Effect of Structured Teaching Program among Patients with Lower Limb Fracture regarding Self-Care of Casted Limb

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Abstract

Casted limb' patients who are suffering from complications as a result of knowledge deficiency and usually suffer from physical, social, psychological, and economic impairment. Empowering patients with sufficient knowledge and skill in caring for themselves preventing complications, and improving bone healing through providing a structured teaching program. **Aim:** To determine the effect of a structured teaching program among patients with lower limb fracture regarding self-care of the casted limb**. Subjects and method: Design:** A quasi-experimental research design was utilized to achieve this study aim. **Setting:** The study was conducted in the Orthopedic Department at Mansoura University Hospital. **Subjects**: A convenient sample of 60 patients with lower limb fracture was included in the study from the previously mentioned setting. **Tools for data collection:** It included**: Tool I:** Structured interviewing questionnaire which consisted of four parts; **Part I:** Demographic data, **Part II:** Patients' medical history, **Part III:** Patients' knowledge regarding self-care of the casted limb, and **Part IV:** Self-care practices. **Results**: a statistically significant difference with the improvement of the level of knowledge pre- and post-structured teaching program about self-care of the casted limb. There were significant associations between patients' knowledge regarding self-care of casted limbs and their demographic characteristics. **Conclusion:** There was a satisfactory level of knowledge post structured teaching program among patients with lower limb fracture regarding self-care of the casted limb. A structured teaching program had a positive effect on changes and improving patients' knowledge**. Recommendations:** Structured teaching program should be conducted frequently for patients with lower limb fractures regarding self-care of the casted limb.

Keywords: Self-care of casted limb, Structured teaching Program, Patients with lower limb fracture**.**

Introduction:

In the human being, the skeletal structure consists of different types of bones that provide stability and mobility. Any factor which may affect the integrity of bones results in fractures of the bones. Fracture is the discontinuity of bones affecting the stability and mobility of the individual. The fracture can create significant changes in a person's life by causing activity restriction, disability, and economic loss ***(*Poeta, Aicale, Robertson, & Maffulli, 2021).**

The skeletal system is collectively the largest organ system in the body. The skeleton acts as a scaffold by providing support and protection for the soft tissues that make up the rest of the body. If any injury like accidents, falls, and blows occur then the functions will be disturbed. Injuries include fractures, sprains and strains, and dislocations. Among them, fractures are the most common injuries. Lower limb fractures account for approximately one-third of all fractures. They can occur isolated or in combination with other serious injuries, including cranial, spinal, and upper body injuries **(Jindal, Jindal, & Dass, 2016).**

The Global Burden of Disease (GBD) study highlighted those musculoskeletal conditions were the second-highest contributor to global disability. While the prevalence of musculoskeletal conditions varies by age and diagnosis, between 20%–33% of people across the globe live with a painful musculoskeletal condition. Related to the musculoskeletal system, bone fractures are considered a major public health problem throughout the world, which causes severe and long-term disability **(WHO, 2018).**

Worldwide**,** osteoporosis causes more than 8.9 million fractures annually. Every 3

seconds 1 case is diagnosed as a fracture. According to a WHO report (2019), the incidence of fractures around the world is 14 cases /10,000 each year, lower limb fractures account for 26%, arm fractures account for 14%, and other fractures for 5%. As compared to other fractures, lower limb fractures are more common than any other fractures **(WHO, 2019).** Also, it was found that musculoskeletal conditions are most frequent in the lower extremity **(Lovalekar et al., 2020).**

Mathew, (2014) reported that every day as many as one forty thousand people are injured on the world's road and more than fifteen thousand are disabled for a lifetime. The highest number of victims of road traffic accidents (29.4%) was between the age group of 20-29 years. 64.9% of the victim was between 15-44 years of age group. Among the fractures, lower limbs (46.3%) were the commonest site for fracture, followed by fracture of upper limbs (24.7%) and skull (13.2%) **(Upadhyaya, & Barman, 2020).** Also, stated that various studies conducted by various authors noted that patients fractured were of young active age group and in their study average age of the patients was 40 years. Head and neck, upper limb, and lower limb were commonly involved. It was stated that road traffic accident remains the commonest cause of injury and fracture are common presentation **(Dhahir, Hameed, &Jaber, 2017).**

