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Nurses' Performance Regarding Peripheral Neuropathy and Diabetic Foot Management

Fatma Ali Ahmed[1], Mohamed Adel[2], Abdulaziz Zienulabeden[3], Islam Mokhtar [4]

[1] Demonstrator of medical surgical Nursing -Faculty of Nursing, Beni-Suef University

[2] Lecturer of medical surgical Nursing -Faculty of Nursing, Beni-Suef University

[3]Assistant Professor of general and vascular surgery-Faculty of Medicine, Beni-Suef University

[4] Assistant Professor of medical surgical Nursing-Faculty of Nursing, Beni-Suef University

ABSTRACT

Background: Diabetic neuropathy is a highly prevalent, disabling condition, the management of which is associated with significant costs. Evidence supports the use of specific anticonvulsants, antidepressants and opioids for pain management. Additionally Diabetic foot ulcers are prevalent, incapacitating, and often result in leg amputation. Recurrence of healed ulcers is common, and mortality is high. The purpose of the study is to evaluate nurses' performance regarding peripheral neuropathy and diabetic foot management. **Research design**: The study was carried out using a descriptive exploratory design**. Setting:** Beni-Suef University Hospital (medical surgical department, diabetic foot clinic outpatient clinic, and intensive care unit) was the site of the study. **Subjects**: convenience sample (50) nurses who work in the aforementioned settings and provide direct care and interaction with diabetic foot patients. **Tools for Data Collection**: The data were gathered using the following two tools: Tool I is a nurse knowledge questionnaire. Tool II: Nurses' Observational Checklist for Peripheral Neuropathy and Diabetic Foot Management. **Result:** The study indicated that half of the nurses evaluated were between the ages of 20 and 25. Over two-thirds of the investigated nurses' were female. More over half of the nurses' were married. Two-thirds of the nurses studied graduated from a technical nursing institute. More over half of the nurses in the study worked in intensive care units. In regards to experience and training, three-quarters of the nurses' had less than five years of experience and no training in diabetic foot care. **Conclusion:** The majority of the studied nurses' had inadequate knowledge, incompetent practice, and a negative attitude toward peripheral neuropathy and diabetic foot management. **Recommendations:** Implementing an in-service training and educational program to help nurses improve their knowledge and practice of peripheral neuropathy and diabetic foot management. To generalize the results, the study needs be duplicated with a wide sample of patients from other hospitals. A diabetic foot ulcer checklist must be designed and followed by all nursing staff.

Key words: nurses; performance; peripheral neuropathy; diabetic foot.

INTRODUCTION

Peripheral neuropathy is damage to neurons induced by chronic high blood sugar. It causes numbness, loss of feeling, and sometimes discomfort in your extremities. It is the most prevalent complication of

diabetes. Diabetic peripheral neuropathy (DPN) is a complex disorder with numerous causes that affects approximately 50% of diabetics, with 30% of diabetic neuropathy causing pain. Given the increased incidence of type 1 and type 2 diabetes and obesity, as well as the effect of DPN on the quality of life of patients and their families, and as a whole healthcare cost, a strategy for early diagnosis and Treatment is required (**Pop - Busui et al., 2022).**

Sensory symptoms are more visible than motor symptoms and usually involve the lower limbs. Those involve pain, paresthesia, hyperesthesia, deep hurting, burning, and intense stabbing sensations. Patients may also have negative signs such as numbness in their feet and legs, which can result in painless foot ulcers and ultimately amputations if the neuropathy is not diagnosed and treated quickly. Unsteadiness is usually caused by improper proprioception and muscular sensory function. Similarly, up to 50% of patients may be asymptomatic, with signs detected after a complete neurological assessment **(Oh et al., 2020).**

Metabolic diseases are the most prevalent clinical group of etiologies, resulting in distal pain from underlying peripheral neuropathy issues. There are various causes of PN. however diabetes mellitus is the most prevalent. Other underlying reasons are including: alcohol use disorder, nutrient deficiencies (e.g., low B12, high B6), Guillain-Barre syndrome, toxins (chemotherapy), and overdosing, inherited or genetic diseases (e.g., Charcot Marie Tooth disease, amyloidosis, porphyria), inflammatory diseases (lupus, rheumatoid arthritis), hypothyroidism, and cancer. (**Bodman et al., 2023).**

For the management, diabetic peripheral neuropathy is frequently undertreated, and the role of enhancing glycemic control in type 2 diabetes remains unknown. It is critical to investigate the mechanisms of action and efficacy of therapeutic strategies. Major international clinical guidelines for the management of DPN recommend a variety of symptomatic treatments. Tricyclic antidepressants, serotonin-noradrenaline reuptake inhibitors, and calcium channel blocking anticonvulsants are one of the first line of treatments. Other treatments include opioids and topical agents like capsaicin and lidocaine (**Khdour, 2020).**

