Factors Affecting Wound Healing and Needs among Patients with Diabetic Foot Ulcer: Suggested Nursing Guidelines

Fatma Mohammed Abdelhamied [(1),] **Nadia Mohammed Taha**[(2)] **&Maha Dosoky Sakr** [(3)]

[(1)] *Demonstrator, medical surgical nursing dep, Faculty of Nursing, Zagazig University,*
[(2)] *Assistant Professor of Medical Surgical Nursing, Faculty of Nursing, Zagazig University,*
[(3)] *Lecturer of Medical Surgical Nursing, Faculty of Nursing, Zagazig University*

Abstract:

Background: Diabetic foot ulcer is one of the most frightened complications of diabetes and is the leading cause of hospitalization among diabetic patients. **Aim of the study:** The present study aimed to assess factors affecting wound healing and needs among patients with diabetic foot ulcers. **Subjects& methods: Research design:** Descriptive exploratory design was utilized. **Setting:** The present study conducted in outpatient clinic at Zagazig University Hospitals. **Subjects:** The study subject includes 70 patients with diabetic foot ulcer as result of diabetes (40 males and 30 females). **Tools of data collection:** four tools were used for collection of data, **first** patient's assessment sheet, the **second** tool was Thai stress test (TST) questionnaire, **Third** tool was questionnaire sheet about patient knowledge about diabetes mellitus and foot care, **Fourth** tool was questionnaire about needs of patient with diabetic foot ulcer. **Results:** The study finding revealed that the mean age of the study sample was (53.4±10) years. Also, there was statistical significant strong positive relation between patient's knowledge and practice about diabetes. The factors that were significantly affect ulcer healing were age, wound grade, vascular condition, infection, blood glucose, offloading devices, and mental stress .The psychological needs and the total needs were significantly affect diabetic foot ulcer healing**. Conclusion:** The study findings concluded that, the most factors which affect ulcer healing were age, wound grade, vascular condition, infection, blood glucose, offloading devices, and mental stress. the high needs for patient with diabetic foot ulcer were psychological needs followed by physical and functional needs then socioeconomic needs and spiritual needs. **Recommendations:** Further studies are recommended to identify effects of educational programs on improving patient knowledge and practice regarding care for diabetic foot ulcer.

Key words: Factors affecting wound healing; diabetic foot ulcer; Thai stress test; Needs.

Introduction:

Diabetes mellitus is a metabolic disorder characterized by high levels of glucose in serum and by changes in carbohydrate, lipid and protein metabolism which are caused by alterations in insulin secretion, in insulin action or in both of these processes. [(1)] The American Diabetes Association (ADA) has reported that 15% of people with diabetes will experience a foot ulcer at some point in their lifetime, although recent research suggests this figure may be as high as 25%.The ADA also state that 14-24% of people with a foot ulcer will require an amputation . Approx. 15-20% of people with diabetes in the US will be hospitalized with a foot complication at some point during the course of their disease. [(2)] In Egypt, the incidence of foot problems and amputations remains very high, accounting for up to 20% of diabetes- related hospital admissions. This can be easily attributed to several practices as barefoot walking, inadequate facilities for diabetes care, low socioeconomic status and illiteracy. [(3)] Diabetic neuropathy and peripheral vascular disease are usually the major factors involved in DFUs. These two factors may act alone, together, or in combination with other conditions such as micro vascular disease, biomechanical abnormalities, limited joint mobility and increased susceptibility to infection. [(4)] Foot ulcers are a serious and disabling complication of diabetes. The prevalence of diabetic foot ulcer (DFU) ranges from 4% to10% in the hospitalized patients and the risk of patients with diabetes developing a foot ulcer in their lifetime could be as high

as 25%. [5] The essential therapeutic areas of diabetic ulcer management are as follows: management of co morbidities; evaluation of vascular status and appropriate treatment; assessment of lifestyle/psychosocial factors; ulcer assessment and evaluation; tissue management/wound bed preparation; and pressure relief.[6] Nurses combine science and art to provide health services and seek to eliminate physical, emotional, mental, social-cultural and spiritual patient needs. Nursing care for hospitalized diabetic foot patients involves day to day observation and assessment of patient's foot and promotes interventions. Initial intervention focuses on supporting vital functions and preventing complication. Throughout the course of care for diabetic foot patients, the nurse play a crucial role for instructing diabetic foot care guidelines to avoid serious foot problems that could result in losing a toe, foot or leg. [7]

Significance of the study:

The risk that the patient with diabetes develops a foot ulcer is about 25% and it is believed that every 30 seconds a lower limb is lost somewhere in the world as a consequence of diabetes.[8] Foot ulcers are a significant complication of diabetes mellitus it frequently precedes limb loss and remains as difficult clinical problem to treat. Moreover, fewer patients with foot ulcerations receive optimal wound management. Therefore the main power resources were being lost due to this problem so the nurse plays an important role toward this patient to prevent complication and met patient needs to improve healing.

