



A FOOT ULCER PREVENTION GUIDELINE PROGRAM FOR ELDERLY DIABETIC PATIENTS AT EL - FAYOUM GENERAL HOSPITAL

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ABSTRACT: *Background:* Diabetic foot ulcer is a serious complication of diabetes and a major cause of morbidity and mortality among diabetic elderly patients, and good prevention guideline programs will inhibit the diabetic foot ulcer and further complication. *Aims:* This study aimed to evaluate the effect of a foot ulcer prevention guideline program for elderly diabetic patients at EL- Fayoum General Hospital. *Research design:* A quasi-experimental research design was used to utilize this study. *Setting:* The study was conducted at the medicine outpatient clinic in EL- Fayoum General Hospital. *Subjects:* A purposive sample was used to choose 300 elderly diagnosed with diabetes. *Tools for data collection:* Two tools for data collection were used. *1st tool:* Structured interviewing questionnaire included demographic characteristics of elderly patients, past and current medical history, knowledge assessment questionnaire, patients reported practice questionnaire. *2nd tool:* Observational checklist to assess foot ulcer risk included neurological foot assessment and peripheral vascular assessment. *Results:* It was revealed that there was a highly statistically significant improvement in total knowledge, good score and satisfactory reported practice represented as (7% to 85.3%) and (40.3% to 93.30%) respectively pretest versus posttest. In addition, there was a highly statistically significant improvement in total neurological foot items and total right and left peripheral vascular items represented as (14.23±3.004 to 16.97±1.800), (11.38±2.57 to 12.22±2.11) and (11.32±2.63 to 12.15±2.14) respectively pretest versus posttest. *Conclusion:* The current study concluded that after applying the foot ulcer prevention guideline program, level of knowledge, reported practice and foot ulcer risk scale of elderly diabetic patients improved. *Recommendation:* Periodic prevention guideline program and reduction sessions regarding the prevention of foot ulcer in diabetic elderly patients.

KEYWORDS: Elderly, diabetic foot ulcer, prevention guideline program.



INTRODUCTION

The global population aged 60 years or over numbered 962 million in 2017, more than twice as large as in 1980 when there were 382 million older persons worldwide. Egypt is the most populous country in the Middle East and the second most populous on the African continent after Nigeria. Following a healthy lifestyle, continuous and regular physical examination protects the elderly from the risk of chronic diseases such as diabetes disease and further complications such as diabetic foot ulcer (Caruso & Puca, 2021).

Diabetic Foot Ulcer (DFU) is a skin sore with full thickness skin loss on the foot due to neuropathy and/or vascular problems; high blood sugar affects peripheral nerves causing motor, sensory, and autonomic nerve damage. Motor neuropathy causes muscle weakness, atrophy, and paresis. Sensory neuropathy leads to loss of the protective sensation of pain and heat. Autonomic dysfunction causes vasodilation and decreased sweating resulting in a loss of skin integrity and fissure (Grennan, 2019).

Large blood vessels in the legs may also be affected by diabetes manifested as faster atherosclerosis that results in severe Peripheral Vascular Disease (PAD). Approximately 80% of the diabetic mortality is attributed to the thrombotic events. The American Diabetes Association (ADA) recommends through consensus that the Ankle-Brachial Index (ABI) should be performed as a measure of early detection of PAD in all diabetic patients over 50 years old (Tresierra-Ayala & Rojas, 2017).

The International Working Group on the Diabetic Foot (IWGDF) 2019 has published evidence-based guidelines on the prevention of diabetic foot ulcer; following these guidelines help health care professionals, especially geriatric nurses, to provide better care for the elderly ones with diabetes at risk of foot ulceration, and good diabetic foot-screening. The basics of screening involve identification of four main elements such as history of lower extremity disease, foot ulceration, amputation, lower extremity bypass, or Charcot neuroarthropathy, sensory neuropathy, PAD and foot deformity (Bus et al., 2020).

Gerontology nursing is crucial for promoting optimal health for elderly patients through the assessment level of knowledge and practice; it determines elderly diabetic needs and prevents further DUF problems through developed effective health education programs to educate diabetic elderlies about daily diabetes foot inspection, foot care and glycemic control to avoid aggressive management for DFU (Boulton et al., 2018). Elderly education should be an essential part of management and prevention due to DFU outcomes being directly influenced by elderlies' knowledge of their own medical status (Bakker et al., 2017).

