Effect of Self –Management Training on Knowledge and Glycemic Control for Patient with Diabetic Foot

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Abstract:
Diabetic foot can lead to significant morbidity and mortality and is considered one of the most feared complications of diabetes. **The Aim of the study** is to assess the effect of self- management training on knowledge and glycemic control for patients with diabetic foot. **Subjects and Method:** pre / post-test utilized to conduct this study. This study was carried out in the internal medicine department and out patient diabetic clinic, at Assiut University Hospital. **Sample** convenience sample of (60) adult patients from both sexes their age ranged from (18-65yrs old.). **Tools: tool (1):** Patient Assessment Questioner. **Tool (II):** diabetic self- management scale questionnaire. Self-management training for patient with diabetic foot was developed based on patients identified needs. **Results:** the mean age of patients was 51.4 ±12.6 years old. Three quarter of patient had poor knowledge, while after implementation of the self- management training, more than two third of patients had satisfactory level of knowledge about the management of diabetic food. **Conclusion:** The findings of the study showed that there was positive connection between total patients' knowledge and total self -management scales after implementation of the self-management training **Recommendations:** (Application of programs for modifying risk factors leading to prevent diabetic foot complications).

Keywords: Diabetic foot, Glycemic control, Knowledge & Self- management training.

Introduction:

Diabetic is chronic condition that develop either when the pancreas does not produce enough insulin or when the patient develop (insulin resistant) and the insulin cannot be used efficiency by the body **(Lancet & Hsai, 2017)**

In the North Africa and Middle East 425 million people have diabetes worldwide .In 2016, the WHO reports that diabetes was the seventh leading ,cause of death there 8222600 cases of diabetes in Egypt according to2017 statistical analysis **(jain & saraf, 2017) .**

A study done in (2015), found that 30,300million American have diabetes (around 9,4 percent of the U.S. population).While according to a recent study by Center for disease Control and Prevention ,over 100 million U.S. Adults are now living with diabetes or pre diabetes (CDC) **(American Diabetes Association, 2014) .**

Diabetes can lead to feet neuropathy, which can lead to a lack of sensation : the disorder often make it hard for person to feel an itching on their foot or notice .While rubbing their shoes .With diet ,physical activity ,medications and routine monitoring and care for complication ,diabetes may be managed ,and its

effects prevented or post pond **(Susan et al, 2019).** Diabetes may also reduce the amount of blood flow to feet, decrease the amount of the blood flow to legs and feet will make it difficult for sore or infection to cure, which may lead to complication as gangrene **(Kaptoge et al 2018)**

Amputation of the toes, foot or part of the leg may result in gangrene and foot ulcer that do not get better with treatment. To prevent infection from spreading to the rest of the body, and to save lives, surgeon may perform an amputation. **(American Association Diabetes, 2017)**

Self –management training has a positive effect on strengthening and enhancing glycemic control. Educational intervention which involve patient cooperation may be more effective in enhancing glycaemia regulation, weight and lipid profiles than did acetic intervention (**Bolton & Armstrong, 2018).** Self –care practices for diabetes are a vital component of care for all people with diabetes and are important to improve out comes of the patients. It is the ongoing process of promoting the awareness, abilities, and capacity required for self -care for diabetes disorder (**Mohan & Shathirani, 2019)**

Significance of the study:
According to the patients' records at Assiut University hospital through 2018, it found that there were about 180 cases with diabetes admitted in the internal medicine department (**Assiut University Hospital record. 2018**). The researchers observed that, the patient with diabetic foot at risk for complications. So, our research designed to enhance knowledge and glycemic control which my help in controlling such complications.

Aim of the study.
To evaluate the effect of self- management training on knowledge and glycaemia control for patient with diabetic foot.

Research Hypothesis:
Patient's level of knowledge and glycemic control will be improved after receiving self -management training.

Patient and Method

Research design:
Quasi-Experimental, One- group pre /posttest research design was utilized to collect data for this study.

Setting: -The data of the study collected from the internal medicine departments and diabetic outpatient clinic at Assiut University Hospital.

Sample:

$$ n = \frac{N \times p(1-p)}{\left[\!\left[N - 1 \times \left(d^2 \div z^2 \right) \right] + p(1-p) \right]} $$

Convenience sample of (60) adult patients diagnosed with diabetic foot, their age ranged from 18-65 years old, adult patient male and female. All patients received self –management training. Power analysis equation to get a represented sample

Tools:
The tools which utilized for data collection included the following:

Tool (l): Patient Assessment Questionnaire: this tool developed by the researcher based on the current national and international literatures and included four parts.

