

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

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Abstract

Background: Diabetic foot amputation is 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. **Aim of 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. **Sample:** Convenience sample of caregivers for patients with diabetic foot amputation from (40- ≤ 70 years) with post diabetic foot amputation within six months from amputation. **Tools: Two tools were used I):** A structured interviewing questionnaire which consists of three parts. A): Demographic characteristics of patients, caregivers and patients' health profile B): Knowledge of caregivers about post diabetic foot amputation, C): Reported practices of caregivers regarding care of patients with post diabetic foot amputation, **II):** Scale to measure patients' satisfaction regarding care provided by their caregivers. **Results:** 46.9 % of caregivers had poor total knowledge about diabetic foot amputation, 56.2% of them had unsatisfactory total practices regarding care of their patients with post diabetic foot amputation and 43.8 % of the patients had low satisfaction regarding caregivers care. **Conclusion:** There were positive highly statistically significant correlations between total caregivers' knowledge, total reported practices and patients' total satisfaction regarding care of caregivers for their patients with diabetic foot amputation. **Recommendations:** Health education program for patients with post diabetic foot amputation and their caregivers to increase knowledge and practice and prevent the recurrence of foot ulcers and amputations.

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. 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 2045 (**Diabetes Research and Clinical Practice (DRCP), 2019**). Diabetic foot ulcers 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

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population and more than 50% 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 diabetic foot amputation and their caregivers to reduce the incidence of foot disease and reamputation (**Goie & Naidoo, 2016**).

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 re-amputation. 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 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%–25% 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 85% of all amputation (**American Diabetes Association (ADA), 2020**).

Aim of the study

The study aimed to assess awareness of caregivers regarding care of patients with post diabetic foot amputation

Research question

- 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 a relationship between demographic characteristic, 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.

Setting:

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 (40- ≤ 70 years) with post diabetic foot amputation attended the previously mentioned settings within six months from amputation for four months.

Tools of data collection:

Two tools were used to collect the data

Tool (I): A structured interviewing questionnaire: 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:

Part 1: It was concerned with demographic characteristics of the studied sample. This part included three items:

A-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).

B-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 and place of residence).

C-It was designed to collect data about health profile of post diabetic foot amputation patients; it comprised of six 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).

Part 2: - 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,

Hospitals Names	The total number of caregivers for patients who attended within 6 months from amputation.
Benha University Hospital	14
Benha Teaching Hospital	18
Health Insurance Hospital	32
Total	64

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medications used in the treatment of post diabetic foot amputation, complications of diabetic foot amputation and preventive measures from diabetic foot amputation).

Scoring system:

The scoring system for caregivers' knowledge was calculated as follows (2) score for correct and complete answer, while (1) score for correct and incomplete answer and (0) 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 $\geq 75\%$ (≥ 18 point), while considered average if it equals 50-75% (12-18 point) and considered poor if it is $< 50\%$ (< 12 point).

Part3: Reported practice through asking questions of caregivers regarding care of diabetic foot amputation which divided into four items as: **Nutrition:** It comprised of six questions, **treatment regimen and follow up:** It comprised of nine questions, **taking proper care of the healthy foot and avoiding any problems with it:** It comprised of nineteen questions, **daily living activity:** it comprised of sixteen questions

Scoring system:

Each step of caregivers' practices has two levels of answers: Done and not done. These were respectively scored 1, 0. 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 = (50 points) was considered satisfactory if the score of the total practices $\geq 60\%$ (≥ 30 points), while considered unsatisfactory if it is $< 60\%$ (< 30 points).

Tool (II):- scale to measure patients' satisfaction regarding care provided by caregivers It comprised of twenty (20) statements; **adapted by (hawthorne et al., 2006).** 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 (caregivers' communication with the patients, caregivers' communication with the patients and patient's satisfaction as regards caregiver's skills and their competences)

Scoring system:

The Interviewing Patient's Satisfaction Questionnaire (IPSQ): It comprised of twenty (20) statements; all statements were scored on a four points Likert Rating Scale whereas, (strongly agree = 4, agree =3, disagree = 2 and strongly disagree =1). 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 = (20 point) was considered high if the score of the total patient's satisfaction $\geq 75\%$ (≥ 15 points), while considered moderate if it equals 50-75% (10-15) point, and considered low if it is $< 50\%$ (< 10 points).