Aim of the study:

The aim of this study was to:
Assess factors affecting wound healing and needs among patients with diabetic foot ulcers.

Research questions:

- What are the factors affecting healing of diabetic foot ulcer?
- What are the needs for patient with diabetic foot ulcers?

Subjects and Methods:

Research design:

A descriptive exploratory design was used in this study.

Setting:

The present study was conducted in outpatient clinic of diabetic foot at Zagazig University Hospital and follow patients who had referral at Emergency Hospital.

Subjects:

The study sample included 70 patients with diabetic foot ulcer as result of diabetes (40 males and 30 females) were admitted to outpatient clinic with mean age 53 years. They were selected according the following

Inclusion Criteria were included:-
Adult patient with diabetic foot ulcer as a result of diabetes mellitus from both genders who agree to participate in the study

Exclusion Criteria:-

Patient diagnosed with arterial occlusion and admitted in the hospital for treated revascular, also patient with chronic disease as liver cirrhosis or cancer were excluded from this study.

Tools for data collection: Four tools were used for data collection

Tool I- Patient's assessment tool: - this tool was adapted by kaewloet [15] to assess the factors affecting healing of diabetic foot ulcer it consisted of four parts.

Part I: composed of 4 main sections:-

1-Demographic and personal characteristics of patients: it consisted of 8 closed ended questions include the following**:** (age, sex, level of education, duration of being diabetes, blood glucose level

(routine investigation from patient sheet), smoking ,diabetes treatment, calculation of body mass index (BMI) according to the equation BMI=Weight (kg) /Height 2 (m) 2
(This equation of BMI adopted from national heart lung and blood institute, 2011) and can be interpreted as the following:
Underweight=<18.5
Normal weight=18.5-24.9
Overweight=25-29.9
Obesity=BMI of 30 or greater

2-Past History, it included the following:-

A- Family history: it consisted of 2 closed ended questions as; do other members of your family have diabetes? And do your family member has diabetic foot ulcer?

B- Past history of foot problems: it composed of 4 closed ended questions as; have you ever had a foot ulcer? And Have you ever had an amputation of a toe, foot, or leg?

3- Current Foot or Leg Problems: it consisted of 5 closed ended questions as; Do you have blood or discharge on your socks?, Do you have any calluses on your feet?**,** and Do you have any tightness, heaviness, pain, or cramps in your feet or legs?**.**

Part II: Data related to treatment regimen involving [debridement (yes or no), type of dressing (normal saline or other specify as betadine, hydrogen peroxide), offloading devices as cast, wheel chairs, crutches, therapeutic footwear]

Part III: Data related to wound involving seven open ended questions:

number of wound, location of wound, duration of wound, cause of wound, taking care of wound dressing, infection, wound grade the researcher based on Wagner's ulcer classification (1987) who classified ulcer into grade :

a- Grade 0: pre- ulcerative lesion

b- Grade 1: partial – thickness wound up to but not through the dermis

c- Grade 2: full thickness wound extending to tendon or deeper subcutaneous tissue but without bony involvement or osteamyelitis

d- Grade 3: full thickness wound extending to and involving bone

e- Grade 4: Localized gangrene

f- Grade 5: Gangrene of the whole foot

Part IV: Doppler report to assess vascularity (from patient's file):

e.g. Arterial insufficiency or adequate arterial supply.

- **The Scoring system:**

  This patient assessment tool consisted of open ended questions and closed ended questions scored through yes=1, no=0.

  2. **Thai stress test (TST) questionnaire:** This tool was developed by department of Psychiatry, faculty of medicine, SirirajHospital(2000). It is an instrument used to detect the mental health illness and level of stress.

  Scoring system:

  Scored through three point likert scale which includes often =3 score. Sometimes =1 score. Never =0 score. And this weight was cumulated into negative and positive scores ranging from 0 to36 for each scale. The following matrix in the table showed how the two scores are then combined to form the index of (TST).

