



Awareness of Elderly Patients Regarding Diabetic Foot Ulcer Prevention at EL Fayoum General Hospital

Sahar Ramadan Abdel Ghani Hamzway*, Dr. Afaf Salah Abd El-Mohsen**, Dr. Amal Ibrahim Foud ***, Dr. Aliaa Mohammed Othman El-Afandy****

Assistant lecture of Geriatric Health Nursing* Professor of Community Health Nursing**, Assist professor of Community & Gerontological Health Nursing *** Assist Professor of Community Health Nursing****, Faculty of Nursing- Fayoum University *&***, Faculty of Nursing- Helwan University **&****

ABSTRACT

Background: Diabetic foot ulcers are one of the most common chronic complications of diabetes that has a tremendous economic and social impact on individuals, families and the health system as a whole. **Aims:** this study aims to assess awareness of elderly patients regarding diabetic foot ulcer prevention at the EL- Fayoum General Hospital. **Research design:** Descriptive research design was used. **Setting:** The study was conducted at the medicine outpatient clinic at EL- Fayoum General Hospital. **Subjects:** Purposive sample composed of 300 elderly diagnosed with diabetes. **Tools for data collection:** Two tools for data collection were used as follow: **1st tool:** Structured Interviewing Questionnaire include demographic characteristics of elderly diabetic patients, past and current medical history, Knowledge assessment questionnaire, patients reported practice questionnaires. **2nd tool:** Observational check list questionnaire to assess foot ulcer risk included neurological foot assessment and peripheral vascular assessment. **Results:** revealed that 7% and 40.30% of studied subjects respectively had total good knowledge and adequate reported practice. In addition to, 14.23 ± 3.004 , 11.38 ± 2.57 and 11.32 ± 2.63 respectively were total score of neurological items, right and left peripheral vascular items. **Conclusion:** The current study concludes that statistically significant difference between neurological risk exposure and total score of knowledge. As well as, significant difference between vascular risk exposures, total score of knowledge, total reported practice score and neurological risk **Recommendations:** Develop an effective health education program to improve the knowledge and practice of the prevention of diabetic foot ulcers to avoid or reduce the risk of foot ulcers.

Keywords: Elderly, diabetic foot ulcer, prevention and awareness

Introduction:

Diabetes mellitus is a serious and long-term condition that arises when there are elevated levels of glucose and the body cannot produce sufficient of the insulin hormone, or cannot effectively use the insulin it produces. Insulin deficit and missing unchecked over the long term can cause damage to many of the body's organs leading to disabling and life-threatening health complications such as cardiovascular diseases, nerve damage (neuropathy), kidney damage (nephropathy), eye disease, Diabetic Foot Ulcer (DFU) and amputation (**Dwivedi and Pandey, 2020**).

The global population aged 60 or more reached 962 million in 2017 and this number of older people is expected to double again by 2050. (**El-Masry et al., 2018**). Diabetic foot ulcer is often complicated by wide-ranging diabetic changes, such as neuropathy and vascular disease, especially in elderly diabetic patients due to with ageing decrease nerve function and vascular flexibility, according to study in the United States 2016 the prevalence of diabetic neuropathy according to Michigan neuropathy screening instrument was 28.8% and it's significantly and positively correlated with higher age (**Popescu et al., 2016**).

A foot ulcer is meant as these are non-traumatic lesions of the skin on the foot elderly diabetic patients; the pathophysiology of DFU is neuropathy, ischemic or neuro-ischemic and immune system components, which all display a base relationship with the hyperglycemic state of diabetes; Hyperglycemia produces oxidative stress on motor, autonomic, sensory nerve cell components lead to neuropathic foot ulcers, and vascular disease such as ischemic foot ulcer (**Syafril, 2018**).

Clinical symptom peripheral neuropathy classified according to types of neuropathy such as autonomic nerves characteristics with reduced sweating results in dry, cracked skin and increased blood flow leads to warm foot, bounding pulses and dilated dorsal veins; Sensory neuropathy characteristics with loss of protective sensation, reduced sensation with pain or temperature changes; Motor neuropathy characteristics with dysfunction of the motor nerves that control the movement of the foot lead to limited joint mobility, increase plantar pressure and develop foot deformities and hammer toes (**Boulton et al., 2019**). The ischemic foot objectively appears cold to touch, pale, and the distal pulses are reduced or absent, the skin is dry, dystrophic, hair is absent, and fissures in the heels (**Cervantes-García & Salazar-Schettino 2017**).