Content validity:

The tools validity was done by five staff nursing experts from Community Health Nursing in Benha Faculty of Nursing who reviewed the tools for clarity, relevance, comprehensiveness, and applicability.

Reliability of 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 0.94, while practices were 0.90 and patient's satisfaction was 0.97.

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 30-45 minutes. No modifications were done, so the pilot study sample was included in the total sample.

Fieldwork:

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 30-45minutes, the average number interviewed at the Surgical Outpatient Clinics were 0-1 caregivers/day depending on their responses of the interviewers.

Statistical analysis:

Computerized data entry and statistical analysis were fulfilling scored using Statistical Package for Social Science (SPSS), version (22). Descriptive statistic was first applied (frequency, percentage) then other statistical test such as, Chi-square and using mean and stander deviation.

The correlation- coefficient was used (r).

Statistical significance was considered at:

- Significant result when P- value < 0.05.
- Highly significant result when P- value <0.001.
- Non- significant result when P-value >0.05.

Results:

Table (1): Shows that; 46.9 % of the studied patients aged from 60 to less than 70 years old with mean age was 58.71 ± 6.56 , 70.3 % of them were males and 81.3 % of them were married. Regarding the educational level, 34.4 % of the studied patients had basic education, 37.5 % of them had free work, 81.2 % of them lived in rural areas in nuclear families and 89.1% of them hadn't enough monthly/ income.

Table (2): Shows that; 42.2 % of the studied caregivers aged less than 30 years old with the mean age was 37.21 ± 13.87 , 73.4 % of them were females, 76.6 % of them were

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married and 29.7% of them were the wives of the patients that cared of them. Regarding educational level, 53.2% of the studied caregivers had secondary education, 46.9 % of them were housewives and 81.2 % of them lived with the patients

Table (3): Presents that; 70.3% of the patients with post diabetic foot amputation had diabetes mellitus for 10 years and above, 65.6 % of them complained from inability of the foot to fight infection and cure it, 62.5% of them had hypertension, 56.3% of them had metatarsal foot amputation, 84.4% of them had high blood sugar level that was irregular and uncontrolled for a long time. According to medications of diabetes mellitus, 53.1% of the patients used insulin injection for treatment of diabetes.

Figure (1): Illustrates that; 46.9 % of the studied caregivers had poor total knowledge score about diabetic foot amputation and only 18.7 % of them had good total knowledge score about diabetic foot amputation.

Figure (2): Shows that; 56.2% of the studied caregivers had unsatisfactory total practices score regarding care of their patients with post diabetic foot amputation and 43.8% of them had satisfactory total practices score regarding care of their patients with post diabetic foot amputation.

Figure (3): Reveals that; illustrates that; 28.1 % of the patients had high and moderate satisfaction regarding caregivers care respectively and 43.8 % of them had low satisfaction regarding caregivers care.

Table (4): Reveals that; there were no statistically significant relation between caregivers' demographic characteristics and their total knowledge score (P-value > 0.05).

Table (5): Reveals that; there was statistically significant relation between kinship degree of the caregiver to the patient and their total reported practices toward them

(P-value< 0.05) and there were no statistically significant relations between caregivers' ages, their marital status, their educational level and their occupation and their total reported practices (P-value > 0.05).

Table (6): 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.

Table (1): Frequency distribution of the studied patients regarding their demographic characteristics (n=64).

Patients' Characteristics	No.	%
Age		
40-<50 years	7	10.9
50-<60 years	27	42.2
60 -<70 years	30	46.9
Mean ±SD		58.71±6.56
Sex		
Male	45	70.3
Female	19	29.7
Marital status		
Married	52	81.3
Widow	10	15.6
Divorced	2	3.1
Educational level		
Can't read or write	21	32.8
Basic education	22	34.4
Secondary education	21	32.8
Occupation		
Employed	7	10.9
Housewife	18	28.2
Free work	24	37.5
Retired	15	23.4
Place of residence		
Urban	12	18.8
Rural	52	81.2
Type of family		
Nuclear family	47	73.4
Extended family	17	26.6
Family monthly income		
Enough and save	7	10.9
Not enough	57	89.1

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Table (2): Frequency distribution of the studied caregivers regarding their demographic characteristics (n=64).