  3. **Questionnaire sheet about patient knowledge** about diabetes mellitus and foot care

  Part I: it consisted of 19 questions for patient knowledge about diabetes and foot care. It was formed of multiple choice and open ended questions. For example definition of diabetes, causes, symptoms

complications , prevention from complication, causes of diabetic coma, causes of hypoglycemia ,symptoms of hypoglycemia , name of used drug, type of diabetic foods ,importance of foot cleaning, right method for diabetic foot care, right method to cut toes nail .

Part II: This part composed of (35) questions determined the patient's practice to different treatment regimens. It was formed of multiple choices and closed ended questions. For example patient's practice toward diet (following diabetic diet regimen, following diabetic diet since discovering diabetes), physical exercise(following certain physical exercise (walking), regular practicing physical exercise, medication use (take drug on time, change dose), practice during hypoglycemia, foot wear (type of used shoes - type of used sockets), safety and prevention for feet and personal hygiene (follow personal hygiene, how to care your eyes, regularly visiting ophthalmologist, regularly visiting dentist, number of bathing).

Scoring system:-

The patient's questionnaire sheet consists of (54) questions... Each item (one mark for correct answer, zero was given to incorrect answer, the maximum knowledge score was 54, the general patient knowledge was classified into two: satisfied knowledge if score> 50% and unsatisfied if score<50%.

Part III: Foot care checklist includes 10 steps for foot care. It assessed by done (1), not done (0) for each step, if the patient done > 60% satisfied practice, if the patient done < 60% unsatisfied practice.

4. **Questionnaire sheet about needs of patient with diabetic foot ulcer** involving the following (Physical/ functional needs, Psycological needs, Socioeconomic needs, Sipritual needs).

Scoring system:-

Items were scored 0,1,2 for the responses ,one for low grade need, two for high grade need and zero for not applicable to me ,respectively for positive items and reversed for negative items. the scores of the items were summed up and the total divided by the number of the items, given a mean score for attitude. These scores were converted into a percent score. The patients' needs was considered high if the percent score was 50% or more and low if less than 50%.

Content validity and Reliability

It was established to assure the content validity by a panel of 5 expertises's in medicine and medical surgical nursing at Zagazig University who revised the tools for clarity, relevance, comprehensiveness, understanding, and ease for implementation and according to their opinion minor modification were applied and reliability test was done for Thai stress test. The TST is a two dimensional rating scale each scale is composed of 12 items. The reliability analyses were conducted for the two scales and the total scale of the TST by using Cronbach's Alpha and Split Half Method (Odd-Even technique). The Alpha coefficient of the TST total test was 0.84. The values of the two scales were from 0.83 to 0.86. The Split Half coefficient of the TST total test was 0.88. The values of the two scales were from 0.85 to 0.91. This showed that the reliability coefficients are in the middle to high values.

Field work:

Field work of this study was executed in 9 months from the beginning of January 2014 to the end of September, 2014. The period of data collection was divided into the following:

The researcher started by introducing herself to the patient, the aim of the study and the component of the tools were explained to the patients at the beginning of data collection, they were assured that the information collected would be treated confidentially and that it would be used only for the purpose of the study (oral consent was taken from the patients). The researcher visited the diabetic foot out-patient clinic two days per week during morning shift 9: AM to 12:MD.

Assessment health status through patient's weight, height, and random blood sugar was carried out within 15 minutes; the medical records were reviewed to obtain the result of lower limb Doppler.

The patient filled the written questionnaire in the presence of the researcher or it was filled by the researcher for illiterate patient, the time needed for completing the patient's assessment tool, Thai stress test, questionnaire sheet about patient knowledge and questionnaire sheet about needs of patient was about 45 minutes to 60 minutes for each patient. Patients were followed until diabetic foot ulcer healing or surgical intervention (either by debridement or amputation). The patients were interviewed in the outpatient clinic weekly at time of follow up and followed by telephone to identify the end result of the ulcer.

Guidelines were given to patients after data collection, time taken for giving all information about the disease varied according to patients health status, patients response and crusty to know more information.

