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Health Education Program for Patients Suffering from Diabetic Foot at Diabetic Center in King Fahad Hospital

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Abstract:

Background: Diabetic foot refers to a foot complication that arise as a result of diabetes, primarily due to prolonged high blood sugar levels which impair blood flow and nerve function. **Aim:** This study aimed to evaluate the effect of health education program for patients suffering from diabetic foot at diabetic center in king Fahad hospital. **Research design:** A quasi-experimental research design was used in this study. **Sample:** Purposive sample include 140 patients with diabetic foot. **Setting:** It was conducted at diabetic center at king Fahad hospital, Saudia Arabia. **Tool:** Two tools, **1st tool:** interview questionnaire included four parts: **1st part:** Demographic characteristics of patients, **2nd part:** Medical history of patients, **3rd part:** Patients' knowledge, and **4th part:** Patients' reported practices about diabetic foot**, 2nd tool:** Observation checklist questionnaire included two parts: **1st part:** Neurological foot assessment and **2nd part:** Peripheral vascular assessment. **Results:** The study result revealed that, 5.3 % of studied patients had good total knowledge pre apply health education program, become 77.2 % of them had good total knowledge post apply health education program. While 90.5 % of studied patients had unsatisfactory with total reported practices pre apply health education program become 92.0 % of them had satisfactory total reported practices post apply health education program. **Conclusion:** The patients' knowledge, and reported practices about diabetic foot improved post apply health education program. **Recommendations**: Continuous an educational program for patients regarding diabetic foot care in another place.

Key words: Diabetic Center, Diabetic Foot, Health Education Program, King Fahad Hospital and Patients.

Introduction:

Diabetes mellitus is a chronic condition characterized by high blood sugar levels due to the body's inability to produce or effectively use insulin. This leads to a range of symptoms including excessive thirst, frequent urination, and fatigue. There are two main types as type 1, where the immune system attacks insulin-producing cells, and type 2, often linked to lifestyle factors and insulin resistance. Managing diabetes involves lifestyle changes, monitoring blood sugar levels, and sometimes medication, aiming to prevent complications and improve quality of life ***(Antar et al., 2023).***

Diabetic foot refers to a range of complications in the feet resulting from diabetes, primarily due to poor blood circulation and nerve damage. This condition can lead to slow-healing wounds, infections, and in severe cases, ulcers or amputations. Effective management involves maintaining blood sugar control, regular foot inspections, and prompt treatment of any injuries or infections. Preventative measures include proper foot care, wearing well-fitted shoes, and avoiding walking barefoot ***(Chandrasekaran & Weiskirchen, 2024).***

Globally, 537 million adults (20-79 years) are living with diabetes, 1 in 10. This number is predicted to rise to 643 million by 2030 and 783 million by 2045. Over 3 in 4 adults with diabetes live in low- and middle-income countries. In Egypt, the prevalence of type 2 diabetes (T2D) in Egypt is around 15.6 % of all adults aged 20 to 79, and 23.7 % in Kingdom Saudia Arabia (KSA). Diabetic Foot Ulcer (DFU), is a break of the skin of the foot to at least the level of the dermis that may result from trauma, neuropathy, ischemia and/or infection the mean prevalence of DFU in Saudi Arabia was 11.85 %, and in Egypt was 4.2% ***(Shahin et al., 2024).***

Common signs and symptoms of developing foot ulcers include persistent redness, swelling, or warmth in the affected area, which may indicate inflammation. Patients might notice changes in skin texture, such as the formation of blisters, calluses, or open sores. Additionally, patients experience pain or discomfort, though ulcers can sometimes be painless due to nerve damage from diabetes. Anomalies like unusual discharge or a foul odor from the wound are

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indicative of potential infection. Early recognition of these symptoms is crucial for effective management and prevention of more severe complications **(Hassanein et al., 2024).**

Common risk factors for developing foot ulcers include diabetes, particularly with poor blood sugar control, which can lead to neuropathy and reduced sensation. Other factors are peripheral artery disease, which impairs blood flow, and high pressure from ill-fitting shoes or foot deformities. Smoking, a history of foot injuries or infections, and poor personal hygiene can also increase the risk. Regular monitoring and proactive foot care are crucial in preventing ulcers ***(Lockhart et al., 2024).*** Foot ulcers must be closely monitored to prevent complications such as infections, gangrene, or even amputation. Regular inspections help detect changes or worsening conditions early, allowing for timely intervention. Effective monitoring includes checking for signs of infection, ensuring proper wound care, and managing any underlying conditions, like diabetes or poor circulation. Prompt attention to any issues can significantly reduce the risk of severe complications and improve overall outcomes ***(McDermott et al., 2023).***

A health educational program directed towards improving the health status of patients with diabetic foot is designed to address the multifaceted needs of individuals living with this condition. The program typically provides comprehensive instruction on daily foot care practices, such as proper cleaning, moisturizing, and inspection to detect any potential issues early. It covers the importance of maintaining optimal blood glucose levels and the impact of diabetes on foot health, helping patients understand how to mitigate risks associated with poor circulation and neuropathy. Moreover, the program often includes guidance on lifestyle modifications, including appropriate footwear and exercises to enhance circulation and strengthen the feet ***(Alkhami et al., 2024).***

Community Health Nurse (CHN) plays a vital role in increasing awareness about diabetic foot among patients by serving as an accessible and knowledgeable resource. CHN educates patients on essential foot care practices, such as daily inspections and proper hygiene, and emphasizes the importance of regular check-ups to detect early signs of complications. By conducting community outreach, providing personalized advice, and facilitating educational workshops, the CHN helps patients understand the risks associated with diabetes and empowers them with strategies to prevent and manage foot issues effectively. This proactive approach ultimately enhances patient self-care and reduces the incidence of severe complications related to diabetic foot ***(Van Netten et al., 2024).***

Significance of the study

In 2022, about 537 million adults (20-79 years) are living with diabetes 1 in 10. This number is predicted rise to 643 million by 2030 and 783 million by 2045.incomes icon over 3 in 4 adults with diabetes live in low- and middle-income countries. Pulse icon Diabetes is responsible for 6.7 million deaths in 2021 - 1 every 5 seconds. Diabetes caused at least USD 966 billion dollars in health expenditure a 316% increase over the last 15 years. People icon541 million adults have Impaired Glucose Tolerance (IGT), which places them at high risk of type 2 diabetes ***(World Health Organization (WHO), 2022).***

The World Health Organization (WHO) has reported that Saudi Arabia ranks the second highest in the Middle East, and is seventh in the world for the rate of diabetes. It is estimated that around 7 million of the population are diabetic and almost around 3 million have pre-diabetes. Egypt ranks ninth in the prevalence of DM worldwide, and the number of adult diabetic patients was 8,850,400 in early 2021, with a prevalence of 15.2% ***(Chen et al., 2022).***

Community health nurse play an important role in keeping blood sugar, blood pressure and blood fats under control will hugely help to reduce risk of developing complications. This means going to diabetes health checks and finding out from diabetes healthcare team how to look after with patients between appointments. Prevent or delay the complications of diabetes. But need to take action and managing diabetes well. Nurses providing health promotion messages that felt were helpful for the patients. Taught patients how to interpret laboratory results, and spent much time in consultation with patients, gathering baseline information about patients, and providing relevant information about diabetes care ***(Saekel, 2022).***

Aim of the Study

This study aimed to evaluate the effect of health education program for patients suffering from diabetic foot at diabetic center in king Fahad hospital through the following objectives:

1-Assessing the knowledge and reported practice of patient about diabetic foot.

