

Impact of Health Intervention about Foot Self-Care Behavior among Adult and Elderly Diabetic Patients

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Abstract:

Background: Diabetic patients with poor health behaviors are at greater risk for a range of adverse health problem. Diabetes foot problems can be avoided by practicing self-care. **Study aim:** evaluate the impact of health intervention about foot self-care behavior among adult and elderly diabetic patients. **Subjects and Methods:** Quasi-experimental design pre and late posttest was applied in Internal and the outpatient clinic at main Assiut university hospital. **The sample size:** This study included purposeful sampling, with a total of 80 diabetic participant. **Data collection tools:** Interviewing questionnaire included personal characteristics, medical data, Diabetic Foot Self-care behavior scale and Health Intervention through International Working Group Diabetic Foot. **Results:** Mean \pm SD of Diabetes Mellitus duration was 10.7 ± 8.2 years, significance difference between the total score of foot self-care behavior in pre and late posttest with a mean \pm SD (42.8 ± 6.96 and 74.04 ± 29.11) respectively. Also, between self-care behavior of the studied sample and their knowledge level in pre & late posttest (P. value= 0.061 & 0.001) respectively **Conclusion:** Health intervention have a positive significant impact on the studied sample self-care behavior regarding diabetic foot. **Recommendations:** Provision of comprehensive foot care and intervention for diabetic patients with foot ulcers in order to avoid complications.

Keywords: Health intervention, Self-care behavior & Diabetic patients

Introduction

Diabetes mellitus (DM) is a category of metabolic disorders caused by insulin resistance or total/relative insulin insufficiency. It is regarded as one of the most serious global health issues of the twenty-first century. Around 425 million people worldwide suffer from diabetes, with 629 million expected to be affected by 2045 (American Diabetes Association, 2020).

Diabetes management demands major behavioral changes. It includes the knowledge, skills, and self-assurance required to improve self-care behavior. Foot care is part of the standard practice for diabetic self-care. Diabetic patients must practice foot self-care on a daily

basis to avoid and delay potential complication. Diabetes is becoming more common, and the consequences of undiagnosed or even correctly treated diabetes will be disastrous in terms of micro and macro vascular disorders. One of the most well-known and debilitating microvascular complications of diabetes is diabetic foot. (Chawla et al., 2016).

Diabetic foot is described as a combination of disorders in which tissue breakdown and possible removal are caused by neuropathy, ischemia, and illness. It is a devastating DM complication that can be avoided to a large extent. Simple interventions such as routine foot exams, patient education on sterile practices, suitable footwear, early identification and

treatment of minor/significant wounds, and a multidisciplinary group approach can reduce ulcer occurrence by 50% and lower limb amputations by up to 85% (Bird, Turner 2017) & (Barello et al., 2020).

Foot health problems are common in the elderly due to pathological changes in their feet, difficulties involved in taking care of their extremities. The prevalence of diabetic foot ulceration in the diabetic population is 4:10%; the condition is more frequent in older patients. Foot ulcers' (FU) risk factors among diabetes patients incorporate peripheral neuropathy, limb ischemia, foot deformity, high plantar pressure, and infections. Poor glycemic control, long term of DM duration and male sex are other significant (Al-Ayed et al., 2019).

Self-care is fundamental for diabetic elderly to survive a long and healthy life. However, various studies have shown that self-care is far from optimal. This has brought about in attempts to understand the elements of self-care behavior in the hope of intervening more effectively. Health beliefs and self-efficacy have each been proposed as explanations for self-care behavior (Trappes, Lomax, 2016; Cnossen et al., 2016 & Li et al., 2019).

The International Working Group on the Diabetic Foot [IWGDF] has issued evidence-based guidelines to prevent and manage diabetic foot disease since year 1999. This is on the anticipation of foot ulceration (FU) in diabetic patients then updated in 2015. The general aim of IWGDF was for clinicians and wellbeing care experts in giving helpful data on the avoidance of diabetic foot among high-risk individuals with diabetes (Bus et al., 2020).

Health knowledge for nursing developments both spoken and written communication that assisted the nurses successfully in meeting the unique needs to improve persistent supplier contact throughout the entire care. It provides techniques for creating socially suitable written materials in everyday language that patients may read and follow when they return home (Parker & Ratzan, 2019).