Part 1: Patient's Demographic data: This part includes patients –age, gender, marital status, level of education, occupation and residency.

Part 2: Patient's Medical data: This part includes past and presence Patient's medical history, date of admission and discharge, previous admission, presence of other chronic diseases, regularity of medications, family history, duration of illness and risk factor identification.

Part 3: Assessment of patient's diabetic foot: This part used to assess signs and symptoms of foot ulcer

regarding to; loss of feeling, numbness, blisters without pain, skin discoloration, temperature change, red streaks, wound with and without drainage, painful tingling and foot complications such as diabetic foot neuropathy ,foot ulcer, diabetic foot infection, gangrene, foot deformity and amputation.

Part 4: Assessment of patient's level of knowledge: This part used to assess Patient's **level of** knowledge about diabetic foot (pre/post). It included 19 questions.

Scoring system:
Scores assigned to each item were between 0 and 2 points as follows; (correct, incomplete correct and incorrect). According to total scores, it was between (0-38). Considering satisfactory knowledge at >75% of the total score, fair level of knowledge at 50 to <75% level, while poor level of knowledge if the patient total score was < 50%.

Tool (ll): Diabetic self-management scale questionnaire, (Norbert, 2015) :- (pre /post) this tool used to assess self – management of patients and glycaemia control it consisted of four sub scales:

1. Glucose management.
2. Dietary control
3. Physical Activity
4. Health Care Use.

Scoring system of tool (II):
5 items: dietary control.
3 items: physical activity.
3 items: health care use
Respondents rate the extent to which each description applies to them on a four-point Likert scale:
3 = applies to me very much
2= Applies to me to a consider- able degree
1= Applies to me to some degree
0 –'does not apply to me'
Total score was 48 points. Items scores are transformed so that higher scores indicate more desirable self-management behavior.

Ethical considerations:
The study was followed the common ethical guidelines of clinical research according to the principles of Helsinki Declaration for medical researchers. (**Helsinki. world medical association declaration of Helsiniki.pp17. (1996).**

Operational design:
The study was carried out on three phases:

Preparatory phase:
This process concluded a review of the current and past, local and foreign related literature such as textbooks, papers, journals, periodicals, and magazines, as well as research tools, and the contents validity and pilot study.

Content validity and reliability:
It was developed by three experts (one from academic internal medicine and two from academic medical-

surgical nursing staff) who reviewed the tools for clarity, validity, and comprehensiveness before designing and testing them in their final format. Cronbach's alpha coefficient was used to determine the tool's reliability. Cronbach's alpha coefficient was used to determine the tool's reliability. Reliability and validity of the Diabetic Self-Management Scale Query (DSMQ); in this analysis, reliability coefficients were found as follows (Cronbach's; stratified by scale (0.79) regarding information validity using Cronbach's test was 0.81.

Administrative design:

The head of internal medicine and the diabetic outpatient clinic at Assiut University Hospitals granted official permission to conduct the research.

Pilot study:

A pilot study was performed on 10% (6 patients) of the sample to determine the tools' applicability and clarification, estimate the time necessary for data collection, and test the feasibility of performing the research. Following the review of the pilot study results, minor adjustments were made.

Implementation phase:

Internal medicine departments and a diabetic outpatient clinic at Assiut University Hospital gathered data (the pre/test). The resources were filled out by interviewees between March and September 2019. The purpose of the research was explained to the patients before they answered the questions, in the pre/test. All patients were included in the analysis, which was performed during morning and afternoon shifts.

Data collected in the pretest were analyzed to identify patient's needs. According to the result of the data analysis, the self – management training was developed based on patient's needs.

Self – management training for diabetic foot patients:

Developed by researcher based on patient's needs and literature review (**Parker et al., 2017**), (**Kurnia & Amatayakul, 2018**) aiming to improve self – care management for patient with diabetic foot to prevent complications. It including instructions about; diet, medications, exercise and foot care as following:

1- Information's about definition of diabetes mellitus, diabetic foot, and causes of diabetic foot, signs and symptoms of diabetic foot, complications, diagnosis and prevention of diabetic foot ulcer.

