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**Effect of integrating health belief model in a prophylactic diabetic foot care program on knowledge, believes, practices and risk for foot ulcer of diabetic elderly**

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**ABSTRACT:** Diabetic food ulcer is one of the most prevalent long-term diabetic consequences, which has a significant financial and social impact on people, families, and the health system. It's also long-term consequence account for direct medical expenditures and lengthy periods of disability. **Aim:** This study aimed to evaluate the effect of integrating health belief model in a prophylactic diabetic foot care program on knowledge, beliefs, practices and risk for foot ulcer of diabetic elderly. **Methodology:** A quasi-experimental research design was utilized in this research. It was done at the medical outpatient clinics affiliated to Tanta University Hospitals. A purposeful sample of 300 older people with diabetes was selected. Two tools were utilized for data gathering. A structured interview schedule was the first tool with questions about the socio-demographics of senior patients, knowledge, reported practices, and perceived believes of diabetic elderly about foot ulcer. Second tool: A neurological foot and peripheral vascular examination was used as an assessment checklist to determine the risk of foot ulcers. **Results** showed a statistically significant improvement in elderly total knowledge (7% to 85.30%), reported practice (40.30% to 93.30%), total perceived beliefs (34.2455 to 44.9000) correspondingly pretest compared posttest. The degree of knowledge, reported practice, perceived believes, and foot ulcer risk scale of older diabetic patients improved after implementing the preventative diabetic foot care program. **Conclusion and recommendation:** there was a positive correlation between knowledge, reported practices, neurological and peripheral vascular risk exposure post applying program. Application of further research on large samples and other settings for generalization.

**KEYWORDS:** Elderly, diabetic foot care, prophylactic program, ulcer, health belief model and risk.

## Introduction

Population ageing becomes a global phenomenon; There are already an estimated 727 million senior people over the age of 65, and this figure is likely to be more than double by 2050, increasing from 9.3 percent in 2020 to 16.0 percent in total. Diabetes is one of the top 10 global causes of mortality, placing a significant burden on both public health and socioeconomic development. Diabetes together with cardiovascular disease, cancer, and respiratory disease, cause more than 80% of all untimely non-communicable disease deaths.<sup>(1)</sup>

One of most serious complications of diabetes mellitus is diabetic foot ulcers (DFU). Foot ulcerations commonly result in significant morbidity, lengthy hospital stays, and mortality for patients, as well as the potential to spread infections and prevent extremity amputations. The estimated annual incidence is roughly 2%, but this may rise significantly when individuals recover from foot ulcers, with reported recurrence rates between 30% and 40% in the first year. The first step in preventing diabetic foot ulcers is to identify those at risk, and high standards of care must be offered in order to reduce the negative effects connected with these ulcers.<sup>(2)</sup>

It has been suggested that a prophylactic foot care program reduce patient morbidity, the need for expensive resources, and the danger of amputations. The identification of risk factors, patient education, and intensive care are a few of the preventative measures that have been proven to be cost-effective or even cost-saving. In recent years, there has been a greater focus on the possible effects of reimbursement structures on the prevention, treatment, and outcomes of diabetic foot lesions.<sup>(3)</sup>

Behavior modification offers the best chance of lowering morbidity and preventable

mortality on a global scale. Patient education based on the Health Belief Model (HBM) can enhance preventative health practices. HBM is a recognized health model for the prevention of health concerns, such as diabetic foot complications, and has been used in research and clinical settings. HBM is a psychological model that solely relies on perspectives and beliefs to predict healthy "behaviors" in humans. To prevent diseases and their impacts, this technique could be used in both individual and group teaching.<sup>(4)</sup>

Community health nurse by implementing educational interventions, identifying high-risk clients, and providing medical care, nurses can prevent diabetic foot problems, including ulceration and lower limb amputation. Nurses can teach patients how to conduct physical checks and provide daily foot care. Nurses may advise patients to do things like check their shoes before putting them on, keep their feet clean, and maintain their nail and skin care regimens in order to prevent foot ulcers or their recurrence. It's also essential to get instruction on choosing the appropriate footwear.<sup>(5)</sup>

### Significance of the Study

The International Diabetes Federation reported in 2017, 2019, Egypt had 8,222,600 patients with diabetes with an annual death of 86,478 as a result of complications of diabetes. One limb is lost worldwide owing to DFU every 30 seconds, making it one of the most hazardous and expensive consequences of diabetes. 15% of elderly diabetics pass away before their time specially from diabetic foot ulcers, suggesting that a huge quantity of those premature deaths may be prevented via early detection or early control of diabetes and enhancing knowledge of the elderly in addition to practicing foot care.<sup>(6)</sup>

### Research Aim

This research aimed to evaluate the effect of integrating health belief model in a prophylactic diabetic foot care program on knowledge, beliefs, practices and risk for foot ulcer of diabetic elderly.

