

Awareness of Caregivers regarding Care of Patients with Post Diabetic Foot Amputation

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Abstract

Background: Diabetic foot amputation as a treatment of diabetic foot ulcers that are one of the major complications of diabetes, have a substantial impact on the health status of the affected patients and leading cause of morbidity and mortality worldwide. **The aim** of this study was to assess awareness of caregivers regarding care of patients with post diabetic foot amputation. **Research design:** A descriptive study design was utilized to conduct this study. **Setting:** This study was conducted at Surgical Outpatient Clinics of Benha University Hospital, Benha Teaching Hospital and Health Insurance Hospital in Benha City. **The sample:** A convenience sample of caregivers for patients with diabetic foot amputation from (40- ≤ 60 years) with post diabetic foot amputation within six months from amputation. **Tools: Two tools are used I):** A structured interviewing questionnaire which consists of three parts to assess A): Demographic characteristics of patients, caregivers and patients' health profile B): Knowledge of caregivers regarding care post diabetic foot amputation, C): practice of caregivers regarding care post diabetic foot amputation, **II):** Scale to measure patients' satisfaction regarding care of care provided by caregivers, **Results:** Only 14.5 % of caregivers had good total knowledge score about diabetic foot amputation, 43.8% of them had satisfactory total practices score regarding care of their patients with post diabetic foot amputation, 34.1 % of the patients had high and moderate satisfaction regarding caregivers care respectively. **Conclusion:** The caregivers of patients had poor knowledge, practices and more than two third of studied patients had low satisfaction regarding caregivers care. **Recommendations:** Guidelines should give for prevention, treatment and reduction of complication among patients with diabetes and DFU.

Key words: Awareness, Caregiver, Care, Post diabetic foot amputation

Introduction

Diabetes Mellitus (DM), is a group of metabolic disorders of numerous etiologies characterized by hyperglycemia and glucose intolerance. The condition arises from the metabolic disturbance of carbohydrate, fat and protein caused by imperfection in insulin release, insulin action, or both. DM is classified into four types: Prediabetes, type 1 Independent Diabetes Mellitus (IDDM), type 2 Non-Independent Diabetes Mellitus (NIDDM), other specific types and Gestational Diabetes Mellitus (GDM) (Sen et al., 2016). People with diabetes are prone to foot complications due to neuropathy, arterial disease and infection. Sensory neuropathy will reduce awareness of injury to the foot which can lead to diabetic foot ulcer. Diabetic Foot Ulcers (DFUs) are extremely common; the most worrying complication of a DFU is the progression to diabetic foot amputation (*Lee & Song, 2019*).

Diabetic Foot Amputation (DFA) is often considered a failure of conservative care or an unpreventable outcome of diabetes. In the diabetic population, DFA amputation is often the result of ischemia or uncontrolled infection. Amputation of the foot may be indicated when neuropathy, vascular disease and ulcerative

deformity have led to soft tissue necrosis, osteomyelitis, uncontrollable infection or intractable pain. DFA is a surgical removal of part of toe, foot or part of the leg. It is typically performed to prevent the spread of gangrene as a complication of diabetes (*Blanchette et al., 2020*).

Diabetes is a serious, long-term condition with a major impact on the lives and well-being of individuals, families and societies worldwide. The DM has a significant impact on the morbidity and mortality of patients and is the third highest risk factor for premature death. The global diabetes prevalence in 2019 is estimated to be 9.3% (463 million people), rising to 10.2% (578 million) by 2030 and 10.9% (700 million) by 2040 (*Diabetes Research and Clinical Practice (DRCP), 2019*). DFU's prevalence rates are increasing in all the world and the incidence of it increasing at a higher rate than other complications of diabetes. In the United States, diabetic patients account for around 3% of the total population and more than 8% of them suffer lower limb amputations. (*Kumar et al., 2020*).

Caregivers are individuals who have a social relationship such as: Spouse, parent, child, other relatives, neighbor and friend with the person cared who are older or dependent

individuals or need assistant and provide unpaid care continuously or when required (*Messenger et al., 2019*). Caregivers may supply emotional support, physical assistance, financial assistance and many other types of care. The role of caregiver should be active in all aspects of care for patient with DFA. This means asking specific, pointed questions of doctors and therapists, managing of blood sugar level, medication management, arranging transportation to medical appointment, following all the way through on rehabilitation and careful monitoring and cares of the amputation site (*National Caregivers Library (NCL), 2019*).

Awareness is the state or ability to perceive to feel or to be conscious of events, objects or sensory patterns. Awareness of caregiver for patient involves the ability to know and understand the factors that will further develop beliefs and dictates attitudes and practices toward responsibility, improvement and success of the care. Considering that the caregiver is the primary foot carer, awareness of good foot care is essential amongst patients with DFA and their caregivers to reduce the incidence of foot disease and reamputation (*Goie & Naidoo, 2017*).

The community Health Nurses (CHNs) play an important role in

educating the caregiver through health education. Health education raises caregiver's knowledge through helping them to establish agreed standards of care patient with DFA and prevention of reamputation. CHNs assist in teaching caregiver of diabetic patients to receive regular blood sugar examination and daily care of the foot to prevent subsequent complications. CHNs teach caregiver about the risk factors that lead to DFA, educating the warning signs that should the caregiver reports to the doctor (*Font-Jimenez et al., 2020*).

-Significance of the study

Diabetic Foot Amputation (DFA) is the no healing of the foot ulcer. Diabetic foot syndrome occurs when diabetic neuropathy and vascular insufficiency are accompanied by infection. This is a risk of developing DFUs in 10%-20% of all diabetic patients. Besides, 60% of DFA is caused by diabetic foot ulcers (*Sayiner et al., 2019*). In addition, previous amputation, foot deformity, visual impairment and poor glycemic control, in addition to cigarettes smoking as well as low self-care practices, neglected or inadequately routine foot examination and risk stratification at eventful primary care settings can lead to amplified risk for foot ulcers, which might result in 80% of all amputation (*American Diabetes Association (ADA), 2020*).