Immobilization of the fractured part is achieved by the application of a Plaster cast. It has been used for centuries as a stiffening agent to treat fractures and other musculoskeletal conditions that require rest, immobilization, or correction of a deformity. Though there are advantages of plaster cast, there are short-term complications also like impaired blood flow, nerve injury, tissue necrosis, infection, compartment Syndrome, fat embolism, deep vein thrombosis, and cast syndrome **(Szostakowski, Smitham, & Khan, 2017).**

Prolonged bed rest and immobilization inevitably lead to complications such as deep vein thrombosis, contracture, pulmonary embolism, pneumonia, pressure ulcer, calculi, osteoporosis, constipation, urinary tract infection, muscle atrophy, depression, and psychosis. It can also create circulatory disturbances, inflammation, and bone disease resulting in osteoporosis, chronic edema; soft tissue atrophy, joint stiffness, and loss of function, and good physiotherapy will help to avoid these problems **(Bhavani, & Sara, 2017).**

There is a need for care after the application of Plaster cast. It helps in early recovery and the prevention of complications. The care during cast includes checking peripheral pulse and nerve function to assess the neurovascular status of the distal part, changing of position, maintenance of nutritional status, maintenance of health hygiene, medications to relieve pain. There is an urgent need to conduct continuing education all concerned on the rational use of drugs. The patient's role is also involved in taking care of their casted limb to prevent swelling, necrosis, and compartment syndrome. Patients' knowledge in skincare, active and passive exercise, proper nutrition, frequent position change is much useful for early recovery, and using bone morphogenic protein which plays a role in fracture healing and provides a novel therapeutic intervention for the treatment of diseases from osteopenia to fracture nonunion **(Long, Koyfman, & Gottlieb, 2019).**

Upadhyaya, & Barman, (2020) conducted a study among arthritis patients' knowledge, attitude, and practice. A patient education program was considered to be effective as it was successful at increasing knowledge, changing behavior, and improving physical health status.

Nurses play a major role in preventing further complications by educating the patient regarding self-care for preventing further complications. This will empower the patient with knowledge and skill in caring for themselves, prevent complications and improve bone healing. Since education is the foundation of achieving the desired goal, motivate, teach self-care management and supervise the following proper self-care, doing exercise, and following a proper diet, body alignment. This will empower the patient with knowledge and skill in caring for himself, preventing complications, and improving bone healing **(Upadhyaya, & Barman, 2020).**

Significance of the study:

According to **WHO (2019)** reported, lower limb fractures are more common than any other fractures**.** Most of the fracture patients with casted limbs have no adequate knowledge about self-care (Techniques to promote cast drying, controlling swelling and pain, use mobility aids, safety avoid excessive use of injured extremity). Patients with casted limbs need special concern to care for them and promote healthy minds as well as physical being.

Patients with lower limb fracture**s** need to be equipped with sufficient knowledge regarding self-care of the casted limb. It was observed that the patients with lower limb fractures needed a teaching program about self-care of the casted limb. Hence, this study was conducted to determine the effect of a structured teaching program among patients with lower limb fracture regarding self-care of the casted limb.

Aim of the study

The study aimed to determine the effect of structured teaching program among patients with lower limb fracture regarding self-care of the casted limb through:

- Assess patient knowledge level regarding self-care of a casted limb after structured teaching program.
- Finding out the association between demographic characteristics of patients and their knowledge regarding self-care of the casted limb**.**
- Implement and evaluate the effectiveness of a structured teaching program on patients' knowledge regarding self-care of the casted limb.

Research hypothesis:

A patient who will receive the structured teaching program regarding self-care of casted limb; their knowledge will be improved and affected positively.

Subjects and Methods:

Research design:

A quasi-experimental research design was utilized to achieve this study. A quasi-experimental design is an empirical study as it estimates the causal impact of an intervention on its target population.