Caregivers' Characteristics	No.	%
Age		
<30	27	42.2
30-<40	9	14.0
40-<50	12	18.8
50+	16	25.0
Mean±SD	37.21±13.87	
Sex		
Male	17	26.6
Female	47	73.4
Kinship degree to the patient		
The wife	19	29.7
The husband	5	7.7
The daughter	12	18.8
The son	12	18.8
Daughter- in –law	13	20.3
One of the relatives	3	4.7
Marital status		
Single	15	23.4
Married	49	76.6
Educational level		
Can't read and write	2	3.1
Basic education	13	20.3
Secondary education	34	53.2
University education	15	23.4
Occupation		
Student	8	12.5
Employed	6	9.4
Housewife	30	46.9
Retired	3	4.7
Free work	10	15.6
Not working	7	10.9
Place of residence		
With the patient	52	81.2
House near from the patient	12	18.8

Table (3): Frequency distribution of the studied patients regarding their health profile (n=64).

Items	No.	%
Duration of diabetes		
<5 years old	2	3.1
5– <10 years old	17	26.6
≥ 10 years old	45	70.3
Patient's complaint		
Loss of sensation of pain, cold and heat	18	28.1
Changing the shape of the foot when wearing narrow shoes for a long time.	4	6.3
Dryness of the foot, which results in peeling and cracking	26	40.6
Blistering on both sides of the foot	26	40.6
The inability of the foot to fight infection and cure it	42	65.6
Diseases or other problems suffering from		
Hypertension	40	62.5
High cholesterol	10	15.6
Peripheral arteriosclerosis	8	12.5
Heart disease	14	21.9
kidney diseases	12	18.8
The amputated part of patient's foot		
Toe of foot	36	56.2
Metatarsal bone of the foot	28	43.8
Factors that lead to diabetic foot amputation		
High blood sugar level that is irregular and uncontrolled for a long time	54	84.4
Past history of the patient or in the family of a foot ulcer, amputation, or diabetic foot	10	15.6
High level of harmful cholesterol and triglycerides	10	15.6
Smoking or drinking alcohol	4	6.3
Lack of interest and care for the feet	42	65.6
Repeated injuries to the feet due to walking barefoot and not wearing shoes	10	15.6
Excessive pressure on the foot due to excess weight and not wearing appropriate shoes	12	18.8
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.	8	12.5
Increasing foot inflammations	28	43.8
The appearance of swellings and cracks of the skin on a continuous basis	24	37.5
Appearing the foot ulcers.	34	53.1
Increasing necrosis in the foot that does not respond to treatment	18	28.1
Medications that are taken for diabetes		
Oral tablet	30	46.9
Insulin injection	34	53.1

*Answers are not mutually exclusive

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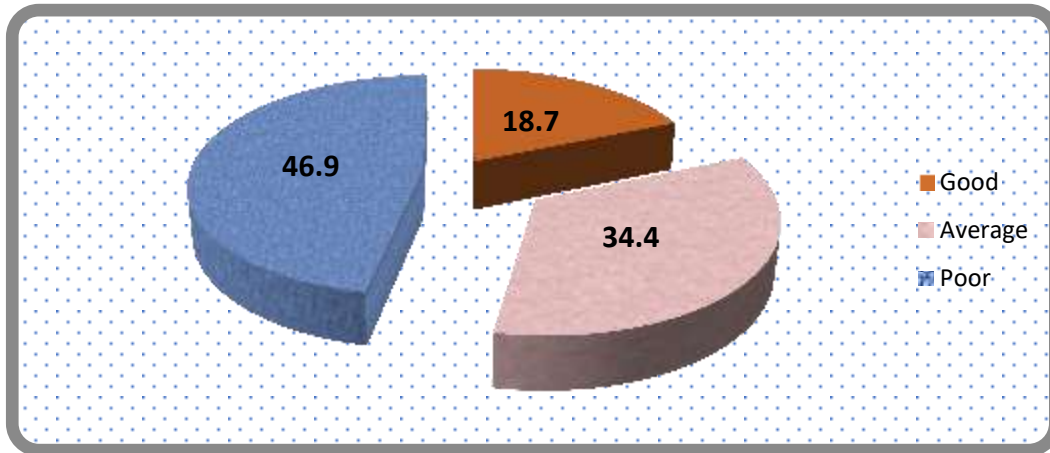