Egypt is currently in the top 10 countries with the highest number of people with diabetes. Diabetic foot patients are one of major complications of diabetes. The risk of developing diabetic foot ulceration is 10-15%. Most of foot ulcers (70-80%) will heal, while 10-15% of them will remain active, and 5-25% of them will end with limb amputation within of 6-18 months (Abu-elenin et al., 2018). In Egypt, if about 2000 patients with diabetes, 45% of them had DFA (62% male and 26% female) (*Assaad-Khalil, 2020*).

Aim of the study:

- The study aims to assess awareness of caregivers regarding care of patients with post diabetic foot amputation
- **Research questions: -**
- What is the knowledge of caregivers toward care of patients with post diabetic foot amputation?
- What are the reported practices of caregivers toward care of patients with post diabetic foot amputation?
- Is there relationship between demographic characteristic on knowledge and reported practices of caregivers toward care of patients with post diabetic foot amputation?
- Is there relationship between caregivers' knowledge and reported practice toward care of patients with post diabetic foot amputation?

- Is there relationship between patient satisfaction and care provided by caregivers post diabetic foot amputation?

Subjects and method:

Research design

A descriptive study design was utilized to conduct this study. This design is one in which information is collected without changing the environment and used to obtain information concerning the current status of the phenomena to describe "what exists" with respect to variables or conditions in a situation.

Settings:

This study was conducted at Surgical Outpatient Clinics of Benha University Hospital, Benha Teaching Hospital and Health Insurance Hospital in Benha City. The investigator chose these settings because the patients attended these hospitals to be cared and followed up the amputee part of the foot.

Sampling:

A convenience sample of caregivers for patients with diabetic foot amputation from (20- ≤ 30 years) with post diabetic foot amputation attended the previously mentioned settings within six months from amputation.

Hospitals Names	The total number of caregivers for patients who attended within ٦ months from amputation.
Benha University Hospital	١٤
Benha Teaching Hospital	١٨
Health Insurance Hospital	٣٢
Total	٦٤

Tools of data collection: -

Two tools were used to collect the data (Appendix II):-

Tool (I): A structured interviewing questionnaire format: It was developed by the investigator based on reviewing related literatures and it was written in simple clear Arabic language: It comprised of three parts:-

The first part: - It was concerned with demographic characteristics of the studied sample. This part included three items:

Demographic characteristics of patients with post diabetic foot amputation; it comprised of eight questions (age, sex, marital status, educational level, occupation, place of residence, type of family and family monthly income).

Demographic characteristics of caregivers for patients with post diabetic foot amputation; it comprised of seven questions (age, sex, kinship

degree to the patient, marital status, educational level, occupation, place of residence).

It was designed to collect data about health profile of post diabetic foot amputation patients; it comprised of seven questions (duration of diabetes, patient's complaint, diseases or other problems suffering from, the amputated part of patient's foot, factors that lead to diabetic foot amputation and medications that are taken for diabetes).

The second part: - It was concerned with knowledge of caregivers about diabetic foot amputation; it comprised of twelve questions (meaning of diabetes, causes of diabetes, symptoms of diabetes, complications of diabetes, methods that used to treat diabetic foot, meaning of diabetic foot amputation, risk factors of diabetic foot amputation, symptoms of diabetic foot amputation, people more vulnerable to diabetic foot amputation, medications used in the treatment of post diabetic foot amputation, complications of diabetic foot amputation, preventive measures from diabetic foot amputation).

Scoring system:

The scoring system for caregivers' knowledge was calculated as follows (٢) score for correct and complete answer, while (١) score for correct and incomplete answer and (٠) for an incorrect answer or don't

know. For each area of knowledge, the score of items was summed up and the total divided by the number of items, giving a mean score for the part. These scores were converted into a percent score. The total knowledge score was considered good if the score of the total knowledge $\geq 70\%$ (≥ 14 point), while considered average if it equals 50% ($12 < 14$ point) and considered poor if it is $< 50\%$ (< 12 point).

The third part: - It was concerned with reported practice through asking questions of caregivers regarding care of diabetic foot amputation to prevent complications and improve general health of the patient which divided into three items:-

1. **Nutrition:** It comprised of six questions as helping the patient to eat three basic meals a day, helping the patient to eat the food on fixed and regular dates, helping the patient to eat the food that contains all the nutrients such as (proteins, iron and all vitamins) but in a specific amount, distributing the permitted food daily to more than one meal, helping the patient to eat snacks from fruits and vegetables between the three main meals and helping the patient to avoid drinking coffee, tea or soft drinks and avoid eating food with high sugar and salt.

2. **The treatment regimen and follow**

up: It comprised of nine questions as giving the medication regularly to the patient, checking blood sugar level periodically, taking care of the wound after diabetic foot amputation with the use of necessary disinfectants and creams, continuously cleaning of the amputation with soap and water and drying it well, continuously following up with the doctor after diabetic foot amputation and wound caring, evaluating of an amputated foot by looking for signs and symptoms of infection and skin irritation, color, temperature and pulse near the stump before rewrapping it, doing a daily massage for the amputation site, changing the patient's position every two hours, using the correct compressive ligament with the foot raised up to avoid swelling.

Taking proper care of the healthy foot and avoiding any problems

with it by: It comprised of nineteen questions as checking the patient's water temperature, washing and drying the foot with gentle soap daily, applying moisturizers after drying the foot to avoid cracking them, examining the feet daily by making sure that there is no dryness or any cracking in the feet or redness or change in color or warmth in the feet or pain when pressing on the foot or presence of cuts, scrapes, blisters, or sores, taking care of toenails: Cutting

nails straight after showering, using a nail file after that, paying attention to avoid clipping the corners of the nail or cutting any part of the skin, choosing the socks carefully that made of wool or cotton, changing socks daily, choosing shoes made from natural leather and natural fibers and avoiding choosing shoes with high heels or sandals, ensuring proper shoe size when buying it, activating blood circulation in the foot by: Keeping the feet high while sitting, moving the toes and heels up and down 2-3 times daily for 5 minutes and regular review with doctor by performing a complete examination of the foot at least once a year and returning to the doctor when any problems with the foot appear.

