.134-	.559-**	-	-	.209-	.181-	.677-**	.444-**
	p	.060	.307	.0001			.108	.166	.0001	.000
Practice	R	.226-	.178-	.597-**	-	-	.194-	.205-	.685-**	.499-**
	P	.082	.174	.0001			.137	.115	.0001	.0001

Table (6) displayed the correlation between knowledge& practice about cast care and the presented local cast complications among the studied sample. It was cleared that there was a significant correlation between knowledge, practice, and incidence of local cast complications throughout the three observation times. The improvement of patient's knowledge and practice reflected a decline in the incidence of potential local cast complications.

4. Discussion
The major consequences of traumas and accidents are limb fractures which subsequently constitute hospital admissions. Casting is the most common treatment for managing most limb fractures for all age groups (Ekwall, *et al*. 2018) [9]. Although the efficiency of orthopedic plaster casts and its highly successful rates for managing limb fractures, may be associated with several potential local and systemic complications increase morbidity and mortality rates, so patients should gain self-care knowledge and practices which is very useful for early recovery and prevention of its complication. Although orthopedic nursing is a specialty area, there are no previous studies in Upper Egypt focusing on this health issue and concerning providing care after the application of plaster cast. This study demonstrated that patients received nursing instruction and education about cast care showed clear improvement in their knowledge and practice and consequently decline the incidence of local cast complications which denotes the contemplation of the study's purpose.

The results of the current study showed that the mean age of the studied group was (41.63±16.8). Most of the studied group was male, married and about one-third were illiterate. These results were consistent with (Hossieny and smith, 2012) [14] who reported that most admitted cases of limbs fractures were aged (18-42 years and the vast majority of them were male but inconsistent with (Delasobera *et al*., 2015) [6] who founded in his study that more than half of admitted cases with fractures managed with orthopedic plaster casts were elderly people with the highest percentages for females. Researchers view this might be due to several factors putting elders at greater risk for falling and fractures as; age-related changes affect musculoskeletal system in which there is reduction in muscle strength and bone density, low absorption of calcium with aging, as well as multiple pregnancies and lactation for women, reduction of estrogen hormone and increased incidence of osteoporosis for them.

Our results revealed that more than half of all casted patients had orthopedic casts that located in upper limbs, this result was matching with the results of the study that was done by (Kaye and Jick, 2017) [16] in the United Kingdom to find out the incidence of limb fractures on a total sample of 2900 patients and founded that the incidence of all upper limb fractures was 32%higher in women than in men versus 17% of lower limbs.

Regarding patient's knowledge about orthopedic cast care, the current study illustrated that there was a highly statistically significant improvement in patient's knowledge regarding all items about cast care post one week of intervention. These results inconsistent with (Hossieny and smith, 2012) [14] who conducted a study on 109 patients to examine the effectiveness of self-instructional module on

knowledge regarding cast safety at University of Notre Dame and results showed that the post-test knowledge score (60.4%) was significantly higher than the pre-test knowledge score (32.7%).

Also the main findings of this study that there was a significant improvement in reported self-care practices about cast care. There was a high difference in comparison between self-care practices regarding cast care at pre-intervention and one-week post-intervention, especially the items of (neurovascular monitoring, elevation of affected limb to control edema, and pain, actions to control itching, keeping cast against water, skin hygiene, closely motion for fingers of affected limb, exercise of unaffected joints, avoid inserting or using any sharp objects under the cast, and avoid putting weights on cast). These findings were supported by the study of (Lilly Mary, 2013) [17] who investigated the effectiveness of self-instructional module on practice regarding care of plaster cast among sixty patients with lower limb casts and founded that the post-test practices score was significantly higher than the pre-test practices score. while disagreeing with (Adib-Hajbaghery, Mokhtari 2018) [1] who stated that that the knowledge and practice on orthopedic cast care among patients as well as nurses are not adequately and consequently leading to incidence of casts complications, and there is a need for designing training programs to improve the quality of provided care and teaching.