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2-Planning and Implementing health educational program for patients regarding diabetic foot.

3-Evaluating the effect of health education program for knowledge and reported practice of patient about diabetic foot.

Research hypothesis:

The patients' knowledge and reported practice will be improved after applying health education program for patients suffering from diabetic foot.

Subjects & Methods:

1. Technical Item:

The technical item includes (research design, setting, sample and tools for data collection).

Research design:

A quasi-experimental research design was conducted to achieve the study.

Setting:

This study conducted in diabetic center at king Fahad hospital, Saudia Arabia.

Sample:

Purposive sample was used in this study.

Sample size:

The study was conduct in diabetic center at king Fahad hospital, Saudia Arabia, which, used to choose (140) patients' total number of patients in one year equal 450 patients begin, of August 2021 to end of July 2022 at diabetic center in king Fahad hospital, Saudia Arabia.

The sample size calculation was done based on the power analysis Herbert Equation.

N = 450 t = 1.96

SE = 0.05 P = 0.50

$$n = \frac{0.50\ (1-0.50)}{(0.05 \div 1.96) + [0.50\ (1-0.50) \div 450)}$$

n = 140

Inclusion Criteria:

Male and female, having diabetic foot, and accept to participate in the study.

Tools for data collection:

Data was collected using the one tool as the following:

Tool (I): Interview questionnaire: (Pre – post format): It consisting of four parts as the following:

A Structure interview questionnaire developed by investigator after reviewing the national and international related literature and approved by supervision. It was written in Arabic language and consists of five parts as the following:

Part (I): Demographic characteristics of patients consisted of 7 items as: age, gender, marital status.

Part (II): Medical history of patients: It divided to 2 sub-items

1st : Past medical history for patients consisted of 8 items as: how long have you been suffering from diabetes, suffer from any other health problems, have a history of certain diseases if the answer is yes.

2nd: Current health status for patients consisted of 8 items as: You can take daily care of your feet if the answer is (no), state the reason, there is one of relatives who has diabetes who suffered from a foot ulcer.

Part (III): Knowledge of patients about diabetic foot, it consisted of 4 sub items (pre – post format) as:

A- Patient's knowledge about diabetes included 10 closed ended questions as: Meaning of diabetes, role of glucose in the body, types of diabetes, causes of type 1 diabetes, causes of type 2 diabetes.

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B- Patient's knowledge about diabetic foot ulcer included 6 closed ended questions as: Meaning of diabetic foot ulcer, concept of diabetic foot, effect of diabetes on the feet.

C- Patient's knowledge about general diabetes practices included 9 closed ended questions as: Ways to protect against diabetic foot ulcers, importance of exercise for diabetics.

D- Patient's knowledge about foot practices towards diabetes included 9 closed ended questions as: The importance of daily foot care for a diabetic patient, daily foot care includes, the correct way to cut nails, the appropriate tool for cutting nails.

Scoring system, it included 34 questions; the answer score 2 point for correct answer and complete, 1 point for correct answer and not complete and zero point to wrong or no answer. The total score of patients 68 points knowledge regarding diabetic foot divided into three levels as the following:

- Poor knowledge < 50 % (< 34 score)
- Average knowledge 50 -75 % (34:48 score)
- Good knowledge > 75% (> 48 score).

Part (IV): Reported practices of patient about care of diabetic foot, it consisted of 8 sub items (pre – post format) as:

A- Reported practices of patient regarding diet intake included 19 closed ended questions as: Eat vegetables, eat fruit, eat nuts, eat legumes such as beans, eat legumes, peas, eat fish, such as salmon.

B- Reported practices of patient regarding diet avoided included 16 closed ended questions as: Eat fried fish, take coconut oils, eat butter, take palm kernel oil, eat egg yolks, eat liver, eat baked goods, eat fast food.

C- Reported practices of patient regarding exercises practices included 5 closed ended questions as: Do walking, do cycling, do swimming.

E- Reported practices of the patient regarding exercises avoided included 4 closed ended questions as: Avoid horse riding, avoid football.

F- Reported practices of patient regarding general foot care practices for diabetic foot included 9 closed ended questions as: Drink fruit juice or any type of sugar before going out to practice any type of sport, wear shoes appropriate for the type of sport you practice to prevent injuries and wounds to the feet.

G- Reported practices of the patient regarding treatment and how to take insulin and care to avoid diabetic foot included 10 closed ended questions as: Medicines used for diabetics, places for insulin injection, how to inject an insulin needle.

H- Reported practices of the patient regarding how to wear shoes and socks to avoid diabetic foot included 8 closed ended questions as: Use your shoes 1/4 to 1/2 inch (0.635 cm to 1.27 cm) deeper than regular shoes so you don't feel uncomfortable when handling the fabric, use shoes with a wide toe box.

I- Reported practices of the patient regarding foot care for patient to avoid diabetic foot included 19 closed ended questions as: Examine your feet in terms of skin color, temperature and skin health daily,.

Scoring system, it included 90 questions; 1 point for done, and zero point to not done answer. The total score of patients 90 points reported practices about care of diabetic foot classified into two levels:

- **Satisfactory practices ≥ 60 % (≥ 54 point).**
- **Unsatisfactory practices < 60 % (< 54 point).**

Tool (2): Observation checklist questionnaire for patients with diabetic foot: was used to assess foot ulcer risk scale adopted from **(International Working Group on the diabetic foot 2019)** and consisted of 2 sub items:

Part (I): Neurological foot assessment included 6 closed ended questions as: foot sensation condition, the skin of the foot contains.

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Part (II): Peripheral vascular assessment consisted of 6 closed ended questions as: right foot occlusive pressure index, left foot occlusive pressure index.