3. Daily living activity: It comprised of sixteen questions as helping the patient in exercising such as walking on a daily, helping the patient in relaxing and sitting in an open and quiet place, helping the patient to do slow and deep breathing exercises, helping the patient in carrying out daily living activities such as: Showering, wearing clothes, preparing the food, eating the food, taking prescribed medications, using the toilet, moving to a chair or bed, mobility within the community, climbing the stairs, personal hygiene, safety and emergency response

procedures, shopping and house hold chores.

Scoring system:

Each step has two levels of answers: Done and not done. These were respectively scored 1, 0. The scoring system for caregivers' practices was calculated as follows (1) score for done and (0) for not done. The scores of the items were summed-up and the total divided by the number of the items, giving a mean score. These scores were converted into percent score. The total practices score = (0. point) was considered satisfactory if the score of the total practices $\geq 60\%$ (≥ 30 point), while considered unsatisfactory if it is $< 60\%$ (< 30 point).

Tool (II):- Scale to measure patients' satisfaction regarding care provided by caregivers *adapted by (Hawthorne et al., 2007)*. The questionnaire was measured on a likert scale type of (strongly agree, agree, disagree and strongly disagree). It was translated into Arabic by investigator which included:

1- Caregivers' communication with the patients by asking the patients about: It comprised of five questions as the satisfying with the decisions that the caregivers made and that affect the care, feeling with the respect from the caregiver, spending a short time with the caregiver, responding the caregiver to the

immediate call and the caregiver gave the patient the time to discuss the condition and treatment plan.

٢- **The patient's satisfaction with the meeting of the caregiver for their needs and patient's physical environment by asking the patient:** It comprised of four questions as the caregiver provided meals on a fixed and organized schedule, the caregiver helped the patient in doing athletic exercises and daily living activities, the caregiver monitored the safety and security to the patient and the caregiver reinforced the positive image of the patient.

٣- **Patient's satisfaction as regards caregiver's skills and their competences by asking the patient:** It comprised of eleven questions as the caregiver washed the hands before caring for the amputated part of the foot, the caregiver prepared everything necessary to care for the amputated part of the foot, the caregiver maintained the privacy of the patient, the caregiver explained the purpose of caring for the amputated part of the foot, the caregiver had self-confidence, the caregiver cared of the amputated part of the foot skillfully, the caregiver understood what providing to the patient, satisfying with the effect of the

caregiver care, satisfying with the interpretations that the caregiver provided regarding results of the care, the caregiver was very careful to check everything when examining the foot and the satisfying with the care that received at home by the caregiver.

Scoring system:

The Interviewing Patient's Satisfaction Questionnaire (IPSQ): It comprised of twenty (٢٠) statements; all statements were scored on a four points Likert Rating Scale whereas, (strongly agree = ٤, agree = ٣, disagree = ٢ and strongly disagree = ١). For analysis patient's responses were plotted under two main categories (satisfied & unsatisfied), Whereas if the patient responses were strongly agree or agree, i.e. satisfied and if the patients responses were disagree or strongly disagree, i.e. unsatisfied. The total patient's satisfaction score = (٢٠ point) was considered high if the score of the total patient's satisfaction $> ٧٥\%$ equal and more (١٥) point, while considered moderate if it equals $٥٠-٧٥\%$ (١٠-١٥) point, and considered low if it is $< ٥٠\%$ equal or less (١٠) point.

Instructional guideline:

Illustrated booklet guideline was distributed to caregivers' of patient with diabetic foot amputation about meaning of diabetes, causes of diabetes, types of diabetes, symptoms

of diabetes, diagnosis of diabetes, complications of diabetes, the concept of diabetic foot amputation, factors that cause diabetic foot amputation, warning symptoms of diabetic foot amputation, people most at risk of diabetic foot amputation, complications of diabetic foot amputation, methods used to treat diabetic foot, medications used to treat post-diabetic foot amputation, preventive methods of diabetic foot amputation and health practices related to post diabetic foot amputation.

Reliability and content validity of the tools:

Reliability of the tool was applied by the investigator for testing the internal consistency of the tool by administration of the same tools to the same subjects under similar condition on one or more occasion. Answers from repeated testing were compared (test-re-test reliability). The reliability was done Cronbach's Alpha coefficient test which revealed that each of the two tools consisted of relatively homogenous items as indicated by moderate to high reliability of each tool. The internal consistency of the knowledge was $.94$, while practices were $.90$ and patient's satisfaction was $.97$.

The tools validity was done by three of Faculty's Staff Nursing

experts from the Community Health Nursing Specialties who reviewed the tools for clarity, relevance, comprehensiveness, applicability and give their opinions.

Ethical considerations:

All ethical issues were assured; oral consent has been obtained from each caregiver for patients with diabetic foot amputation before conducting the interview and given them a brief orientation to the purpose of the study. They were also reassured that all information gathered would be treated confidentially and used only for the purpose of the study. The caregivers for patients with diabetic foot amputation had right to withdraw from the study at any time without giving any reasons.

Pilot study:

The pilot study was carried out on (7) caregivers of patients with diabetic foot amputation which represented 10% of the sample size. The pilot study was aimed to assess the tool clarity, applicability and time needed to fill each sheet, completing the sheet consumed about 30-40 minutes. No modifications were done, so the pilot study sample was included in the total sample.

Preparatory phase:

An extensive review of the current and past available national and international references related to the research title was done, using a journal, textbooks and internet search was done. This was necessary for the investigator to be acquainted with and oriented about aspects of the research problem as well as to assist in the development of data collection tools; this took time for preparing the tools about two months.