Significance of the Study

Globally, according to the World Health Organization, in 2016, diabetes disease was the direct cause of 1.6 million patients' deaths from diabetes complications (World Health Organization, 2018). The International Diabetes Federation (IDF) in 2017 estimated that 8,222,600 patients had diabetes in Egypt, and that in every 30 seconds, one limb was lost due to DFU in the world (International Diabetes Federation, 2017). The prevalence of diabetes is around 15.56% among adults between 20 to 79 years, with an annual death of 86,478 as a result of complications of diabetes such as DFU in Egypt in 2015 (Hegazi et al., 2016).



According to the International Diabetes Federation in 2019, DFU is one of the most dangerous and costly complications of diabetes, and it is estimated that 15% of older people with diabetes die early mainly from diabetic foot ulcers, suggesting that a large number of these premature deaths can be prevented through early detection or early management of diabetes and improving knowledge of the elderly as well as practicing foot care through applying preventive guidelines from the medical team, especially geriatric health nurses, to prevent complications of DFU (Saeedi et al., 2020).

Aim of the Study

Assessment of the effect of a foot ulcer prevention guideline program for elderly diabetic patients at EL- Fayoum General Hospital through the following objectives:

- 1- Assessing knowledge and reported practice of elderly diabetic patients regarding a foot ulcer prevention guideline program.
- 2- Appraising foot ulcer risk for elderly diabetic patients before and after a prevention guideline program.
- 3- Design, planning, implementing and evaluating a foot ulcer prevention guideline program for elderly diabetic patients.

Research Hypothesis:

After implementation of a foot ulcer prevention guideline program for elderly diabetic patients, knowledge, reported practice, and the foot ulcer risk will change.

Subjects and Methods

Research Design: A Quasi experimental research design (pre-posttest) was used in this study.

Setting: The study was conducted at a medicine outpatient clinic at the EL - Fayoum General Hospital.

Sampling: A purposive sample was used to choose 300 elderlies diagnosed with diabetes mellitus that represent 25% of the total number of 1200 diabetic elderly patients diagnosed in previous years from January 2019 to January 2020, determined according to the following size equation provided by Yamane (1967) as a simplified formula to calculate sample size:

$$N = \frac{N}{1+N(e)^2}$$

where: N = total population, n = sample size, e = level of precision = 0.05



Tool for Data Collection: Tools for data collection:

1st Tool: Structured Interviewing Questionnaire

The questionnaire sheet was designed and translated into Arabic language form to avoid misunderstanding by the researcher based on reviewing related works of literature divided into 4 parts:

Part I: Demographic characteristics of elderly diabetic patients:

This contains 9 questions adapted from **Catherine et al. (2019)**, used to assess demographic characteristic of study sample such as sex, age, level of education, previous occupation and current occupation, marital status, place of residence, income.

Part II: Patient's medical history:

Adapted from (Mokabel et al., 2017) divided into:

- A- Medical history such as onset of diabetes disease, history of other disease, method of drug administration, types of currently prescribed therapeutic regimen, symptoms which appeared during medication intake, family history of diabetes mellitus, smoker.
- B- Foot care history such as practice foot care everyday, the reason for not practicing foot care, family history of diabetic foot ulcer, visit diabetic outpatient for inspected foot once at least every year.

Part III: Knowledge assessment questionnaire:

It was adapted from Algshane et al. (2017), composed of 29 close ended questions to assess elderlies' general knowledge about diabetic foot ulcer prevention such as meaning of diabetic foot ulcer, causes, signs and symptoms, complications of diabetic foot ulcer, effect of diabetes on foot, and specific knowledge about diabetic foot ulcer prevention method (diet, exercise, follow up, medication, and foot care) pre and post applying program.

Scoring system was presented as (2) for complete answers, (1) for incomplete correct answers and (0) for incorrect answers.

- The total scores for the elderlies' knowledge regarding diabetic foot ulcer divided were into three levels as the following:
- Poor knowledge <50% (0–28).
- Fair knowledge 50 -75% (29–43).
- Good knowledge \geq 75% (43.5–58).

Part IV: Elderly reported practice questionnaires:

It was adapted from American Diabetes Association (2018), composed of 18 close ended questions to assess elderly reported practice questionnaires pre and post applying program, such as checking foot every day, checking between the toes, regular washing the feet, using warm water during foot care, checking temperature of water before using, drying between toes,



using lotion on the skin of the feet after washing, using a clipper to cut nails, cutting nails straight, wearing leather shoes of appropriate size, checking the shoes, wearing closed slippers inside the house, removing hard skin by your physician, keeping away from fire and heat, making foot massage everyday, consulting the medical team when signs of foot ulcer appear.