Diabetic foot is defined as infection, ulceration, or loss of foot tissues associated with neuropathy and/or peripheral vascular disease in patients with diabetes mellitus. A foot ulcer occurs before nearly 80% of all non-traumatic lower limb amputations in diabetes individuals. Approximately 50% of diabetics die within five years of developing a foot ulcer, and close to 70% die within five years of having an amputation. It also accounts for a considerable portion of health-care resources. As a result, it puts a substantial load on the patients, their profession, and the care system (**Nicoletti et al., 2020).**

Three risk factors may combine to cause a diabetic foot wound. These factors are neuropathy, vasculopathy, and immunopathy—the "Diabetic Foot Triad." Neuropathy defined as the numbness in the foot caused by excess blood glucose impairing the nerves. Vasculopathy is defined as a blockage of the leg's arteries—the anterior or posterior tibial arteries—that supply blood to the dorsum (front) or volar aspect (sole) of the foot, resulting in ischaemia. Immunopathy refers to the foot's increased susceptibility to infection when blood glucose levels are not well controlled. In such cases, only one risk factor predominates, such as dry gangrene caused solely by vasculopathy. In other cases, a combination of two risk factors may be responsible, such as Dry gangrene caused by vasculopathy alone. In some cases, a mixture of multiple risk factors may be to blame, such as wet gangrene induced by vasculopathy with superimposed infection (immunopathy). In other cases, all three factors may contribute: neuropathy, vasculopathy, and immunity (**Nather, 2023).**

Because 50% of diabetic patients with peripheral neuropathy are asymptomatic, screening is essential for detecting diabetic foot risk. All diabetics should be checked for peripheral neuropathy. Early recognition and

treatment and of diabetic foot patients will decrease complications and healthcare expenses. A number of diagnostic tools can be utilized: The Semmes-Weinstein monofilament examination (SWME) is easy to handle and readily available. The test uses a 5.07/10-g monofilament that buckles when bent. Inability to detect touch or pressure suggests a lack of protective feeling. **(Nather, 2023).**

The International Diabetes Federation believes that rather than treating diabetic foot ulcers, a greater emphasis should be placed on their prevention. People with diabetes must be screened using a clinical examination that creates a risk score for the development of diabetic foot in order to avoid it. For screening to be effective, a professional (such as a doctor or registered nurse) must have the necessary expertise, training, and competences (**Oh, 2021).**

Significance of the study

Diabetes affects 537 million people worldwide, including 73 million in the Middle East and North Africa (MENA) region; by 2045, this will rise to 135.7 million. Diabetes is prevalent in adults (18.4%). Adults with diabetes account for 10,930,700 cases (ADA.2021). Egypt is one of 21 countries in the MENA region. The average annual cost of managing DF diseases in the US is $8659 per patient, with a total economic burden ranging from 9 to 13 billion dollars. Addition to the costs for Diabetes management (**Al-Jasim et al., 2020).**

According to the Statistics Office at Beni Suef University Hospital, the number of diabetic foot patients in 2022 was 1232, with 400 cases reported from the beginning of 2023 to April (**Statistics Office at Beni-Suef University Hospital 2023).**

As Diabetic foot ulcers are the major cause of non-traumatic amputation among diabetes mellitus patients, occurring every 20 seconds and affecting 85% of cases. 6% of diabetes individuals globally have active ulcers, and up to 34% will acquire this illness at least once in their lifetime owing to a lack of intervention (**Parliani, 2021).**

AIM OF THE STUDY

To assess nurses' performance regarding peripheral neuropathy and diabetic foot management.

Research questions

1. What is the level of nurses' knowledge regarding diabetic neuropathy and diabetic foot management?
2. What is the level of nurses' practice regarding diabetic foot management?
3. What is the level of nurses' attitude regarding diabetic neuropathy and diabetic foot management?

SUBJECTS AND METHODS

Technical design

The technical design involved the research design, setting, subjects, and tools for data collection.

Research design

The present study is a descriptive research design to attain its aim.

Setting: The study conducted at Beni-Suef university hospital (medical surgical department which located at 3rd &5th level in hospital contain 72 beds which distributed in 9 rooms. Outpatient of diabetic foot clinic which located at 4th level in hospital contains 2 beds. Intensive Care Unit which sited at 3rd level in hospital, contains 19 beds, 12 ventilators, 19 monitors and 3 emergency carts, they are distributed in 3 rooms).

Subjects:

1. **Sample type:** Convenience sample of all available nurses (50 nurse), who are working in the beforehand mentioned settings and give direct nursing care and directly contact with diabetic foot patients.
2. **Sample size:** included all available nurse who providing

care for diabetic foot patients at previously mentioned setting.

Tools of data collection:

Data were collected using the following two tools:

Tool (I): Nurses' Knowledge Questionnaire Format:

This tool was developed by the researcher after reviewing literature in simple Arabic language. This tool is composed of three parts:

Part I: Demographic characteristics of nurses:

It was used to assess the nurse's demographic characteristics including: gender, age, marital status, education level, working place, experience in years and wound care training.