Setting:

The study was conducted in the Orthopedic Department at Mansoura University Hospital. This setting was chosen because of the high prevalence rate of patients attending the previously selected setting, as well as, it serves the most population in the delta region.

Subjects:

A convenient sample of 60 patients with lower limb fracture was included in the study from the previously mentioned setting within six months.

Tools of data collection:

The tool I: Structured interviewing questionnaire: it was developed by researchers and consisted of four parts as follows after reviewing the related literature: **(Jindal, Jindal & Dass, (2016) & WHO, 2019).**

Part (1): It included demographic data of the patients with lower limb fracture such as age, gender, educational level, working status, and residence.

Part (2): Patients' medical history: previous history of fracture, having previous information regarding fracture, and previous experience as a caregiver for the casted patient.

Part (3) Patients' knowledge regarding self-care of casted limb **(WHO, 2019; Szostakowski, Smitham, & Khan, (2017).; Bhavani, & Sara, (2017)**, to assess the level of patient's knowledge, it was contained 30 items regarding self-care of casted limb, such as; introduction regarding fracture, introduction about the cast, checking peripheral pulse and nerve function, frequent changing of position, maintenance of nutritional status and proper nutrition, maintenance of health hygiene and skin care, medications, observing swelling, necrosis and compartment syndrome, use mobility aids, safety avoid excessive use of an injured extremity, active and passive exercise, and

complication of the cast and its management**.**

Scoring system of knowledge:

Each question was answered by the patients either yes or no. The scoring system was (0) if the checked is no and (1) if the checked is yes with the total grade of 30. The level of the patient's knowledge was considered unsatisfactory when less than 60%, while ≥ 60%, the patient level of knowledge was considered as satisfactory level.

Part (4) Patients' self-care practices **(WHO, 2019; Bhavani, & Sara, (2017)**, to assess the level of patient's practice, it was contained 50 items regarding self-care of casted limb, such as; checking peripheral pulse and nerve function, frequent changing of position, maintenance of proper nutrition, skincare, observing swelling, necrosis and compartment syndrome, use mobility aids, and active and passive exercise**.**

Scoring system of practice:

Each step was done by the patients. The scoring system was (0) if the step is not done and (1) if the step is done with a total grade of 50. The level of the patient's practice was considered inadequate when less than 60%, while ≥ 60%, the level of practice was considered as adequate level.

Tool Validity:

The content validity of the tool was reviewed by five experts in the medical-surgical nursing field for testing its clarity, comprehensiveness, and appropriateness to test the content validity before using it in the study. Modifications were done according to the panel's judgment.

Tool reliability:

The Cronbach's α test was used to assess the reliability of the questions relating to knowledge, which was 0. 88.

Data collection methods:

To fulfill the aim of this research, the following phases were adopted, the preparatory phase, interviewing and assessment phase, planning phase, implementation of the structured teaching program phase, and evaluation phase.

Pilot study

A pilot study was conducted on 10% of the studied sample (6 patients) to assess the clarity and test the feasibility of the research process and needed modifications were carried out based on the results of the pilot study to develop the final form of the tools. Patients involved in the pilot study were excluded from the study.

Fieldwork:

The study was started from the beginning of February 2021 to the end of July 2021 (six months). The interview took approximately 25-30 minutes for each patient to answer and fill the questionnaire. The researchers visited the previously mentioned setting one day per week, from 9.00 am to 12.00 pm.

A- Preparatory phase: The researchers conducted this phase by reviewing international-related literature concerning the various aspects of the research problem. The researcher interviewed the patients and explained the aim of the study and procedures. After that their participating agreement in this study was obtained.

B- Interviewing and assessment phase: In this phase the researcher interviewed the patients to collect baseline data (pre-test). At the beginning of the interview, the researchers welcomed the participating patients, explained the purpose of the research and provided them with all information about the study research (purpose and duration), and obtained their oral consent to participate in the study.