Scoring System: Elderly reported practice has been scored as done = (2), sometimes = (1) and not done = (0). The total scores for the elderlies' reported practice regarding foot care are classified into two levels:

- Unsatisfactory practice < 60% (0–21)

- Satisfactory practice \geq 60% (21.6–36)

2nd tool: Observation Checklist Questionnaire Tool:

This tool was adapted from IWGDF (2019), used as a foot screen checklist to identify diabetic foot ulcer risks that consisted of:

Part I (Neurological foot assessment): Used to assess elderly's neurological lower limb for foot before and after applying program—assessment for foot sensation condition, skin condition, skin color, foot temperature, nail condition, foot deformity, history of ancient neuropathy ulcer and lower limb amputation.

Scoring system: Neurological condition has been scored as (1) for (No) normal condition and (0) for (YES) abnormal condition. Total score calculated by sum of total items by Mean \pm SD.

Part II (Peripheral vascular assessment):

This consisted of ankle brachial index test (ABI) to measure degree of peripheral artery disease in addition to assessing foot pulse, skin condition, foot temperature and foot pain in right and left leg.

Measurement of ABI was by the use of a digital sphygmomanometer cuff.

The ABI was performed by measuring the systolic blood pressure of both brachial arteries, both dorsalis pedis and posterior tibial arteries in the supine position. The ABI is calculated by dividing the highest systolic blood pressure at the ankle by the highest systolic blood pressures in the arm.

Scoring system: Peripheral vascular has been scored as (0) for abnormal condition and (1) for normal condition except ankle brachial index test score which was calculated by dividing the posterior tibia or dorsalis pedis systolic blood pressure for right and left foot by brachial systolic blood pressure, then interpreted as follows: 0.97–1.3 (normal), 0.8–0.96 (mild ischemia), 0.4–0.79 (moderate ischemia) and 0.39 or less (severe ischemia) and above 1.3 (vessels stiffness).

Operational items: These include preparatory phase, pilot study content validity, content reliability and field work.

The preparatory phase: This includes reviewing related literature and theoretical knowledge of various aspects of the study using books, articles and magazines and preparing the tool of data collection.



Pilot study: The pilot study was conducted to test the clarity, applicability and understanding ability of the tool. It was conducted on a sample of 10% (30) of diabetic elderly patients. The results of the pilot helped in refining the interview questionnaire and to schedule the time framework. The participants of the pilot were excluded in the main study sample due to the available number of samples.

Validity: Revision of the tools for clarity, comprehensiveness and applicability was done by (jury) five experts from Faculty of Nursing – Helwan University and Fayoum University (two experts specialized in geriatric health nursing, one expert specialized in medical surgical health nursing and two experts specialized in community health nursing) to measure the content validity of the tools and the necessary modifications were done accordingly.

Reliability: The study tools were tested by the pilot subjects at the first session for calculating Cronbach's Alpha which was 0.91 for reported practices questionnaire, 0.897 for knowledge and 0.944 for neurological and peripheral vascular risk exposure.

Field work:

- Before conducting the study, permission was obtained from the directors of the hospitals.
- At the beginning, the researcher introduced herself and explained the purpose of study to the elderly ones to gain their confidence and trust and convince them to participate in the study, then the verbal or written consent was obtained from them.
- Actual field work was carried out in the period from September 2020 up to September 2021.
- The researcher collected data for 4 days per week (Sunday, Monday, Wednesday, and Thursday) visiting from 8 am – 12 pm. The questionnaires were distributed to elderly patients and completed by the researcher's assessment.
- All studied subjects filled a questionnaire sheet themselves except for illiterates who were helped by the researcher according to their answers.
- The researcher took about 7–8 elderly people a day to fill a questionnaire sheet, and consumed 30 minutes with each to fill a questionnaire sheet.
- Prevention guideline program was developed, implemented and distributed by the researcher.

Prevention guideline program construction consists of four phases:

Phase 1 (Preparatory phase):

The prevention guideline program was designed by the researcher based on reviewing the related recent, national and international literature and theoretical knowledge of various aspects of the study using books, articles, scientific journals and the internet. The content of the prevention guideline program was validated by a panel of experts in geriatric and community health nursing.



Phase 2 (Assessment phase):

This phase involved the pre-test data collection for baseline assessment. In this phase the researcher collected the following data: the elderlies' demographic characteristics; the current and past medical history; level of elderlies' knowledge about diet, exercise, follow up, medication and foot care; report practice; and assessment of elderlies' lower limb neurovascular.