Field work:

The actual field work was carried out over a period of 4 months from the beginning of July 2020 to the end of October 2020. The investigator visited the Surgical Outpatient Clinics of Benha University Hospital from 9 am to 12 am, two days per week (Saturday and Sunday) while visited the Surgical Outpatient Clinics of Benha Teaching Hospital from 9 am to 12 am, another two days per week (Monday and Tuesday) and visited the Surgical Outpatient Clinics of Health Insurance Hospital from 9 am to 12 am, another two days per week (Wednesday and Thursday) to collect data from caregivers for patients with post diabetic foot amputation and distributed instruction guideline about care of diabetic foot amputation to prevent complications and improve general health of their patients. The

average time needed for the sheet was around 30-40 minutes, the average number interviewed at the Surgical Outpatient Clinics were 1-2 caregivers/day depending on their responses of the interviewers.

Administrative approval:

The aim of the study was explained to administrative personnel; the written permission was obtained and delivered from Dean of Faculty of Nursing Benha University to the administrators of Benha University Hospital, Benha Teaching Hospital and Health Insurance Hospital in Benha city. Where the study was conducted concerned the title, objectives, tools and the study technique were illustrated to gain their cooperation which was needed to allow the investigator to meet patients with diabetic foot amputation and their caregivers.

Statistical analysis:

All data collected were organized, tabulated and analyzed by using the Statistical Package for Social Science (SPSS version 20), which was used frequencies and percentages for qualitative descriptive data, and chi-square coefficient χ^2 was used for relation tests and mean and standard deviation was used for quantitative data, Pearson correlation coefficient (r) was used for correlation analysis

and degree of significance was identified.

The observation difference and associations were considered as the following: (p-value)

Highly statistically significant
 $P < .001$

Statistically Significant
 $P < .05$

Not significant
 $P > .05$

Result:**Table (1):** Frequency distribution of the studied patients regarding their demographic characteristics (n=74).

Patients' Characteristics	No.	%
Age		
40-<50 years	7	9.5
50-<60 years	27	36.5
60-<70 years	30	40.6
Mean ±SD		58.71±6.06
Sex		
Male	40	54.1
Female	34	45.9
Marital status		
Married	52	70.3
Widow	10	13.5
Divorced	2	2.7
Educational level		
Can't read and write	21	28.4
Basic education	22	29.7
Secondary education	31	41.9
Occupation		
Employed	7	9.5
Housewife	18	24.3
Free work	24	32.4
Retired	15	20.3
Place of residence		
Urban	12	16.2
Rural	62	83.8
Type of family		
Nuclear family	47	63.5
Extended family	27	36.5
Family monthly income		
Enough and save	7	9.5
Not enough	67	90.5

Table (1): Shows that; 40.6 % of the studied patients aged from 60 to less than 70 years old with mean age was 58.71±6.06, 54.1 % of them were males and 70.3 of them were married. Regarding the educational level, 29.7 % of the studied patients had basic education, 32.4 % of them had free work, 83.8 % of them lived in rural areas in nuclear families and 90.5% of them hadn't enough income/ month.

Table (٧): Frequency distribution of the studied caregivers regarding their demographic characteristics (n=٦٤).

Caregivers' Characteristics	No.	%
Age		
<٣٠	٢٧	٤٢.٢
٣٠- <٤٠	٩	١٤.٠
٤٠- <٥٠	١٢	١٨.٨
٥٠+	١٦	٢٥.٠
Mean±SD	٣٧.٢١±١٣.٨٧	
Sex		
Male	١٧	٢٦.٦
Female	٤٧	٧٣.٤
Kinship degree to the patient		
The wife	١٩	٢٩.٧
The husband	٥	٧.٧
The daughter	١٢	١٨.٨
The son	١٢	١٨.٨
Daughter- in –law	١٣	٢٠.٣
One of the relatives	٣	٤.٧
Marital status		
Single	١٥	٢٣.٤
Married	٤٩	٧٦.٦
Educational level		
Can't read and write	٢	٣.١
Basic education	١٣	٢٠.٣
Secondary education	٣٤	٥٣.٢
University education	١٥	٢٣.٤
Occupation		
Student	٨	١٢.٥
Employed	٦	٩.٤
Housewife	٣٠	٤٦.٩
Retired	٣	٤.٧
Free work	١٠	١٥.٦
Not working	٧	١٠.٩
Place of residence		
With the patient	٥٢	٨١.٢
House near from the patient	١٢	١٨.٨

Table (٧): Shows that; ٤٢.٢ % of the studied caregivers aged less than ٣٠ years with mean age was ٣٧.٢١±١٣.٨٧, ٧٣.٤ % of them were females and ٧٦.٦ % of them were married. Regarding educational level, ٥٣.٢% of the studied caregivers had secondary education, ٤٦.٩ % of them were housewives, ٨١.٢ % of them lived with the patients and ٢٩.٧% of them were the wives of the patients that cared of them.

Table (۳): Frequency distribution of the studied patients regarding their health profile (n=۶۴).

