

Factors Affecting Healing Process of Patients with Diabetic Foot Ulcer

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Abstract

Background: Diabetic foot ulcer is a major medical, social, economic problem and a leading cause of morbidity and mortality. The most type of neuropathy affecting person with diabetes is sensory neuropathy this can lead to the loss of protective sensation in the lower extremity. **The study Aims:** to assess the factors affecting healing process of diabetic foot ulcer among diabetic patients. **Research design:** descriptive exploratory design was utilized. **Setting:** This study conducted in ICU and surgical department at ELArish General Hospital. **Subjects:** The study subject includes 75 patients with diabetic foot ulcer as result of diabetes. **Tools of data collection:** four tools were used for collection of data it included Patient interviewing questionnaire, questionnaire about patient's knowledge about diabetes mellitus and patients practice about foot care, Wagner classification system to assess wound grade, Thai stress test questionnaire. **Results:** The present study finding showed that one thirds of studied patients were old age, majority of studied patients had poor glycemic control, two thirds of studied patients had diabetes from ten years ago, more than half of them had high stress level and more than half of studied patients had unsatisfactory level of knowledge about diabetes mellitus, while more than half of studied patients had good practices about foot care. Factors that were significantly affect negatively ulcer healing were age, smoking, obesity, wound grade, infection, debridement, blood glucose level, lack uses offloading device and mental stress. **Conclusion** The study findings concluded that, the most factors which affect wound healing were age, wound grade, infection, debridement blood glucose, offloading device and mental stress. **Recommendation** Developing and disseminate a simplified and comprehensive booklet including basic information about caring of diabetes patient's.

Key words: wound healing, foot ulcer.

Introduction

Diabetic foot ulcer (DFUs) is a major medical, social, economic problem and a leading cause of morbidity and mortality, especially in the developing countries. Following a diagnosis of diabetic foot ulcer, more intensive surveillance and aggressive care by multidisciplinary team involved in diabetic foot care may improve patient's outcome (Abdelhamied, 2015).

Diabetic neuropathy and peripheral vascular disease are usually the major factors involved in DFUs. About 60% to

70% of patients with diabetes mellitus have some degree of neuropathy. The most common type of neuropathy affecting person with diabetes is sensory neuropathy this can lead to loss of protective sensation in the lower extremity and coupled with other factors. This significantly increases the risk for lower limb complication foot ulcer (Veves, Giurini and Logerfo, 2012).

Many potential sources for trauma in patients with diabetes are cracks and fissures caused by dry skin or infection such as athlete's foot, blister caused by improperly fitting shoes, pressure from stocking or

shoes ingrown toe nails and direct trauma (cuts, bruiser, bums). It is important to remember that the person with diabetic neuropathy who has lost the perception of pain may not be aware to the injury occurred (when a part of the body loses the sensation, the person tends to disassociate from the part so that injury may go unattended for days or weeks (**Lemon, Dwyer, Jones, Burke, Moxham & Searl, 2014**)).

Diabetes is one factor that affects wound healing process. In diabetic foot ulcers, healing impairment is caused by several factors (neuropathy, vascular problems causes' poor blood circulation, and other complicated systemic effects due to diabetes, wound infection, callus formation, and excessive pressure to the site). In addition to physiological predisposing factors, there is evidence that psychological stress adversely affects immune system, and this could impact on wound healing (**Soliman, 2012**).

Diabetic foot ulcer care in all stages needs multidisciplinary management to control mechanical, wound, microbiological, vascular, metabolic, and educational aspects. Achieving good metabolic control of blood glucose, lipids and blood pressure is important in each stage, as is educational control to teach proper foot care appropriate for each stage. Aggressive management of diabetic foot ulceration will reduce the number of feet proceeding to infection and necrosis and thus reduce the number of major amputations in diabetic foot patients (**Dewit, 2009**).

Significance of the study:

The incidence of diabetic foot ulcer ranges from 10% and the life time incidence may be high as 25%. The recurrence rates for diabetic foot ulcer are 40% over 3 year and 70% over 5 year. About 15% of patients with diabetic foot ulcer require lower extremity amputation (**Chawla, 2012**).