2- Information's about diet for patients with diabetes:
- Purpose of diet regulation, stick allowed diet and how to prepare a meal for patients with diabetes.

3- Exercise training program for patients with diabetic foot. It included benefits, precautions before exercise application, types and technique for each type of exercise.

A-Foot and toes stretches: These foot and ankle strengthening exercises are an important part of rehabilitation for improving the strength and control around the foot. It may also help to perform calf strengthening, **it consisted of:** Standing foot stretch. Static pull ups, Static push downs. And Static turn outs.

B-Ankle inversion/eversion/dorsiflexion: it is important to strengthen the medial and lateral muscles around the ankle joint to prevent any recurring ankle sprains, soft tissue injury to the ankle: ligament injuries**, it consisted of:** Resisted ankle inversion, resisted ankle eversion and resisted ankle dorsiflexion.

C- Resistance Ankle Exercises: Ankles that are strong and resilient are a vital cornerstone for preventing injury. **It contained** the rap and pull-ups, as well as the rap and pushdowns. As well as rap and Turn Outs.

D - Strength Plantar Fasciitis Exercises: Exercises that strengthen and stretch the foot, ankle, and calf muscles will help to minimize plantar fasciitis pain and inflammation if performed correctly. **It contained:** Arch Lifts, Towel Scrunches, Marble Pick-Ups**, Toe** Squeezes and Towel stretch.

4- Responsibilities of the Patient toward himself.
  - Insulin-dependent patient with diabetic foot should visit a specialist in managing diabetes regularly to monitor the dosage of the medicine specified for and consult him before taking other medicines, as some medicines double or increase the effectiveness of the diabetes medicine.
  - The patient must maintain the diet, take medicines on time, and should exercise regularly because of its benefits in balancing blood sugar.
  - The patient should do some periodic checks to help control the level of sugar, including: Measurement of blood pressure: It is recommended to perform a blood test at each visit to the doctor, aiming to reach a blood pressure of less than 130/80, and for patient with diabetes aged 40 years and over, their blood pressure should be no more than 140/90.

5- Diabetes treatment.
  - Important notes about the diabetes.
  - Insulin side effects.
  - Learn how to self-inject insulin.
  - Tips for injecting insulin into the body.
  - Preparing the insulin dose.
  - How to store insulin

6- Medications of diabetic foot:

The reader is directed to authoritative recommendations provided by the Infectious Diseases Society of America for the assessment and treatment of diabetic foot infections, including antimicrobial agent of choices. Patients with minor infections can be treated with oral antibiotics that protect skin flora

such as streptococci and Staphylococcus aurous in outpatient settings.

7- Diabetic foot care:

Even if the patients do not have any issues with their feet, they should have regular checkup. Take control of his diabetes by adhering to the doctor's guidelines about diet, exercise, and medications.

After patient assessment by using tool I, II (the pretest). All patients received the self- management training for diabetic foot content which based on patients identified needs by the researcher herself using standardized teaching method discussion, posters, handout, demonstration and Re-demonstration.

Self –management training sessions:

The implemented self- management training for diabetic foot was conducted through 5 theoretical sessions; the duration of each session was around 15 minutes. Patients were interviewed twice: once before the self-management training and again three months after implementation of the self-management training for diabetic foot.

- **The first session:** The researcher started by making a formal presentation to the audience and explaining the purpose of the meeting, as well as orienting the patient on diabetic foot self-management training. Contents of this session were; brief illustration for definition of diabetes mellitus, definition of diabetic foot, diabetic foot problem and diabetic foot risk factors.

- **The second session:** The aim of the current session is to summaries what was covered in the previous session. The contents of this session include signs and symptoms of diabetic foot, triggers, diagnosis, and diabetic foot precautions. The session ended with a review of the material and patient reviews. Many of the patients were friendly and enthusiastic about the subject at hand.

- **The third session**: a rundown of what was discussed in a previous session; objective of the following are the contents of the new session: complication of diabetic foot, responsibilities of patients toward self and diet for diabetic foot and treatment. The session ended with a review of the contents and patient input through discussion and questions.

- **The fourth session:** a description of what was addressed in a previous session, the goal of the current session, and the contents of this session are as follows: exercise for diabetic foot that involves foot and toes stretches, ankle inversion/eversion/dorsiflexion, resistance ankle exercises and strength plantar fasciitis exercises. The session came to a close with a review of its contents and patient input through discussion and questions.