In the field of diabetic foot prevention and self-care, nurses have an educational role. they are in charge of detecting any changes in skin and foot sensation, as well as providing foot care, dressing, and implementing new technologies. Nurses have a critical role in preventing and treating foot ulcers in the elderly (FU). Nurses must validate that the treatments, characteristics, and lifestyles of patients and their families, as well as the risk factors connected with diabetes,

are appropriate to ensure that a treatment is accepted (Ibrahim et al., 2017).

Significance of the study

Diabetic foot ulcers (DFUs) contribute significantly to diabetic patient morbidity, lengthen hospital stays and account for about 20% of all diabetes-related hospitalizations. Diabetes individuals have a lifetime risk of getting foot ulcers ranging from 19 percent to 34 percent, and DFUs are responsible for roughly 85 percent of all diabetic lower limb amputations (DLA). The mortality rate after DLA is 7.8%, with foot ulcers accounting for 24.6 percent of deaths after 5 years and 45.4 percent within 10 years (Jeyaraman et al., 2019). DFUs impose a huge socioeconomic burden on patients and their families in addition to morbidity and mortality. Consequently, they have a considerable impact on the quality of life of patients, as they are a leading cause of depression and physical disability.

According to a systematic research comprising more than 800,000 contributors diagnosed with DM worldwide, the global prevalence of DFUs is estimated to be 6.3 percent. Furthermore, the findings revealed a greater prevalence of DFUs in Africa (7.2%) than Asia (5.5%) or Europe (5.2%). (3 percent). According to research conducted in Egypt, DFUs are present in 6.1% to 29.3% of diabetes patients (Galal et al., 2021).

Aim of the study

To evaluate the impact of health intervention about foot self-care behavior among adult and elderly diabetic patients.

Research Hypothesis:

Hypothesis (0): Application and practicing of health intervention will not be improving diabetic patients' self-care behavior

Hypothesis (1): Application and practicing of health intervention will be improving diabetic patients' self-care behavior

Subjects and Methods

Study design

A quasi-experimental pre and late posttest research design was applied for this work.

Setting of the study

This study was conducted in the diabetic ward of Internal Medicine Department and the Diabetic Foot outpatient clinic at main Assiut university hospital, this clinic provides preventive and curatives cares for all patients. Make counseling regularly for diabetic patients about foot care, injection of insulin, diet control

and how to measure blood sugar regularly in home and follow up.

Sample:

Purposeful sampling was used in this study to select the participants. The total number of diabetic patients attending an outpatient clinic at Main Assiut University Hospital, in the previous six months from January to July/2019 was 1612. Sample size was calculated by using software EPI/info7, Version 3.3, using expected frequency of good knowledge to be 50% with a confidence level 95% and confidence limit 5%, the estimated sample size was 311. The health intervention applied to 25% of this sample and increased to become 80.

Inclusion criteria

Patients 'aged ≥ 20 years, able to communicate with health team, free from mental problems, and agreed to participate in the study were included.

Tools of the study:

Three tools were used to collect data for this study:

Tool I: Interviewing questionnaire was designed and developed by the research team after reviewing of different researches and literatures. It was covered two parts:

Part 1: Personal characteristics: Consisted of six questions related demographic data such as age, gender, marital status, educational status occupation and residence.

Part (2): Medical data: Involved five questions related to diabetes mellitus it included history of DM, duration, blood glucose level, diabetic medication and complication.

Tool II: Foot Self-care Behavior Scale (Pre/late posttest): Foot self-care behavior (FSCB). This scale was developed by (Chin & Huang 2013). Based on existing literature and a modified version of the Diabetes Foot Self-Care Behavior Scale (DFSBS). Its goal was to assess diabetic patients' foot self-care habits. It consisted of 17 items; responses were scored on a 5 points Likert's scale (1=never through 5=always that was converted to percentages as follows: 1=0%, 2=25%, 3=50%, 4=75%, and 5=100%.

Scoring of Scale:

The actual total score was derived by the addition of each item score and converted them into a standard score ranged from 0–100 degrees to quantify the level of foot self-care behaviors among diabetic patients.

The category classification was as follows:

- <60 =poor self-care behavior,
- $60- <80$ =medium self-care behavior.
- 80 =good self-care behavior.

Tool III: Health Intervention through IWGDF:

In the International Working Group on the Diabetic Foot (IWGDF) Practical Guidelines, 2019 describes the basic principles of prevention and management of diabetic foot disease. The Practical Guidelines are based on the IWGDF, consisting of evidence-based guideline; it included Classification of diabetic foot ulcers, Prevention of foot ulcers, offloading foot ulcers, Diagnosis, prognosis and management of peripheral artery disease in patients with a foot ulcer and diabetes, Diagnosis and treatment of foot infection, and Interventions to enhance healing of foot ulcers (Bus et al., 2020). In addition to introduction about DM, causes, signs and symptoms, blood sugar level, diabetic medication, injection of insulin. Life style and diabetic complication.