The risk that the patients with diabetes develop a foot ulcer is about 25%, and it's

believed that every 30 seconds a lower limb lost somewhere in the world as a consequence of diabetes. Diabetic foot is one of the most significant complications of diabetes. The majority of foot ulcer will heal, while (15%) of them will remain active and (24%) of them will finally lead to limb amputation. Diabetic neuropathy is the most common factors in almost 90% of diabetic foot ulcer (**Alexiadou and Doupis, 2012**).

The prevalence of diabetic foot ulcer has been found to be high in Egypt. According to the findings of a recent study conducted among diabetics in Egypt, it is estimated that (29.3%) of diabetics had foot ulcer disease, (63.3%) had vascular complications and neuropathy was reported in (88.0%) of them. This can be easily attributed to several practices prevalent such as barefoot walking, inadequate facilities for diabetic care, low socioeconomic status and literacy (**Abdasalam, Bakry, Said, Hammad, Mohammed & ELshabrawy, 2017**).

Aim of the study

The aim of the study to:

Assess the factors affecting healing process of diabetic foot ulcer among diabetic patients.

Research question:

What are the factors affecting healing process of diabetic foot ulcer?

subjects and methods

The present study was carried out through the following four designs:

- I. Technical design.
- II. Operational design.
- III. Administrative design.
- IV. Statistical design.

I. Technical design:

The technical design includes research design, setting, subjects and tools of data collection used in this study.

Research design:

A descriptive exploratory design was conducted to achieve the aim of this study.

Setting:

This study was conducted at the intensive care unit and surgical department at El Arish general hospital. ICU contains 13 beds, surgical department contain 5 rooms for diabetic foot patients, 4 rooms for patients contains 2 beds, 1 room for dressing.

Subjects:

A purposive sample of 75 adult patients diagnosed with diabetic foot ulcer. the sample size was determined as regarding that the total number of patients with foot ulcer as a result to diabetes mellitus admitting to ICU and surgical wards at Al Arish General Hospital at 2018 were 400 patients, with power of the test 80% and confidence level 95% margin error 5%. All patients who accepted to participate in the study from both genders, with different types of diabetes, diabetic foot ulcer wound and during hospitalization period in the previous mentioned setting.

Inclusion criteria:

Adult patients with diabetic foot ulcer, type I and type II diabetes mellitus from both genders who agreed to participate in the study.

Exclusion criteria:

Patients diagnosed with arterial occlusion and admitted in the hospital for treated re-vascular were excluded from this study

Tools of data collection:

The study data was collected through using the following tools:

Tool one: Patient interviewing questionnaire: It was developed and filled by the researcher, the questionnaire translated and retranslated. It composed of five parts.

These parts include the following:

- **Part1:** It aimed to assess the patient's demographic characteristics and consisted of 7 closed ended questions include the following: (age, sex, residence, occupation, marital status, level of education and average monthly income).
- **Part 2:** It was used to assess and collect data about Patients clinical health status. it consisted of 9 closed ended questions include the following (body weight, height, duration of being diabetes, diabetes type, associated chronic disease, diabetes treatment, smoking, fasting and random blood glucose level).
- **Part 3:** It was used to assess data related to treatment regimen involving (debridement [yes or no], type of dressing, [normal saline or other specify as betadine], offloading devices as special shoes, crutches, walkers, wheelchairs, therapeutic foot wear, none).
- **Part 4:** It was used to assess data related to wound characteristics involving 3 close ended questions include (location of wound, duration of wound, taking care of wound and infection).
- **Part 5:** Interviewing Patient's knowledge questionnaire: this tool was adapted from *Garcia and Association, (2001)*. This section concerned with assessing present patients' level of knowledge about diabetes, it was consisted of 22 yes or no question distributed as the following: causes (3) questions, symptoms (2) questions, care (13) questions and complication (4) questions.

❖ **Scoring system:**

The total score of Patient's knowledge questionnaire was 22 grades. Each correct answer was given one grade and incorrect answer was given zero.

It was considered as follow:

- Equal or more than 75% was satisfactory level of knowledge.
 - Less than 75% was unsatisfactory level of knowledge.
- **Tools 2 :** Foot care practice questionnaire

This tool was adapted from (*Bijoy et al., 2012; Pollock et al., 2004*). It was formed of 17 questions about foot care practice closed ended and yes or no question. It cover good foot care practice in the area of foot inspection, washing, technique, skin ,nails care and foot wear care.