Pilot study

A pilot study for tools of data collection was carried out in order to test whether they are clear, understandable, feasible applicability and time consuming to fill the tool. For this study, the researcher randomly selected 10 patients to participate in the pilot testing of the questionnaire sheet and checklist. Simple modify was done based on pilot results and the sample who shared in the pilot study excluded from the study sample

Administrative and Ethical considerations:

An official permission for data collection in Zagazig University Hospitals was obtained from the out-patient administrative personnel by the submission of a formal letter from the dean of the faculty of Nursing. An oral consent was taken from patients for permission to participate in research process. The agreement for participation of the subjects was taken after explaining the aim of the study and component of the tool to them; they were given the opportunity to refuse to participate and to withdraw at any time. In addition, confidentiality, and anonymity of the subjects were assured through coding of all data.

Statistical Design:

After the collection of data, Data were checked, entered and analyzed using SPSS version 19 for data processing and statistic- P value of < 0.05 indicates significant results.

Results:

Table (1) :Shows that more than half of patients included in the study (57.1%) were male, the mean age of the study sample was (53.4±10) , more than two fifth (41.4%) of them were read and write. no one in the study sample had body mass index underweight, (25.8%) had normal body weight, (37.1%) had body mass index overweight , (37.1%) had body mass index obesity and the mean of body mass index of patients under study(30.9±10).

Table (2): Shows that more than three fifth of patients in the study had blood glucose level <200mg/dl (62.9 %) ,the mean blood glucose level for patients under study (197.3±68.5), the mean duration of being diabetic for patients under study was (13.2±5.7), all of patients under study were treated

with insulin injection while (12.9%) of them were treated with insulin and oral hypoglycemic drugs, more than half of patients under study had no family history of diabetes (54.3%) and the majority of them (84.3%) had no family history of diabetic foot ulcer.
Regarding smoking, relatively three quarters of patients under study (74.3%) were nonsmokers.

Table (3): there was statistical significant difference between ulcer prognosis (healing, debridement or amputation) and patient age but there was no statistical significant difference between ulcer prognosis (healing, debridement or amputation) and sex ,education & body mass index with p. value >0.05

Table (4): shows that, there was statistical significant difference between ulcer prognosis (healing, debridement or amputation) and wound grade and there was statistical significant difference between ulcer prognosis and wound infection in which all amputated patients had infection but there was no statistical significant difference between ulcer prognosis, number of wounds, location, causes of wound, care of wound dressing with p. value >0.05.

Table (5): shows that, there was statistical significant difference between ulcer prognosis and vascular condition.

Table (6): shows that, there was statistical significant difference between ulcer prognosis (healing, debridement or amputation) and level of mental stress.

Table (7): shows that, more than half of patients under study had high needs, the highest needs was for psychological (60%), followed by physical /functional needs, socioeconomic needs (50%) and spiritual needs (12.9 %).

Table (8): shows that, there was statistical significant difference between psychological needs and ulcer prognosis in which 76 % of amputated patients had high psychological needs also there was highly statistical significant difference between total needs and ulcer prognosis in which (96.3%) of patients who had surgical debridement had high needs as p. value <0.001

Discussion:

One of the noticeable findings of the study was that more than half of the patients included in the study were male. This result is due to men with diabetes are at increased risk of foot ulcers or amputation compared with women with diabetes. This finding is supported by Mohsen and Shehata [3] who published their study about foot self-care: knowledge, practice and barriers among diabetic patients in Menofia University found that more than half of their study were male but this finding is in disagreement with Mohamed [10], who was studying factors contributing to diabetic patients foot ulcers and concepts of prevention as perceived by medical and surgical nurses and reported that the majority of the study were female.

The results showed that more than two fifth of the patients included in the study were read and write. This finding was consistent with Soliman[12] who was studying factors affecting healing of diabetic foot ulcer in Ainshams University found that about half of the patients in the study was secondary educated and in agreement with Phillipo, et al [13] who was studying surgical management of diabetic foot ulcers: A Tanzanian university teaching hospital experience found that most of the studied sample had either primary or no formal education. The result of the present study may be due to low level of education lead to certain factors, such as barefoot walking, low socioeconomic status and late presentation by patients to hospital or clinic.

Concerning duration of being diabetic, the present study revealed that, the duration of being diabetic for the majority of patients included in the study was ≥ 5 years with mean 13 years. This result was in agreement with the result of Soliman[12] who found that more than half of patients in her study was ranged between(11-20) and in accordance with Abd-Elrazak[14] who was studying compliance of diabetic patients toward different therapeutic regimen in Zagazig University who reported that about one half of patients had diabetes of more than five years, and this finding might be due to the chronicity of the disease.