Phase 3 (Program planning and implementation):

Planning phase:

- Determine learning objectives of the program
- Determine learning contents of the program
- Choose teaching methods as discussion and presentation
- Determine education media as video and educational booklet.

Implementation phase:

- Foot ulcer prevention guideline program was implemented based on conducting sessions plan using different educational methods and media in addition to the use of guiding booklets specifically designed and developed based on elderlies' assessment needs.
- Foot ulcer prevention guideline program was implemented in the waiting hall front medicine outpatient clinic through the use of teaching and education methods.

General Objective: The general objective of the foot ulcer prevention guideline program sessions was to upgrade elderly patients' knowledge and reported practices regarding prevention of diabetic foot ulcer.

Specific objectives: By the end of the sessions, the elderlies should be able to:

The theory part includes:

- Identify the definition of diabetic foot ulcer
- List risk factors of diabetic foot ulcer
- List causes of diabetic foot ulcer
- Recognize symptoms of diabetic foot ulcer
- Discuss the complication of diabetic foot ulcer
- Determine ways of prevention of diabetic foot ulcer
- State characteristics of choosing the right shoe and socks.



The practical part includes:

- Show the way of the foot screen
- Apply steps of foot care
- Demonstrate nail care.

Program sessions:

- First session included an orientation about the program; the elderly patients were informed about the time of the program. Each session started by explaining the objectives taken into consideration using simple and clear language.
- By the end of each session, a summary was made and time was allocated for questions and answers; plans for the next session were made and the researcher made adjustments of the day for the next session according to follow up time.
- Teaching methods such as lectures, group discussions, demonstrations, booklets, pictures, and posters or banners.
- The researcher and the studied elderlies shared telephone numbers to be in contact for follow up.
- The researcher classified 300 diabetic elderly patients into 30 groups and each group contained 10 diabetic elderlies to give a program for them for two days: the first day for the theoretical part and the other day for the practical part.
- The researcher took two groups per week—20 diabetic elderlies per week (each group took two days) for 15 weeks (about four months) to give the program for all (300) elderly diabetic patients. This means $20 \text{ patients/week} \times 15 \text{ weeks} = 300 \text{ elderly diabetic patients}$.

Phase 4 (Evaluation phase):

Evaluation was applied after the implementation program for three months through post-test using the same tools in order to identify differences, similarities and areas of improvement as well as defects, and estimate the effect of the prevention guideline program on improving elderlies' knowledge, reported practices and foot ulcer risk scale.

Ethical considerations:

The research approval was obtained from the Scientific Ethical Committee in the Faculty of Nursing at Helwan University before starting the study. The researcher clarified the objective of the study to the elderly patients included in the study to gain their confidence and trust. The researcher obtained verbal or written consent from them. The researcher gave assurance of the maintaining of anonymity and confidentiality of subjects' data. The elderly patients were informed about being allowed to choose to participate or not in the study and having the right to withdraw from the study at any time.

**Statistical design:**

The data was collected, coded and entered into a personal computer. It was analyzed with the program statistical package for social science (SPSS) version 19. The collected data was organized, revised, analyzed and presented in numbers and percentage in tables, figures and diagrams. Proper and suitable statistical tests were used to test the significance of the results obtained. The following statistical techniques were used: percentages, mean value, standard deviation, chi-square (X²), proportion probability (p-value) and T test.

Significance of results:

- When $P > 0.05$, it is a statistically insignificant difference.
- When $P < 0.05$, it is a statistically significant difference.
- When $P < 0.01$ or $P < 0.001$, it is a statistically highly significant difference.

RESULTS

Table (1) shows 73.3% of elderly patients aged between 60 and 65 years with mean age 62.60 ± 2.835 ; 58.7% and 57.7% respectively of them were females and of place of residence in rural areas. In addition, 67.3% of them were married. Regarding education level and income status, 42.7% and 58.7% respectively of them didn't read and write, and didn't have enough income.

Figure (1) shows that 7%, 23% and 70% respectively of the studied subjects had good, average and poor knowledge about diabetic foot ulcer pre applying program, compared to 85.30%, 9%, 5.70% respectively of them which had good, average and poor knowledge about diabetic foot ulcer post applying program.

Figure (2) shows that there was a statistically significant difference between elderlies' total satisfaction reported practices about foot care pre and post implementation program. In the pre applying program, 40.30% compared to 93.30% of the studied subjects had satisfactory total reported practice post applying program.