Figure (1): Percentage distribution of the studied caregivers regarding their total knowledge score about diabetic foot amputation (n=64).

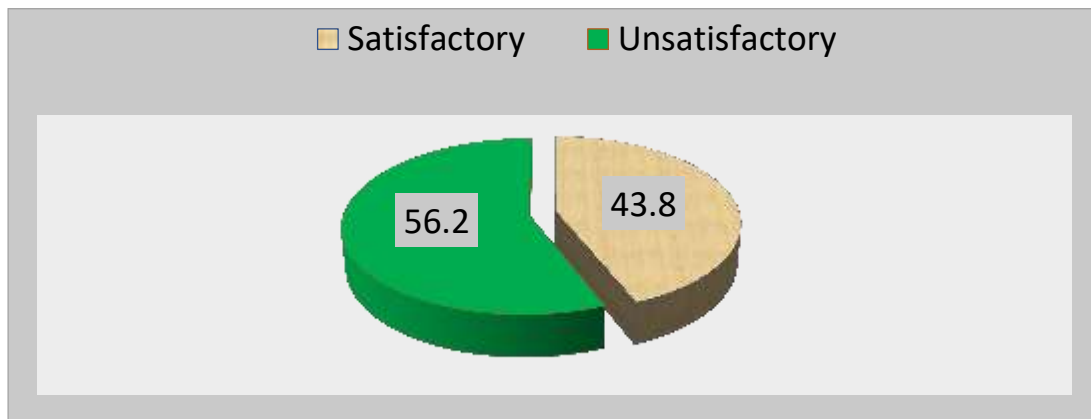


Figure (2): Percentage distribution of the studied caregivers regarding their total reported practices score about care of patients with post diabetic foot amputation (n=64).

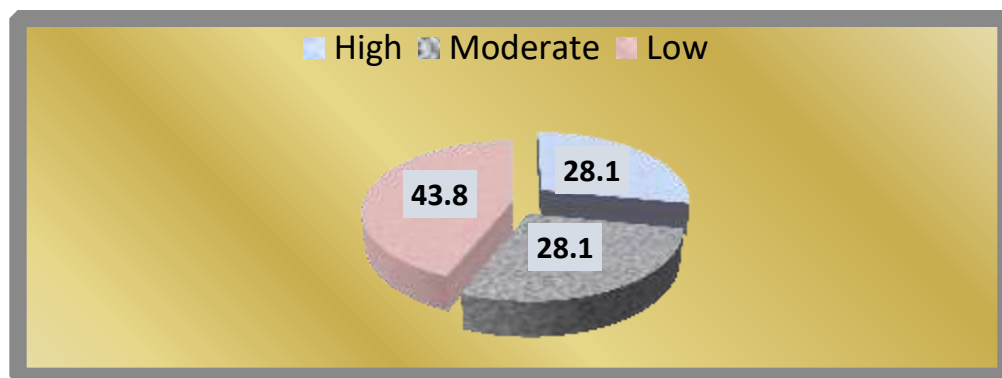


Figure (3): Percentage distribution of the studied patients regarding their total satisfaction about caregiver care (n=64).

Table (4): Relations between the caregivers' demographic characteristics and their total knowledge level about diabetic foot amputation (n=64).