Risk factors of DFU correlated with poor practices and knowledge so awareness elderly diabetic patients about DFU prevention guidelines and early management of diabetic foot essential to prevention or reduce diabetic foot ulcer complication such as amputation (**Pourkazemi, et al., 2020**). Gerontological nurse plays a crucial role in assessing and improving elderly knowledge and practice through applying new guideline and strategies regarding to diabetes diseases management and prevention DFU and recommend diabetic elderly patients to change lifestyle and good adherence to therapeutic regimen such as diet, exercise, follow up, foot care and medication (**Smith et al. 2018**).

Significant:

According the International Diabetes Federation (IDF) in 2019, estimates that Egypt is the 9th country worldwide had diabetic patients (8,850,400) from 18 to 79 years. By 2045, Egypt is expected to be the 7th country worldwide. Diabetic foot ulcer is one of the most common chronic complications of diabetes which has a negative impact on elderly patients due to peripheral neuropathies detrimental effects on stability, sensorimotor function, gait, and activities of daily living (**Azzam et al., 2021**).

The prevalence the diabetic foot ulcer has been found to be higher among diabetic patients, the reason commonly stated for this prevalence, lack knowledge and practice about diabetic care including therapeutic regimen diet, exercise, follow up and foot care (**Serag, 2017**). The international diabetes federation 2017 estimates that at least one limb is lost due to DFU somewhere in the world every 30

seconds and globally the prevalence of foot ulcers among diabetic patients was about 15% (Abdissa et al., 2020).

Aim of the study:

Assess awareness of elderly patients regarding diabetic foot ulcer prevention at EL - Fayoum General Hospital.

Through the following objectives.

- 1- Assess knowledge and reported practice of elderly diabetic patients regarding foot ulcer prevention guideline program.
- 2- Appraise foot ulcer risk for elderly diabetic patients.

Subjects and Methods

Research design: A descriptive research design was used in the study. **Setting:** The study was conducted at medicine outpatient clinic at EL - Fayoum General Hospital. **Sampling:** A purposive sample was used to choose 300 elderly from total number 1200 of diabetic elderly patients diagnosed in previous years (2019-2020). according to the following size equation that provides by Yamane (1967).

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

Tool for data collection:

The data was collected by using two tools:

1st tool: Structured Interviewing Questionnaire:

The questionnaire sheet was designed and translated into Arabic language form to avoid misinterpretation by the researcher based on reviewing related literatures included 4 parts:

Part 1: demographic characteristics of elderly diabetic patients: Contain 9 questions used to assess demographic characteristic of study sample such as sex, age, level of education, marital status, and place of residence, income, previous and current occupation.

Part II- Patient medical history: Adapted from (Rajappa et al., 2018). Consisted of two

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

Part III: Knowledge assessment questionnaire:

It was adapted from (Alghshanen, et al., 2017). Composed of 29 closed ended questions to assess elderly general knowledge about diabetic foot ulcer prevention general such as meaning of diabetic foot ulcer, signs, complication of diabetic foot ulcer and specific knowledge about diabetic foot ulcer prevention method (diet, exercise, follow up, medication, and foot care). **Scoring system** were presented as (2) for complete answer, (1) for in complete correct answer and (0) for incorrect answers or don't know.

- The total scores for the elderly's knowledge regarding diabetic foot ulcer divided into three levels as the following

- Poor knowledge <50%
- Fair knowledge 50 -75%
- Good knowledge ≥75%

Part IV: Patients reported practice questionnaires:

It was adapted from (American diabetes association, 2018). Composed of 18 closed ended questions to assess elderly reported practice questionnaires such as check foot every day, checking the shoes before wearing, keeping foot away from fire.

Scoring system: The elderly reported practice has been scored as done = (2), sometime (1) and not done = (0). The total scores for the elderly's reported practice regarding foot care classified into two levels:

- Adequate reported practice < 60%
- Not adequate reported practice \geq 60%

2nd tool: Observation checklist questionnaire tool:

This tool adapted from (The International working Group on the Diabetic Foot, 2019):

Used as a foot screen checklist to identify DFU risk that consisted of:

Part I: neurological foot assessment: Used to assess elderly's neurological lower limb for foot such as foot sensation condition, skin condition, skin color, foot temperature (hotness), 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 (0) for (YES) abnormal condition. Total score calculated by summed of total items by Mean \pm SD

Part II: peripheral vascular assessment consisted of: Ankle brachial index test (ABI) to measure degree of peripheral artery disease and assessment foot pulse, skin condition, foot temperature (cold) and foot pain. Measurement of ABI: By using digital sphygmomanometer cuff.