Table (2) shows statistically significant difference between pre and post applying program in all neurological items regarding sensation, skin, nails and foot deformities condition except Hammer toes with $p < 0.005$.

Table (3) demonstrates statistically significant difference between pre and post program implementation in all peripheral vascular items with $p < 0.005$.

Table (4) demonstrates that all peripheral vascular items had statistically significant difference with Mean \pm SD of 11.38 ± 2.57 in pre test versus 12.22 ± 2.11 post test in right leg and left leg with Mean \pm SD of 11.32 ± 2.63 in pre test versus 12.15 ± 2.14 post test.

Table (5) shows highly statistically significant positive correlation between knowledge, reported practice, neurological and peripheral vascular risk exposure in right and left legs post applying the program at $p\text{-value} < 0.000$.

**Table (1): Frequency Distribution of Demographic Data among Elderly Diabetic Patients (n=300)**

Demographic characteristic	The studied sample (N=300)	
	No.	%
Sex:		
Male	124	41.3
Female	176	58.7
Age:		
60 - < 65	220	73.3
65 - < 70	61	20.3
70 - ≤75	19	6.3
Mean ± SD	62.60±2.835	
Level of education:		
No read and no write	128	42.7
Read and write	81	27
Secondary	61	20.3
University and more	30	10
Pervious Occupation		
Housewife	121	40.3
Professional	65	21.7
Farmer	69	23
Craft	32	10.7
No regular work	13	4.3
Marital status:		
Single	25	8.3
Married	202	67.3
Divorced	17	5.7
Widow	56	18.7
Residence		
Rural	173	57.7
Urban	127	42.3
Income		
Sufficient	124	41.3
Insufficient	176	58.7
Current occupation		
Work	78	26
Not work	222	74
Responsible about your care:		
No one	24	8
Wife or husband	61	20.3
Son	181	60.3
Relative	34	11.4

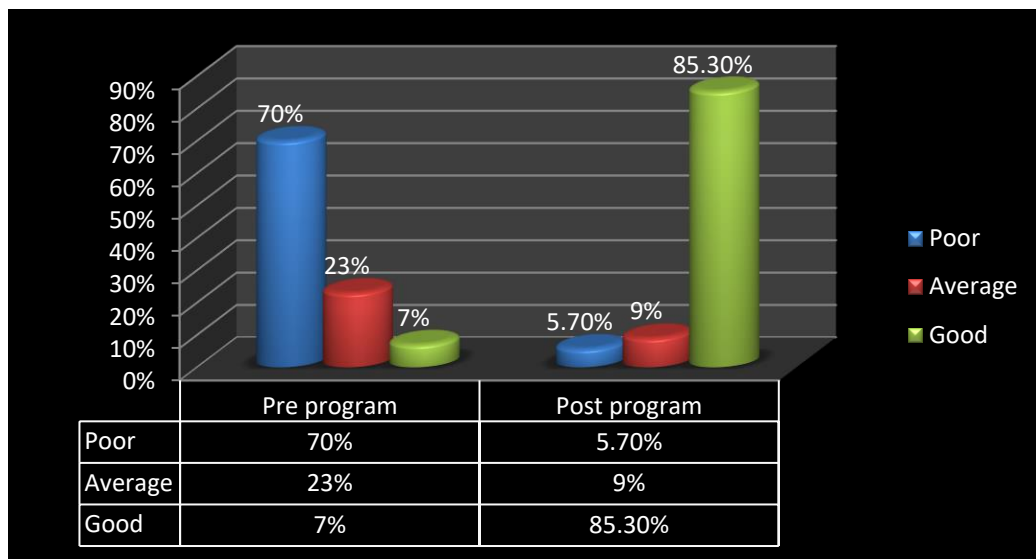


Figure (1): Percentage of Total Knowledge of Diabetic Elderly Patients about Diabetes Foot Care Pre and Post Applying Program