Items	No.	%
Duration of diabetes		
> ۰ years old	۲	۳.۱
۰- < ۱۰ years old	۱۷	۲۶.۶
≥ ۱۰ years old	۴۵	۷۰.۳
Patient's complaint		
Loss of sensation of pain, cold and heat	۱۸	۲۸.۱
Changing the shape of the foot when wearing narrow shoes for a long time.	۴	۶.۳
Dryness of the foot, which results in peeling and cracking	۲۶	۴۰.۶
Blistering on both sides of the foot	۲۶	۴۰.۶
The inability of the foot to fight infection and cure it	۴۲	۶۵.۶
Diseases or other problems suffering from		
Hypertension	۴۰	۶۲.۵
High cholesterol	۱۰	۱۵.۶
Peripheral arteriosclerosis	۸	۱۲.۵
Heart disease	۱۴	۲۱.۹
kidney diseases	۱۲	۱۸.۸
The amputated part of patient's foot		
Toe of foot	۳۶	۵۶.۲
Metatarsal bone of the foot	۲۸	۴۳.۸
Factors that lead to diabetic foot amputation		
High blood sugar level that is irregular and uncontrolled for a long time	۵۴	۸۴.۴
Past history of the patient or in the family of a foot ulcer, amputation, or diabetic foot	۱۰	۱۵.۶
High level of harmful cholesterol and triglycerides	۱۰	۱۵.۶
Smoking or drinking alcohol	۴	۶.۳
Lack of interest and care for the feet	۴۲	۶۵.۶
Repeated injuries to the feet due to walking barefoot and not wearing shoes	۱۰	۱۵.۶
Excessive pressure on the foot due to excess weight and not wearing appropriate shoes	۱۲	۱۸.۸
Bruising or burning with hot water, walking on a hot floor, or using mousse or sharp materials to clean the feet and wrong ways to cut nails.	۸	۱۲.۵
Increasing foot inflammations	۲۸	۴۳.۸
The appearance of swellings and cracks of the skin on a continuous basis	۲۴	۳۷.۵
Appearing the foot ulcers.	۳۴	۵۳.۱
Increasing necrosis in the foot that does not respond to treatment	۱۸	۲۸.۱
Medications that are taken for diabetes		
Oral tablet	۳۰	۴۶.۹
Insulin injection	۳۴	۵۳.۱

*Answers are not mutually exclusive

Table (۳): Shows that; ۷۰.۳% of the patients with post diabetic foot amputation had diabetes mellitus for ۱۰ years and above, ۶۵.۶ % of them complained from inability of the foot to fight infection and cure it, ۶۲.۵% of them had hypertension, ۵۶.۳% of them had metatarsal foot amputation, ۸۴.۴% of them had high blood sugar level that was irregular and uncontrolled for a long time. According to medications of diabetes mellitus, ۵۳.۱% of the patients used insulin injection for treatment of diabetes.

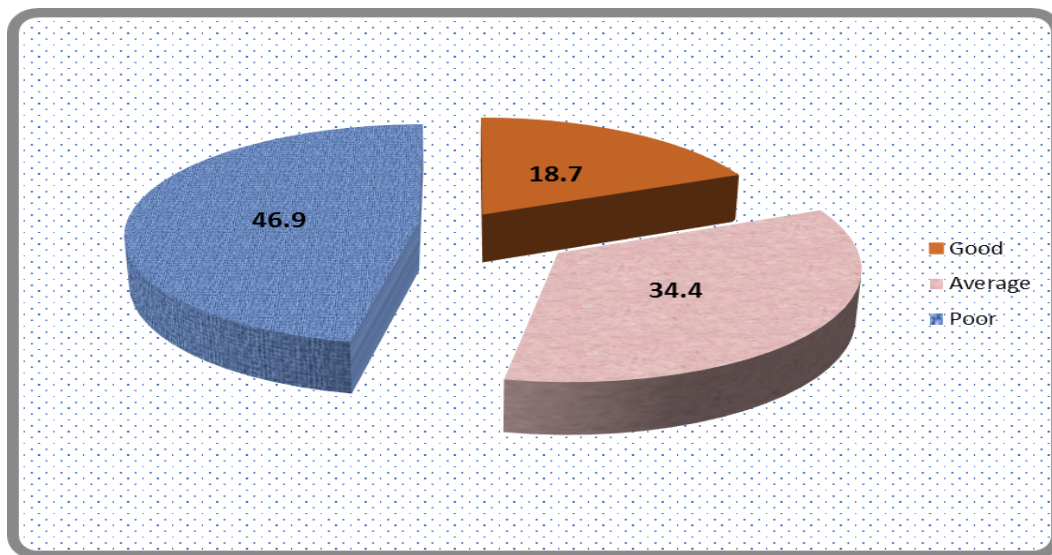


Figure (١): Percentage distribution of the studied caregivers regarding their total knowledge score about diabetic foot amputation (n=٦٤).

This figure illustrates that; ٤٦.٩ % of the studied caregivers had poor total knowledge score about diabetic foot amputation and only ١٨.٧ % of them had good total knowledge score about diabetic foot amputation.

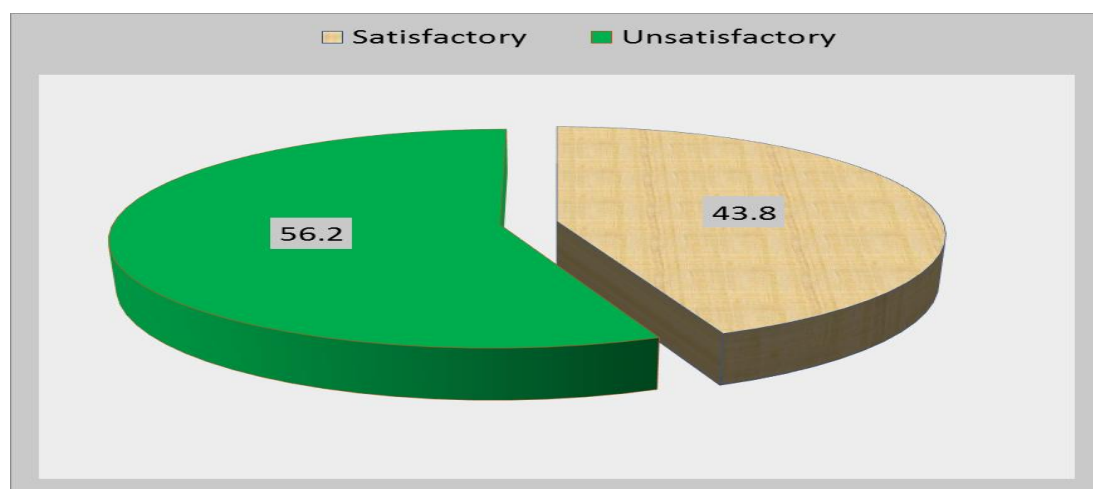


Figure (٢): Percentage distribution of the studied caregivers regarding their total reported practices score about care of patients with post diabetic foot amputation (n=٦٤).