Scoring system, it included 102 questions; 2 points for done, and 1 point to not done answer. The total score of patients 204 points reported practices about diabetic foot classified into two levels:

- **Satisfactory practices ≥ 60 % (≥ 122 point).**
- **Unsatisfactory practices < 60 % (< 122 point).**

A) Content Validity:

The validity of the tool was tested through five experts from Faculty of Nursing - Helwan University five experts in the community health nursing to review the relevance of the tools for clarity, relevance, comprehensiveness, understanding and applicability.

***B) Tool Reliability*:**

Reliability was applied for testing the internal consistency of the tool, by administration of the same tools to the same subjects under similar conditions two times. Answers from the repeated testing were compared (Test- re- test reliability was 0.88 for knowledge), and Cronbach's Alpha reliability was 0.788 for reported practices.

Ethical consideration:

An official permission to conduct the proposed study obtained from the Scientific Research Ethics Committee. Participation in the study is voluntary and subjects will be given complete full information about the study and their role before signing the formal consent. The ethical considerations included explaining the purpose and nature of the study, stating the possibility to withdraw at any time, confidentiality of the information where it was not be accessed by any other party without taking permission of the participants. Ethics, values, culture and beliefs respected.

II) Operational item:

1) Preparatory phase:

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

2) Pilot study:

A pilot study conducted on 10% of the patients equal 14 patients under study to assess the feasibility, practicability, clarity and objectivity of the tools. Based on the results, no modification was done. Patients in the pilot study were included in the main study sample because no modifications were done.

Field work:

After attaining the approval to conduct the study, sample collected during the day of the diabetic center in king Fahad hospital, Saudia Arabia. After establishing a trustful relation, every mother interviewed only by the investigator to explain the study purpose then study tool completed by mothers. Teaching method used as group discussion, brainstorming, demonstration and re-demonstration, also media picture and handout. Booklet prepared by the investigator. The study implemented through three phases preparatory, implementation and evaluation item.

An education program conducted in following phases:

Assessment phase: by using pre-testing questionnaire to assess the patient's knowledge, and reported practice about diabetic foot. The investigator first introduced herself and explained the purpose of the study briefly to the patient. Every patient was met and formal consent for participation was obtained. Patients were assured that the obtained information confidentially, and used only for the purpose of the study.

Planning phase: Based on the result obtained from the assessment phase, the investigator designed the health education program sessions contents according to the patient's needs. Detected needs, requirements and were clarified and discussed in the form of booklet. Contents of the booklet were selected on the base of identified needs. The booklet consisted of knowledge about diabetic foot such as: Meaning of diabetes, role of glucose in the body, types of diabetes, causes of type 1 diabetes, causes of type 2 diabetes, symptoms of diabetes, normal blood sugar level in patients with diabetes, diagnosis of diabetes, complications of diabetes, and treatment of diabetes, meaning of diabetic foot ulcer, concept of diabetic foot, effect of diabetes on the feet, causes, signs and symptoms, and complications, ways to protect against, importance of exercise, precautions to be taken while exercising, methods of taking insulin, insulin injection sites, how to inject an insulin needle, symptoms that appear when the wrong injection is taken, methods of preventing diabetes, and the most

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common complications of diabetes treatment (insulin).The importance of daily foot care for a diabetic patient, daily foot care includes, the correct way to cut nails, the appropriate tool for cutting nails, the appropriate sock for diabetics is, specifications of the shoes worn by a diabetic patient, it is preferable to follow up with a diabetes clinic at least once a year in case, it is preferable to follow up with a diabetes clinic in the event of loss of feeling in the foot or insufficient blood circulation once every, and it is preferable to follow up with a diabetes clinic in the event of loss of feeling in the foot in addition to a history of ulcers or amputation once every. Teaching methods used as lecture, open discussion, brain storming demonstration and re-demonstrations were frequently applied during sessions. Media such as PowerPoint, data show, pictures, video and booklet prepared by investigator.

Implementation phase:

- Actual field work carried out in the period from October 2023 up March 2024 years, two day per week Tuesday and Wednesday from 9 am -1pm and interview patients in diabetic center at king Fahad hospital, Saudia Arabia.

- An education program was improved patients' knowledge, and reported practice about diabetic foot and explained to all participants. Based on the result of the pre-test questionnaire the investigator utilized 6 sessions each session needs from 30-45 minutes and the education program conducted through 4 theoretical sessions and 2 practical sessions.

- Post-test done after applies sessions. The study sample equal 140 patients divided to 5 groups of them contained about 28patients.

The investigator attended the previous mentioned study setting for two day per week because the clinic works every Tuesday and Wednesday from 9 am- 2 pm. The investigator introduced herself to each participant and explained the aim of the study to gain the participants confidence and trust in order to obtain their formal consent from patients then explain the aim of the study to each patient to fulfill the interview questionnaire.

Evaluation phase:

This phase utilized to evaluate the effect of educational program on improving patients' knowledge and reported practice. It conducted pre-intervention and post intervention after an educational program, utilizing the same format utilized pre intervention.

III) Administrative Item:

After explanation of the study aim and objectives, an official permission was obtained from the Dean of faculty of nursing and the general at diabetic center in king Fahad hospital, Saudia Arabia, asking for cooperation and permission to conduct the study.

IV) Statistical Item:

Upon completion of data collection, data computed and analyzed using Statistical Package for the Social Science (SPSS), version 24 for analysis. The P value set at 0.05. Descriptive statistics tests as numbers, percentage, mean standard ± deviation (± SD), used to describe the results. Appropriate inferential statistics such as "F" test or "t" test used as well.

Degrees of Significance of the results were:

- Non-significant (NS) if $p > 0.05$.
- Significant (S) if $p < 0.05$.
- Highly significant (HS) if $p < 0.01$.

Results:

Table (1): Frequency Distribution of the Studied Patient regarding their Demographic Characteristics (n=140).

Item	No.	%
Age		
40 - 49 years	44	31.4
50- 59 years	50	**35.7**
≥ 60years	46	32.9
Mean ± SD	**55.4 ± 0.89 years**	
Gender		
Male	100	**71.4**
Female	40	28.6
Marital status		

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Single	21	15.0
Married	98	**70.0**
Divorced	18	12.9
Widowed	3	2.1
Educational level		
Reads and writes	30	21.4
Intermediate qualification	40	28.6
Basic education	9	6.4
University education	61	**43.6**
Job		
Employee	55	**39.3**
Housewife	35	25.0
Does not work	50	35.7
Monthly income		
Not enough for basic need	20	14.3
Sufficient for basic needs	100	**71.4**
Enough and saved	20	14.3

Table (1): Shows that, the mean age of studied patient was 55.4 ± 0.89 years & 71.4 % of studied patient was male. Also, 70.0 %of the studied patient had married in marital status. Moreover 39.3 % of the studied patient's job was employee while, 71.4 % of the studied patient's monthly income was sufficient for basic needs.