❖ **Scoring system:**

The total score of patient's foot care practice questionnaire was 17 grades. Each correct answer was given one grade and incorrect answer was given zero.

It considered as the following:

- Less than 75% was considered poor patients foot care practice
 - Equal or more than 75% was considered good patients foot care practice.
- **Tools 3:** Wagner classification system

This tool was used to assess wound grade adapted from *Wagner, (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 extend to tendon or deeper subcutaneous tissue but without bony involvement or osteomyelitis.
- d- Grade (3): full thickness wound extending to and involving bone.

e- Grade (4): localized gangrene.

f- Grade (5): gangrene of the whole foot.

Tools 4: Thai stress test (TST) questionnaire;

It was adapted from *psychiatric association Thailand (2002)*. This tool was used to assess patients stress level. It consisted of 18 close end question, the patient answer by never, often, sometimes.

❖ **Scoring system:**

Each question had 3 responses, its score ranging from 0-2 as the following: often answer was scored two, sometimes answer was scored one and the never answer was scored zero.

The total score of patients stress level was (36 degree) calculated consedring the number of questions and the patients responses. So the patients stress level was categorized as the following:

- Less than 50% was considered low stress.
- More than 50% and less than 75% was considered average stress.
- More than 75% was considered high stress.

II. Operational design

The operational design included preparatory phase, ethical consideration, content validity and reliability test, pilot study, field work and limitation of the study.

Preparatory phase:

It included reviewing of related literature, and theoretical knowledge of various aspects of the study using books, articles, internet, periodicals and magazines to develop tools for data collection.

Content Validity and reliability test:

Content validity of the proposed tools by using face and content validity. Face validity aimed at inspecting the items to determine whether the tools measure what supposed to measure. Content validity was conducted to determine whether the content of the tools cover the aim of the study. Validity tested through by a jury of 7 experts, two of them were professors and two assistant professors and three of them were lecturers of medical surgical nursing at faculty of nursing, Ain Shams University. The expertise reviewed the tools for clarity, relevance, comprehensiveness, simplicity and applicability of the tools. Experts responses were either agreed or disagreed or agreed with modification for the face validity and content validity, about 90% of the experts were agreement with the proposed tools.

Testing reliability

the tools was tested using alpha Cronbach's model which is a model of internet consistency and its normal range between 0 and 1 (value more than 0.5 acceptable reliability) interviewing questionnaire was reliable at (0.76), knowledge questionnaire was reliable at (0.88), foot care practice questionnaire was reliable at (0.68), observational checklist Wagner classification was reliable at (0.68), Thai stress test questionnaire was reliable at (0.82) of proposed tools was done statistically by alpha Cronbach test.

Ethical considerations

The ethical research considerations in this study included the following:

- The research approval of protocol was obtained from scientific research ethical committee in faculty of nursing before starting the study.
- The researcher clarified the objective and aim of the study to the patients included in the study.
- The researcher assured maintaining anonymity and confidentiality of the subject data.
- Patients were informed that they allowed choosing to participate or not in the study and they had right to withdraw from the study at any time without giving any reasons.
- Ethics, values, culture and beliefs were respected.

Pilot study:

A pilot study was conducted to test feasibility and applicability of the study tools used in this study. It was carried out on 10% of total study subjects. There wasn't modifications on tools were done after pilot study so that, the patients who included in the pilot study were included in the studied subjects.

Field work:

Data were collected in six months, from beginning of January 2018 the end of June 2018. The period of data collection was divided into the following:

The researcher started by introducing herself to the patients, the aim of the study and the component of the tools were explained to the patients who agree to participate in the study prior to any data collection.

The researcher visited the study setting three days per week (Saturday, Monday, Wednesday), during shift morning 9:00 am to 2:00 pm. The researcher assess the factors

affecting healing process of diabetic foot ulcer through the following:

Assessment health status through patient's weight, height, random blood sugar was carried out through 15 minute, and assess wound grade through dressing.

The researcher filled written questionnaire, the time needed for completing the patients interviewing questionnaire, Thai stress test, questionnaire about patients knowledge and questionnaire about foot care practice was about 35 minutes to 45 minutes for each patients .patients were followed until diabetic foot ulcer healing or surgical intervention (either by debridement or amputation).