The ABI was performed by measuring the systolic blood pressure of both brachial arteries, both dorsal 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 scored was calculated by dividing the posterior tibia or dorsal pedis systolic blood pressure for right and left foot by brachial systolic blood pressure then interpreted as following: 0.97 – 1.3 are normal, 0.8 - 0.96 are mild isocheimal, 0.4 - 0.79 are moderate ischemia and 0.39 or less: severe ischemia And above 1.3 is vessels stiffness. Totals scored summed by Mean \pm SD.

Operational items: Includes preparatory phase, pilot study content validity, content reliability and filed work.

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

- **Pilot study:** The pilot study was conducted on a sample of 10% (30) of elderly diabetic patients to test the clarity, applicability and understand ability of the tool. The results of the pilot helped in refining the interview questionnaire and to schedule the time framework. The participants of the pilot were excluding in the main study sample.

- **Validity:** The content validity of the tools was reviewed by (jury) five experts from Faculty of Nursing – Helwan University and Fayoum University (two experts specialized in geriatric health nursing, two experts specialized in community health nursing and one experts specialized in medical surgical health nursing to test the content validity of the tools for clarity, relevance, comprehensiveness, understanding and applicability. The necessary modifications were done accordingly to the expert's comments.

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

- **Field work:**

- The actual field work started from October 2020 till January 2021 for the data collection.
- Before conducting the study, permission was obtained from the directors of the hospitals.

- At the beginning, the researcher introduced her- self and explains the purpose of study to elderly to gain their confidence and trust to convince them to participate in the study then the verbal consent was obtained from them.
- The researcher collected data during 3 days-week (Sunday, Monday, and Tuesday) the visiting was from 8:30 am to 11:30 am .the questionnaire were distributed on elderly patients and completed by the researcher assessment.
- All studied subjects filled questionnaire sheet by themselves except don't write and read elderly by researcher according to their oral answer.
- The researcher took about 7 elderly in day to fill questionnaire sheet, consumed 30 minute with elderly to answer questionnaire sheet.

. Ethical considerations:

The research approval was obtained from 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 included in the study to gain their confidence and trust. The researcher obtained written or oral consent from elderly. The researcher assured maintaining anonymity and confidentiality of subjects' data. The elderly were informed about allowing 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 to 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 diagram. Proper and suitable statistical tests were used to test the significance of 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 statistically insignificant difference.
- When $P < 0.05$, it is statistically significant difference.
- When $P < 0.01$ or $P < 0.001$, it is high significant difference.

Results:

- **Table (1)** Shows 72.3% of elderly patients between $60 \leq 65$ years with mean age 61.60 ± 2.835 as that 57.7 % residence in rural area and 67.3% of them were married.
- **Figure (1):** Clarifies 58.7% of studied subjects are female.
- **Table (2)** Shows 20.3 % of studied subjects practice foot care every day and 53% of them didn't practice foot care due to lack of knowledge.
- **Table (3)** Clarifies that less than one quarter (17.3%,17.7%, 19.3%, 21.7% , 18.3%, and 24 %) respectively of studied subjects knew meaning of diabetic foot ulcer, the effect of diabetic on foot, causes, signs and symptom , complication and methods of protection against diabetes foot ulcers.
- **Table (4)** Shows that (13.3%, 16%, 16%, 32%) respectively of the studied subjects knew importance of daily foot care for diabetic patient, steps foot daily foot care , right way to cut the fingernails, The proper tool for cutting nails.
- **Table (5)** Illustrates that 40.30% of studied subjects were adequate about total reported practices of foot care while 59.70% of them were not adequate about total reported practices with total mean score 14.77 ± 9.43 .

- **Table (6)** Reports Mean \pm SD for total score of neurological items was 14.23 ± 3.004 . While, Mean \pm SD for total score of right and left peripheral vascular items were 11.38 ± 2.57 and 11.32 ± 2.63 .