The fifth session: summaries what was addressed in a previous session, the current session's purpose, and the contents of this session are including:, diabetic foot care (even if the patients do not have any foot problems) also the importance of checkups to avoid foot care problems, to ensure that diabetes is well-managed.

Also including the important of follow up doctor's nutritional guideline, medications recommendations, and keeping blood sugar levels within the doctor's recommended range. The session ended with a review of its contents and patient input through discussion and questions. A copy of self-management training for diabetic foot was given to each patient in a simple Arabic language.

Evaluation phase:

The assessment process was completed, than the researcher assessed all of the studied sample information through filling (tool I) part 4 after three months of implementing the self-management instruction for patients with diabetic foot through filling (tool I, part 3 and 4) and (tool II). The researcher used (tool II) to complete the self-management questionnaire at the time of admission and again three months later, comparison between the two assessment stage (pre and posttest) were done.

Statistical design:

SPSS was used to conduct all of the analyses (IBM version 22.0). The researchers used descriptive statistics and constituent ratio to evaluate the general data of the subjects. The researchers used the Pearson chi-square and paired t-tests to examine the frequency of foot problems complicating diabetes and the Diabetic Foot Self-management scale, as well as patient awareness ratings.

Results:

Table (1): Frequency distribution of patients' demographic characteristics for the (n=60)

Demographic characteristics	No	%
Age group:		
18 <35	6	4.2
35 < 45	15	10.5
45 < 55	15	10.5
55 < 65 yrs.	24	40.0
Mean age ±	**51.4±12.6 years old**	
Gender:		
Male	44	56.7
Female	26	43.3
Marital status:		
Single	6	10.0
Married	48	80.0
Widow	6	10.0
Occupation:		
Employee	18	30.0
Farmer	9	15.0
House wife	15	25.0
Not work	18	30.0
Residence:		
Rural	48	78.3
Urban	18	21.7
Level of education:		
Illiterate	24	40
Primary education	6	10
Secondary education	21	35
Hhigh education	9	15

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

Medical data	No.	%
Previous admission:		
Yes	60	100
No	0	0.0
Chronic diseases:		
Yes	24	40.0
No	36	60.0
Medications regulatory:		
Yes	30	50.0
No	30	50.0
Family history diabetic foot :		
Yes	51	85.0
No	9	15.0
Smoking :		
Yes	48	60.0
No	32	40.0
Diabetes mellitus duration:		
<5 years	21	35.0
5-10 years	15	25.0
>10 years	24	40.0
Mean ±SD	**10.7 ±8.2 years**	
Peripheral vascular disease:		
Yes	51	85.0
No	9	15.0
Neuropathy :		
Yes	48	80.0
No	12	20.0
Glucose control :		
Yes	30	50.0
No	30	50.0

Medical data	No.	%
Previous amputation or debridement :		
Yes	12	20.0
No	48	80.0
Hypertension :		
Yes	36	60.0
No	24	40.0
Random Blood glucose level :	Mean ±SD	267.30 ± 72.17
HbA1C	49.78±12.8mmol/ml	6.4+1.8%

Table (3): Frequency distribution of the studied patients regarding their complications of diabetic foot (n = 60).

Complications	No.	%
Neuropathy:		
Yes	51	15.0
No	9	85.0
Infection:		
Yes	12	20.0
No	48	80.0
Gangrene :		
Yes	4	6.7
No	56	93.3
Deformity :		
Yes	4	6.7
No	56	93.3
Amputation :		
Yes	4	6.7
No	56	93.3

Table (4): Frequency distribution of the total score of the patient's knowledge pre and post self-management training (n=60):

Total Knowledge	Satisfactory		Fair		Poor		P.value
	No.	%	No.	%	No.	%	
pre	0	0.0	15	25	45	75	0.001**
post	42	70	18	30	0	0.0	

*Significance p≤ 0.05   **highly significance p<0.05   non significance p >0.05

Table (5): Distribution of self-management domains of the studied patients before and after implementation of the self –management training (n. =60)