This part consisted of (24) questions to assessing foot self-care knowledge among diabetic patient; in this section, each correct answer took 1 degree and incorrect answer took zero. Scoring system of Knowledge was considered poor if $<50\%$, fair 50-60 and good $>50\%$ (Ragab et al, 2021).

Validity of the tools: -

The tools were transferred to Arabic language and reviewed to ascertain their validity by three experts in medical and nursing sciences, who reviewed the instrument for clarity, relevance, comprehensiveness, understanding and applicability.

Reliability of the tools II:

A reliability test was carried out by the researchers in order to examine the internal consistency of its questions. It was done during the pilot study before starting of data collected on 10% (8) of participant. The value of Cronbach's alpha was = 0.76.

Methods

Administrative phase: The dean of Assiut University's Faculty of Nursing sent an official approval letter included a permission to carry out the study, to the directors of the Internal Medicine Department, outpatient clinic, and counseling room.

A pilot study was carried out before starting data collection to test the study tools' clarity and applicability of the questionnaire and statement, content, feasibility, and consistency for identifying any ambiguity. It was carried out on (8) patients (10%). The pilot also served to estimate the time required to fill the tools. There was no modification needed, as a result, the pilot sample was included to the main sample.

Ethical consideration: Research proposal was approved from the ethical committee in the Faculty of Nursing, Assiut University (**IRB no.2680031**). There was no risk for the study subjects during the application of the research the researchers followed all the ethical issues in conducting the research. Consent was secured orally from the participants who were willing to participate in the study. The participants were informed that participation in this study is voluntary; they can withdraw at any time during the study without giving reasons. The researchers explained the aim of the study to all patients in the study sample. They reassured that any obtained information would be strictly confidential.

The phases of program:

The program had been developed by the researchers based on the national and international literature using books, articles and periodicals.

Assessment phase:

- During the first contact with participants, the researchers introduced themselves, explained the nature and aim of the study, and gained consent.
- Then the researchers began to collect the data individually from each patient regarding tool I, II, and III).
- Finally based on pre- test assessment of patients' knowledge about diabetic patients' self-care behavior which denotes knowledge deficit, so the program was prepared to improve patients' knowledge and behavior related to foot self-care.

Planning phase: The sessions and time of the program decided. Other facilities were checked and arranged during this phase as the teaching place, teaching methods and materials.

Teaching place: was conducted in available places (nursery room, outpatient and counseling room). This arrangement was done with the directors of the hospital.

Teaching methods and materials: It was prepared before implementing the program to prepare simple teaching methods to be used such as: lecture, discussion, demonstration and re-demonstration. In this study, the materials that were used consisted of a power point presentation (PPT), a pamphlet, colored book (for participants) and a foot kit (including a pamphlet on foot care, a nail clipper, moisturizing lotion, and a small towel) to help promote participant retention.

Sessions: The content of the program divided into four sessions: **the first session included:**

introduction about DM, causes, signs and symptoms, blood sugar level, diabetic medication, injection of insulin. **The second session included:** knowledge related life style modification, diabetic complication, foot self-care behaviors. **The third and the last session included:** the basic principles of prevention and management of diabetic foot disease. The Practical Guidelines are based on the IWGDF, Classification of diabetic foot ulcers, Prevention of foot ulcers, offloading foot ulcers, Diagnosis, prognosis and management of peripheral artery disease in patients with a foot ulcer and diabetes, Diagnosis and treatment of foot infection, and Interventions to enhance healing of foot ulcers.

Implementation phase:

- The researchers implemented the health intervention according to the baseline data two day/week using IWGDF Guidelines.
- During the intervention program, a group seminar comprised a 20- to 30-minute Power Point presentation then 20-minute for open discussion. After that advised Participants to read the leaflet or watch the video IWGDF Guidelines carefully twice a week and compliance with routine visits to the outpatient biweekly until the end of the program. Patients' follow-up conducted via telephone/Whats-App application if available to ensure the patient compliance.
- An application of health intervention using IWGDF guidelines 2019 consumed six months in the period from 1st of August 2019 to the end of January 2020.

Evaluation stage

The evaluation was done through

- Late posttest after (4 weeks) which done after implementing the program to assess patients' knowledge and performance intervention by using observational checklist at outpatient clinic and counseling room for diabetes patients.