### Research Hypothesis

After implementation of Prophylactic Diabetic Foot Care Program for elderly, their knowledge, reported practice, health beliefs and risk foot ulcer will improve.

### Operational definition

The dorsalis pedis, posterior tibial arteries, and both brachial arteries are measured by the ankle brachial index (ABI),( a scale. The ABI is calculated by dividing the highest ankle systolic blood pressure by the highest arm systolic blood pressure.)

### Subjects and Methods

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

**Setting:** The research was conducted at the medical outpatient clinics affiliated to Tanta University Hospitals.

**Sampling:** A purposive sample of 300 elderly with diabetes mellitus was selected. This represented 25% of the total number of 1200 diabetic elderly patients diagnosed in previous years from January 2021 to May 2022. Exclusion criteria were diabetic elderly patient with wound or active foot ulcer, elderly with amputation. The following size equation provided by (Yamane (1967) was a simplified formula to calculate sample size):

$$N = N$$

$$1 + N (e)^2$$

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

### Research Tools

**1st tool:** A structured interview schedule was designed based on reviewing associated literature and included 4 parts as follow:

#### Part I: Socio-demographic features of the

**aged diabetic patients.** This incorporates nine questions, used to evaluate demographic characteristic of study sample consisting of sex, age, level of education, preceding profession and current profession, marital status, region of residence, and income.

#### Part II: Knowledge assessment sheet.

It was adapted from **Algshanen et al. (2017)** <sup>(7)</sup>, composed of 29 close ended questions to assess elderlies' general knowledge about diabetic foot ulcer prevention such as the definition of a diabetic foot ulcer, its causes, symptoms, and consequences 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.

The scoring system was provided as (2) for fully accurate responses, (1) for partially correct responses, and (0) for wrong responses. The overall scores for the elderlies' knowledge divided to three levels as the following: Poor knowledge if the score is less than 50% (0–28). Fair with a score of 50 -75% (29–43). Good knowledge with a score of more than or equal 75% (43.5–58).

#### Part III: Elderly reported practices for foot care.

It was adapted from **American Diabetes Association (2018)** <sup>(8)</sup>, composed of 18 close ended questions to evaluate aged reported practice questionnaires pre and post applying program, including checking foot each day, checking among the toes, regular washing the toes, the usage of warm water during foot care, checking temperature of water before the usage of, drying among toes, the usage of lotion on the skin of the feet after washing, the usage of a clipper to cut nails, slicing nails straight, sporting leather-based footwear of suitable size, checking the footwear, wearing closed

slippers within the house, doing away with tough pores and skin by physician, keeping away from fire and heat, making foot rub down each day, consulting the clinical group whilst signs of foot ulcer appear.

Scoring System: elderly reported practices has been graded as done = (2), occasionally = (1), and not done = (0).

The elderly's reported practices for foot care received an overall score that is divided into two levels: Unsatisfactory practice less than 60% (0–21). Satisfactory practice more than or equal 60% (21.6–36)

**Part IV: Elderly believes about risks for diabetic foot ulcer.** This was based on the Health belief model. It was adapted from **Beranath (1999)**<sup>(9)</sup>, 16 items make up the associated of diabetes Disease Scale, which is consisted of four subscales measuring four concepts.