This figure illustrates that; ٥٦.٢% of the studied caregivers had unsatisfactory total practices score regarding care of their patients with post diabetic foot amputation and ٤٣.٨% of them had satisfactory total practices score regarding care of their patients with post diabetic foot amputation.

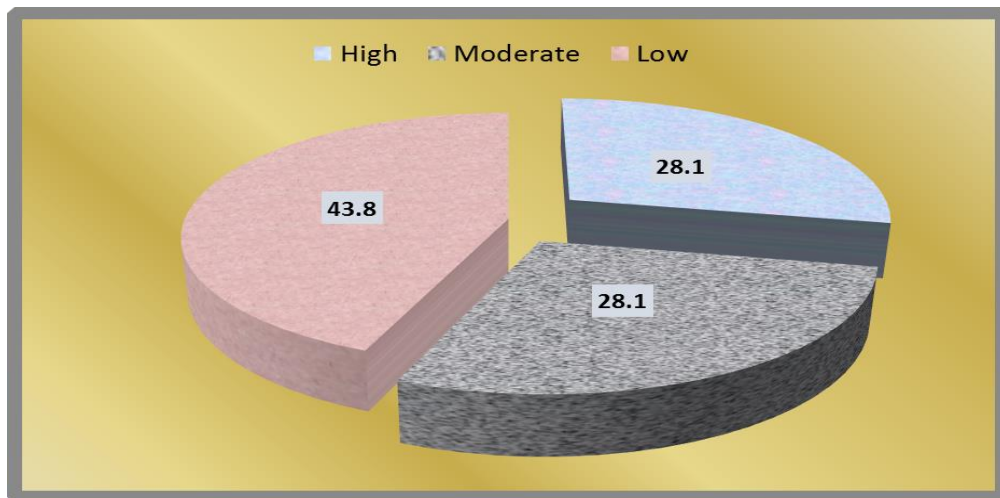


Figure (٣): Percentage distribution of the studied patients regarding their total satisfaction about caregiver care (n=٦٤).

This figure illustrates that; ٢٨.١ % of the patients had high and moderate satisfaction regarding caregivers care respectively and ٤٣.٨ % of them had low satisfaction regarding caregivers care.

Table (4): Correlation matrix between total caregivers' knowledge, total practices and patients' total satisfaction scores (n=74).

Items		Total knowledge	Total practices	Total patient satisfaction
Total knowledge	R	1	.771**	.733**
	p-value		.000	.000
	N	74	74	74
Total practices	R	.771**	1	.782**
	p-value	.000		.000
	N	74	74	74
Total patient satisfaction	R	.733**	.782**	1
	p-value	.000	.000	
	N	74	74	74

** Highly significant difference < .001

Table (10): Reveals that; there were positive highly statistically significant correlations between total caregivers' knowledge, total practices and patients' total satisfaction regarding care of caregivers for patients with diabetic foot amputation.

Discussion:

Diabetes Mellitus (DM) is a global health concern. It's the leading cause of morbidity and mortality worldwide. The complications of DM include nerve damage and poor blood circulation. These problems make the

feet vulnerable to skin sores (ulcers) that can worsen quickly and are difficult to treat. Poor glycemic control is a significant risk factor for amputation in diabetic foot patients (*Farooque et al., 2019*). Diabetic foot ulcers are one of the major

complications of DM and have a substantial impact on the health status of the affected patients. Diabetic foot amputation as a treatment of diabetic foot ulcer is probably a major burden for the individuals from the patient's family and friends, as caregivers often support the patient in coping with the physical disabilities and emotional distress (*Çamur et al.*, 2020).

This study aimed to assess awareness of caregivers regarding care of patients with post diabetic foot amputation. It will discuss under three main sections: Demographic characteristics of patients with diabetic foot amputation, patients' caregivers and patients' health profile, assessing knowledge and practices of caregivers about diabetic foot amputation for developing instruction guideline to help caregivers to improve care of foot and daily living activities for patients with post diabetic foot amputation.

According to demographic characteristic of the studied patients

with diabetic foot amputation, the finding of the present study showed that; less than half of the patients with diabetic foot amputation aged ranged from 60 years old and more (table 1). This finding agreed with *Verrone et al.* (2017), they studied Risk Factors for Foot Amputation in Patients Hospitalized for Diabetic Foot Infection at the Vascular Surgery Clinic of the Conjunto Hospitalar de Sorocaba, in Sorocaba county, São Paulo state, southeastern Brazil Brazil, (n = 100) and they found that 50 % of patients older than 60 years old. This might be due to ageing is a most common risk factor for developing of complication of diabetes mellitus.

The current study revealed that; more than two- third of the patients with diabetic foot amputation were males (table 1). This finding agreed with *Julien et al.* (2020), they studied Short Duration of Post-Amputation Antibiotic Therapy in Diabetic Foot Patients with Total Resection of Osteomyelitis at the

University Hospital of Reims, France, (n = 10) and they found that 43% of their participants were males. Also this finding agreed with **Sayiner et al.** (2019), they studied Patients' Clinical Characteristics and Predictors for Diabetic Foot Amputation at the Department of Endocrinology and Metabolism of the Faculty of Medicine of Gaziantep University between the years of 2012–2017, (n = 100) and they found that 40.6 % of their subjects were males.

Concerning to the marital status of the studied patients, the current study revealed that; the majority studied sample were married (**table 1**). This finding was in the same line with **Yacout** (2016), who studied Knowledge and Practices of Type II Diabetic Patients' Regarding Diabetic Foot Self-Care and their Foot Disorders at Teaching Hospital and Ministry of Health outpatient clinics in Damanhour, (N= 360) and found that 80.5% of the studied sample were married.