Statistical analysis

Data entry and data analysis were done using SPSS version 22 (Statistical Package for Social Science). Data were presented as number, percentage, mean and standard deviation. Chi-square was used to compare between qualitative variables. Mann-Whitney test was used to compare quantitative variables between two groups and Kruskal Wallis test for more than two groups. P-value considered statistically significant when $P < 0.05$.

Results:-**Table (1): Distribution of studied sample according to their demographic data (N=80).**



Demographic data		N=80	%
Age in years	25:35	8	10.0
	>35:45	20	25.0
	>45:60	20	25.0
	>60	32	40.0
Mean ±SD		51.6±9.6 years old	
Gender	Male	48	60.0
	Female	32	40.0
Marital status	Single	8	10.0
	Married	64	80.0
	Widow	8	10.0
Education level	Illiterate	32	40.0
	Basic education	8	10.0
	Secondary education	20	25.0
	High education	20	25.0
Occupation	Employee	28	35.0
	Farmer	12	15.0
	Housewife	20	25.0
	Unemployed	20	25.0
Residence	Rural	64	80.0
	Urban	16	20.0

Table (2): Distribution of the studied sample related to their medical data (N =80).

Medical data		No.=80	%
History of diabetic foot	Not present	68	85.0
	Present	12	15.0
DM duration	Mean ±SD	10.7 ±8.2 years	
Blood glucose level	Mean ±SD	276.0 ± 71.7 mg/dl	
Diabetic medication	Oral hypoglycemic	30	37.5
	Insulin dependent	50	62.5
	Lifestyle	0	.0.0
Diabetes complications*			
Hypertension	Present	48	60.0
Coronary disease	Present	8	10.0
Diabetic nephropathy	Present	16	20.0
Diabetic kidney disease	Present	12	15.0

* Answers are not mutually exclusive

Table (3): Foot Self-care behaviors of the studied sample pre and late post health intervention. (N=80)

Items	Pre		post		P.value
	No	%	No	%	
1. Daily web spaces.	32	40.0	44	55.3	0.001**
2. Bathing the foot daily.	40	50.0	69	86.3	0.001**
3. Test the temperature of water with wrist or a thermometer prior foot bathing.	56	70.0	58	72.5	0.01*
4. Drying the feet with a towel and web spaces.	52	65.0	69	86.3	0.004*
5. Using oil, lotion, or lanolin cream after foot bathing.	24	30.0	44	55.0	0.001**
6. Trimming the toenail as in the picture: 	16	20.0	58	72.5	0.001**
7. Walking barefoot.	4	5.0	79.0	98.8	0.001**
8. Choosing shoes in standing (afternoon or at night).	48	60.0	66.0	82.5	0.003**
9. Choosing appropriate shoe wear as in picture: 	60	75.0	73	91.3	0.005*
10. Checking the inner side of the shoes before wearing.	64	80.0	70	87.5	0.108
11. Wearing shoe with open toes.	60	75.0	77	96.3	0.001*
12. Changing daily the pair of clean socks.	52	65.0	52	65.0	0.566
13. Wearing the light-colored socks.	28	35.0	28	35.0	0.001**
14. Wearing the tight socks.	32	40.0	78	97.5	0.001**
15. Increasing the time of wearing gradually until using a new shoe.	32	40.0	52	65.0	0.001**
16. Using an electric heating or hot water bags for warming the feet.	20	25.0	62	77.5	0.001**
17. Scheduling the feet clinical examination.	12	15.0	28	35.0	0.003*