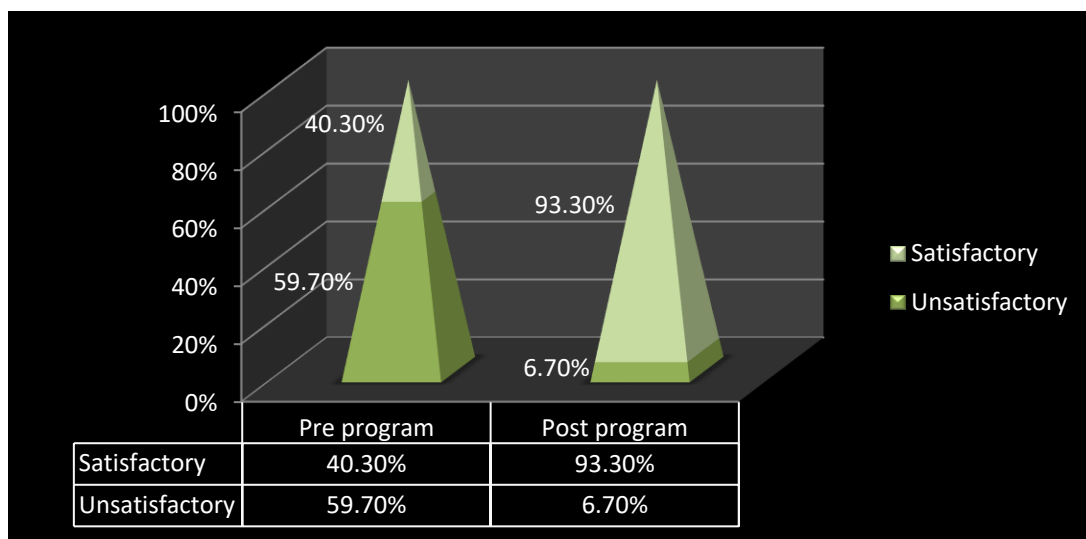


Figure (2): Percentage of Total Reported Practices among Diabetic Elderly Patients about Diabetes Foot Care Pre and Post Applying Program (300)



Table (2): Distribution of Diabetic Elderly Patients about Neurological Foot Assessment Pre and Post Applying Program (N=300).

Items	The studied sample								T value	P value
	Pre				Post					
	Yes		No		Yes		No			
	N	%	n	%	N	%	N	%		
Sensation Condition										
Reduced or absent sensation to touch or pain	73	24.3	227	75.7	32	10.7	268	89.3	6.69	0.000
Tingling	111	37	189	63	43	14.3	257	85.7	8.19	0.000
Skin condition :										
Skin thickness (Callus or corns present)	74	24.7	226	75.3	12	4	288	96	8.48	0.000
Dry	148	49.3	152	50.7	26	8.7	274	91.3	13.4	0.000
Cracks	79	26.3	221	73.7	13	4.3	287	95.7	8.02	0.000
Swelling	71	23.7	229	76.3	28	9.3	272	90.7	6.14	0.000
Foot hotness	64	21.3	236	78.7	26	8.7	274	91.3	5.40	0.000
Nails:										
Thickness	125	41.7	175	58.3	32	10.7	268	89.3	11.24	0.000
Weakness and easy break	71	23.7	229	76.3	29	9.7	271	90.3	4.80	0.000
Thickness and long nail	12	4	288	96	3	1	297	99	2.74	0.006
cutting no straight	184	61.3	116	38.7	5	1.7	295	98.3	20.74	0.000
Skin color condition (redness)	16	5.3	284	94.7	2	0.7	298	99.3	3.56	0.000
Foot deformities										
Hammer toes	13	4.3	287	95.7	10	3.3	290	96.7	1.73	0.083
limited joint mobility	31	10.3	269	89.7	22	7.3	278	92.7	2.34	0.020
High arch of foot	17	5.7	283	94.7	9	3	291	97	2.32	0.021
abnormally large bony prominences	11	3.7	289	96.3	11	3.7	289	96.3	----	-----
History lower limb disease										
ancient ulcer	29	9.7	271	90.3	3	1	297	99	5.11	0.000
Total neurological scale	Mean ±SD		Range		Mean ±SD		Range		20.47	0.000
	14.23±3.004		14		16.97±1.800		11			

**Table (3): Distribution of Diabetic Elderly Patients about Peripheral Vascular Assessment Pre and Post Applying Program (300)**