C- Planning phase: Based on results obtained from the pretest during the assessment phase, the teaching program was developed by the researchers in a form of a printed Arabic booklet to improve the studied patient's deficit knowledge regarding the research topic.

Sessions were introduced to patients in six groups of ten patients, at the previously selected setting in the form of lectures and group discussion with a duration of 45 - 60 minutes for each session. In the first session,

the meaning of checking peripheral pulse and nerve function, frequent changing of position, maintenance of nutritional status and proper nutrition, medications, observing swelling, necrosis and compartment syndrome, and safety avoid excessive use of an injured extremity. While, in the second session was concerned with the discussion and implementation of maintenance of health hygiene and skin care, use of mobility aids, active and passive exercise, and complication of the cast and its management.

At the end of each session, the important points were reviewed. The educational sessions were repeated to each group of patients. Each patient was provided with the educational booklet at the end of the 1st session as a guide and was informed about the time of the next sessions.

D-Implementation of the structured teaching program phase:

The structured teaching program was used as supportive material and given to patients in the Arabic language to cover all the knowledge about self-care of a casted limb after reviewing the related literature based on the assessment of the actual needs of the studied patients. Different teaching methods were used such as lectures, discussions. Different media of teaching as pamphlets, pictures, posters were used.

The structured teaching program included knowledge regarding self-care of the casted limb as follow:

- Introduction regarding fracture
- Introduction regarding Cast
- Checking peripheral pulse and nerve function
- Frequent changing of position
- Maintenance of nutritional status and proper nutrition
- Maintenance of health hygiene and skin care
- Medications, observing swelling, necrosis, and compartment syndrome
- Use mobility aids
- Safety avoids excessive use of an injured extremity
- Active and passive exercise
- A complication of the cast and its management

E- Evaluation phase: This phase was evaluated one week after the implementation of a structured teaching program using the same format of tools that were used to evaluate patients' knowledge regarding self-care of the casted limb.

Administrative and ethical considerations:

Administrative permission was obtained through an issued letter from the Dean of Faculty of Nursing, Mansoura, University to the director of the Orthopedic department Center at Mansoura University Hospital to conduct this study. The aim of the study was explained and the expected outcomes were included in this letter to obtain permission to collect the research data. The researchers informed the participants that, the study was voluntary; they were allowed to refuse to participate in the study. Patients had the right to withdraw from the study at any time, without giving any reason. Patients were assured that their information would be confidential and used for research purposes only.

Statistical analysis:

Data were revised, coded, computed, and analyzed using a statistical package for social sciences (SPSS) version 23. Frequency distribution, percentages, mean and standard deviation were calculated, Chi-square and Paired sample T-test were used to describe the level of statistical significance which was considered at $p < 0.05$.

Results:

Table 1 illustrated that (60%) of the respondents were from the age group of 30<40 years, (67%) of them were male. Regarding education, (55%) of the patients had higher education, (67%) of them were not working, and 62% of them were living in rural areas.

Table 2 portrayed that (72%) did not have a previous history of fracture, 74% of them did not have previous information regarding fracture and only 8% of the patients have previous experience as a caregiver for the casted patient.

Figure (1): Showed that 72% of the studied patient**s** stated that their main source of information about knowledge regarding self-care of the casted limb was doctors.

Table (3) showed the effect of a structured teaching program on patients' knowledge regarding self-care of the casted limb. It was noticed that the highest percentage of the patient their knowledge improved regarding self-care of the casted limb in all items post structured teaching program than pre with a highly statistically significant difference (P<0.001).

Table (4): Showed that there was an improvement in the patients' knowledge post structured teaching program as compared to pre-structured teaching program, with a highly statistically significant difference between total knowledge pre/post one week of structured teaching program (P-value <0.000).

Figure (3) illustrated the total practice scores of the patients' pre and post receiving structured teaching programs. Before the structured teaching program, it was revealed that (83%) of the patients had inadequate practice, which reduced to 17% after the intervention. However, only 23% of the patients in the study had adequate practice before the structured teaching program, but after the structured teaching program, 77% of patients increased their practices score with a statistically significant difference.