Subscales of Health-belief model:

1. Perceived susceptibility such as Suffering from diabetic complication in the future ,Having foot ulcer in the future, Getting other diseases from diabetes in the future, and Recurrent of entering hospitalization from diabetic disease.
2. Perceived Severity, such as the belief that having diabetes will jeopardise a relationship with a significant other, alter one's entire life, negatively impact one's sexual life, and cause death within ten years.
3. Elderly Perceived Benefits, including eating a good diet and exercising for 30 minutes most days of the week as one of the best strategies to prevent diabetic complications, quitting smoking and adopting a healthier lifestyle as a means to prevent diabetic ulcers.
4. Elderly perceived barriers like not knowing the right activities to undertake or not having the time to do them to lower their risk of getting diabetic complications or not knowing what constitutes a healthy diet.

### Scoring

Disagree = 1, Not sure = 2 Agree = 3 . Calculate the mean of the responses to the subscale items to determine the score for each of the six subscales.

### 2nd tool: Foot assessment Checklist

This tool was adapted from **IWGDF (2019)**<sup>(10)</sup>, used as a foot screen checklist to identify diabetic risk for foot ulcer that consisted of:

**Part I: Neurological foot assessment:** Used to assess elderly's neurological lower limb before and after applying program—assessment for foot sensation, 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 and calculation of 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.

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, validity, reliability and field work.

### **The preparatory phase**

The preliminary step entails examining relevant material; gaining theoretical understanding of many areas of the study through books, journals, and periodicals, as well as getting the data collection tool ready.

### **Pilot study**

Thirty diabetic elderly (10% of the sample) were tested for it. The results of the pilot research led to improvements in the interview schedule.

The participants in the pilot research were left out of the main study sample due to the restricted number of samples available.

**Validity:** Three specialists from the Tanta University Faculty of Nursing revised the instruments for clarity, comprehensiveness, and applicability. They also evaluated the content validity of the instruments and made any necessary corrections.

**Reliability:** Cronbach's Alpha for the study instruments, which were evaluated by the pilot subjects at the 1<sup>st</sup> session, was 0.91 for the reported practices, 0.897 for knowledge, 0.944 for the neurological and peripheral vascular risk exposure scale, and 0.85 for the constructs of HBM.

### **Field work**

The hospital directors gave their authorization before the study could be carried out.

In order to acquire the trust of the elderly participants and persuade them to engage in the research, the researcher introduced herself, and discussed the study objectives before requesting their verbal or written agreement.

- The actual fieldwork took place between January 2021 and June 2021.

Sunday, Monday, Wednesday, and Thursday were the four days the researcher visited the

hospital and the hours were 8 am to 12 pm. Elderly patients were interviewed by the researchers individually..

- The researcher took about 10–12 elderly people a day to fill the interview sheet, and consumed 20 minutes with each to fill a the sheet.

- Prophylactic program was developed, implemented and distributed by the researcher.

Prophylactic program construction consists of four phases:

### **Phase 1: Preparatory phase**

The dean of Faculty of Nursing - Tanta University sent an official letter requesting approval to conduct the study to the director of the medical outpatient Clinic. When a patient with diabetes and ulcer risk decided to participate in the trial, the researchers explained the goals of the study, including assessing the program's effectiveness on patients' knowledge, reported practices, their beliefs and perspectives, and risk to foot ulcer and technique of data collection and to seek participants' co-operation, highlighting that all collected information is firmly confidential, then oral or written approval agreement was obtained from them before the program method was applied.

### **Phase 2: Assessment phase**

Pre-test data collection for baseline evaluation was part of this phase. The researcher collected the following information at this phase: the elderly' demographic characteristics; level of elderly knowledge, reported practice; their beliefs and perspectives and assessment of elderly lower limb neurovascular.

### **Phase 3: Program planning and implementation**

Program was implemented using different educational methods and media such as lectures, group discussions, demonstrations, booklets, pictures, and posters or banners

were developed based on elderly assessment needs. Program implemented in the waiting hall in front of medicine outpatient clinic that cover theoretical session about definition, risk factors, causes, symptoms complication, ways of prevention, their beliefs and perspectives and characteristics of choosing the right shoe and socks of diabetic foot ulcer. Then the practical part includes way of the foot screen, apply steps of foot care, and demonstration of nail care. The researcher classified 300 diabetic elderly patients into 30 groups and each group contained 10 diabetic elderly to give a program for them for two days.

#### **Phase 4: Evaluation phase**

Evaluation was carried out three months following the program's implementation through a post-test utilizing the same tools in order to spot variations, similarities, opportunities for improvement as well as flaws. This allowed researchers for estimating program's impact on older adults' knowledge, reported practices, beliefs and perspectives, and risk of foot ulcers.