III. Administrative design:

An official letter was issued from the faculty of nursing Ain Shams University to the director of El Arish general hospital and director ICU unit and surgical department at

Result

Table (1): shows, 34.7% of studied patients from 50-60 years old with mean age 52.9 ± 12.7 also 53.3% of studied patients were male, 72.0% of studied patients come from rural, 38.7% of studied patients were Housewife/ unemployed more over 82.7% of studied patients were Married, 41.3% of studied patients had high education and 58.7% of studied patients had insufficient income.

Table (2): shows, 49.3% of studied patients were obese, 97.3% of studied patients had type 2 and 68.00% of studied patients have diabetes more than 10 years also 46.7% of studied patients don't had associated disease, 78.7% of studied patients

which the study was conducted, explaining the purpose of the study and requesting the permission for conducting this study.

IV. Statistical design:

The collected data were organized, analyzed using appropriate statistical significant tests. All Data were tabulated and subjected to statistical analysis. Statistical analysis is performed by SPSS in general (version 20.0), also Microsoft office Excel is used for data handling and graphical presentation. Chi square (X^2) test of significance was used in order to compare proportions between two qualitative parameters.

The p-value was considered significant as the following:

Insignificant (NS) $p > 0.05$

Moderate Significant (S) $p < 0.05$

Highly significant (HS) $p < 0.001$.

treated by Insulin injection, additionally 97.3% of studied patients had un controlled fasting blood sugar, 82.7% of studied patients had impaired random glucose level and 54.7% of studied patients were smoker.

Figure (1): shows that, 57.3% of the studied patients had unsatisfactory of level overall knowledge regarding to diabetes.

Figure (2): show that, 37.4% of studied patients had grade 3, while 21.3 % of them have grade 1.

Table (3): shows that there were highly statistical significant relation between diabetic foot ulcer healing, debridement or amputated and BMI, duration of being

diabetes, diabetes treatment with p -value <0.05 , while moderate statistical significant relation between smoking, fasting blood level with p -value <0.001 .

Table (4): shows that, there were insignificant relation between diabetic foot ulcer healing and wound (duration, location of wound taking care of wound), while

moderate statistical significant relation between diabetic foot ulcer healing and infection with p -value <0.05 .

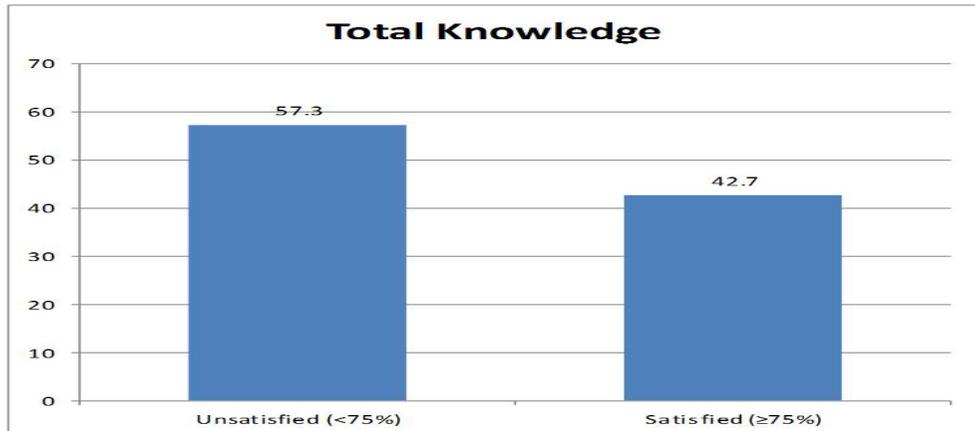
Table (5): shows that, there were highly statistical relation between stress level and diabetic foot ulcer healing, debridement or amputated with p -value <0.001 .

Table (1): Frequency and percentage distribution of studied patients regarding to socio-demographic characteristics (N=75).