Concerning the correlation between patients' knowledge and their age, gender, level of education, residence, and working status, **table (5)** showed a highly significant correlation between patients' knowledge and their age, gender, level of education, residence, and working status.

Table (1): Frequency and percentage distribution of the patients regarding their demographic characteristics (n=60)

Items	No.	%
Adult patients ' age in years		
21< 30 years	18	30
30< 40 years	36	60
40 - 60 years	6	10
Gender		
Male	40	67
Female	20	33
Education level		
Illiterate	0	0
Read and write	3	5
Secondary education	24	40
Higher education	33	55
Occupation		
Working	20	33
Not working	40	67
Residence		
- Rural	37	62
- Urban	23	38

Table (2): Frequency and percentage distribution of the patients regarding their past and medical data (n=60)

Variables		No	%
Previous history of fracture	Yes	17	28
	No	43	72
Having previous information regarding fracture	Yes	16	26
	No	44	74
Previous experience as a caregiver for the casted patient.	Yes	5	8
	No	55	92

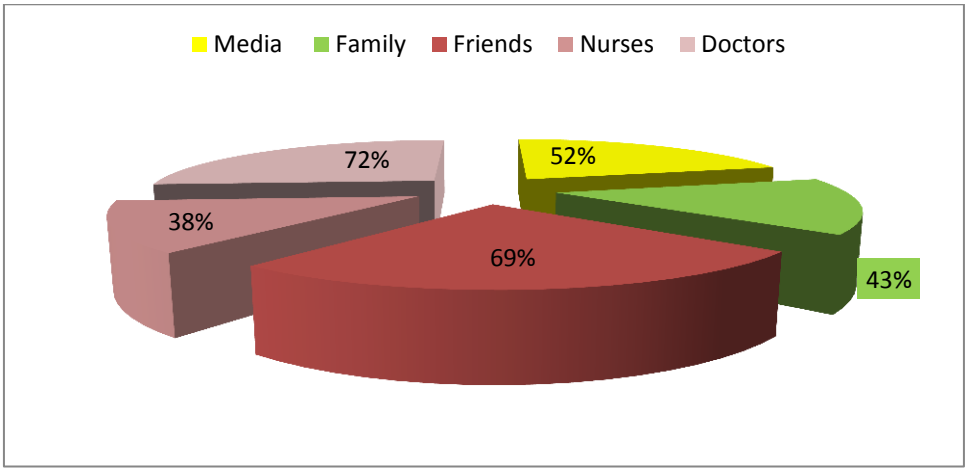

Figure (1): Percentage distribution of the patients about their source of knowledge regarding self-care of the casted limb

Table (3): Frequency and percentage distribution of patients' knowledge regarding self-care of the casted limb pre and post structured teaching program

Patients' knowledge	Pre structured teaching program(No/%)	Post structured teaching program(No/%)	P-value
Introduction of fracture	9 (15)	54 (90)	<0.001*
Introduction of cast	0 (0)	44 (74)	<0.001*
checking peripheral pulse and nerve function	3 (5)	54 (90)	<0.001*
frequent changing of position	6 (10)	40 (67)	<0.001*
maintenance of nutritional status and proper nutrition	12(20)	54 (90)	<0.001*
maintenance of health hygiene and skin care	9(15)	41(69)	<0.001*
Medications	14 (23)	48(80)	<0.001*
observing swelling, necrosis, and compartment syndrome	20 (34)	44 (74)	<0.001*
use mobility aids	16 (27)	51 (85)	<0.001*
safety avoid excessive use of an injured extremity	14 (24)	54 (90)	<0.001*
active and passive exercise	0 (0)	44 (74)	<0.001*
A complication of the cast and its management	0 (0)	48(80)	<0.001*

*Highly significance at 0.0001 levels

Table (4): Frequency and percentage distribution of the total knowledge level of the patients pre- and post- structured teaching program