Table (2): Frequency Distribution the Past & Current History of the Studied Patient (N=140).

Item	No.	%
Past History		
How long have you been suffering from diabetes?		
< 5 years	30	21.4
5: < 10 years	90	**64.3**
<10 years	20	14.3
Suffer from any other health problems		
Yes	100	**71.4**
No	40	28.6
Have a history of certain diseases		
Yes	110	**78.6**
No	30	21.4
If the answer is yes, what is the disease? (n=110)		
Hypertension	69	**62.7**
Diseases of the circulatory system	21	19.1
Kidney diseases	20	18.2
Current diabetes treatment regimen:		
Treatment only	10	7.1
Diet and exercise.	40	28.6
Treatment and nutritional system	30	21.4
Treatment, nutritional and exercise regimen.	60	**42.9**
How to take the treatment		
Orally (tablets)	20	14.3
Injection (insulin)	40	28.6
Both	80	**57.1**
Current History		
You can take daily care of your feet		
Yes	120	**85.7**

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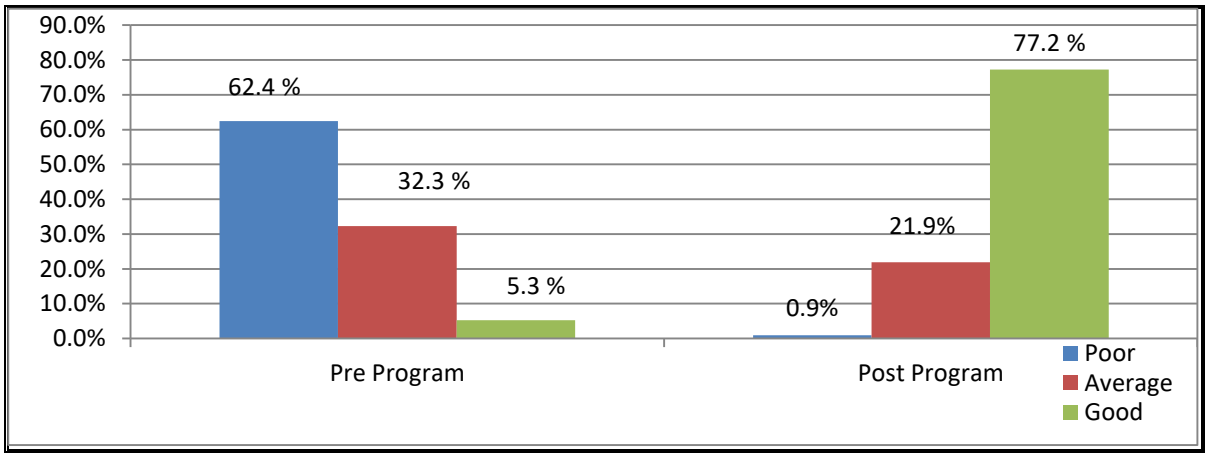
No	20	14.3
If the answer is (no), state the reason (n=120)		
No one from the medical team (Physician or nurse) told me about the importance of daily foot care.	90	**75.0**
There is no one to help me	5	4.2
Health problems.	10	8.3
I forget to do foot care.	15	12.5
There is one of your relatives who has diabetes who suffered from a foot ulcer:		
Yes	90	64.3
No	50	35.7
Visit the diabetes clinic at least once a year to examine your feet:		
Yes	30	21.4
No	110	**78.6**
Suffer from tingling in the feet		
Yes	120	**85.7**
No	20	14.3

Table (2): Demonstrates that, 64.3 % of studied patient suffering from diabetes from 5: < 10 years. Moreover, 78.6 % of studied patient had a history of certain diseases, and 62.7 % of them had hypertension. 92.9 % of studied patient has suffer from foot pain. Moreover, 85.7 % of studied patient suffer from burning in the feet. While, 85.7 % of studied patient suffer from tingling in the feet.



***χ2=27.33 **P value=0.000**

Figure (1): Percentage Distribution of Total Knowledge among Studied Patient regarding Diabetic Foot Pre & Post Applying Health Education Program (N=140).

Figure (1): Shows that, 5.3 % of studied patients had good total knowledge pre applied an educational program, which improved and become 77.2 % of them had good total knowledge post applied an educational program. While, 62.4 % of studied patients had poor total knowledge applied an education program which improved and become 0.9 % of them had poor total knowledge post applied an education program where P value 0.000 and paired t test = 27.33.

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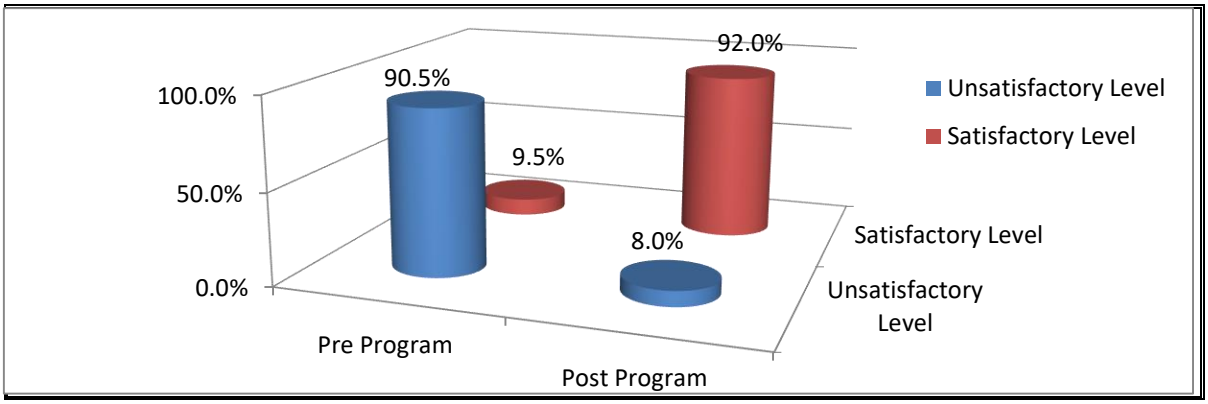

***χ2=28.99 **P value=0.000**

Figure (2): Percentage Distribution of Total Reported Practices among Studied Patient regarding Diabetic Foot Ulcer Pre and Post Health Education Program (N=140).

Figure (2): Illustrate that, 90.5 % of studied patient had unsatisfactory with total reported practices pre applied health education program which improved and become, 8.0 % of them had unsatisfactory with total reported practices post applied health education program. While, 9.5 % of studied patient had satisfactory total reported practices pre applied health education program which improved and become, 92.0 % of them had satisfactory total reported practices post applied health education program where P value 0.000 and paired t test =28.99.

Table (3): Frequency Distribution of Studied Patient's Reported Practices About Evaluating Foot Nerves and Assessing Vessels to Avoid Diabetic Foot Pre & Post Applying Health Education Program (N=140).