Table (7) Clarity statistically significant difference between neurological risk exposure and total score of knowledge. As well as, significant difference between vascular right risk exposures, total score of knowledge, total score practice and neurological risk. Also, there was significant difference between vascular left risk exposure, total score of knowledge, practice, neurological risk exposure and vascular right risk exposure.

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

Demographic characteristic	The studied sample (N=300)	
	No.	%
Age:		
60 - < 65	217	72.3
65- < 70	64	21.3
70 - \leq 75	19	6.3
Mean \pm SD	61.60 \pm 2.835	
Level of education:		
No read and no write	125	41.7
Read and write	81	27
Secondary	64	21.3
University	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	170	56.7
Urban	130	43.3
Income		
Sufficient	127	42.3
Insufficient	173	57.7
Current occupation		
Work	81	27
Not work	219	73
Responsible about your care:		
No one	27	9
wife or husband	61	20.3
Son	178	59.3
Relative	34	11.4

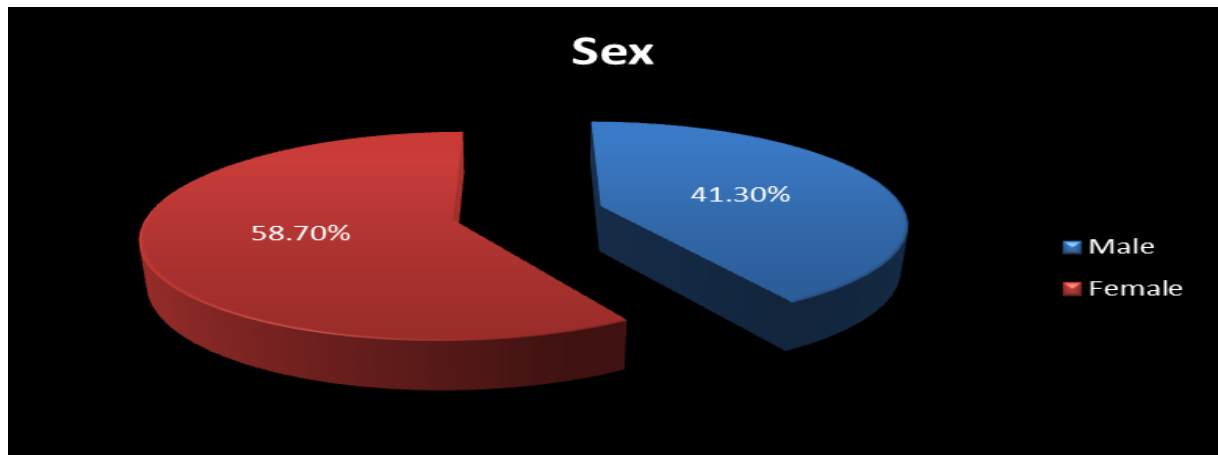


Figure (1): Frequency Distribution of Sex among Elderly Patient Diagnosed with Chronic diabetes mellitus (n=300).

Table (2) Distribution of the Studied Sample Foot Care Medical data among Elderly Diabetic Patients (N=300).

Items	No.	%
Practice foot care every day		
Yes	61	20.3
No	239	79.6
The reason not practice foot care*		
Lack knowledge	106	35.3
visual problem	50	16.7
no one help me	22	7.3
Physical limitation	40	13.3
Not remember	21	7
Family history of diabetic foot ulcer		
Yes	51	17
No	249	83
Visit diabetic outpatient for inspected foot once at least every a year:		
Yes	45	15
No	153	51
Some time	102	34

Table (3): Distribution of Elderly Diabetic Knowledge about General Diabetic Foot ulcer (N=300).

General knowledge items	The studied sample	
	No.	%
Definition of diabetes		
wrong or no answer	181	60.3
correct answer and not complete	89	29.7