*Statistical significant at $P \leq 0.05$

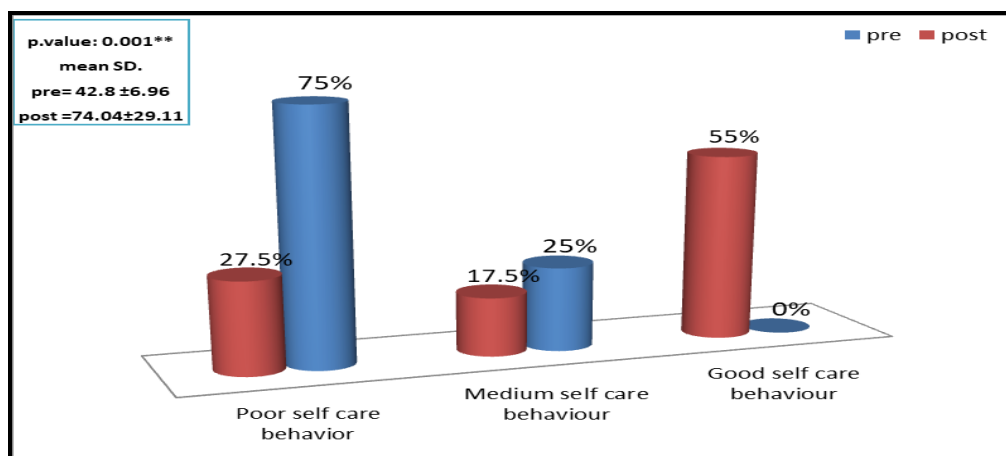


Figure (1): Total score of diabetic foot self-care behavior for the studied sample pre and late post health intervention (N=80).

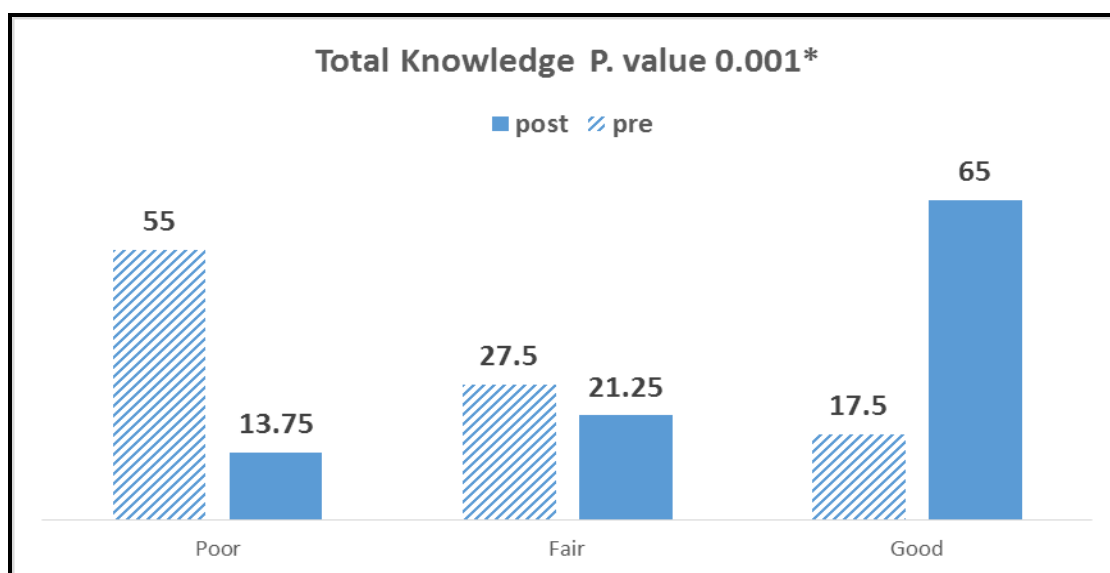


Figure (2): Total score of knowledge among studied sample pre, post (N= 80).

Table (4): Relation between demographic data of the studied sample and their knowledge level in late posttest (N= 80).

Demographic data		Poor	Fair	Good	P.value
Age in years	>25:35	5	2	1	0.000*
	>35:45	1	7	12	
	>45:60	4	3	13	
	>60	1	5	26	
Sex	Male	2	7	39	0.000*
	Female	9	10	13	
Marital status	Single	1	5	2	0.036*
	Married	8	11	45	
	Widow	2	1	5	
Educational Level	Illiterate	9	12	11	0.000*
	Primary school	2	3	5	
	High school/ technical school	0	1	19	
	High education	0	1	19	
Occupation	Employee	1	10	17	0.004*
	Farmer	2	5	5	
	Housewife	2	1	17	
	Unemployed	6	1	13	
Residence	Rural	9	14	41	0.939
	Urban	2	3	11	

*Statistical significant at $P \leq 0.05$

Table (5): Relation between diabetic foot self-care behavior & demographic data among studied sample pre and late post health intervention (N=80)