Reported Practice items	The studied patient				χ^2	P value
	Pre		Post			
	No.	%	No.	%		
Foot sensation condition						
Done	29	20.7	125	89.3	18.556	0.002
Not Done	111	79.3	15	10.7		
The skin of the foot contains						
Done	22	15.7	139	99.3	19.210	0.000
Not Done	118	84.3	1	0.71		
High foot temperature (hotness)						
Done	18	12.9	124	**88.6**	18.102	0.002
Not Done	122	**87.1**	16	11.4		
Foot color						
Done	22	15.7	139	99.3	19.210	0.000
Not Done	118	84.3	1	0.71		
There are signs of foot deformity, such as						
Done	22	15.7	139	99.3	19.210	0.000
Not Done	118	84.3	1	0.71		
There are traces of old ulcers						
Done	36	25.7	138	98.6	17.142	0.000
Not Done	104	74.3	2	1.4		
Right foot occlusive pressure index						
Done	29	20.7	125	89.3	18.556	0.002
Not Done	111	79.3	15	10.7		
Left foot occlusive pressure index						
Done	22	15.7	139	99.3	19.210	0.000
Not Done	118	84.3	1	0.71		
Assess foot pulse						

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Done Not Done	0 140	0.0 **100.0**	124 16	**88.6** 11.4	16.555	0.000
Evaluate the skin of the foot						
Done Not Done	22 118	15.7 84.3	١٣٩ 1	99.3 0.71	19.210	0.000
Cold feet						
Done Not Done	29 111	20.7 79.3	125 15	89.3 10.7	18.556	0.002
Suffer from foot pain						
Done Not Done	36 104	25.7 74.3	138 2	98.6 1.4	17.142	0.000

Table (3): Shows that, 100.0 % of studied patient don't assess foot pulse in pre - health education program which improved and become 88.6 % of them had done post- health education program. Also, 87.1 % of studied patient don't evaluate high foot temperature (hotness) in pre -health education program which improved and become 88.6 % of them had done post- health education program.

Table (4): Correlation between Total Score Knowledge and Reported Practices of Studied Patient Pre & Post Health Education Program (N = 140).

Item	Total Reported practices			
	Pre- program		Post –program	
	R	P value	R	P value
Total Knowledge	**- 0.026**	**0.281**	**0.362**	**0.000****

(*) Statistically significant & (**) High statistically significant P≤0.00

Table (4): **Shows that,** there was positive correlation between studied patient's total knowledge regarding to diabetic foot and their total reported practices. Moreover, there was highly significance improvement in studied patient's total knowledge and total reported practices.

Table (5): Relation between Studied Patient's Demographic Characteristics and their Total Knowledge Post- Health Education Program (n=140).

Demographic Characteristics	The studied patient						χ^2	P value
	Post -Educational Program							
	Poor (n=1)		Average (n=31)		Good (n=108)			
	No.	%	No.	%	No.	%		
Age								
40-49 years	**1**	**100.0**	**10**	**32.3**	**33**	**30.6**	**8.110**	**0.000**
50-59 years	**0**	**0.0**	**20**	**64.5**	**30**	**27.8**	**7.112**	**0.000**
≥ 60 years	**0**	**0.0**	**1**	**3.2**	**45**	**41.7**	**8.658**	**0.001**
Gender								
Male	**1**	**100.0**	**20**	**64.5**	**79**	**73.1**	**12.002**	**0.002**
Female	**0**	**0.0**	**11**	**35.5**	**29**	**26.9**	**10.876**	**0.005**
Marital Status								
Single	**1**	**100.0**	**10**	**32.3**	**10**	**9.3**	**7.445**	**0.005**
Married	**1**	**0.0**	**20**	**64.5**	**78**	**72.2**	**8.998**	**0.000**
Divorced	**0**	**0.0**	**1**	**3.2**	**17**	**15.7**	**7.456**	**0.005**
Widowed	**0**	**0.0**	**0**	**0.0**	**3**	**2.8**	**6.558**	**0.005**
Educational levels								
Reads and writes	**0**	**0.0**	**10**	**32.3**	**20**	**18.5**	**10.447**	**0.002**
Intermediate qualification	**0**	**0.0**	**20**	**64.5**	**20**	**18.5**	**6.552**	**0.001**

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Basic education	**0**	**0.0**	**0**	**0.0**	**9**	**8.3**	**6.447**	**0.000**
University education	**1**	**100.0**	**1**	**3.2**	**59**	**54.7**	**10.887**	**0.005**
Job								
Employee	**1**	**100.0**	**20**	**64.5**	**34**	**31.5**	**11.221**	**0.005**
Housewife	**0**	**0.0**	**10**	**32.3**	**25**	**23.1**	**9.998**	**0.005**
Does not work	**0**	**0.0**	**1**	**3.2**	**49**	**45.4**	**10.333**	**0.005**
Monthly income								
Not enough	**1**	**100.0**	**10**	**32.3**	**9**	**8.3**	**11.223**	**0.001**
Sufficient for basic needs only	**0**	**0.0**	**21**	**67.7**	**79**	**73.1**	**9.669**	**0.002**
Sufficient for basic needs and savings	**0**	**0.0**	**0**	**0.0**	**20**	**18.6**	**8.998**	**0.002**
Place of residence								
Urban	**0**	**0.0**	**31**	**100.0**	**104**	**96.3**	**7.112**	**0.002**
Rural	**1**	**100.0**	**0**	**0.0**	**4**	**3.7**	**9.552**	**0.001**

Table (5): Shows that, there was highly statistically significant relation between studied patient's total knowledge and all items of demographic characteristics, where (P = < .0001).

Table (6): Relation between Studied Patient's Demographic Characteristics and their Total Reported Practices Post - Health Education Program (n=140).