#### **Ethical considerations**

The approval of the ethical committee was obtained to conduct the study. The elderly participants were given a clear explanation of its purpose by the researcher in order to win their confidence and trust. The researcher assured that the privacy and confidentiality of the subjects' data would be maintained. The elder patients were informed of their rights and that they had the option to opt out of the study at any time.

#### **Statistical design**

The data was compiled, encoded, and input into a computer. The statistical software for social science (SPSS) version 19 was used to review it. The acquired data was organized, edited, looked over, and presented as percentages and statistics in tables, figures, and diagrams. Using suitable and proper

statistical procedures, the data significance was examined. Among the statistical techniques used were percentages, mean value, standard deviation, chi-square (X<sup>2</sup>), proportion probability (p-value), and T test.

#### **Results**

Table (1) shows 73.3% of elderly patients aged between 60 and 65 years with mean age  $62.60 \pm 2.835$  years; 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) demonstrates that prior to the execution of the program, 7%, 23%, and 70% of the participants had good, average, and poor knowledge, respectively, concerning diabetic foot ulcers. However 85.30%, 9%, 5.70% respectively of them had good, average and poor knowledge regarding diabetic foot ulcer after implementation of the program.

Figure (2) shows that there was a statistically significant difference between how satisfied seniors were with their reported foot care practices before and after the program's adoption, prior to implementing the program, 40.30% compared to 93.30% of the studied subjects had satisfactory total reported practice post applying program.

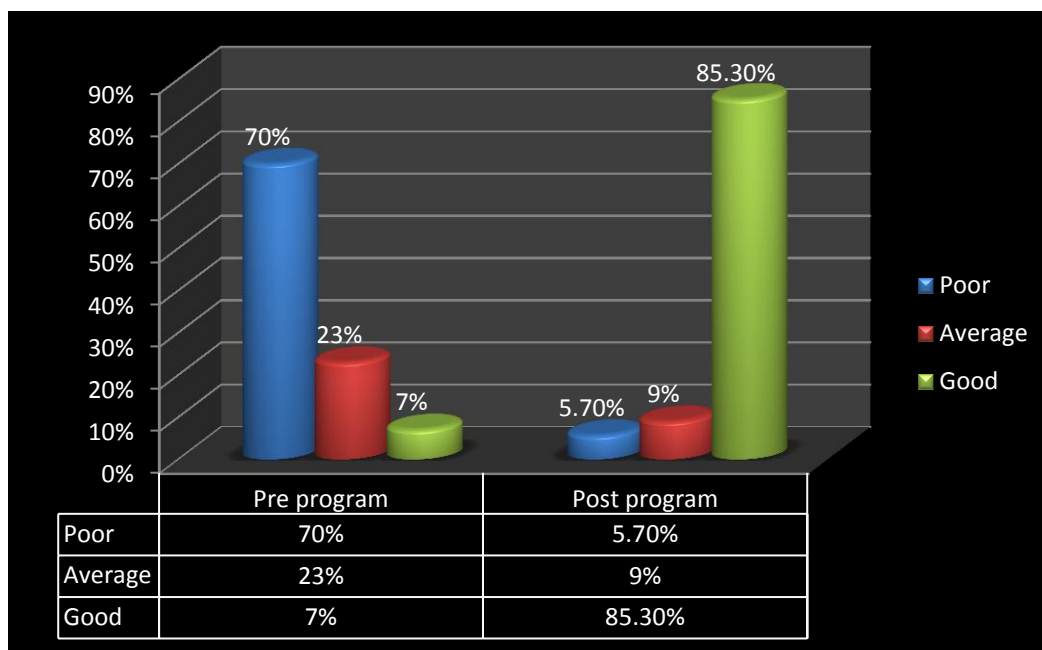
Table (2): denotes that elderly total believes score and sub items were improved with highly statistically significant difference (0.000) after program.

Table (3) illustrates statistically significant difference before and after program implementations in all neurological items related to sensation, skin, nails and foot deformities condition except Hammer toes with  $p < 0.005$ .