Demographic data		Pre guidelines application			Post guidelines application		
		Poor self-care behavior N=60 (75%)	Medium self-care behavior N=20 (25%)	Good self-care behavior N=0 (0.0%)	Poor self-care behavior N=22 (27.5%)	Medium self-care behavior N=14 (17.5%)	Good self-care behavior N=44 (55%)
Age	25:35	8	0	0	1	6	1
	>35:45	12	8	0	5	3	12
	>45:60	18	2	0	11	1	8
	>60	22	10	0	5	4	23
P. value		0.102			0.000*		
Gender	Male	28	20	0	14	9	25
	Female	32	0	0	8	5	19
P. value		0.001**			0.813		
Marital Status	Single	0	8	0	3	1	4
	Married	52	12	0	17	12	35
	Widow	8	0	0	2	1	5
P. value		0.001**			0.947		
Education	Illiterate	28	4	0	8	6	8
	Basic education	8	0	0	2	2	10
	Secondary education	20	8	0	8	4	12
	High education	4	8	0	4	2	14
P. value		0.001*			0.001*		
Residence	Rural	52	12	0	17	12	35
	Urban	8	8	0	5	2	9
P. value		0.015*			0.821		
Occupation	Employee	8	16	0	8	4	12
	Farmer	8	4	0	3	3	6
	Housewife	20	0	0	5	2	13
	Un employee	24	0	0	6	5	13
P. value		0.001**			0.906		

*Statistical significant at $P \leq \text{value } 0.05$

Table (6): Relation between diabetic foot self-care behavior & studied sample medical data pre and late post health intervention (N=80)

Medical data		Pre guidelines application			post guidelines application		
		Poor self-care behavior	Medium self-care behavior	Good self-care behavior	Poor self-care behavior	Medium self-care behavior	Good self-care behavior
History Diabetic foot	Present	48	20	0	19	12	37
	Not Present	12	0	0	3	2	7
P. value		0.023*			0.976		
Hypertension	Not present	20	12	0	9	6	17
	Present	40	8	0	13	8	27
P. value		0.033*			0.956		
Coronary Disease	Not present	60	12	0	19	13	40
	Present	0	8	0	3	1	4
P. value		0.001**			0.782		
Diabetic Nephropathy	Not present	48	16	0	18	10	36
	Present	12	4	0	4	4	8
P. value		0.637			0.667		
chronic kidney disease	Not present	56	12	0	18	12	38
	Present	4	8	0	4	2	6
P. value		0.001**			0.885		
Duration of DM	<5 years	24	4	0	7	7	14
	5-10 years	12	8	0	6	2	12
	>10 years	24	8	0	9	5	18
P. value		0.128			0.745		

*Statistical significant at $P \leq \text{value } 0.05$

Table (7): Relation between self-care behavior of the studied sample and their knowledge level in pre & posttest (N= 80).

Total knowledge		Poor self-care behavior		Medium self-care behavior		Good self-care behavior		P. Value
		N.	%	N	%	N	%	
(Pretest)	Poor	32	40.0	9	11.25	3	3.75	0.061*
	Fair	3	3.75	11	13.75	8	10.0	
	Good	2	2.5	4	5	8	10.0	
(post-test)	Poor	1	1.25	3	3.75	7	8.75	0.001*
	Fair	9	11.25	7	8.75	1	1.25	
	Good	3	3.75	6	7.5	43	53.75	

*Statistical significant at $P \leq \text{value } 0.05$

Table (1): Revealed that 40% of studied sample were >60 years with a mean \pm SD (51.6 \pm 9.6), and 60% from them were male; also, the table cleared that 80%, 40% 35% and 80% of studied sample were married, illiterate, employee, and from the rural area, respectively.

Table (2): Presented that 85% of studied sample hadn't diabetic foot history with mean \pm SD of DM duration (10.7 \pm 8.2) years, while mean \pm SD of glucose level was (276.0 \pm 71.7 mg\L) and 62.5% of them dependent on insulin as a medication. As regards diabetes complication; 60% of studied sample have hypertension followed by nephropathy 20.0% and only 10.0% have coronary disease.

Table (3): Illustrated that; there were a statistically significance difference between most of items foot self-care behavior among studied sample pre and late post health literacy intervention except (checking the inner side of the shoes before wearing and changing daily the pair of clean socks).

Figure (1): Stated that there was a statistically significance difference between the total score of foot self-care behavior in pre and late post health literacy intervention (P. value=0.001) with a mean \pm SD (42.8 \pm 6.96 and 74.04 \pm 29.11 respectively).

Figure (2): Presented that there was a statistically significance difference between total score of knowledge in pre and late post health literacy intervention (P. value=0.001).

Table (4): Showed there was a statistically significance difference between all items of demographic data of the studied sample and their knowledge level in late posttest except residence $P=0.939$.