Concerning diabetes treatment, the present study showed that all of patients in the study were treated with insulin injection. This finding was consistent with Soliman[12] who found that the majority of patients in the study were treated with insulin injection and in agreement with Abd-Elrazak[14] who reported that more than half of diabetic patients were depending on insulin to control their blood glucose levels in addition to (15%) of them were taking both insulin and oral hypoglycemic agents.

As regard smoking, the result of this study revealed that three quarters of patients were nonsmokers. This result may be due to the negative effects of smoking on wound-healing outcomes have been known for a long time .This result was in agreement with Kaewloet[15] who found that the most of the sample did not smoke.

The results showed that more than half of patients in the study had previous history of diabetic foot ulcer. This finding was consistent with Soliman[12]who found that more than half of patients had previous history of foot ulcer. This result may be due to presence of factors contributing to recurrence of diabetic foot ulcer (e.g. lack of knowledge related to prevention of diabetic foot, improper self-care… etc.

Concerning history of amputation, the results showed that more than two fifth of patients in the study had previous history of amputation. This result was in accordance with Crawford, et al [16] who found that history of previous amputation was consistently associated with risk of future ulceration.

Offloading and debridement are considered vital to the healing process, for diabetic foot wounds. The goal of offloading is to redistribute force from the ulcers sites and pressure points at risk, to a wider area of contact. There are multiple methods of pressure relief, including total contact casting, half shoes, removable cast walkers, wheelchairs, and crutches Armstrong, et al [17].The results of the present study revealed that more than half of the patients in the study had no offloading devices. This disagree with Soliman[12] who found that more than half of the patients were using offloading devices(crutches, walkers and wheelchairs). The result of the current study may be due to lack of patient's knowledge about presence of these offloading devices and it costs them much money.

The results of the present study revealed that the majority of the study sample had chemical debridement with normal saline and hydrogen peroxide .This finding doesn't go in the same line with Bohtera[11] who stated that chemical debridement was done to nearly about quarter of the study sample. This result is due to chemical debridement is an important part and leading cause to healing process.

As regards taking care of wound dressing more than half of the patients in the study were taking care of wound dressing at (home, clinic or hospital). This result was consistent with Soliman[12] who reported that more than three quarters of patients were taking care of wound dressing at clinic or hospital. The result in current study may be related to diabetic patients fear of amputation post foot ulcer , so they take

care of wound dressing at both (home and follow their wounds through medical staff at clinic or hospital).

Regarding relation between wound characteristics and their ulcer healing, debridement or amputation, the present study showed that there was statistical significant difference between ulcer prognosis and wound grade 2, 3.4,5. and there was statistical significant difference between ulcer prognosis and wound infection in which all amputated patients had infection, but there was no statistical significant difference between ulcer prognosis, number of wounds, location, causes of wound, care of wound dressing. This finding was consistent Zubair, et al., [9] who was studying Incidence, risk factors for amputation among patients with diabetic foot ulcer in a North Indian tertiary care hospital found that infection was found to be the major cause of amputation. Also this finding was consistent with soliman[12] who reported that there was positive relation between ulcer healing and wound grade while the finding disagree with her regarding to there was no statistical significant difference between ulcer prognosis , number of wounds, location, causes of wound, care of wound dressing. This findings agree with Margolis , Kantor, and Berlin[19] ,who mentioned that wound duration did not significantly affect wound healing. Also the result was in the contrary with Kaewloet[15],who found that wound grade did not significantly associated with wound healing .

By studying the relation between vascular condition and their ulcer healing, debridement or amputation, the results revealed that there was statistical significant difference between ulcer prognosis and vascular condition in which about three quarters of amputated patients had arterial insufficiency and more than three quarters of healed ulcer patients had adequate arterial supply. This result was congruent with Armstrong, et al [6] who concluded that arterial perfusion is a vital component for healing and must be assessed in the ulcerated patient, since impaired circulation contributes significantly to nonhealing of ulcers and subsequent risk for amputation. Also this result was congruent with Pham, Rich, Veves[20] , who concluded that patients with inadequate blood flow to the feet had difficult and prolonged wound healing ,also agree with Soliman[12] who reported that there was positive correlation between foot ulcer healing and vascular condition.

Concerning to total needs of patients with diabetic foot ulcer in this study, the results of the present study revealed that more than half of the studied patients had totally high needs. This might be due to defect of physical, psychological and social needs.