Total knowledge' level	Pre structured teaching program		Post structured teaching program		T	P-value
	No	%	No	%		
Satisfactory	9	15	57	95	26.034	<0.001*
Unsatisfactory	51	85	3	5		

*Statistically significant level at P < .05

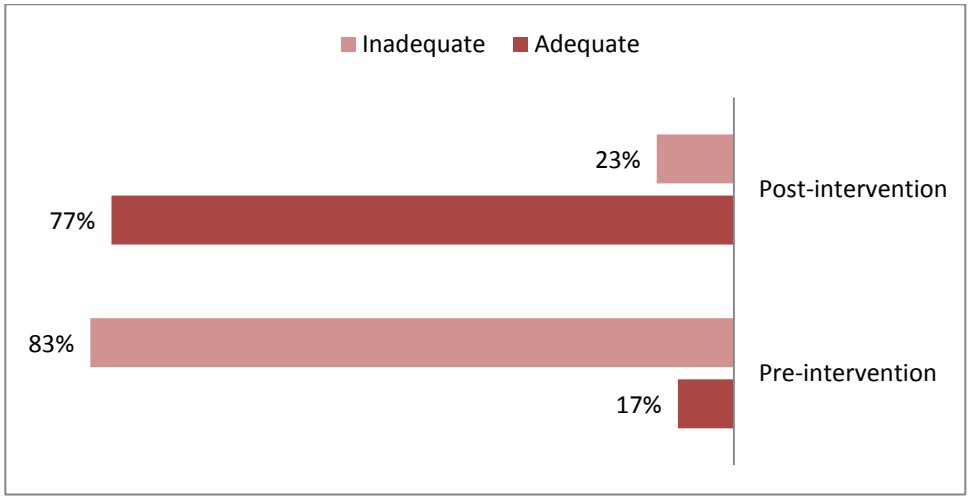

Figure (2): The total practices score level of the studied patients regarding self-care of the casted limb pre-and post- structured teaching program

Table 5: Correlation between the patients' knowledge and their demographic characteristics

Total knowledge	Age	Gender	Education	Residence	Working status
Pre structured teaching program					
R	.833	.527	.912	.463	.827
P	< .001	< .001	< .001	< .001	< .001
Post structured teaching program					
R	808	533	.847	472	763
P	< .001	< .001	< .001	< .001	< .001

Discussion:

Cast has several complications such as deep vein thrombosis, compartment syndrome, soft tissue swelling, and pressure soreness, and venous congestion. Therefore, it is important to do the care of cast effectively. It is important to teach the patient about the care of casted limbs (keep the caste dry), nutritional aspects (protein and calcium-rich diet), exercise (flexion, extension, and rotation) (**Rajasthan, et al., 2019)**. Hence, the researchers have done this study to determine the effect of structured teaching programs among patients with lower limb fracture regarding self-care of the casted limb.

The results of the present study indicated that the age of two-thirds of the studied patients was from the age group of 30<40 years and more than two-thirds of them were male. This result is in the same line with a study conducted by **RupaUpadhyaya and Hiramoni (2020)** who conducted a study about the effect of teaching program on patient knowledge with plaster cast limbs and found that majority of the respondents were from the mean age group of 40 years and were male.

Regarding the medical history, the current study revealed that less than three-quarters of the studied patients did not have a previous history of fracture and did not have previous information regarding fracture. The same results also, are reported by **Upadhyaya and Barman (2020)** and found the same results.

The present study findings reported that the highest percentage of the patient their knowledge improved regarding self-care of the casted limb in all items post structured teaching program than pre-program. This result has reflected the improvement of the patients' knowledge and the importance and positive effects of the teaching program. This finding is in agreement with **Rosaline, (2015)** that conducted a study among patients with fractures about the effect of structured teaching

program on self-care after application cast limb at Chidambaram and observed that majority of participants had adequate knowledge on self-care of Plaster of Paris cast lower limb.

Similary, **Rajasthan, et al., (2019)** who done a study among fracture patients titled "Effectiveness of Self-Instructional Module on Knowledge Regarding Cast and its Management" in Udaipur City and reported that the self-instructional module was effective in improving the patients' knowledge level regarding cast and its management among fracture patient.