Table (5): Illustrated that there was statistically significant difference between foot self-care behavior among the studied sample & their demographic data in pretest related to age, gender, marital status, educational level residence and occupation (P. value= 0.000, 0.001, 0.001, 0.001, 0.015 & 0.001) respectively. On other hand there was only statistically significant difference between self-care

behavior & educational level for studied sample in late posttest (P. value= 0.001).

Table (6): Reported that there was statistically significant difference between foot self-care behavior among studied sample & their medical data in pretest related to history of diabetic foot, hypertension, coronary diseases, CKD as complications for DM (P. value= 0.023, 0.033, 0.001, 0.001) respectively, while there was not statistically significant difference between self-care behavior and medical data among the studied sample in late posttest.

Table (7): Illustrated that there was statistically significant difference between self-care behavior of the studied sample and their knowledge level in pre & late posttest (P. value= 0.061 & 0.001) respectively.

Discussion:

Diabetic patients are susceptible to diabetic foot complications as infection, ulcer and gangrene. Proper foot care is critical in preventing these problems and enhancing these patients' quality of life. Diabetic foot problems are one of the most common chronic complications of diabetes that has a tremendous economic and social impact on individuals, elderly, families and on health system as a whole in developing and developed countries (Saleh et al., 2012).

The study aimed to evaluate the impact of health intervention about foot self-care behavior among adult and elderly diabetic patients'.

Foot self-care behavior improved after the health intervention, according to the current study. In terms of demographic characteristics, it was discovered that half of the study sample were between the ages of 36 and 60, and the other half were elderly patients aged >60, with a mean age of 51.6 \pm 9.6; this indicates that long periods of living with diabetes increase population awareness of the disease.

These results similar to Abdelsalam et al., (2017) who conducted study of Effectiveness of health education intervention on foot self-care practice among diabetics at Zagazig university hospitals which

found that the greatest of samples were in the age of 26-70 years with a mean age of 55.0 ± 10.1 .

Regarding gender, it was illustrated that three fifths of the studied sample were males, this may be due to women put their health of low priority due to increased daily family duties. this agree with **Siti et al., (2018)** who carried study about the effect of self-efficacy enhancing program on foot self-care behavior of older adult with diabetes which found that more than half of the studied sample were males, on other hand this disagree with **Abdelsalam et al., (2017)** who reported that the most of the studied sample were females.

In terms of education, it was discovered that two-fifths of the studied sample were illiterate, while half had secondary and higher education. Additionally, the current study found a statistically significant relationship between educational level of the studied sample and knowledge level $P < 0.000$, which could be related to the fact that educated people were more aware of their health and sought help as soon as possible, in contrast to illiterate people.

This is similar to **Al-Ghazaly et al., (2015)**, who conducted a study titled Risk factors of diabetic foot ulcer in patients attending a diabetic foot outpatient clinic in Tanta and found that diabetic foot was more common in uneducated people (88.0%) who did not complete high school education compared to those with higher educational attainment, and that there was a statistically significant effect between educational level of the study group and knowledge level $P = 0.001$. Also, the present study in the same line with **Saeed et al., (2010)** who carried study of Frequency of patients with diabetes taking proper foot care according to international guidelines and its impact on their foot health who presented that diabetic foot problem was more prevalent among low educational participants or could only read and write.

In concerns of diabetic foot history, it was revealed that 85 percent of the participants had no history of diabetic foot, with a Mean \pm SD 10.7 ± 8.2 years. This could be attributed to the fact that the chance of developing a diabetic foot ulcer increases as the duration of diabetes exceeds 10 yrs. This agrees with **Elmadhoun et al., 2016** who reported that the longer duration of diabetes was significantly associated with diabetic foot ulcer was 95%.

In addition, the present study revealed that about two thirds of the studied sample was insulin dependent, this due to the participants had type 2 diabetes. This finding consistent with **Almobarak et al., 2015** who reported that 85% of the studied sample had uncontrolled type 2 diabetes.

In line for diabetic complications, three-fifths of the participants in the study had hypertension, which could be due to diabetes mellitus causing peripheral

vasoconstriction. This contradicts the findings of **Al-Ghazaly et al., 2015**, who found that 47.4% of the individuals tested had no complications and 36% had diabetes-related hypertension.

The results of the current study noticed that foot self-care behaviors improved in posttest than pretest this indicate the effectiveness of health intervention program, this similar to **Al-Ghazaly et al., 2015** who reported that there was statistically significant relationship between pre and posttest regarding foot self-care behaviors.