Items	The studied sample								T value	P value
	Pre				Post					
	Right		left		right		left			
	n	%	N	%	n	%	N	%		
Ankle brachial index										
Dorsalis pedis SBP/ Brachial SBP										
>1.3 stiffness	15	5	15	5	10	3.3	12	4	Pre vs. post in right/ 5.95	0.000
.5<.8 (moderate ischemia)	11	3.7	12	4	4	1.3	7	2.3		
.8<.9 (low ischemia)	49	16.3	51	17	22	7.3	25	8.3	Pre vs. post in left/4.78	0.000
.9:1.3 (normal)	225	75	222	74	264	88	256	85.3		
Posterior tibia SBP/ Brachial SBP										
>1.3	15	5	15	5	12	4	12	4	Pre vs. post in right/5.48	0.000
.5<.8	14	4.7	15	5	7	2.3	7	2.3		
.8<.9	52	17.3	55	18.3	25	8.3	25	8.3	Pre vs. post in left/6.18	0.000
.9:1.3	219	73	215	71.7	256	85.3	256	85.3		
Pulse										
Absenvery of pedal pulses										
yes	28	9.3	34	11.3	21	7	23	7.7	Pre vs. post in right/ 2.12	0.034
no	272	90.7	266	88.7	279	93	277	92.3		
Absence of posterior tibial pulses										
yes	45	15	49	16.3	20	6.7	29	9.7	Pre vs. post in right/ 2.80	0.005
no	255	85	251	83.7	280	93.3	271	90.3		
Brittle skin (loss of hair)										
Yes	61	20.3	61	20.3	29	9.7	29	9.7	Pre vs. post in right/left= 3.97	0.000
No	239	79.7	239	79.7	271	90.3	271	90.3		
Decreased foot temperature										
Yes	47	15.7	47	15.7	15	5	15	5	Pre vs. post in right/left= 5.97	0.000
No	253	84.3	253	84.3	285	95	285	95		
Pain sensation										
Yes	63	21	61	20.3	10	3.3	8	2.7	Pre vs. post in/R=6.96	0.000
No	237	79	239	79.7	290	96.7	292	97.3		
									Pre vs. post in/L=7.09	0.000



Table (4): Distribution of Elderly Diabetic Patients about Peripheral Vascular Foot Assessment Pre and Post Applying Program (N=300)

Peripheral vascular foot	The studied sample				T	P value
	Pre		Post			
	Mean \pm SD	Range	Mean \pm SD	Range		
<i>Right leg</i>	11.38 \pm 2.57	11	12.22 \pm 2.11	12	7.75	0.000
<i>Left leg</i>	11.32 \pm 2.63	11	12.15 \pm 2.14	11	7.26	0.000

Table (5): Correlation between Studied Variables Post Applying Program (N=300)

Changes of Knowledge, reported practices, neurological and vascular risk exposure	Scores of total knowledge, reported practices, neurological and vascular risk exposure							
	Knowledge		Reported practices		Neurological risk exposure		Vascular right risk exposure	
	R	P	R	P	R	P	R	P
Knowledge								
Reported practices	0.946	0.00						
Neurological risk exposure	0.399	0.000	0.454	0.000				
Vascular right risk exposure	0.509	0.000	0.598	0.000	0.398	0.00		
Vascular left risk exposure	0.498	0.000	0.592	0.000	0.418	0.000	0.979	0.000

DISCUSSION

Diabetic Foot Ulcer (DFU) is a serious complication of diabetes mellitus (DM) which can increase morbidity and mortality. Managing DFUs is usually very challenging especially in resource-constrained settings. DFUs account for up to 40% of diabetes-related expenditures, making it one of the most expensive diabetes complications to deal with. DFUs often heal very slowly resulting in prolonged hospitalization, or may fail to heal completely making the patient prone to infection with resultant tissue necrosis and gangrene and consequently, foot ulcerations are the commonest causes of lower extremity amputation (Ugwu et al., 2019).

The present study finding revealed that more one third of the studied subjects were males and this finding was similar with Catherine et al. (2019) who conducted a published study in Nigeria with the title, "Assessment of Knowledge of Drug and Dietary Regimen among Diabetic Clients in Endocrinology Clinic at Federal Medical Center, Ido-Ekiti, Ekiti State, Nigeria" and reported that 40% of the studied subjects were males.



The present study finding revealed that more than two third of the studied subjects were married and less than one tenth were divorced and single. This result was in accordance with Khalil et al. (2020) who conducted a published study at Assiut University Hospital titled, "Effect of Self-Management Program on Self-Efficacy Regarding Osteoporosis Risk among Diabetic Patients" and reported that 80%, 6.7% and 6.7% respectively of the studied subjects were married, single and divorce.

The present study showed that less than one tenth of the studied subjects had good knowledge regarding total level of knowledge and this finding was in accordance with Elsayed et al. (2017) who conducted published study at a specialized medical hospital in Mansoura with the title, "Assessment of Barriers to Self-Management among Patients with Type 2 Diabetes Mellitus at Specialized Medical Hospital in Mansoura University" and reported that less than one tenth of the studied subjects had good knowledge.