The results of the present study highlighted that there was an improvement in the patients' knowledge post structured teaching program with a highly statistically significant difference between total knowledge pre/post one week of the structured teaching program. This may be attributed to that the simplicity of information given in the teaching program and indicated the success of the teaching program in improving the knowledge of patients.

This study's findings are consistent with those of **Rosaline, (2015)**, who noticed that there was a significant increase in the level of knowledge of patients between the pretest and post-test after the structured teaching program. Also, this result is congruent with **Rajasthan et al., (2019)** who found in the post-test none of the respondents had inadequate knowledge regarding the use of self-instructional module on cast & its management among fracture patients.

This difference in pre-test and post-test knowledge scores of respondents indicates that the teaching program was effective in improving the knowledge score regarding self-care of cast among fracture patients. Hence, the research hypothesis was accepted. This study finding supports the study conducted by **Rosaline, (2015)** where a significant increase in the level of knowledge of patients between the pretest and posttest was noted. Another study conducted by **Komal et al., (2018)** who studied "Effectiveness of Self- Instructional Module on Knowledge Regarding Prevention of Prevention of Plaster Cast Complications among Staff Nurses Working in Selected Hospitals of Punjab" and reported also similar findings.

The finding of the present study indicated that the majority of patients their self-care practices scores have been improved after the teaching program, with a statistically significant difference. This reflected the success of the teaching program and its positive effect.

The result is supported by **Rajasthan, et al., (2019)** conducted a study among fracture patients in Udaipur City titled "Effectiveness of Self-Instructional Module on Knowledge Regarding Cast and its Management" and found that the self-instructional module was effective in improving the patients' practice level regarding cast and its management.

The findings of the present study revealed that a highly significant correlation between patients' knowledge and their demographic data. This result is supported by **Rajasthan et al., (2019)** who found that there is a significant association between pre-post-test knowledge scores with their selected socio-demographic variables.

This finding is supported by the study conducted by **Mathew, (2014)** who studied "Effectiveness of Structured Teaching Program on Road Safety Measures among Primary School Children at Bangalore" and reported a significant relationship between the level of knowledge and educational status. The study by **Damor, (2019)** also about" Effectiveness of Self- Instructional Module on Knowledge Regarding Cast and its Management Among Fracture Patient Admitted in Orthopedic Ward in selected Hospitals Udaipur city", revealed a significant association between knowledge score with age, education.

The findings of the present study revealed that highly statistically significant differences were detected between the results of the pre & post-teaching program regarding all items. Also, there was a highly statistically significant difference found between pre and post program regarding the total level of knowledge at p. (<0.001), this is maybe due to the improvement of the patient's knowledge which was mentioned during the teaching sessions, and the booklet. This reflected the positive effect of

information included in the booklet and following teaching program had been received from the researchers and the awareness of the patients about the importance of information in the program about their self-care of the cast.

This result is in accordance with **Komalet al., (2018)** who conducted a study among staff nurses working in selected hospitals of Punjab about "Effectiveness of Self- Instructional Module on Knowledge Regarding Prevention of Prevention of Plaster Cast Complications" and observed that self-instructional module was effective on patient knowledge regarding prevention of plaster cast complications

Conclusion:

Based on the results of the present study, the study findings conclude that There was a highly statistically significant improvement of knowledge regarding self-care of the casted limb found between pre and post structured teaching program regarding the total level of knowledge at p. (<0.001). There was a satisfactory level of knowledge post structured teaching program among patients with lower limb fracture regarding self-care of the casted limb. A structured teaching program had a positive effect on changes and improving patients' knowledge**.**

Recommendations:

Based on the results of the present study, the results of this study recommended the following:

- A structured teaching program should be conducted frequently for patients with lower limb fractures regarding self-care of the casted limb.
- A simple booklet should be provided for patients with lower limb fractures which may be a guide and reference to them.
- Replication of the study on a larger population selected from different geographical areas in Egypt and should be generalized.

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