Items	No.	%
Age (years)		
30-40 years	10	13.3
>40-50 years	19	25.3
>50-60 years	26	34.7
>60 years	20	26.7
Mean±SD	52.9±12.7	
Sex		
Male	40	53.3
Female	35	46.7
Residence		
Rural	54	72.0
Urban	21	28.0
Occupation		
Housewife/unemployed	29	38.7
Governmental employee	27	36.0
Freelance	10	13.3
Retired	9	12.0
Marital status		
Single	2	2.7
Married	62	82.7
Divorced	0	0.0
Widow	11	14.7
Education		
Illiterate	18	24.0
Read and write	19	25.3
Secondary education	7	9.3
High education	31	41.3
Average monthly income		
500-1500	44	58.7
2000-3000	15	20.0
3000-4000	3	4.0
>5000	13	17.3

Table (2): Frequency and percentage distribution of studied patients regarding to clinical health status (N=75).

Items	No.	%
BMI [wt/(ht)2]		
Normal weight	18	24.0
Overweight	20	26.7
Obese	37	49.3
Diabetes type		
Type I	2	2.7
Type II	73	97.3
Duration of being diabetic		
0_10years	6	8.0
>10_-20 years	51	68.0
>20 years	18	24.0
Associated chronic disease		
None	35	46.7
Kidney disease	4	5.3
Hypertension	26	34.7
Other	10	13.3
Diabetes treatment		
Insulin injection	59	78.7
Oral medication	16	21.3
Fasting blood sugar		
≤200	2	2.7
≥200	73	97.3
Random blood sugar		
Normal	6	8.0
Impaired glucose	7	9.3
Diabetic	62	82.7
Smoking		
No	34	45.3
Yes	41	54.7

Figure (1): Frequency and percentage distribution of patients level of knowledge

regarding to diabetes (N=75).

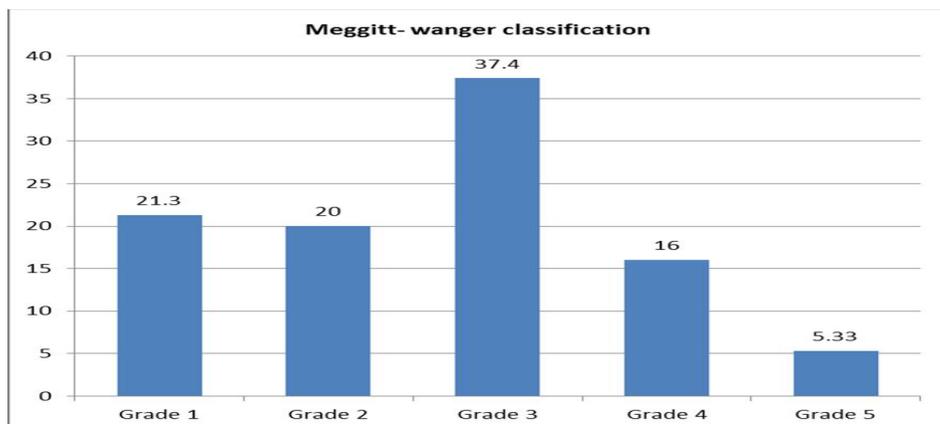
Figure (2): Frequency and percentage distribution of patients regarding to their Wagner classification.

Table (3): Relation between studied patients clinical health status and healing, debridement and amputation (N=75).

Clinical health status	Healing (n=16)		Debridement (n=24)		Amputation (n=35)		Chi-square test	
	No.	%	No.	%	No.	%	x2	p-value
BMI [wt/(ht)2]								
Normal weight	9	56.3%	4	16.7%	5	14.3%	20.340	<0.001**
Overweight	5	31.3%	8	33.3%	7	20.0%		
Obese	2	12.5%	12	50.0%	23	65.7%		
Duration of being diabetes								
<1 years	2	12.5%	0	0.0%	0	0.0%	22.590	<0.001**
1-5 years	5	31.3%	7	29.2%	4	11.4%		
>5-10 years	4	25.0%	1	4.2%	1	2.9%		
>10 years	5	31.3%	16	66.7%	30	85.7%		
Fasting blood sugar								
<200 Normal	2	12.5%	0	0.0%	0	0.0%	7.577	0.023*
>200 Diabetic	14	87.5%	24	100.0%	35	100.0%		
Diabetes treatment								
Insulin injection	5	31.3%	21	87.5%	33	94.3%	27.639	<0.001**
Oral medication	11	68.8%	3	12.5%	2	5.7%		
Smoking								
No	4	25.0%	7	70.8%	13	37.1%	9.914	0.007*
Yes	12	75.0%	17	29.2%	22	62.9%		

*p-value <0.05 S; **p-value <0.001 HS

Table (4): Relation between studied patients wound characteristics and healing, debridement and amputation (N=75).