correct answer and complete	30	10
Risk factors for diabetes		
wrong or no answer	111	37
correct answer and not complete	150	50
correct answer and complete	39	13
Normal blood sugar level in elderly		
wrong or no answer	144	48
correct answer and not complete	126	42
correct answer and complete	30	10
Diabetes complication		
wrong or no answer	121	40.3
correct answer and not complete	138	46
correct answer and complete	41	13.7
Meaning of diabetic foot ulcer		
wrong or no answer	178	59.3
correct answer and not complete	70	23.3
correct answer and complete	52	17.3
Meaning of diabetic foot		
wrong or no answer	172	57.3
correct answer and not complete	93	31
correct answer and complete	35	11.7
Effect of diabetic on foot		
wrong or no answer	159	53
correct answer and not complete	88	29.3
correct answer and complete	53	17.7
Causes of d diabetic foot ulcer		
wrong or no answer	154	51.3
correct answer and not complete	88	29.3
correct answer and complete	58	19.3
Signs and symptom of diabetic foot		
wrong or no answer	161	53.7
correct answer and not complete	74	24.7
correct answer and complete	65	21.7
Complication of diabetic foot ulcer		
wrong or no answer	154	51.3
correct answer and not complete	91	30.3
correct answer and complete	55	18.3
Methods of protection against diabetes foot ulcers		
wrong or no answer	156	52
correct answer and not complete	72	24
correct answer and complete	72	24

Table (4) Distribution of Elderly Diabetic Patient Specific Knowledge Regarding Diabetes Foot Care (N=300).

Specific Knowledge items	The studied sample	
	No.	%
Diet knowledge		
Foods that a diabetic patient can eat without being bound by calories		
wrong or no answer	167	55.7
correct answer and not complete	62	20.7
correct answer and complete	71	23.7
Foods a diabetic patient should take into account the calories		
- wrong or no answer	159	53
- correct answer and not complete	71	23.7
- correct answer and complete	70	23.3
Foods a must avoid for diabetic patient		
- wrong or no answer	162	54
- correct answer and not complete	69	23
- correct answer and complete	69	23
Exercise knowledge		
The importance of exercise to diabetic patient		
- wrong or no answer	157	52.3
- correct answer and not complete	78	26
- correct answer and complete	65	21.7
Precautions to be taken during exercise		
- wrong or no answer	171	57
- correct answer and not complete	68	22.7
correct answer and complete	61	20.3
Exercises are allowed for diabetic patient		
- wrong or no answer	195	65
- correct answer and not complete	43	14.3
- correct answer and complete	62	20.7
Medication knowledge		
Methods of taking insulin		
- wrong or no answer	95	31.7
- correct answer and not complete	196	65.3
- correct answer and complete	9	3
Insulin injection sites		
- wrong or no answer	100	33.3
- correct answer and not complete	108	36
- correct answer and complete	92	30.7
Common complications of diabetes medication		
- wrong or no answer	111	37
- correct answer and not complete	116	38.7
- correct answer and complete	73	24.3
Foot care knowledge:		
Importance of daily foot care for diabetic patient		
- wrong or no answer	178	59.3
- correct answer and not complete	82	27.3
- correct answer and complete	40	13.3

Table (5): Percentage of total practices among Elderly diabetic Patients about Diabetes foot care (N=300).

Total practices scores about	No.	%
Levels of total practices:		
Adequate	179	59.7
Not adequate	121	40.3
Mean scores of total reported practices		
Range	34	
Mean ± SD	14.77±9.43	

Table (6) Total Distribution of Studied Patients Regarding Neurovascular Foot Assessment (N=300).

Neurovascular foot item	The studied sample	
	Mean ±SD	Range
Total neurological scale	14.23±3.004	14
right peripheral vascular items	11.38±2.57	11
left peripheral vascular items	11.32±2.63	11

Table (7): Correlation between Knowledge, Reported Practices, Neurological and Vascular Right and Left Risk Exposure (N=300).

Knowledge, reported practices, neurological and vascular risk exposure	Scores of total knowledge, 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

Discussion

Diabetes is a cumulative impact on almost every country according to the IDF in 2015, approximately 415 million patients were suffering from diabetes worldwide, and this number is expected to exceed 640 million by the year 2040, diabetic foot ulcer (DFU) are one of the most common chronic complications of diabetes and elderly with diabetic lack knowledge related to

foot care were higher risk for foot ulceration and lower extremity amputation (Papatheodorou et al, 2018).

Concerning age, less than tenth percent of studied subjects had above 70 years, and this finding was in agreement with **Thunberg & Hellenberg, (2013)** who conducted published study entitled as "Knowledge and practices regarding foot care among patients with Type 2 diabetes in Ho Chi Minh City, Vietnam " reported that 9% of studied subjects were above 70 years.

Concerning the education level of the present study revealed that tenth of studied subjects had a university education and this finding was similar with **Algshanen, et al., (2017)** who conducted a published study entitled as" Diabetic Foot Awareness among Diabetic Patients in Saudi Arabia" conducted cross-sectional study directed among the diabetic clinic visitors in Primary Health Care Centers in Saudi Arabia and founded that 5.6% participants had university education. From researcher point view, might be, in the past the Fayoum Governorate was considered rural area that concerning agriculture more than education.