The presence of diabetic foot ulcers may have a major impact on patient health-related quality of life (HRQoL)Hanestad, et al [21]. Regarding relation between total needs and their ulcer healing, debridement or amputation the results of the present study revealed that there was statistical significant difference between psychological needs and ulcer prognosis in which three quarters of amputated patients had high psychological needs also there was highly statistical significant difference between total needs and ulcer prognosis, in which the majority of patients who had surgical debridement had high needs. This may be due to the effect of stress, depression on ulcer healing. This result was supported by Guo and DiPietro , [22] who reported that in addition to the direct influences of anxiety and depression on endocrine and immune function, stressed individuals are more likely to have unhealthy habits, which include poor sleep patterns, inadequate nutrition, less exercise, and a greater propensity for abuse of alcohol,

cigarettes, and other drugs. All of these factors may come into play in negatively modulating the healing response. The effects of stress on wound healing. Stress-impaired wound healing is mediated primarily through the hypothalamic-pituitary-adrenal, sympathetic-adrenal medullary axes, and psychological-response-induced unhealthy behaviors.

Conclusion:

According to the results of the present study, it can be concluded that, the factors that were significantly affect diabetic foot ulcer healing were (age, wound grade, vascular condition, infection, blood glucose, offloading devices, and mental stress) and the results of the present study had shown that the high needs for patient with diabetic foot ulcer were psychological needs followed by physical and functional needs then socioeconomic needs and spiritual needs. The psychological needs and the total needs were significantly affect diabetic foot ulcer healing and the total needs were significantly affected by (age and body mass index).

Recommendations

Based on the results of the present study the following recommendations are suggested:

A poster about diabetic foot and guidelines for diabetic foot care should be available for each patient present in the diabetic foot outpatient clinic. Improving diabetic patient's knowledge and practice should reduce the occurrence of diabetic foot ulcer and their complications. Counseling clinics and trained nursing team should be available at diabetic foot outpatient clinic. Health education for the patients to modify their needs, and factors that affect ulcer healing. Training courses about diabetic foot care and handouts about suitable shoes should be available for diabetic foot ulcer patients. Patients need to attend in special training to use the latest instructions of diabetic foot care. Further studies are recommended to identify effects of educational programs on improving patient knowledge and practice regarding care for diabetic foot ulcer.

Table (1): Socio demographic characteristics of the patients in the study sample (N= 70)

Items	No.	%
Age (years)		
≤50	23	32.9
>50	47	67.1
Mean ±SD	53.4±10	
Median	54	
Range	25-70	
Sex		
Female	30	42.9
Male	40	57.1
Education		
Illiterate	25	35.7
Read and write	29	41.4
Educated	16	22.9
BMI		
Underweight	0	0.0
Normal body weight	18	25.8
Overweight	26	37.1
Obesity	26	37.1
Mean ±SD	30.9±10	
Median	27.7	
Range	22.04-74.39	

Table (2): Health characteristics of the patients in the study sample (No. = 70)

Items	No.	%
Random blood glucose levels		
Normal(<200mg/dl)	44	62.9
Above normal(≥200mg/dl)	26	37.1
Mean± (SD)	197.3±68.5	
Median	180	
Range	82-348	
Duration of D.M (years)		
<5	6	8.6
≥5	64	91.4
Mean± (SD)	13.2±5.7	
Median	14	
Range	2-23	
Diabetes treatment		
Insulin	70	100.0
Oral and insulin	9	12.9
Family history of diabetes		
Yes	32	45.7
No	38	54.3
Family history of diabetic foot		
Yes	11	15.7
No	59	84.3
Smoking		
Yes	18	25.7
No	52	74.3

Table (3): Relation between socio-demographic characteristics and patients knowledge about diabetes (N= 70)

Socio demographic data	Total knowledge				X2	P
	Satisfactory No.= 28		Unsatisfactory No.= 42			
	No	%	No	%		
Age (years)					0.87	0.349
≤50	11	39.3	12	28.6		
>50	17	60.7	30	71.4		
Sex					3.89	0.048*
Female	16	57.1	14	33.3		
Male	12	42.9	28	66.7		
Education					1.95	0.378
Illiterate	11	39.3	14	33.3		
Read and write	13	46.4	16	38.1		
Educated	4	14.3	12	28.6		
BMI					24.13	<0.001**
Normal	16	57.1	2	4.8		
Overweight/ Obesity	12	42.9	40	95.2		