Wound characteristics	Healing (n=16)		Debridement (n=24)		Amputation (n=35)		Chi-square test	
	No.	%	No.	%	No.	%	x2	p-value
Duration of wound								
<7 days	5	31.3%	4	16.7%	3	8.6%	4.862	0.302
>7 days _1 month	9	56.3%	14	58.3%	25	71.4%		
>1month	2	12.5%	6	25.0%	7	20.0%		
Location of wound								
Planter surface	7	43.8%	14	58.3%	20	57.1%	0.986	0.617
Dorsal surface Foot	9	56.3%	10	41.7%	15	42.9%		
Taking care of wound dressing								
Self dressing	0	0.0%	0	0.0%	0	0.0%	0.000	1.000
Dressing at clinic or hospital	16	100.0%	24	100.0%	35	100.0%		
Infection								
No	2	12.5%	16	66.7%	19	54.3%	11.91	0.003
Yes	14	87.5%	8	33.3%	16	45.7%		

*p-value <0.05 S

Table (5): Relation between studied patients level of stress and healing, debridement and amputation (N=75).

Level of Thai stress test (TST)	Healing (n=16)		Debridement (n=24)		Amputation (n=35)		Chi-square test	
	No.	%	No.	%	No.	%	x2	p-value
Low stress (<50%)	12	75.0%	0	0.0%	0	0.0%		
Average stress (50%-75%)	3	18.8%	11	45.8%	9	25.7%	56.606	<0.001**
High stress (>75%)	1	6.3%	13	54.2%	26	74.3%		

**p-value <0.001 HS

Discussion

In relation to demographic characteristics, the results of the present study showed that, the mean of the studied subjects' age were 53.9 ± 12.7 . This finding showed that one third of studied patients belonged to age group between 50 and 60 years. This explains that most of those patients were old age, which put them, at higher risk of delayed ulcer healing, increasing age may be contributing factors to chronic wound as the skin easily damage, aging physiological change loss skin elasticity and delay healing process.

This finding agrees with *Rosyid, Dharmana, Suwondo, Nugroho and Sugiarto, (2018)*; who showed the mean of the studied subjects' age were 52.1 ± 7.6 and reported delayed wound healing at old age. This is related to changes in inflammatory responses, such as the delay in infiltration of T cells into the wound with changes in chemokine production and decreased production of macrophages.

Regarding residence, the current study revealed that more than two thirds of studied patients belong to rural area. This finding agree with *Shahi, Kumar, Singh, Kumar and Gupta, (2012)* who showed that more than two thirds of studied patients had hailing from rural area. this may be due to diabetic patients hailing from rural area are more prone to foot ulcer more than urban area, this may be due to the fact that

individual in rural area sleep in huts, farm house or out doors on the farms, those people are commonly subject to rodent bites, especially to the feet, many rural people walk bare foot on roads can lead to chronic ulcer.

Regarding education, the current study revealed that one third of studied patient had bachelor level of education. This finding is inconsistent with *Kisojie et al. (2017)* who showed that more than half the studied patients had primary education level.

Regarding weight, the current study revealed that half of studied patients were obese. Obese patients experiencing compromised wound healing due to poor blood supply to adipose tissue. This finding disagrees with *Zaine et al. (2014)* who Showed that one third of studied patient were overweight.

Regarding diabetes type, the current study revealed that majority of studied patients have type 2 DM. This finding agrees with *Ahmed, Asif, Saleem, Abdul Majeed, And Bint-E-Athar, (2017)* who reported the majority of studied patients have type two DM.

Regarding duration of being diabetic, the current study revealed that two thirds of studied patients had diabetes of more than 10 years duration. Duration of diabetes had direct adverse impact on the outcomes of disease non healing ulcer or amputation to

chronic complication. These findings agree with *Mahmoud, Akhtar, AboTalib, Abbasi, ul-Salkeen and Nqvi, (2008)* who conducted that two thirds of the studied patients have diabetes more than 10 years.