Self-management domains	Groups	Do not apply		Apply to me to some degree		Apply a considerable degree		Apply to very much		P.Value
		N=60	%	N=60	%	N=60	%	N=60	%	
Hyperglycaemia	pre	15	25	31	51.7	14	23.3	0	0.0	0.001*
	Post	0	0.0	16	26	44	73.3	0	0.0	
Dietary control	pre	12	20	45	75	3	5	0	0.0	0.001*
	post	0	0.0	0	0.0	60	100	0	0.0	
Physical activity	pre	21	35	27	45	12	20	0	0.0	0.002*
	post	8	13.3	24	40	28	63.3	0	0.0	
Health care use	pre	39	65	21	35	0	0.0	0	0.0	0.001*
	post	0	0.0	8	13.3	52	86.7	0	0.0	
Total self-management score= (48)	pre	3	5	27	45	24	40	6	10	0.001*
	post	0	0.0	0	0.0	8	13.3	52	86.7	

* Statistically signficant difference

Figure (1): Correlation between patient's total knowledge scores and total self- management scores after training application.
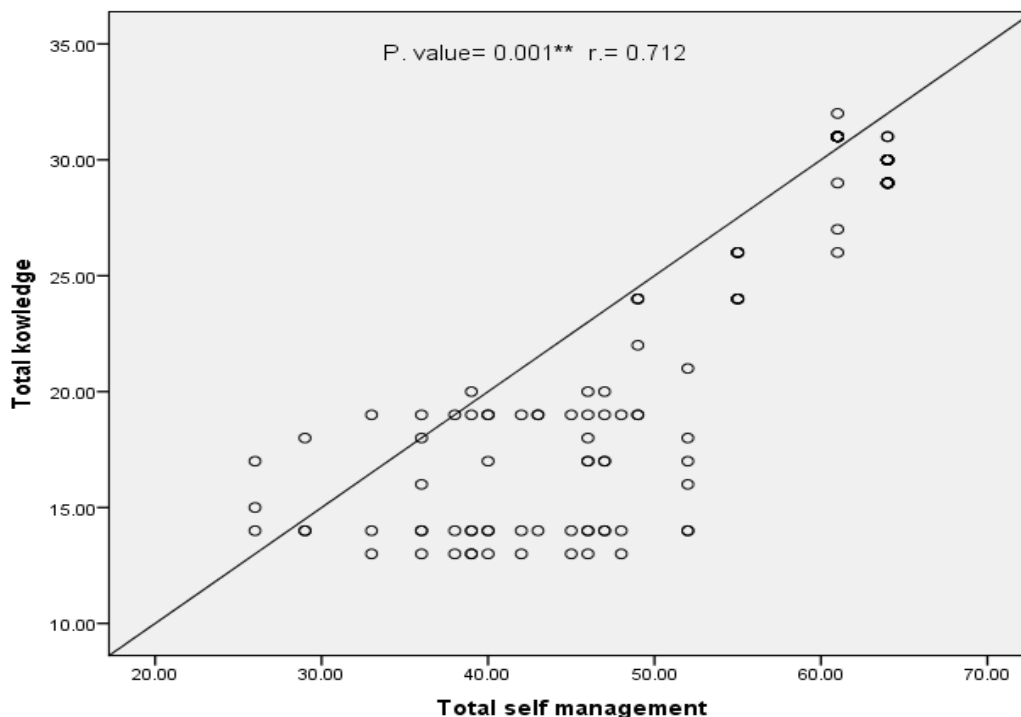

P. value= 0.001** r.= 0.712

Table (1): Demonstrates that the mean age of patients was **51.4±12.6 years old**. As regard age, two fifth (40%) of the studied patients were aged less than 56-65yrs old .As regard gender more than half \the studied patients were employee and one third (30%) not working. As regard the residence more than three quarter (78.3%) in rural area. and more than one fifth of the patient (24%) were illiterate.

Table (2): As regard chronic disease more than half of patients (60.0%) had chronic disease .As regard medication regularity of patients, half of the patients (50%) had regular intake of medications. there was two fifth of patients (40%) their duration of (DM) was >10 years, majority of patients (85%) had experience of Peripheral vascular disease, and (80%) had experience of neuropathy

Table (3): Shows that one fifths of the patients (20%) had experience of the infection, whereas patients (6.7%) of patients had experience of gangrene, deformity and amputation while (15%) of patients had experience of neuropathy.

Table (4): Shows that before training program, three quarters 75% of patients had poor level of knowledge, while after implementation of the self- management training**,** 70% of patients were have satisfactory level of   knowledge .So there was highly statistical significance differences between total feature of knowledge scores about diabetic foot self – care pre

and post the implementation of the self- management training.