Demographic Characteristics	The studied patient				χ^2	P value
	Post -Educational Program					
	Unsatisfactory (n=11)		Satisfactory (n=129)			
	No.	%	No.	%		
Age						
40-49 years	**10**	**90.9**	**34**	**26.4**	**8.664**	**0.000**
50-59 years	**1**	**9.1**	**49**	**38.0**	**7.998**	**0.000**
≥ 60 years	**0**	**0.0**	**46**	**35.6**	**9.985**	**0.001**
Gender						
Male	**11**	**100.0**	**89**	**69.0**	**12.887**	**0.002**
Female	**0**	**0.0**	**40**	**31.0**	**10.900**	**0.005**
Marital Status						
Single	**0**	**0.0**	**21**	**16.3**	**7.899**	**0.005**
Married	**0**	**0.0**	**98**	**76.0**	**9.198**	**0.000**
Divorced	**8**	**72.7**	**10**	**7.7**	**8.322**	**0.005**
Widowed	**3**	**27.3**	**0**	**0.0**	**7.321**	**0.005**
Educational levels						
Reads and writes	**10**	**90.9**	**20**	**15.5**	**11.229**	**0.002**
Intermediate qualification	**1**	**9.1**	**39**	**30.2**	**7.662**	**0.001**
Basic education	**0**	**0.0**	**9**	**7.0**	**7.214**	**0.000**
University education	**0**	**0.0**	**61**	**47.3**	**11.889**	**0.005**
Job						
Employee	**10**	**90.9**	**45**	**35.0**	**12.995**	**0.005**
Housewife	**1**	**9.1**	**34**	**26.4**	**10.668**	**0.005**
Does not work	**0**	**0.0**	**50**	**38.6**	**11.212**	**0.005**
Monthly income						
Not enough	**10**	**90.9**	**10**	**7.8**	**12.002**	**0.001**
Sufficient for basic needs only	**0**	**0.0**	**100**	**78.7**	**10.235**	**0.002**
Sufficient for basic needs and savings	**1**	**9.1**	**19**	**14.5**	**10.221**	**0.002**

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Place of residence						
Urban	**9**	**81.8**	**126**	**97.7**	**8.221**	**0.002**
Rural	**2**	**18.2**	**3**	**2.3**	**10.001**	**0.001**

Table (6): Shows that, there was highly statistically significant relation between studied patient's total reported practices and all items of demographic characteristics, where (P = < .0001).

Discussion

Diabetic foot is a serious complication that affects many individuals with diabetes, characterized by a range of debilitating symptoms including ulcers, infections, and neuropathy. Due to prolonged high blood sugar levels, nerve damage can impair sensation in the feet, leading to unnoticed injuries and infections. Poor circulation exacerbates these issues, making it difficult for wounds to heal and increasing the risk of severe complications ***(Negara et al., 2024).*** The condition not only causes physical discomfort and pain but significantly impacts a patient's quality of life, often leading to emotional distress and social isolation. Effective management requires a comprehensive approach, including meticulous foot care, regular medical check-ups, and stringent control of blood glucose levels to prevent and address issues promptly ***(Gunardi, 2024).***

A health education program for patients suffering from diabetic foot is crucial for empowering patients to manage their condition effectively and prevent complications. Such programs typically provide comprehensive guidance on foot care practices, emphasizing the importance of daily inspections for wounds or abnormalities, proper hygiene, and wearing well-fitting shoes to avoid pressure sores. Education covers recognizing the signs of infection and understanding when to seek medical attention. By incorporating practical demonstrations and interactive components, these programs aim to enhance patient skills in self-care and promote adherence to preventive measures ***(Irawan et al., 2023).***

Demographic characteristics of the studied patient.

The present study finding more than one third of studied patients had aged from 55 to 59 years, this finding was in agreement with **Gershater & Wessman, (2023)** who conducted published study at Philippine entitled as "Keeping feet in remission after healing of diabetic foot ulcers: A qualitative study of patients' experiences" who reported that, 36.1 % of studied subjects were aged from 55 to 59 years. From investigator's point view, by the time individuals reach their late 50s, they may have had diabetes for several years. Long-term diabetes increases the risk of complications like diabetic neuropathy (nerve damage) and peripheral vascular disease (poor blood circulation), both of which contribute to diabetic foot problems.

Concerning to patient's marital status, more than two third of studied patient was married. This result was in accordance with **Montesi et al., (2024)** who conducted published study at Mexico entitled as " Health Care Delays and Social Suffering Among Indigenous People with Diabetic Foot Complications in Mexico", who reported that 73.2 % of studied patient was married. From investigator's point view, this might be due to social norms around marriage have evolved, and people in their late 50s might feel more liberated to marry later in life than previous generations. It's increasingly common for people to seek companionship and partnership later in life.

Regarding to patient's educational level, less than half of studied patient was university education. This result was in accordance with **Rümenapf et al., (2024)** who conducted published study at Germany entitled as " Peripheral Arterial Disease and the Diabetic Foot Syndrome: Neuropathy Makes the Difference", who reported that 43.4 % of studied patient was university education. From investigator's point view, this might be due to individuals reach their late 50s, they may have pursued university education to advance in their careers or shift to new professional fields. Many people seek higher education to improve job prospects or gain specialized knowledge.

Concerning to patient's job, more than one third of studied patient was employee. This result was in accordance with **Ansari et al., (2022)** who conducted published study at Germany entitled as " Hyperglycemia-linked diabetic foot complications and their management using conventional and alternative therapies", who reported that 37.4 % of studied patient was employee. From investigator's point view, this might be due to economic factors, such as saving for retirement or meeting financial obligations, can necessitate continued employment. People in this age range may need to work longer to ensure they have adequate financial resources for retirement or to cover other expenses.

Regarding to patient's monthly income, more than two third of studied patient's monthly income was sufficient for basic needs. This result was in accordance with **Tuglo et al., (2022)** who conducted published study at Volta Region, Ghana entitled as " Knowledge and practice of diabetic foot care and the prevalence of diabetic foot ulcers among diabetic patients of selected hospitals in the Volta Region, Ghana", who reported that 72.4 % of studied sample's monthly income was sufficient for basic needs. From investigator's point view, this might be due to good financial planning and

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management throughout their working years can ensure that individuals have a sufficient income to meet their needs. This includes budgeting, investing wisely, and preparing for retirement.

Regarding patients suffering from diabetes, less than two third of studied patient's suffering from diabetes between 5 to < 10 years. This result was in accordance with **Rubin et al., (2023)** who conducted published study at Helsinki entitled as " Effects of the COVID-19 pandemic on the outcome and mortality of patients with diabetic foot ulcer", who reported that 62.5 % of studied samples suffering from diabetes between 5 to < 12 years. From investigator's point view, this might be due to long-term lifestyle factors such as diet, physical activity, and body weight can have a substantial impact on the development of diabetes. Sedentary lifestyles, poor dietary habits, and obesity are significant risk factors for type 2 diabetes.

Concerning patients take the treatment by oral and injection route, more than half of studied patients take the treatment by oral and injection route. This result was in accordance with **Ma et al., (2023)** who conducted published study at China entitled as " The perceptions of living with diabetic foot ulcers: a systematic review and meta-synthesis of qualitative studies", who reported that 52.3 % of studied samples take the treatment by oral and injection route. From investigator's point view, this might be due to diabetes management often starts with oral medications, but as the disease progresses, insulin production and insulin sensitivity may deteriorate, necessitating additional treatments. Injectable insulin or other injectable medications might be introduced when oral medications alone are no longer sufficient to control blood glucose levels.