In our study patients compliance with given instructions reflected cast maintenance and low incidence of local cast complications, such as monitoring neurovascular status immediately after cast application, keeping the cast and lining dry to prevent skin breakdown and potential infection, elevation of the affected limb to control pain edema, and exercise of unaffected joints. The results of the current study revealed that the giving education was effective in reducing the degree of pain and edema at the affected limb until reached to no pain and edema throughout the three observation time post-intervention, as well as very low percentages of cases, had itching, impaired skin integrity, and infection at the third weeks of follow up. These findings was supported by (Nguyen *et al*., 2016) [20] who reported that the application of orthopedic cast requires giving information by the healthcare providers to the patient/caregiver to ensure proper cast maintenance and was effective in reducing immobilization complications associated with orthopedic casts, also in agreement with the results of (Halanski and Noonan, 2019) [12] who founded that the quality of nursing care, suitable patient education, and precise documentation of the caring process showed low percentages rates of immediate and delayed cast complications especially compartment syndrome, pressure ulcers, infection, and muscle atrophy. While disagreeing with the study conducted in Sweden by (Ekwall *et al*., 2018) [9] who reported that about one-quarter of the studied patients with orthopedic plaster cast experienced cast related problems and complications, and reported that the most common occurred complications among the casted patients were pressure sores and infection. Also disagree with (Ahmed and Hussein 2016) [2] who conducted a study on one hundred patients and nurses, and found that only one-third of nurses were knowledgeable and skillful regarding post-casting care and its complications, and reported that the

quality of nursing care was undesirable which consequently affected both frequencies of orthopedic casts and patient readmissions due to the complications.

Concerning relationship between patients' knowledge and practice regarding orthopedic cast care and their data, results reflected that significant differences association between patients' knowledge and self-care practice with their (age, educational level, gender and place of residence) in which young adults, male, educated, and who came from urban areas shown high improvement in their knowledge and practice regarding cast care than elderly, female, illiterate and came from rural areas. Researchers view that education is a very important factor that highly affects patients' awareness and outcomes. As regards elderly people most of them were low education, have a low attention span, and may depend on their caregivers in self-care which affects their outcomes than young adults. Our results are similar to the results of other studies conducted in different regions by (Lilly Mary, 2013 & Chandrasekhar, 2018) [17, 4] who reported that there is an increased level of knowledge and self-management on cast among young adults and educated patients came from urban areas than others. While disagreeing with (Hossieny and Carey Smith, 2012) [14] who founded a non-significant relationship between the gender and level of knowledge.

Also, the main finding of this study was a positive correlation between total knowledge and practice regarding cast care among the studied sample and incidence of cast complications. In our study, the percentages of potential local cast complications are declined with sufficient awareness and self-care practices for applied orthopedic limb costs such as pain, edema, impaired skin integrity, itching, pressure ulcers, and infections. This means that received nursing instruction and education about cast care showed clear improvement in patients' knowledge and self-care practice and consequently decline the incidence of local cast complications which denotes the contemplation of the study's purpose. These finding is in line with the study of (Albarwari *et al*., 2014) [3] who founded that mild swelling and pain associated with casts the first few days were declined when the victim advised to keep the cast above the level of heat for 24 to 48 hours and apply a bag of ice covered with a thin towel to the cast for 20 minutes every two hours while awake. Also, the results supported by (Eldosoky and Ahmad, 2016) [10], and founded a significant correlation between the incidence of orthopedic cast complications and improper cast care. From this point, it can be concluded that Patients on Plaster of Paris cast limb needs special concern and proper teaching from nurses in order to care for themselves and to prevent or reducing the potential complications for them.

5. Conclusion
Implementation of nursing instructions was effective in improving patients' knowledge and self-care practice regarding cast care and showed a low incidence of potential local extremities cast complications.

6. Recommendation
1. Applying nursing interventions regarding cast care on a large sample and other different types and locations of the orthopedic cast and measuring the effect of nursing

intervention on reducing both local and systemic complications.
2. Designing and implementing an educational training program for orthopedic nurses to improve the quality of care before, during, and after casting.
3. Another study can be conducted that mainly focusing on geriatric patients with fractures managed with the orthopedic cast because they are the riskiest age group for the incidence of local and systemic complications of the orthopedic cast.

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