Table (5): Shows that after implementation of the self –management training, there were statistically significance differences in all domains of self- management scales of the studied patients before and self –management training.

Figure (1): This figure reveals that there was a connection between total level knowledge and overall knowledge level and total self- management scales after self- management training for patients.

Discussion:

This research was carried out to determine the effects of the self-management training on knowledge and glycemic control for patient with diabetic foot.

The self-management training program recommended to increase awareness avoid diabetic foot and its complications by applying nursing intervention programs regarding importance of foot care and to improve knowledge about foot care, use media to motivate patient with diabetes during their monthly clinic visiting (**Mardanian et al., 2017**).

The finding of the study to assess the effects of patient's distribution according to their demographic variables revealed that less than half of the patients were aged (fifty-six to sixty-five years old) this disagreed with **Coppini et al., 2017** in their study,

who demonstrated that Diabetic foot was more common among smokers than nonsmokers in younger patients. Similarly, **Katsilambros et al., 2019 in their study** found that patients aged sixty five and up had a poor prognosis as compared to other age groups.

The study showed that more than half of the patients were males. This was supported by **Monteiro et al ., 2018**, finding, who stated that, the prevalence of peripheral vascular disease among women with diabetes have less sensory neuropathy than men with diabetes, and the gender factors can play a role in diabetic foot lesions, as males presented greater deficit in self-care compared to females. In the study, more than half of the study group was male. This result agrees with a study done by **Gerassimidis et al., 2016, in which** who discovered that there was no substantial difference between patients with diabetes and patients without diabetes with or without foot ulcer in terms of sex. This is corresponding to study done by **Kumar et al., 2017, in which they** found no difference regarding Diabetic foot ulcers between male and female patients.

Most patients in this study were diagnosed with rheumatoid arthritis. Married and less than half of the studied patients was employee and the rest are not working. While less than half of the studied patients were illiterate. Also, there are hormonal change, differences in health behavior, frequency of clinic visits, and knowledge deficit in relation to lifestyle modifications. This result dis agreed with **Morbach et al., 2017**, who showed that diabetes length, educational level, marital status, and age all were unrelated to foot ulcer risk factors in a multivariate study, as well occupation, and glycemic control(glycated haemoglobin) (HbA1c).

More than three-quarters of the patients in this sample lived in rural areas. This study is similar to **Ndip et al., 2016** who found that the majority of patients with diabetes living in rural areas, develop a diabetic foot ulcer, which they attribute to spending the majority of their time in pain or on water, as well as they showed a lack of information about foot management and health education, with poor economic conditions.

The study reported that the majority of patient had family history of diabetic foot .This agreed with **Stephanie & Armstrong, 2018** who assured that the majority of patients had family history of diabetic foot and It has been proposed that patients with a history of diabetic foot have all of the risk factors that require to develop diabetic foot within a year of a wound healing.

Regarding smoking, this study found that more than half of patients are smokers. This finding was confirmed by **Moss et al., 2016**, who discovered that smoking was predictive of foot ulceration and

amputation. The study found that smoking was another significant risk factor leading to peripheral neuropathy disease and inflammatory process and disagree with **Selby et al., 2017 & Letho et al, 2018** who miss to show any association between foot complications and smoking. The percentage of smokers was compared to patients with diabetes without foot ulcers; the rate of patients with diabetic foot ulcer was substantially higher. Smoking was found to be substantially associated with diabetic foot problems by **Beuker et al., 2016 & Shailesh et al., 2017,** in their study.

According to the results of this report, less than half of the studied patient their duration with diabetes mellitus were >10 years, this agreed with **Reiber et al., 2017,** who reported that duration of patients with diabetes had a slightly higher prevalence comparing to those patients without diabetes with foot ulcer for more than 10 years with diabetes mellitus duration. Also agreed with **Laiteerapong et al., 2016** who showed a six-fold increase in other risk factors such as peripheral neuropathy and peripheral vascular disease developing over time. Patients with 20 years or more diabetes mellitus have a greater risk of diabetic foot ulcer than patients with a shorter period of diabetes mellitus.

Most of the patients have peripheral vascular disease, according to the results of this research. Peripheral vascular disorder was found to be a major risk factor for diabetic foot ulcers by **Aloolado et al., 2017**. In their study who fund a significant contributor to growth of diabetic foot.