Regarding to daily care of patient feet, majority of studied patients take daily care of patient feet. This result was in accordance with **Hoe et al., (2024)** who conducted published study at Malysia entitled as "The use of videos for diabetes patient education", who reported that 82.9 % of studied samples take daily care of patient feet. From investigator's point view, this might be due to diabetes can lead to diabetic neuropathy, which is nerve damage that can reduce sensation in the feet. This means that patients might not feel injuries, blisters, or sores, increasing the risk of infections and ulcers result it need to daily care of patient feet.

Enhancing research hypothesis, the patients' knowledge and reported practice will be improved after applying health education program for patients suffering from diabetic foot.

Regarding the effective of the program on total knowledge studied patients, the present study revealed that there was statistical significant difference between pre and post program apply in all knowledge items this finding was supported with **Shani & Kaya, (2024)** whose conducted published study in Iraq under title of " Evaluation of diabetes patients' knowledge and practice levels about diabetic foot care" who reported that, there statistical significant difference between pre and post implementation program in the knowledge of studied subjects and recommended with diabetic foot. From investigator's point of view, this might be due to many patients with diabetes may not fully understand the risks and complications associated with diabetic foot issues. Education programs provide crucial information about the importance of foot care, warning signs of potential problems, and preventive measures.

Enhancing research hypothesis, the patients' knowledge and reported practice will be improved after applying health education program for patients suffering from diabetic foot.

Concerning the effective of the program on total reported practices studied patients, the present study revealed that there was statistical significant difference between pre and post program apply in all reported practices items this finding was supported with **Ali & Ghonem, (2019)** whose conducted published study in Egypt under title of " Effectiveness of health education program regarding foot self-care on risk for developing foot ulcer among patients with diabetes" who reported that, there statistical significant difference between pre and post implementation program in the reported practices of studied subjects and recommended with diabetic foot. From investigator's point of view, this might be due to consistent adherence to prescribed practices, including medication, diet, and exercise, is essential for maintaining blood sugar levels within a target range. This helps prevent complications associated with diabetes, such as cardiovascular disease, neuropathy, and retinopathy.

Regarding to evaluation foot nerves and assessing vessels to avoid diabetic foot, the present study showed that more than two third of studied patient hadn't traces of old ulcers pre apply health education program and become most of them traces of old ulcers post apply health education program and this finding was in the same line with **Amini et al., (2023)** who conducted published study at Iran under title " Evaluation of foot self-care status and foot screening problems in patients with diabetes in Iran" and reported that, 91.8 % of studied subjects traces of old ulcers post apply health education program. From investigator's point of view, this might be due to diabetes can lead to complications that affect

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the healing process. High blood sugar levels can impair the body's ability to repair damaged tissues, making old ulcers more likely to recur or persist.

Correlation & relation between the studied variables:

The present study clarified that there statistically significant relation was between knowledge and reported practices post apply health education program and this finding supported by **Coppola et al., (2023)** who conducted published study at Canada under title "A comprehensive therapeutic patient education may improve wound healing and reduce ulcer recurrence and mortality in persons with type 2 diabetes" who reported that, there was a significant and direct relation between knowledge and reported practices. From investigator's point of view, this might be due to diabetes management requires not only knowledge but also the application of that knowledge in daily practices. A strong correlation suggests that increased understanding leads to better self-management practices, such as adherence to medication, dietary changes, and regular monitoring of blood glucose levels.

Concerning correlation between total percentage of knowledge and reported practices post apply health education program, the present study show significant correlation between total score knowledge and reported practices and this finding was supported with **Tekir et al., (2023),** who published study at Turki under title of " The Effects of Education on Foot Care Behaviors and Self-Efficacy in Type 2 Diabetes Patients " reported that, there was significant correlation observed between studied sample knowledge and reported practices. From investigator's point of view, a significant correlation indicates that the health education program is effective in translating knowledge into practical behaviors. If patients' knowledge increases and this is reflected in their reported practices, it validates the program's impact and effectiveness.

Regarding relationship between total knowledge and female's demographic characteristics post apply health education program, the present study showed significant relation between them and this finding was in agreement with **Amini et al., (2023)** who published study at Iran under title **"**Evaluation of foot self-care status and foot screening problems in patients with diabetes in Iran", who reported that, statically significant relation between total knowledge and demographic characteristics post apply health education program. In addition, this finding in accordance with **Subrata et al., (2020),** who published study at Indonesia under title "Improving clinical outcomes of diabetic foot ulcers by the 3-month self-and family management support programs in Indonesia" who reported significant relation between total knowledge level among the studied subjects and demographic characteristics. From investigator's point of view, understanding how different demographic factors (such as age, gender, education level, socioeconomic status, and cultural background) affect diabetes knowledge can help healthcare providers tailor educational materials and interventions to better meet the needs of diverse patient populations.

Conclusion

On the light of the current study, it could be concluded that:

The results of present study supported the research hypothesis that there is marked an improvement in total knowledge, and total reported practices regarding diabetic foot for patients after applying of a health education program. There was statistically significant relation between patients'' demographic characteristics and their total knowledge, and total reported practices regarding diabetic foot.

Recommendations

In the light of the findings of the present study, the following recommendations are suggested:

1- Continuous health education program for patients suffering from diabetic foot.

2- Provide patients with diabetic foot by booklet about methods to reduced symptoms.

3- Make posters or banners about reported practices of diabetic foot and put diabetic centers under observation of community health nurse.

4- Encourage group discussion peers among patients with diabetic foot under supervision of community health nurse.

5- Apply further research in large sample and other setting for generalization.

References:

1. **Ali, M. M., & Ghonem, S. E. (2019).** Effectiveness of health education program regarding foot self-care on risk for developing foot ulcer among patients with diabetes. American Journal of Nursing, 8(5), 280-93.
2. **Alkhami, F., Rubin, S., Borderie, G., Foussard, N., Larroumet, A., Blanco, L., ... & Rigalleau, V. (2024).** Increased risk of renal events in people with diabetic foot disease: A longitudinal observational study. Diabetes & Metabolism, 50(4), 101536.