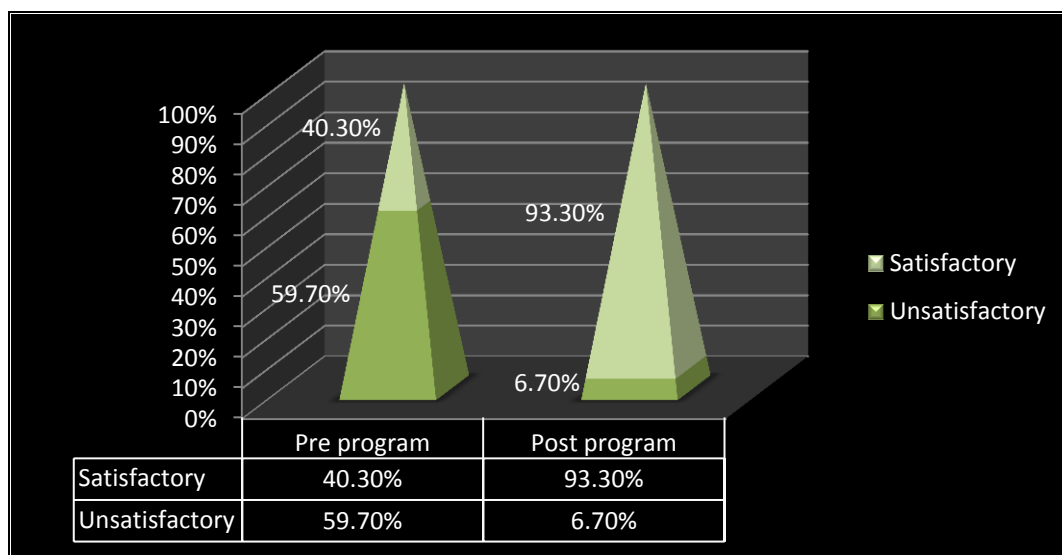
Table (4) demonstrates statistically significant difference before and after implementation of the program in all peripheral vascular items with  $p < 0.005$ .

Table (5) demonstrates highly statistically significant positive correlation between

knowledge, reported practices, elderly perceived health believes, and neurological and peripheral vascular risk exposure in right and left legs post applying the program at  $p$ -value  $< 0.000$ .



**Figure (1): Percentage of Total Knowledge of Elderly Diabetic Patients Regarding Diabetic Foot Care pre and post Program Implementation (N=300).**



**Figure (2): Percentage of Total Reported Practices among Diabetic Elderly's Regarding Diabetic Foot Care before and after Program Implementation (N =300).**

**Table (2): Mean and SD of scores of elderly perceived believes before and after program implementation (n=300).**

Neurological foot	The studied sample		P value
	Pre	Post	
	Mean ±SD	Mean± SD	
Perceived benefits	8.3182 ±3.44000	11.1091±3.71297	<b>0.000</b>
Perceived severity	9.9091±3.14350	12.8091±3.29719	<b>0.000</b>
Perceived susceptibility	7.4273±2.78086	10.5909±3.62280	<b>0.000</b>
Perceived barriers	8.5909±2.44310	10.3909±3.19143	<b>0.000</b>
<b>Total</b>	<b>34.2455±11.635</b>	<b>44.9000±13.551</b>	<b>0.000</b>

**Table (3): Frequency Distribution of Diabetic Elderly Patients Regarding Foot Ulcer Risk (Neurological Foot Assessment) before and after Program Implementation (N =300).**

Items	The studied sample								$\chi^2$	P value
	Pre				Post					
	Yes		No		Yes		No			
	No.	%	No.	%	No.	%	No.	%		
<b>Sensation Condition</b>										
- 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
<b>Skin condition</b>										
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
<b>Foot hotness</b>	<b>64</b>	<b>21.3</b>	<b>236</b>	<b>78.7</b>	<b>26</b>	<b>8.7</b>	<b>274</b>	<b>91.3</b>	<b>5.40</b>	<b>0.000</b>
<b>Nails</b>										
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
<b>foot color condition</b>										
(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	----	-----	
ancient ulcer	29	9.7	271	90.3	3	1	297	99	5.11	0.000	
Mean total neurological scale	14.23±3.004				16.97±1.800				Paired t test	20.47	0.000

Table (4): Distribution of Diabetic Elderly Patients Regarding Foot Ulcer Risk (Peripheral Vascular Assessment) before and after Program Implementation (N=300).