The majority of patients in this study had neuropathy, this was in agreement with **Williams et al., 2017** who found in there study a substantially higher in patients with diabetic foot with peripheral neuropathy relative to patients with diabetes without foot ulcer. These results matched those of another report from the United States. However, the findings contradicted **Alex et al., 2018**, who found that foot deformity was a non-significant risk factor for diabetic foot but were comparable to a **research conducted at the Texas Diabetes Institute and the University of Texas Health Science Center Clinics in San Antonio.** They came to the conclusion that microvasculature which involving (nephropathy and retinopathy) was not found to be a major risk factor for ulceration.

The current research found that half of the patients have inadequate glucose regulation, which is consistent with the findings of **Balla et al., 2017** who found that uncontrolled blood sugar was linked to the development of foot problems.

In terms of hypertension, this study found that more than half of patients had hypertension, which is consistent with a study done by **Scott Ramsey et al., 2019**, which found that hypertension was the most

common comorbidity among patients with diabetic foot. Patients with diabetic foot ulcers were more likely to develop diabetic foot ulcers among patients with hypertension. The occurrence of lower extremity gangrene and/or amputation was linked to baseline serum triglyceride and CHO (cholesterol) levels. In diabetic foot ulcer patients, lower lipid levels were a sign of malnutrition.

As regard to the complications, less than half of patients experience infection, also a small sample of patient experience gangrene, deformity and amputation with one quarter of patient experience of neuropathy. Mechanisms of pathophysiology hypotheses that ulcer growth, May due to neuropathy, reduced vascular perfusion, foot deformity, and higher foot pressure, all are support in these findings

This disagreed with the **Fedele et al., 2017** who reported that, gangrene, deformity, and amputation were among the majority of populations who were recruited from the primary health care centers (PHCC). This result was similar to that of **Piaggesi et al., 2016**, who found that the amputation rate increased with age and that the wound healing process is weakened as people age due to a number of factors including peripheral arterial disease, reduced defense mechanisms, and impaired immunity. Also, agreed with **Carlson & Reed, 2017,** who reported that deformity, diabetic neuropathy, and ischemia were obvious risk factors for toe amputation.

The present study also showed that there were significant increase as regard total feature of knowledge scores pre and post self –management training, this agreed with the study of **Vatankhah et al ., 2017,** who indicated that the subjects' awareness of self-care behaviors increased significantly after self-management training, which was intended to encourage self-care behaviors' in a group of patients with diabetic foot, as the finding was analyzed and the participants' knowledge level was assessed prior the conducting of the training sessions to assess the improvement in their self-care knowledge. That fading disagree with **Desalu et al., 2016** who found that two-thirds of patients with diabetes had a limited understanding of foot treatment procedures.

The current study found statistically significant differences among the self-management domains (physical activity) of the studied patients before and after the training program, which agrees with **Flahr et al., 2018** who found that physical activity and/or exercise can lower blood levels of inflammatory markers. Other pathological variables associated with exercise are positively influenced by exercise. According to **Akalin et al., 2017,** impaired glycemic regulation is the primary cause of diabetic foot problems. Other research, such as that done by **Bennett et al., 2018,** found that an improvement in

HbA1c was a contributory factor in diabetic foot ulcers. This may be due to glucotoxicity and inflammatory processes, both of which have been linked to the development of diabetic foot.

Finally, based on the results of this research, there was a positive correlation between total level of knowledge and total self-management scale after the implementation of the self-management training for patients, which agreed with a study done by **Dydarlu et al., 2015**, who reported a strong correlation between total levels of self-management instruction, patients' level of knowledge and overall self-management scales after the implementation of the self-management training. and after patients' training sessions which were conducted for patients with diabetic foot ulcers, As they assessed its impact on foot care awareness and found that knowledge related to foot care has improved due to increase Patients' awareness and self-care habits which were strengthened as a result of the training sessions.

Conclusion:
The finding of the study revealed that there was statistically significant difference as regard to self-management scale questionnaire pre and post self-management training. There were statistically significant differences found in the self- management scale in posttest comparing to pre- test. Also, there was positive correlation between total level of knowledge and total self –management scale after the implementation of self –management training for patients

Recommendations:
1- Screening of patient who living in rural areas especially patient with diabetes and the patient having risk factor to develop diabetic foot problem.
2- Develop and apply life style modification programs based on patient define need for modifying risk factors to avoid diabetic foot problems

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