As regards total level of knowledge, more than two third of the studied subjects had poor knowledge and this finding was in disagreement with Rajappa et al. (2018) who conducted a published study at a tertiary care teaching hospital with the title, "Assessment of Degree of Awareness about Diet, Physical Exercise, and Lifestyle Modifications among Diabetic Patients" and reported that 40% of the studied subjects had poor knowledge. From the researcher's point of view, this might be due to the fact that more than half of the studied subjects of the current study could not read and write.

Regarding the effectiveness of the program on participants' knowledge, the present study revealed that there was statistically significant difference between pre and post implementation program in all knowledge items, and this finding was in the same line with Mohamed and Shabrawy (2017), who conducted a published study at Zagazig University Hospital outpatient clinics with the title, "Effectiveness of Health Education Intervention on Foot Self-Care Practice among Diabetics at Zagazig University Hospitals" and revealed that there was significant improvement in the knowledge of studied subjects after the application of the health education intervention.

Regarding the effectiveness of the program on participants' reported practice, it was revealed that there is a statistically significant difference between pre and post implementation program in all practice items, and this finding was similar with Mohamed and Shabrawy (2017) whose report shows that there is a significant improvement of self-care practice items and a significant improvement in the practice total score, except for drying between toes items.

The present study results reported that less than one tenth of the studied subjects had foot deformity such as hammer toes and high arch foot and had previous history of foot ulcer pre applying program. This finding was in agreement with Shohood et al. (2018) who conducted a published study at Benha University Hospitals with the title, "Predicting the Diabetic Foot Ulcer Risk Using Sensory Monofilament Test among Diabetic Patients at Benha University Hospitals" and reported 5%, 1.7% and 1.7% respectively of the studied subjects had hammer toes, Charcot foot and pervious foot ulcer.

The present study results indicated that more than one third of the studied subjects suffered from the tingling pre applying program. This finding was similar with Alhabshan et al. (2017) who published a study titled, " Assessment of Knowledge toward Complications of Diabetic Septic Foot among Diabetics Patients in Saudi Arabia" and reported that 20.9% of the subjects



had suffered from numbness and tightness. From the researcher's point of view, this might be due to half of the subjects studied lacking knowledge about diet, exercise, medication and foot care leading to poor glucose control and diabetic complications.

Concerning peripheral vascular foot assessment ankle brachial index test, one quarter of the studied subjects had peripheral vascular disease pre applying program. This finding was similar with El-Malky et al. (2021) who conducted published study at Menoufia University Hospitals with the title, "Ankle Brachial Index Screening for Peripheral Arterial Disease in Asymptomatic Diabetic Patients" and reported that 36.2% of the studied subjects had peripheral artery disease according to measured ankle brachial index test.

Concerning pedal pulse sensation, about one tenth of the studied subjects had un palpate pedal pulse sensation in the left and right foot pre applying program. This finding was similar with El Din et al. (2016) who conducted a published study at different areas comprising upper and lower Egypt as well as delta region with the title, "Prevalence of Risk Factors for Egyptian Diabetic Foot Ulceration" and reported that 19.4% and 18.1% respectively of the studied subjects had un palpate pedal pulse sensation in left and right foot respectively.

Regarding the neurological and vascular assessment pre and post applying program, the present study shows statistically significant difference (improvement) between pre and post applying prevention guideline program in mean scores of neurovascular assessment. This finding was in congruence with Hamza et al. (2017) who conducted a published study at the diabetic and endocrine outpatient clinic, affiliated with Governmental Cairo University Hospital, Egypt with the title, "Effect of Training Program on the Improvement of Knowledge and Ankle Brachial Index Measurement for Diabetic Patients" and reported that there is a high significant improvement in neurovascular assessment mean score between the three time measurement.

The present study shows significant correlation between total score knowledge, reported practice, neurological and vascular exposure. This finding was supported with Amin (2016) who published a study with the title, "Knowledge and Practices of Type II Diabetic Patients Regarding Diabetic Foot Self-Care And Their Foot Disorders" and reported that a significant correlation was observed between total foot self-care and knowledge and reported practices regarding their reported peripheral neuropathy complaints and observed foot disorders.

CONCLUSION

The current study concluded that after applying the foot ulcer prevention guideline program, the level of knowledge, reported practice and foot ulcer risk scale of elderly diabetic patients improved. There was a positive correlation between knowledge, reported practices, neurological and peripheral vascular risk exposure post applying program.



RECOMMENDATION

- Periodic prevention guideline program and re-education sessions regarding diabetic foot ulcer prevention for diabetic elderly patients.
- Apply further research in large samples and other settings for generalization.

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