P": P value of X^2 test

Table (4): Relation between wound characteristics as a factors affecting on ulcer healing, debridement or amputation (N= 70)

Wound characteristics	Healing No=18		Debridement No=27		Amputation No=25		X2	P
	No	%	No	%	No	%		
Number of wounds							0.76	0.684
<2	14	77.8	23	85.2	19	76.0		
≥2	4	22.2	4	14.8	6	24.0		
Location							2.88	0.237
Toe/s or between toes	7	38.9	9	33.3	14	56.0		
Foot	11	61.1	18	66.7	11	44.0		
Wound grade								
Grade 0	2	11.1	0	0.0	0	0	5.95	0.051
Grade 1	4	22.22	3	11.11	0	0	5.8	0.055
Grade 2	12	66.66	9	33.33	0	0	22.38	<0.001
Grade 3	0	00.0	15	55.55	7	28.0	15.68	<0.001
Grade 4	0	00.0	0	00.0	7	28.0	14.0	<0.001
Grade5	0	00.0	0	00.0	11	44.0	23.49	<0.001
Causes of wound							3.65	0.161
Unknown cause	14	77.8	26	96.3	21	84.0		
Trauma	4	22.2	1	3.7	4	16.0		
Care of wound dressing							4.37	0.357
Self dressing at home	0	0.0	2	7.4	2	8.0		
Dressing at clinic/hospital	4	22.2	6	22.2	10	40.0		
Both	14	77.8	19	70.4	13	52.0		
Infection							18.58	<0.001
Absent	8	44.4	2	7.4	0	0.0		
Present	10	55.6	25	92.6	25	100.0		

P": P value of X^2 test

P < 0.05 (significant)

Table (5): Relation between vascular condition as a factors affecting on ulcer healing, debridement or amputation (N= 70)

Vascular condition	Healing No=18		Debridement No=27		Amputation No=25		X2	P
	No	%	No	%	No	%		
Arterial insufficiency	4	22.2	6	22.2	18	72.0	16.59	<0.001**
Adequate arterial supply	14	77.8	21	77.8	7	28.0		

Table (6):- Relation between level of mental stress as a factors affecting on ulcer healing, debridement or amputation (N= 70)

Mental stress	**Healing No=18**		**Debridement No=27**		**Amputation No=25**		**X2**	**P**
	No	**%**	**No**	**%**	**No**	**%**		
Excellent mental health	2	11.1	0	0.0	0	0.0	6.0	0.049*
Normal mental health	13	72.2	9	33.3	1	4.0	14.61	<0.001**
Mild stress	3	16.7	16	59.3	18	72.0	16.14	<0.001**
Stressful	0	0.0	2	7.4	6	24.0	10.5	0.005*

Table (7): Total needs of patients in the study sample (n=70)

Total needs	To great extant	
	No.	%
Psychological	42	60.0
Physical /functional	40	57.1
Spiritual	9	12.9
Socioeconomic	35	50.0
Total needs		
High	37	52.9
Low	33	47.1

Table (8):- Correlation between total needs and their ulcer healing, debridement or amputation (N= 70)

	Healing No=18		Debridement No=27		Amputation No=25		X2	P
	No	%	No	%	No	%		
Physical /functional							3.7	0.157
High	7	38.9	16	59.3	17	68.0		
Low	11	61.1	11	40.7	8	42.0		
Psychological							6.02	0.049*
High	7	38.9	16	59.3	19	76.0		
Low	11	61.1	11	40.7	6	24.0		
Socioeconomic							1.85	0.396
High	7	38.9	16	59.3	12	48.0		
Low	11	61.1	11	40.7	13	52.0		
Spiritual							0.85	0.653
High	3	16.7	4	14.8	2	8.0		
Low	15	83.3	23	85.2	23	92.0		
Total needs							40.69	<0.001**
High	9	50.0	26	96.3	2	8.0		
Low	9	50.0	1	3.7	23	92.0		