Ankle brachial index items	The studied sample								$\chi^2$	P value
	Pre				Post					
	Right foot		Left foot		Right foot		Left foot			
	No.	%	No.	%	No.	%	No.	%		
<b>Dorsalis pedis SBP/ Brachial SBP</b>										
->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		
<b>Posterior tibia SBP/ Brachial SBP</b>										
->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		
<b>Pulse</b>										
<b>Absent pedal pulses</b>										
-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	Pre vs. post in left/1.18	0.001

<b>Absence of posterior tibia pluses</b>											
-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	Pre vs. post in left/2.74	0.020	
<b>Brital skin (loss hair</b>											
-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			
<b>Decreased foot temperature</b>											
-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			
<b>Pain sensation</b>											
-Yes	63	21	61	20.3	10	3.3	8	2.7	Pre vs. post in right = 6.96	0.000	
-No	237	79	239	79.7	290	96.7	292	97.3	Pre vs. post in left=7.09	0.000	
<b>Total ankle brachial index test and peripheral vascular foot</b>	<b>Right leg</b>	11.38±2.57			12.22±2.11				<b>Paired t test</b>	7.75	0.000
	<b>Left leg</b>	11.32±2.63			12.15±2.14					7.26	0.000

**Table (5): Correlation between Knowledge, Reported Practices, Perceived Believes, Neurological and Vascular Right and Left foot Risk Exposure Pre Program Implementation (n=300).**

Items	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	0.027	.639							
Neurological risk exposure	0.124	0.032	0.004	0.948					

Vascular right risk exposure	0.120	0.038	0.130	0.024	0.464	0.000*		
Vascular left risk exposure	0.123	0.033	0.125	0.030	0.482	0.000*	0.989	0.000*
Perceived believes	0.121	0.000*	0.998	0.000*	0.668	0.000*	0.669	0.000*

*\*Statistically significant at (P<0.05)  
(P<0.001)*

*\*\* Highly statistically significant at*

## DISCUSSION

It is estimated that half of diabetic elderly patients are unaware of their condition, making them more susceptible to developing diabetic complications. Elderly education should be a crucial component of the management and prevention of diabetes, because it significantly affects morbidity, mortality, and the availability of medical resources. In Egypt, diabetes is an increasingly serious health issue. (Ugwu et al., 2019)<sup>(11)</sup>. More than one third of the subjects in the current study were men, which was similar to Catherine et al. (2019), who carried out a research project titled (Assessment of Knowledge of Drug and Dietary Regimen among Diabetic Clients in Endocrinology Clinic at Federal Medical Center, Ido-Ekiti, Ekiti State) in Nigeria. And found that 40% of the subjects were men<sup>(5)</sup>.

Less than one tenth of the researched subjects were divorced and single, according to the current study findings, while more than two thirds were married. According to Khalil et al. (2020), who conducted a study at Assiut University Hospital titled Effect of Self-Management Program on Self-Efficacy Regarding Osteoporosis Risk Among Diabetic Patients, the study subjects were

married, single, or divorced in 80%, 6.7%, and 6.7% respectively<sup>(12)</sup>.

The findings of this study were consistent with those of Elsayed et al. (2017), who conducted a study that was published under the title Assessment of Barriers to Self-Management Among Patients with Type 2 Diabetes Mellitus at Specialized Medical Hospital in Mansoura University and found that less than one tenth of the study subjects had good knowledge while more than two thirds of them had poor knowledge pre-program.<sup>(13)</sup>

The current study, in contrast, did not support Rajappa et al. (2018) findings, which carried out a study at a teaching hospital for tertiary care with the title "Assessment of Degree of Awareness about Diet, Physical Activity, and Lifestyle Modifications among Diabetic Patients" and found that 40% of the subjects had inadequate knowledge<sup>(14)</sup>. According to the researcher, this could be as a result of the fact that more than 50% of participants in this study couldn't read or write.