The present study reported a statistically significant relationship between the age of the studied sample and their knowledge level $P < 0.000$, with participants aged >60 years achieving a higher level of knowledge than those aged $>35-60$ years, owing to the longer time spent living with diabetes aiding adaptation to disease changes. As the patient learns more about the ailment and gains experience, he or she gets more knowledgeable. These findings confirmed those of **Siti et al., (2018)**, who found a statistically significant relationship between the age of the study sample and their level of knowledge.

Also, the present study showed that there was statistically significant difference between gender of the studied sample and their knowledge level $P = 0.000$, this agree with **Saleh et al., (2012)** who reported that there was statistical significant effect between sex of the study group and their knowledge level $P < 0.001$.

Concerning the residence, it was observed that more than three quarters was from rural areas, this is similar to **Litwak et al., (2013)** who conducted study about Prevalence of diabetes complications in people with type 2 diabetes mellitus and its association with baseline characteristics in the multinational A1chieve in Russia study and referred that the majority of respondents were from rural places.

Our findings revealed that health intervention most items of foot care practice was significantly improved after that while a study conducted in a primary care center by **Saurabh et al., (2014)** who applied study of Effectiveness of foot care education among people with type 2 diabetes in rural Puducherry, India and illustrated that improvement of foot care practice after guidelines booklet.

The current study found that the investigated sample made considerable progress in terms of good self-care behavior in the late posttest compared to the pretest, indicating the program's success. **Fan et al., (2013)** studied the feasibility, acceptability, and effectiveness of a foot self-care educational intervention on minor foot problems in adult diabetic patients with low risk of foot ulceration and toenails problems (all $p < 0.05$) at the late posttest.

Owing to total knowledge level for the present results revealed that there was statistically significant difference between pre and late post health intervention whereas good knowledge level score improves in late posttest, this finding agrees with **Abdelsalam et al., (2017)**.

Our findings showed that there was statistical significant difference between age of the studied sample & their self-care behavior late post intervention $P < 0.000$ while participants aged > 60 years, This may be because diabetic patients with long duration have been exposed to more complications such as foot ulcers. This similar to **Seyyedrasooli et al., (2015)** who conducted study about Self-efficacy in foot-care and effect of training: a single-blinded randomized controlled clinical trial which found that statistical significant difference between age & their self-care behavior late post guidelines application $P < 0.000$.

At pre-test, there was a statistically significant difference between gender, residence, and self-care behavior among the studied sample, according to the current study. These findings are in sharp contrast to those of (**Abdelsalam et al., 2017**). Furthermore, the current findings revealed that during pre-test, there is a statistically significant difference between education, occupation, and self-care behavior. These findings align with those of (**Abdelsalam et al., 2017**), who found that occupation and education had no effect on foot self-care practice at baseline.

This study findings shown that there were no statistically significant differences between the studied sample self-care behavior and the duration they got DM before pre and late post the health literacy intervention ($P = 0.128$ & 0.745) respectively. These results are opposite to the findings reported from the study conducted in China by **Rao Li et al., (2014)** which founded that the foot self-care behaviors were influenced by duration of diabetes.

There were statistically significant differences between the studied sample's knowledge levels and self-care behavior before (at pre-test) and after (late post-test) the health literacy intervention ($P = 0.061$ & 0.001). This finding is in line with **Lael-Monfared et al (2019)**. In addition, a study by **Sari et al. (2020)** found that one of the five determinants of foot self-care behavior is knowledge level.

This study reflected that there was no statistically significant differences between knowledge levels of the studied sample and their self-care behavior at pre-test while there was statistically significant differences between knowledge levels and their self-care behavior at post-test, $P = 0.001$. In the same line, the study done by **Lael-Monfared, et al. (2019)** which revealed that the constructs of knowledge, and

health intervention related to self-care behaviors were significantly ($p < 0.05$).

Conclusion:

It can be concluded the following based on the results of the existing study:

Health intervention have a good and significant impact on patients' diabetic foot self-care behavior. In the pre-test, more than half of the study sample had a low level of understanding about foot care, but their knowledge improved once the education program was implemented. In the pretest and late posttest, there was a statistically significant difference in participant knowledge.

Recommendations:

Based on the results of the present study:, can be recommended the following:

- Provision of comprehensive foot care and intervention for diabetic patients with foot ulcers in order to avoid complications.
- Encouraging diabetes patients to have their feet examined at each appointment to detect peripheral neuropathy, peripheral arterial disease, and plantar pressure early.
- Dissemination of a comprehensive health education package on diabetic foot self-care through various forms of media, including television.
- Further studies about diabetic patients with high risk of foot ulceration.

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