References

1. Ahmed I, Glodstein B: Diabetes mellitus. Clin Dermatol; 2006; 24:237–46.
2. Charles A. A,Thomas S. R: The Diabetic Foot Surgical Clinics of North America, The, 2007-10-01, Volume 87, Issue 5, 2007; Pages 1149-1177 Copyright © 2007 Elsevier Inc. available at https://www.clinicalkey.com/#!/content/1-s2.0-S0039610907000977 accessed on 21 March, 2015.
3. Mohsen M.M and Shehata A. E: Foot Self Care: Knowledge, Practice And Barriers Among Diabetic Patients. Published paper inZagazig Nursing Journal, Faculty of Nursing, MenofiaUniversity;2014.
4. SnyderBJ,Waldman BJ: Venous thromboembolism prophylaxis and wound healing in patients undergoing major orthopedic surgery. Adv Skin Wound Care; 2009; 22:311–5.
5. Singh N, Armstrong DA, Lipsky BA: Preventing foot ulcers in patients with diabetes. JAMA; 2005; 293: 217-28.
6. Armstrong D G, Peters EJ.G, Athanasiou KA. LaveryL A, Diabetic Foot Disorders. The Journal Of Foot& Ankle Surgery 45(5), September/October 2006.
7. Peimani M, Tabatabaei-Malazy O, Pajouhi M: Nurses' Role in Diabetes Care; A review. Iranian Journal of Diabetes and Lipid Disorders, 2010; 9:1–9.
8. American Diabetes Association (ADA): Standards of medical care in diabetes. Diabetes Care, 2010; 33(1):S38.
9. Zubair M, Abida M, Jamal A, (): Incidence, risk factors for amputation among patients with diabetic foot ulcer in a North Indian tertiary care hospital. The Foot; 2012; 21(1):6–14. http://dx.doi.org/10.1016/j.actbio.2013.03.033 retrieved 12 April ,2013 from www.elsevier.com/locate/ .

10. Mohamed, S., A.: Factors contributing to diabetic patients foot ulcers and concepts of prevention as perceived by medical and surgical nurses. The New Egyptian Journal of Medicine, 2008; 38(3), 192.
11. Bohtera, F., M., M.: Our experience in diabetic foot management. The New Egyptian Journal of Medicine, 2011;44(1),49
12. Soliman, A M.: Factors Affecting Healing of Diabetic Foot Ulcer. Faculty of nursing. Ainshams University. Master thesis, 2012; P:24.
13. Peimani M, Tabatabaei-Malazy O, Pajouhi M: Nurses' Role in Diabetes Care; A review. Iranian Journal of Diabetes and Lipid Disorders, 2010; 9:1–9.
14. Abd-Elrazak B.G: Compliance of diabetic patients toward different therapeutic regimen, Unpublished Master thesis, Faculty of Nursing, ZagazigUniversity; 2009.
15. Kaewloet,N.: The correlations between affecting factors and healing rate in diabetic foot ulcers. Retrived From: http://mulinet 10.li.mahidol.ac.th14737289.pdf, 2008; Accessed on 3July 2010.
16. Crawford F, Inkster M, Kleijnen J, Fahey T,;" Predicting foot ulcers in patients with diabetes: a systematic review and meta-analysis",oxfordjournals.org; 2007; 100:65–86.retrieved April 11, 2013 from http://qjmed.oxfordjournals.org/.
17. Armstrong DG, Lavery LA, Nixon BP, et al: It's not what you put on, but what you take off: techniques for debriding and off-loading the diabetic foot wound. Clin Infect Dis; 2004; 39(Suppl 2): S92-S99
18. Mokhtar, I.M.: Diabetic patient suffering from foot problem at MetGhamer Hospital. Master thesis .Zagazig University; 2011.
19. Margolis, D., J., Kantor, J., and Berlin, J., A: Healing of diabetic neuropathic foot ulcers receiving standard treatment. A meta-analysis. Diabetes Care, 2013, 22(5), 692-695. Retrieved from: http://care.diabetesjournals.org/content/22/5/692.short, accessed on 9 March 2014.
20. Pham, H., T.,Rich, J., and Veves, A.: Wound Healing in Diabetic Foot Ulceration: A Review and Commentary. Wounds, 2000; 12(4), 1-4. Retrieved from: http://www.medscape.com/viewarticle/407553, accessed on March 2014
21. Hanestad BR, Moum T, Birkeland K, Rustoen T: Health-related quality of life among patients with diabetes and foot ulcers: association with demographic and clinical characteristics. J Diabetes Complications. 2007; 21(4):227–236.
22. Guo .S. & DiPietroL.A.: Factors Affecting Wound Healing. J Dent Res. Mar 2010; 89(3): 219–229. doi: 10.1177/0022034509359125 Available at: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2903966/ accessed on 2014-11-01 at 10 am.