Regarding elderly diabetic patients reported practice foot care every day the present study revealed that less than one quarter unable to practice foot care every day due to physical limitation and this finding was agreement with **Abu-elenin et al., (2018)** who conducted published study in outpatients clinics at Tanta University hospitals under title of " Knowledge, practice and barriers of foot self-care among diabetic patients at Tanta University Hospitals" reported that 18.5 % of studied subjects unable to practice foot care every day due to physical limitation.

Elderly's awareness level of the questionnaires weren't homogenous, and elderly's knowledge appeared to be haphazard and not based on scientific background. more than two third of studied subjects had poor knowledge and this finding disagreement with **Rajappa et al., (2018)** who conducted published study at tertiary care teaching hospital under title "Assessment of degree of awareness about diet, physical exercise, and lifestyle modifications among diabetic patients" reported 40% of studied subjects had poor knowledge From the researcher point of view, this might be due to less more than half of studied subjects of the current study didn't read and write while more than three quarter of studies subjects of Rajappa were literate.

As regarding, the present study clarified that more than one third of studied subjects were adequate about reported foot care practice, and this finding agreement with **Saurabh et al., (2014)** who conducted published study at India under title of " Effectiveness of foot care education among people with type 2 diabetes in rural Puducherry, India" reported that 35.9% of studied subjects were satisfactory about reported foot care practice.

Concerning lower limb neurological assessment mean scores was 14.23 ± 3.004 and this finding in the same line with **Hamza, et al (2017)**. Who conducted published study at the Diabetic and Endocrine outpatient clinic, affiliated to Governmental Cairo University Hospital, Egypt under title of "Effect of training program on the improvement of Knowledge and ankle brachial index measurement for diabetic patients" reported that lower limb neurological assessment mean scores was 13 ± 2 in right leg and 11 ± 3

The present study clarified there statistical significant correlation between knowledge and practice post applying program and this finding supported with **Pourkazemi et al. (2020)**, who

published study at azan Diabetes Center under title of Diabetic "Foot Care: Knowledge and Practice" reported that there was a significant and direct correlation between knowledge and practice, a targeted educational program is needed to promote knowledge of patients with diabetes.

Conclusion:

The results of this study concluded that more than tow third of studied subjects had poor knowledge about diabetic foot ulcer and more half of them were not adequate reported practices about foot care. In addition to, significant difference between vascular right risk exposures, total score of knowledge, total score reported practice and neurological risk. Also, there was significant difference between vascular left risk exposure, total score of knowledge, reported practice, neurological risk exposure and vascular right risk exposure.

Recommendation:

- Health awareness program to identify diabetic risk factors and decrease the numbers of diabetes mellitus by adopting a healthy lifestyle and compliance to therapeutic regimen.
- Periodic prevention education program and reeducation sessions regarding diabetic foot ulcer prevention for diabetic elderly patients to reduce the risk scale of foot ulcers.
- Apply more research in large sample and other setting for generalization

Reference

- 1- **Abdissa, D., Adugna, T., Gerema, U., & Dereje, D. (2020):** Prevalence of diabetic foot ulcer and associated factors among adult diabetic patients on follow-up clinic at jimma medical center, southwest Ethiopia, 2019: an institutional-based cross-sectional study. *Journal of diabetes research*, 2020.
- 2- **Abu-elenin, M. M., Elshoura, A. A., & Alghazaly, G. M., (2018):** Knowledge, practice and barriers of foot self-care among diabetic patients at Tanta University Hospitals, Egypt. *Egyptian Journal of Community Medicine*, 36(4), 94-102.
- 3- **Algshanen, M. A., Almuhanha, M. F., Almuhanha, A. M., Alghobaish, F. F., Bari, O. S., Alajji, N. A., & Alzamanan, M. Y. (2017):** Diabetic foot awareness among diabetic patients in Saudi Arabia. *The Egyptian Journal of Hospital Medicine*, 68(2), 1289-1290.
- 4- **American Diabetes Association, (2018):** Lifestyle management: standards of medical care in diabetes—2018. *Diabetes Care*, 41(1), 38-S50.
- 5- **Azzam, M.M., Ibrahim, A.A. & Abd El-Ghany, M.I. (2021):** Factors affecting glycemic control among Egyptian people with diabetes attending primary health care facilities in Mansoura District. *Egypt J Intern Med* 33, 33 (<https://doi.org/10.1186/s43162-021-00065-w>)
- 6- **Boulton, A. J. M., Armstrong, D. G., Kirsner, R. S., Attinger, C. E., Lavery, L. A., Lipsky, B. A., & Steinberg, J. S. (2019):** Diagnosis and management of diabetic foot complications.
- 7- **Cervantes-García, E., & Salazar-Schettino, P. M. (2017):** Clinical and surgical characteristics of infected diabetic foot ulcers in a tertiary hospital of Mexico. *Diabetic foot & ankle*, 8(1), 1367210.