Regarding the educational level of the studied patients with diabetic foot amputation, the present study revealed that; approximately more than one third of the patients with diabetic foot amputation had basic education (**table 1**). This finding agreed with **Li & Guo** (2019), they studied An educational Intervention on Foot Self-Care Behavior among Diabetic Retinopathy Patients with Visual Disability and their Primary Caregivers at A first Class Comprehensive Hospital in Nantong City in China from July–September 2017, (n=88) and they reported that 29.33% of this patients had attained education primary education. In other hand, this finding was incongruent with **Bajwa et al.** (2015), they studied Social-Behavioral, Clinical and Anesthetic Concern Associated with Diabetic Foot Amputation in A tertiary Care Institute of North India for Social Health Diabetes, (n= 111) and they reported that 32.45% of their participants had attained education above secondary school.

Regarding the residence of the studied patients with diabetic foot amputation, the present study revealed that; approximately most of the studied patients with diabetic foot amputation lived in rural area (**table 1**). This finding agreed with **Mostafa et al. (2015)**, they studied Effect of Implementing Rehabilitation Program on Knowledge, Physical and Psychological Function of Patients Had Lower Limb Amputation in The Vascular Surgery Department, Outpatient Clinics of The Vascular Surgery, Physiotherapy Department at Assiut University Hospital, (n=30) and they reported that; 86.7% of their participants lived in rural areas.

Concerning income/ month of the studied patients with diabetic foot amputation, the present study revealed that; approximately most of the studied patients with diabetic foot amputation hadn't enough income in month (**table 1**). This is might be due to during collecting data was found that more than one third of the studied

patients were free workers and farmers as their source of income.

According to demographic characteristic of caregivers for patients with diabetic foot amputation, the finding of the present study showed that, less than half of caregivers of patients with diabetic foot amputation aged less than 30 years old and with mean age was 37.21 ± 13.87 (**table 2**). This finding agreed with **Ojoawo et al. (2017)**, they studied Comparison the Burden of Caregiving among Different Levels of Amputation at selected Hospitals in South-West Nigeria, (n=66) and they found that mean \pm SD of caregivers age was 36.6 ± 13.0 . As well, this finding was in congruent with **Alves Costa & Pereira (2018)**, they studied Predictors and Moderators of Quality of Life in Caregivers of Amputee Patients by Type 2 Diabetes at six Hospital Units in The Northern region of Portugal, (n=101) and they found that mean \pm SD of caregivers age was 51.60 ± 10.32 . This might be due to younger age group had more

time to take care of their loved ones during periods of illness unlike most adults were very busy with their work and family.

As regards to sex, the result of the present study showed that nearly three quarters of caregivers for patients with diabetic foot amputation were females (**table ۲**). This finding agreed with **Costa et al.** (۲۰۲۰), they studied Burden and Quality of Life in Caregivers of Patients with Amputated Diabetic Foot at Clinics of six Hospitals in Northern Portugal, (n=۱۱۰) and they found that ۷۷.۳% of caregivers were females.

As regards to kinship degree of caregivers from the patients, the results of the present study showed that less than one third of caregivers were wives of the patient with diabetic foot amputation (**table ۲**). This finding agreed with **Çamur et al.** (۲۰۲۰), they studied Effect of Lower Extremity Amputation on Caregiving Burden in Caregivers of Patients with Diabetic Foot:

Prospective Cohort Study at A Single-Level Trauma Center in Turkey from June ۲۰۱۶ to December ۲۰۱۸, (n=۱۲۹) and they found that ۲۷% of caregivers were wives of their patients with diabetic foot amputation.

As regards to the marital status, the result of the present study showed that more than two thirds of caregivers for patients with diabetic foot amputation were married (**table ۲**). This finding agreed with **Çamur et al.** (۲۰۲۰) and they found that ۷۳% of caregivers of patients were married. As well, this finding in the same line with **Costa, et al.** (۲۰۲۰) and they found that ۷۹.۹ % of their caregivers were married.

As regards to their educational level, the results of the present study showed that more than half of caregivers for patients with diabetic foot amputation had secondary education (**table ۲**). This finding disagreed with **Abd El-Rahman & Abo-Shousha** (۲۰۱۵), they studied

Effect of An educational Program on Caregivers, Knowledge about Diabetic Foot Care at Elderly Home in Damanhur–Egypt, (n=33) and they found that 34.4% of caregivers patients were illiterate.

As regards to their occupation, the result of the present study showed that; less than half of caregivers for patients with diabetic foot amputation were housewives (table 2). This finding agreed with **Alves Costa & Pereira** (2018) and they found that 40% of their caregivers were unemployed.

The result of the present study revealed that; the majority of the studied caregivers for patients with diabetic foot amputation lived with patient (table 2). This finding might be due to the most of caregivers are patients' wives, their son and daughter that live with them because people in rural areas prefer to live with extended family

Regarding to the studied patient's health profile, the present

study showed that; less than three quarters of patients with diabetic foot amputation had diabetes from 10 years or more (table 3). This finding agreed with **Pourkazemi et al.** (2020), they studied Diabetic Foot Care: Knowledge and Practice was conducted in Jazan Town, the Provincial capital of Jazan region in South-Western Part of Saudi Arabia, (n=200) and they found that 72 % of patients with diabetic foot amputation had diabetes from 10 years or more.

Concerning health profile of patients with diabetic foot amputation, the present study results showed that; nearly two thirds of the studied patients with diabetic foot amputation complained from inability of the foot to fight infection and cure it (table 3). This finding disagreed with **Gordon et al.** (2020), they studied Accuracy of A foot Temperature Monitoring Mat for Predicting Diabetic Foot Ulcers in Patients with Recent Wounds or Partial Foot Amputation at Centers for Medicare and Medicaid Services

in the United States, (n=129) and they found that 62% of their participants complained from inability of the foot to fight infection and cure it.