ISSN 2786-0183
Helwan International Journal for Nursing Research and Pratctice
Vol. 3, Issue 8, Month: December 2024, Available at: https://hijnrp.journals.ekb.eg/

3. **Amini, M. R., Sanjari, M., Mohajeri Tehrani, M. R., Nasli, E., Yazdanpanah, L., Mousavi, Z., ... & Aalaa, M. (2023).** Evaluation of foot self-care status and foot screening problems in patients with diabetes in Iran: a national multicenter study. BMC endocrine disorders, 23(1), 178.
4. **Ansari, P., Akther, S., Khan, J. T., Islam, S. S., Masud, M. S. R., Rahman, A., & Abdel-Wahab, Y. H. (2022).** Hyperglycemia-linked diabetic foot complications and their management using conventional and alternative therapies. Applied Sciences, 12(22), 11777.
5. **Antar, S. A., Ashour, N. A., Sharaky, M., Khattab, M., Ashour, N. A., Zaid, R. T., & Al-Karmalawy, A. A. (2023).** Diabetes mellitus: Classification, mediators, and complications; A gate to identify potential targets for the development of new effective treatments. Biomedicine & Pharmacotherapy, 168, 115734.
6. **Chandrasekaran, P., & Weiskirchen, R. (2024).** The role of obesity in type 2 diabetes mellitus—An overview. International Journal of Molecular Sciences, 25(3), 1882.
7. **Chen MX, Zhong YJ, Dong QQ, Wong HM, Wen YF (2022).** Global, regional, and national burden of severe periodontitis, 1990-2022: an analysis of the Global Burden of Disease Study 2022. J Clin Periodontal 2022; 48: 1165- 1188.
8. **Coppola, A., Montalcini, T., Gallotti, P., Ferrulli, A., Pujia, A., Luzi, L., & Gazzaruso, C. (2023).** A comprehensive therapeutic patient education may improve wound healing and reduce ulcer recurrence and mortality in persons with type 2 diabetes. Canadian Journal of Diabetes, 47(1), 73-77.
9. **Gershater, M., & Wessman, Y. (2023).** Keeping feet in remission after healing of diabetic foot ulcers: A qualitative study of patients' experiences. Journal of Wound Management, 24(1), 10-17.
10. **Gunardi, S. (2024).** The Effect of Supportive Education on Foot Care Knowledge in Type 2 Diabetes Mellitus. Jurnal Ilmiah Ilmu Keperawatan Indonesia, 14(01), 15-21.
11. **Hassanein, M., Shaltout, I., Malek, R., Khalil, S. A., Ballout, H., Annabi, F., & Shereen, M. (2024).** Real-world safety and effectiveness of insulin glargine 300 U/mL in participants with type 2 diabetes mellitus during the period of Ramadan in four countries (Egypt, Jordan, Lebanon, and Turkey): a prospective observational study. Current Diabetes Reviews, 20(5).
12. **Hoe, C. Y. W., Ahmad, B., & Watterson, J. (2024).** The use of videos for diabetes patient education: A systematic review. Diabetes/Metabolism Research and Reviews, 40(2), e3722.
13. **Irawan, E., Fitrianingsih, N., Yanti, T., De Leon, J. M., Risdianti, H., AW, W. A., ... & Untari, S. (2023).** Risk Factors of Diabetic Foot Ulcers in Type 2 Diabetes Mellitus Patients: Basis for Foot Care Education. Indian Journal of Public Health Research & Development, 14(2).
14. **Lockhart, M., Dinneen, S. F., & O'Keeffe, D. T. (2024).** Plantar pressure measurement in diabetic foot disease: A scoping review. Journal of Diabetes Investigation.
15. **Ma, L., Chen, J., Sun, Y., Feng, Y., Yuan, L., & Ran, X. (2023).** The perceptions of living with diabetic foot ulcers: a systematic review and meta-synthesis of qualitative studies. Journal of Tissue Viability, 32(1), 39-50.
16. **McDermott, K., Fang, M., Boulton, A. J., Selvin, E., & Hicks, C. W. (2023).** Etiology, epidemiology, and disparities in the burden of diabetic foot ulcers. Diabetes Care, 46(1), 209-221.
17. **Montesi, L., Ramírez-Rojas, M. G., & Elizarrarás-Rivas, J. (2024).** Health Care Delays and Social Suffering Among Indigenous People with Diabetic Foot Complications in Mexico. Medical Anthropology, 1-17.
18. **Negara, C. K., Sukartini, T., Setiya, D. Y., & Nursalam, N. (2024).** Effectiveness of Diabetes Self-Management Education on Non-Ulcer Diabetic Foot Incidents. Health Education and Health Promotion, 12(1), 53-58.
19. **Rubin, G., Feldman, G., Dimri, I., Shapiro, A., & Rozen, N. (2023).** Effects of the COVID-19 pandemic on the outcome and mortality of patients with diabetic foot ulcer. International Wound Journal, 20(1), 63-68.
20. **Rümenapf, G., Abilmona, N., Morbach, S., & Sigl, M. (2024).** Peripheral Arterial Disease and the Diabetic Foot Syndrome: Neuropathy Makes the Difference! A Narrative Review. Journal of Clinical Medicine, 13(7), 2141.
21. **Saekel R (2022).** Comparison of oral health status in Asia: results for eight emerging and five high income countries or regions and implications. Chinese Journal of Dental Research the Official Journal of the Scientific. 2022; 19: 191- 206.
22. **Shahin, N. N., Shaker, O. G., & Mahmoud, M. O. (2024).** GOAT rs10096097 and CREB1 rs6740584 single nucleotide polymorphisms are associated with type 2 diabetes mellitus in Egyptians. Archiv der Pharmazie, e2400011.
23. **Shani, A. O., & Kaya, N. T. (2024).** Evaluation of diabetes patients' knowledge and practice levels about diabetic foot care. Innowacje w Pielęgniarstwie i Naukach o Zdrowiu, 9(1), 78-100.
24. **Subrata, S. A., Phuphaibul, R., Grey, M., Siripitayakunkit, A., & Piaseu, N. (2020).** Improving clinical outcomes of diabetic foot ulcers by the 3-month self-and family management support programs in Indonesia: A randomized controlled trial study. Diabetes & Metabolic Syndrome: Clinical Research & Reviews, 14(5), 857-863.
25. **Tekir, Ö., Çevik, C., & Özsezer, G. (2023).** The Effects of Education on Foot Care Behaviors and Self-Efficacy in Type 2 Diabetes Patients. Nigerian journal of clinical practice, 26(2).
26. **Tuglo, L. S., Nyande, F. K., Agordoh, P. D., Nartey, E. B., Pan, Z., Logosu, L., & Chu, M. (2022).** Knowledge and practice of diabetic foot care and the prevalence of diabetic foot ulcers among diabetic patients of selected hospitals in the Volta Region, Ghana. International wound journal, 19(3), 601-614.
27. **Van Netten, J. J., Bus, S. A., Apelqvist, J., Chen, P., Chuter, V., Fitridge, R., ... & International Working Group on the Diabetic Foot. (2024).** Definitions and criteria for diabetes-related foot disease (IWGDF 2023 update). Diabetes/Metabolism Research and Reviews, 40(3), e3654.
28. **World Health Organization (WHO) (2022),** Prevalence of Diabetes Mellites' all Over the World http://turner-white.com/pdf/jcom_may27_diabete