The current study assessed the effect of an educational program based on the Health Belief Model on diabetic foot care in type-2 diabetic patients, and the results showed a significant improvement in the overall score of elderly perceived believes that based on

the health belief model and its elements pre versus post program. Furthermore, Mohebi et al., (2013), study on Structural role of perceived benefits and barriers to self-care in patients with diabetes, found that patients with higher health belief sub-item scores, particularly those who are more susceptible, are better able to prevent and manage diabetic foot complications. <sup>(15,16)</sup>

Effect of educational intervention based on the Health Belief Model on promoting self-care behaviors of type-2 diabetes patients, by Parisa et al. (2017), found that before the intervention, the mean scores for susceptibility, severity, perceived benefits and barriers, self-efficacy, and self-care behaviors were average and lower levels; however, after the educational intervention, the mean score of each HBM construct and the self-care behaviors significantly increased ( $p < 0.001$ ) <sup>(17)</sup>. The significant improvement in the overall score of elderly perceived believes of the study group from preprogram to post implementation of the program may be related to the conducted educational program about a prophylactic diabetic foot care .

On the other hand the current study found that there was a statistically significant difference before and after program implementation in all knowledge and practice items with regards to the program effectiveness on participants' knowledge and reported practices. These findings were consistent with those of Mohamed and Shabrawy (2017), who conducted a study at Zagazig University Hospital outpatient clinics that was published under the title Effectiveness of Health Education Intervention on Foot Self-Care Practice Among Diabetics at Zagazig University Hospitals and found that after using the health education intervention, the knowledge

and behaviors of the study subjects significantly improved <sup>(18)</sup>. This improvement may be attributed to attending the training program.

Less than one tenth of the participants exhibited foot deformities like hammer toes and high arches, as well as a history of foot ulcers, according to the study findings. This result was in line with a study by Shohood et al. (2018) titled Predicting the Diabetic Foot Ulcer Risk Using Sensory Monofilament Test among Diabetic Patients at Benha University Hospitals, and reported that 5%, 1.7% and 1.7% respectively of the studied subjects had hammer toes, Charcot foot and pervious foot ulcer <sup>(19)</sup>. These results may highlight the significance of educating nurses sufficiently on the treatment of diabetic foot ulcers throughout their undergraduate studies or following graduation through an in-service training program.

The results of the current research revealed that more than a third of the studied participants felt tingling before application. This outcome was in line with research done by Alhabshan et al (2017) who studied Assessment of Knowledge about Complications of Diabetic Septic Foot among Diabetics Patients in Saudi Arabia, and found that 20.9% of the patients had experienced tightness and numbness in their feet <sup>(20)</sup>. The researcher believes that this may be connected to a lack of awareness regarding nutrition, exercise, medicine, and foot care, which results in poor glucose management 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 result was consistent with **El-Malky et al., (2021)**, research on asymptomatic diabetes

individuals' ankle brachial index screening for peripheral artery disease, and reported that 36.2% of the studied subjects had peripheral artery disease according to measured ankle brachial index test.<sup>(21)</sup> This result reflects that the diabetic elderly at risk to foot ulcer need a periodic application of integrating health belief model in a prophylactic diabetic foot care program.

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 consistent with a study conducted by El Din et al. (2016) titled "Prevalence of Risk Factors for Egyptian Diabetic Foot Ulceration" that was conducted in several regions of upper and lower Egypt as well as the delta region. 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<sup>(22)</sup>.

The current study revealed a statistically significant improvement in the mean neurovascular evaluation scores between the pre- and post-applying the program with regard to the neurological and vascular assessment. This outcome was consistent with research done by Hamza et al (2017), who applied a published research at the diabetic and endocrine outpatient clinic and published their findings., 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.<sup>(23)</sup>

The present study showed 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<sup>(24)</sup>. These findings highlight the significance of good supervision and follow-up in addition to good training for reported practice, neurological and vascular exposure in older diabetics at risk for developing foot ulcers.

### **Conclusion**

The results of the current study showed the significance of implementing a preventative foot care program on older diabetic patients' knowledge, reported practice, perceived believes, and foot ulcer risk scale. Additionally, there was a positive correlation between knowledge, reported practices, neurological and peripheral vascular risk exposure post applying the program.

### **Recommendation**

- Periodic application of integrating health belief model in A Prophylactic diabetic Foot Care Program for elderly at risk to foot ulcer.
- Apply further research in large samples and other settings for generalization.

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