The present study results showed that; more than half of patients with diabetic foot amputation had amputation in toe of foot (**table 3**). This finding agreed with **Abdelhamied et al.**, (2016), they studied Factors Affecting Wound Healing and Needs among Patients with Diabetic Foot Ulcer: Suggested Nursing Guidelines at Outpatient Clinic at Zagazig University, (n=20) and they found that 67% of their subjects had toe amputation.

The results of the present study showed that; less than two thirds of patients with diabetic foot amputation suffered from hypertension (**table 3**). This finding agreed with **Czerniecki et al.** (2017), they studied the Development and Validation of the Ampredict Model for Predicting Mobility Outcome after Dysvascular Lower Extremity Amputation at Four

Veterans Administration Medical Centers (Located in Seattle, Portland, Houston and Dallas), (n=200) and they found that 83% of their participants with diabetic foot amputation had hypertension.

The result of the present study showed that; the majority of patients with diabetic foot amputation had high blood sugar level that is irregular and uncontrolled for a long time (**table 3**). This finding agreed with **Niakan et al.** (2020), they studied Clinical Outcome and Determinants of Amputation in A Large Cohort of Iranian Patients with Diabetic Foot Ulcers at Outpatient DFU Clinics of Namazi Hospital, A tertiary Healthcare Center Affiliated with Shiraz University of Medical Sciences, Southern Iran, (n= 432) and reported that 80.1% of their participants with diabetic foot amputation had high blood sugar level that is irregular and uncontrolled for a long time

The result of the present study showed that; more than half of patients with diabetic foot amputation took insulin injection for treatment of diabetes (**table 3**). This finding was congruent with **Bajwa et al.** (2015), (n= 111) and reported that 67.7% of their participants took insulin injection for treatment of diabetes. In the other hand, this finding disagreed with **Yacout** (2016), who found 9.9 % of their subjects took on oral diabetic medication.

Concerning the total knowledge score of caregivers regarding care of their patients with diabetic foot amputation, the results of the current study revealed that less than half of caregivers had poor total knowledge score about care of their patients with diabetic foot amputation (**figure 2**). This finding was congruent with **Kenchetty & George** (2014), they studied Study on the Awareness on Diabetic Foot Care among Caregivers of Patients with Diabetes at A tertiary Care Hospital in Mangalore with Diabetic Foot Ulcers, (n=33) and they

found that 43.6% of their caregivers had poor total knowledge score about care of patients with diabetic foot. This might be due to decreased accessibility of health services in rural areas and they didn't see doctors unless there was patient's problem and had low level of education.

Concerning to total reported practice score of caregivers toward care of patients with post diabetic foot amputation, the result of the present study showed that more than half of the studied caregivers had unsatisfactory total practices score regarding care of their patients with post diabetic foot amputation (**figure 3**). This finding was incongruent with **Primanda et al.** (2017), they studied the Effect of the Foot Care Education Program on Knowledge and Self-Efficacy among Family of Diabetes Mellitus Patients in Medical and Surgical Nursing Department, School of Nursing, University Muhammadiyah Yogyakarta, Indonesia, (n= 26) and they found that 76 % of the caregivers

had satisfactory practices regarding care of their patients with diabetic foot amputation. This might be due to caregivers' poor knowledge and lack of proper communication between patients' caregivers and medical team and inadequate education which may be reflected on their practices.

As regards to patients' total satisfaction regarding care provided by their caregivers, the results of the present study showed that nearly half of the studied patients had low total satisfaction regarding caregivers care (**figure 9**). This might be due to nearly half of patients' age ranged from 70 and more, this age needs more attention and care from their caregivers.

The results of the present study showed that there were a positive highly statistically significant correlation between total knowledge score of caregivers toward care of patients with post diabetic foot amputation; and their total practices score toward care of patients with

post diabetic foot amputation (**table 10**). This might be due to knowledge play an important role in changing behavior leading to change of practices. The decrease in total knowledge was associated with a decrease in the total practice score. This finding agreed with **Pourkazemi et al.** (2020); they found significant correlation between caregivers' knowledge and practice of patient with diabetic foot.

The results of the present study showed that there was a positive highly statistically significant correlation between patients' total satisfaction and care provided by caregivers post diabetic foot amputation (**table 10**). This might be due to the caregivers adhered with doctors' instructions that were associated with an increase in healing of wound and patients felt with assurance with their family.

Conclusion

Based on the results of the present study and research hypothesis, the study concluded that:

Nearly half of patients with diabetic foot amputation were age ranged from 60 to less than 70 years old, with mean age was 68.71 ± 6.06 , 70.3 % of them were males, 81.3 of them were married, 34.4 % of the studied sample had basic education, 37.0 % of them had free work, 81.2 % of them lived in rural areas in nuclear families and 89.1% of them hadn't enough income/ month. As regard to patients' caregivers 42.2 % of them aged less than 30 years with mean age was 37.21 ± 13.87 , 72.4 % of them were females and 76.6 % of them were married, 03.2% of them had secondary education, 46.9 % of them were housewives, 81.2 % of them lived with the patients and 29.7% of them were the wives of the patients that cared of them. Only less than one-third of the studied caregivers had good total knowledge score about diabetic foot amputation, more than half of the studied caregivers had

unsatisfactory practices and more than two third of studied patients had low satisfaction regarding caregivers care. There were positive highly statistically significant correlations between total caregivers' knowledge, total practices and patients' total satisfaction regarding care of caregivers for patients with diabetic foot amputation.

Recommendations:

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

- 1-The findings can be used to guide health education programs for patients' post diabetic foot amputation and their caregivers on foot care and prevent recurrence the foot ulcers and amputations.
2. Emphasize the importance of educating the individuals at risk on annual screening for diabetic complications and on practice of diabetes foot care.
3. Recommendations and guidelines in advertising media and medical caravans on the importance of prevention, treatment and

reduction of complication among diabetic patients.

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