Regarding associated chronic disease, the current study revealed that less than half of studied patients had non comorbidity condition. This finding disagrees with *Smith-storm et al. (2017)*. Who showed that less than half have a coronary artery disease.

Regarding fasting blood sugar, the current study revealed that majority of studied patient had poor glyceemic control. Poor glyceemic control are associated with an increased incidence and progression of diabetic complications. This finding agree with *Almaramhy, Muhhabbat, Fallatah, Al-Ahmad, Al-Alawi, and Guraya, (2018)* who reported the majority of patients under study presented with poorly controlled type 2 diabetes.

Regarding smoking, the current study revealed that more than half of studied patients were smoker. Smoking which a strong risk factor over half of studied patients. The history of smoking in whom higher level of amputation were have poor prognosis, smoking affects the small blood vessels and make wounds heal slowly. This finding in agreement with *Ravinthar et al. (2016)* who conducted that more than half of studied patients were smoker.

According to the finding of the present study, more than half of studied patients had unsatisfactory level of knowledge about diabetes. This finding agrees with *Berhe et al. (2014)* who showed that more than half of studied patient had poor knowledge about diabetes.

As regard to assessment wound grade by Wagner classification among diabetic patients. The current study revealed that one third had ulcer with grade 3. Worse prognosis on ulcer healing and need to amputation. This finding agrees with *Anand,*

(2016). Who showed that less than half of studied patient had grade 3.

Regarding the relation between patients ulcer healing and patients clinical health status there were highly statistical significant relation between body mass index, duration of being diabetes and diabetes treatment, while moderate significant relation between fasting blood glucose level, smoking and diabetic foot ulcer healing. This finding agree with *Mahmoud et al. (2008)* who reported poor glyceemic control and long duration of diabetes were significant risk factors in relation to foot ulceration and the risk of amputation increase with age and duration of diabetes.

On other hand the results was the same with *Raventhair, Saravanan, Kesavphani, Krishna, (2016)* who reported gave the history of smoking in whom higher level of amputation were attempted with poor prognosis, smoking affect the small blood vessels and make the wounds heal slower. The patients with healed ulcers were diabetic foot for less than ten years as increase in the duration of being diabetic impairs healing process.

Regarding the wound characteristics, there were no significant relation between patients diabetic foot ulcer healing and duration, location, and taking care of wound, while moderate significant relation with wound infection. This finding was in agreement with *Margolis, Kantor and Berlin, (1999)*, who mentioned in their study that wound duration did not significantly affect the wound healing.

While the finding was disagreed with *Mussa, (2012)* who concluded in their study that ulcer site had no effect on diabetic foot ulcer healing. Also the result was agreed with *Marston, (2006)* who illustrated in his study that the absence of infection were found to have a positive effect on healing of all diabetic foot ulcer. On other hand, this

finding disagrees with *Raimi and Fasmade, (2018)* who reported self home treatment may contribute to late presentation.

Considering the relation between patient's level of stress and patients ulcer healing, the current study revealed there was highly statistical significant relation between patient's level of stress and diabetic foot ulcer healing. This may be because of experiencing stress is a common state between diabetic patients who developed diabetic foot ulcer because of fear of amputation, as the popular perception that people with diabetes lose their limbs is in the minds of many people. These results agree with *Soliman, (2012)* who stated there was relation between diabetic foot ulcer and level of stress.

Conclusion

Based on findings of the current study, it can be concluded that: the mean age of studied subject 52.9 ± 12.7 , half of studied patients were male, half of studied patients were obese, and two thirds of studied patients had diabetes of more than 10 years duration. Majority of studied patient had poor glyceimic control and majority of studied patient had chemical debridement, was used normal saline dressing and had wound infection. There were significantly relation between diabetic foot ulcer and patients (age, sex, body weight, educational level, smoking, blood glucose, infection, type of dressing, debridement, offloading device, type of dressing, wound grade, mental stress). More than half of studied patients had unsatisfactory level of knowledge about disease process and good foot care practice.

Recommendations:

Based on the findings of the present study, the following recommendations are made:

- Developing a simplified and disseminate comprehensive booklet including basic

information about caring of diabetes patients.

- Diabetic foot complications could be applied on a large scale using an intervention design.

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