Caregivers' characteristics	Total knowledge score							X ²	p-value
	Poor (n=30)		Average (n=22)		Good (n=12)				
	no	%	No	%	No	%			
Age									
<30	10	33.3	10	45.5	7	58.3	5.79	0.447	
30-<40	5	15.7	3	13.6	3	25			
40-<50	6	20	4	18.2	0	0.0			
50+	9	30.0	5	22.7	2	16.7			
Sex									
Male	10	33.3	4	18.2	3	25.0	1.512	0.469	
Female	20	66.7	18	81.8	9	75.0			
Marital status									
Single	6	20.0	7	31.8	2	16.7	1.365	0.505	
Married	24	80.0	15	68.2	10	83.3			
Educational level									
Can't read and write	2	6.7	0	0.0	0	0.0	9.686	0.139	
Basic education	9	30.0	4	18.2	1	8.3			
Secondary education	16	53.3	11	50	6	50.0			
University education	3	10.0	7	31.8	5	41.7			
Occupation									
Student	2	6.7	3	13.6	3	25.0	15.241	0.124	
Employed	3	10	2	9.1	2	16.7			
Housewife	16	53.3	10	45.5	3	25.0			
Retired	0	0.0	2	9.1	1	8.3			
Free work	8	26.7	1	4.5	1	8.3			
Not working	1	3.3	4	18.2	2	16.7			
Place of residence									
With the patient	26	86.7	19	86.4	7	58.3	5.092	0.078	
House near from the patient	4	13.3	3	13.6	5	41.7			

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Table (5): Relations between the caregivers' demographic characteristics and their total reported practices level about the care of post diabetic foot amputation (n=64).

Caregivers' characteristics	Total reported practices score					
	Unsatisfactory (n=36)		Satisfactory (n=28)		X2	p-value
	No.	%	No.	%		
Age						
<30	16	44.4	11	39.3	6.471	0.091
30-<40	4	11.1	5	17.9		
40-<50	10	27.8	2	7.1		
50+	6	16.7	10	35.7		
Sex						
Male	12	33.3	5	17.9	1.934	0.164
Female	24	66.7	23	82.1		
Kinship degree to the patient						
The wife	9	25	9	32.1	11.874 ^a	0.037*
The husband	2	5.6	3	10.7		
The daughter	9	25.0	3	10.7		
The son	11	30.5	2	7.1		
Daughter- in- law	3	8.3	10	35.7		
One of the relatives	2	5.6	1	3.6		
Marital status						
Single	11	30.6	4	14.3	2.323	0.127
Married	25	69.4	24	85.7		
Educational level						
Can't read and write	2	5.6	0	0.0	1.64	0.65
Basic education	7	19.4	6	21.4		
Secondary education	19	52.8	15	53.6		
University education	8	22.2	7	25.0		
Occupation						
Student	5	13.9	3	10.7	9.322	0.097
Employed	3	8.3	3	10.7		
Housewife	15	41.7	14	50.0		
Retired	0	0.0	3	10.7		
Free work	9	25.0	1	3.6		
Not working	4	11.1	4	14.3		
Place of residence						
With the patient	29	80.6	23	82.1	0.026	0.872
House near from the patient	7	19.4	5	17.9		

***Significant P < 0.05**

Table (6): Correlation matrix between total caregivers' knowledge, total practices and patients' total satisfaction scores (n=64).

Items		Total knowledge	Total practices	Total patient satisfaction
Total knowledge	R	1	.771 ^{**}	.733 ^{**}
	p-value		.000	.000
	N	64	64	64
Total practices	R	.771 ^{**}	1	.682 ^{**}
	p-value	.000		.000
	N	64	64	64
Total patient satisfaction	R	.733 ^{**}	.682 ^{**}	1
	p-value	.000	.000	
	N	64	64	64

**** Highly significant difference < 0.001**

Discussion:

Diabetes Mellitus 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**).

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 age ranged from 60 years old and more. This finding agreed with **Verrone et al. (2016)**, 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 country, São Paulo state, southeastern Brazil, (n = 100) and they found that 55 % of patients older than 60 years old. This might be due to aging 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. 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 = 15) and they found that 73% of their participants were males.

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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, (n = 400) and they found that 70.6 % of their subjects were males.