- 8- Dwivedi, M., & Pandey, A. R. (2020): Diabetes mellitus and its treatment: an overview. *Journal of Advancement in Pharmacology*, 1(1).
- 9- El-Masry. R., Elwasify. M., & Khafagi.M. (2018). Adaptation and Reliability of the Arabic Version of Alzheimer's Disease Knowledge Scale (ADKS) among Sample of Middle aged and Elderly Egyptians Attending Outpatient Clinics in Mansoura University Hospital. *The Egyptian Journal of Community Medicine*, 36, 59-69.
- 10- Hamza, M. F., Abdel-Hakeim, E .H. Hassanein .S.T., (2017): Effect of Training Program on the Improvement of Knowledge and Ankle Brachial Index Measurement for diabetic Patients. *Assiut Scientific Nursing Journal*, (5)10.
- 11- International working Group on the Diabetic Foot, (2019): IWGDF Guidelines on the prevention and management of diabetic foot disease foot disease available at: file:///I:/New%20folder%20(2)/IWGDF-Guidelines-2019%20(1). 5-2-2020.3:pm
- 12- Papatheodorou, K., Banach, M., Bekiari, E., Rizzo, M., & Edmonds, M., (2018): Complications of diabetes 2017. *Journal of diabetes research*, 2018 (3086167). Available at: <https://www.hindawi.com/journals/jdr/2018/3086167/>.3.9.2021-4:am
- 13- Popescu, S., Timar, B., Baderca, F., Simu, M., Diaconu, L., Velea, I., & Timar, R. (2016): Age as an independent factor for the development of neuropathy in diabetic patients. *Clinical interventions in aging*, 11, 313.
- 14- Pourkazemi, A., Ghanbari, A., Khojamli, M., Balo, H., Hemmati, H., Jafaryparvar, Z., & Motamed, B. (2020): Diabetic foot care: knowledge and practice. *BMC endocrine disorders*, 20(1), 1-8.
- 15- Rajappa, T., Ponniraivan, K., Kalyan, H., Selvaraju, K., & Karunanandham, S. (2018): Assessment of degree of awareness about diet, physical exercise, and lifestyle modifications among diabetic patients. *International Journal of Medical Science and Public Health*, 7(6), 481-487.
- 16- Saurabh, S., Sarkar, S., Selvaraj, K., Kar, S. S., Kumar, S. G., & Roy, G. (2014): Effectiveness of foot care education among people with type 2 diabetes in rural Puducherry, India. *Indian journal of endocrinology and metabolism*, 18(1), 106.
- 17- Serag, R. M. (2017): Relationship between Diabetic Patients' Knowledge Regarding Diabetic Foot Ulcer care and their Wound Status. *Port Said Scientific Journal of Nursing*, 4(1), 141-155.
- 18- Smith AN, Willis .E, Chan VT, (2018): Treatment of diabetic foot induces dermal fibroblast responses to injury. *Exp Cell Res*; 316: 48–54.
- 19- Syafril, S. (2018): Pathophysiology diabetic foot ulcer. In IOP Conference Series: Earth and Environmental Science . 125(012161). 1-7.
- 20- Thunberg, S., & Hellenberg, S. (2013): Knowledge and practices regarding foot care among patients with Type 2 diabetes in Ho Chi Minh City, Vietnam: A quantitative study, Thesis in Caring Sciences 15 ECTS credits, Uppsala University, Department of Public Health and Caring sciences Section of Caring Science P.p14.
- 21- Yamane T., (1967): Statistics, an Introductory Analysis, 2nd edition. New York: Harper and Row, Chapter 7, P. P., 190: 192.