Concerning to the marital status of the studied patients, the current study revealed that; the majority of the studied sample were married. 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 80.7% 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. This finding agreed with **Li et al., (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, (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= 171) and they reported that 32.74% 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; the majority of the studied patients with diabetic foot amputation lived in rural area. 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 at The Vascular Surgery Department, Outpatient Clinics of The Vascular Surgery, Physiotherapy Department in 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. 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, approximately two fifths of caregivers of patients with diabetic foot amputation aged less than 30 years old and with mean age was 37.21 ± 13.87 . 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 Type2 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 ± 15.32 . 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. This finding agreed with **Costa et al. (2020)**, they studied Burden and Quality of Life in Caregivers of Patients with Amputated Diabetic Foot at Clinics of six Hospitals in Northern Portugal, (n=110) and they found that 77.3% 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. This finding agreed with **Çamur et al. (2020)**, 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, (n=129) and they found that 27% 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 three quarters of caregivers for patients with diabetic foot amputation were married (table 2). This finding agreed with **Çamur et al.**

(2020) and they found that 76% of caregivers of patients were married. As well, this finding in the same line with **Costa, et al. (2020)** and they found that 79.9 % of their caregivers were married.

As regards to caregivers' educational level, the results of the present study showed that more than half of caregivers for patients with diabetic foot amputation had secondary education. This finding disagreed with **Abd El-Rahman & Abo-Shousha (2015)**, they studied Effect of An educational Program on Caregivers, Knowledge about Diabetic Foot Care at Elderly Home in Damanhur–Egypt, (n=32) 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. This finding agreed with **Alves Costa & Pereira, (2018)** and they found that 40% of their caregivers were unemployed.

The results of the present study revealed that; the majority of the studied caregivers for patients with diabetic foot amputation lived with patient. 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; more than two thirds of patients with diabetic foot amputation had diabetes from 10 years or more. 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=250) and

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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; almost two thirds of the studied patients with diabetic foot amputation complained from inability of the foot to fight infection and cure it. 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 US, (n=129) and they found that 72% of their participants complained from inability of the foot to fight infection and cure it.

The results of the present study showed that; more than three fifths of patients with diabetic foot amputation suffered from hypertension. 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 73% of their participants with diabetic foot amputation had hypertension.

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=25) and they found that 56% of their subjects had toe amputation

The results 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 results 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= 171) and reported that 56.7% of their participants took insulin injection for treatment of diabetes. In the other hand, this finding disagreed with **Yacout (2016)**, who found 50.9 % 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. 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. 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. This might be due to nearly half of patients' age ranged from 60 and more, this age needs more attention and care from their caregivers.

The present study revealed that there were no statistically significant relations between

total knowledge of caregivers toward care of patients with post diabetic foot amputation and their age and educational level (table 1). This might be due to effect of the aging and education factors on caregivers' ability to acquire knowledge.

The current study showed that there was statistically significant relation between total reported practices of caregivers toward care of patients with post diabetic foot amputation and kinship degree with patients (table 2). This might be due to the most of caregivers lived with patients, so they were available any time to take care of patients. Also, these results showed that there were no statistically significant relations between caregivers' sex, their educational level, their occupation, place of residence and their total practices score. These findings disagreed with **Pourkazemi et al. (2020)**; they found that gender, place of residence, occupation and level of education had significant relationships with practice.

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. 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

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statistically significant correlation between patients' total satisfaction and care provided by caregivers post diabetic foot amputation. 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

Approximately less than half of caregivers had poor total knowledge about diabetic foot amputation, more than half of them had unsatisfactory total practices regarding care of their patients with post diabetic foot amputation and more than two fifth of the patients had low satisfaction regarding caregivers care respectively. There were positive highly statistically significant correlations between total caregivers' knowledge, total practices and patients' total satisfaction regarding care of caregivers for their patients with diabetic foot amputation.

Recommendations

-Health education program for patients with post diabetic foot amputation and their caregivers to increase their knowledge and practices and prevent the recurrence of foot ulcers and amputations.

-Emphasize the importance of providing support and appropriate follow up care for diabetic patients in outpatient clinics by specialized team in order to prevent diabetic complications and on practice of diabetes foot care.

-Further study is proposed to the effect of home health care intervention on the prevention of diabetic foot amputation among large sample size.

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