Part II: **Nurses' knowledge about Peripheral Neuropathy & Diabetic Foot Care:**

This part was developed by researcher after reviewing literature. Such as (**Bilal, et al.,2018).** It was used to assess nurses knowledge regarding the following:

section (1): Definition of peripheral neuropathy(3 items), Types(4 items) , symptoms of peripheral neuropathy(5 items) and diagnosis of peripheral neuropathy(3 items).

section (2): Definition of diabetic foot(2 items),risk factors(4 items), characteristics of diabetic foot ulcers(2 item s), classification(6 items), standards for foot ulcer care(14 items), complications (4 items), and preventive measures of diabetic foot ulcers (11 items).

Scoring system:

The correct answer was scored "1" grade, while the incorrect was scored zero, so the total score of knowledge was 58 degree, classified into the following:

The total knowledge score was further classified into:

•Satisfactory level of knowledge level when ≥75% (≥44 degree)

•Unsatisfactory level of knowledge level when <75% (<44degree)

Part III: Nursing attitude towards patients with peripheral neuropathy and diabetic foot care (Appedix I)

This tool was developed by researcher after reviewing literature such as **(Abate et al., 2020); (Kumarasinghe et al., 2018),** to assess the nurses' attitude towards patients with peripheral neuropathy and diabetic foot care. It is composed of Cognitive domain (12 items), affective domain (7 items), Psychomotor domain (10 items). This consisted of 29 questions to be answered on a five-point Likert scale developed with bipolar adjectives. (Strongly disagree=1, disagree=2, neutral=3, agree=4 and strongly agree=5).

Scoring system:

For calculating the total score of this scale taking into consideration that strongly agree or agree as positive attitude while strongly disagree, disagree as negative attitude beside neutral attitude. The total score ranged (from29-145) So classified into:

- ≥ 90 %(≥104 degree) was considered **positive attitude.**
- <90% (<104 degree) was considered **negative attitude.**

Tool II. Nurses' Observational Checklist about Nursing Peripheral neuropathy and Diabetic Foot Management (Appedix II)

This tool was developed by researcher after reviewing literature such as **(Jia et al., 2022) ;(Nather, 2023).** It used to assess nurses' practice toward Diabetic Foot Examination and Foot Ulcer Care. And classified as:

preparation(9 items), inspection(3 items), gait(2 items), palpation(3 items) and sensation(4 items) **.**

Foot Ulcer Care checklist involved 5 items: assessment, preparation, implementation, post care, recording and reporting.

Scoring system:

Each item in the above sections was scored by **not done= zero, done incomplete =1 and done complete correctly=2**.

Total score of tool II was classified as the following:

- ≥ 90 %(≥ 90 degree) was considered **competence level.**
- <90 % (<90 degree) were considered **incompetence level.**

I- Operational item.

The operational design contains preparatory phase, content validity, pilot study and field work.

1) Preparatory phase:

It composed primarily a review of relevant literature of as well as theoretical basis of numerous parts of the research through the use of books, papers, the internet, journals, and magazines to create data gathering tools.

2) Pilot study:

A pilot research was done on five nurses from the study participants to evaluate the tools' clarity, application, practicality, and significance, as well as the time necessary to use the study tools. Nurses who participated in the pilot trial were skipped from the sample since the changes would be based on the pilot study results**.**

3) Field work:

•The researcher received approval from hospital and nursing directors.

•The study's purpose was simply clarified to the studied nurses, who agreed to participate before data collection.

•Nurses' informed consent to participate in the study was obtained after the researcher explained to the nurses the objective of the study.

•Nurses were unaware of being observed, which could affect their practices and lead to inaccurate data and results and analyzed nurses' performance using an observational checklist.

•Upon completion of the observations of the nurses, the researcher collect from each nurse a self administered questionnaire (tool I).

•Then interview was carried out during break, the sheet completion ranged from 20- 30 minutes for each nurse.

•Data collection was completed within 6 months (June 2023-November 2023) The researcher visited ICU, medical surgical depaetments and outpatient clinic of diabetic foot to collect data from nurses three days per week during actual nurses' work at morning (from 9 am to1 pm) and afternoon shifts (from 3 pm to 9 pm).

4) Content Validity of the tools

- Five experts in medical surgical nursing professionals evaluated the tools' content validity for clarity and applicability. Four specialists were assistant professors of medical surgical nursing at Beni-Seuf University' Faculty of Nursing, and one was in the medical field, and essential changes were made. The experts assessed the tool for sentence clarity, relevance, accurateness, comprehensiveness, simplicity and application. And made minor changes.
- Some questions were removed, others adapted. A concesus approach with experts in medical surgical was used to approve the validity of the modified questionnaire.

5) Reliability of the tools

The reliability for the study was calculated by: The Cronbach Alpha was calculated for both Part II of the tool: Nursing knowledge about peripheral neuropathy & diabetic foot management was (0.802), Tool III: Nurses' observational checklist about nursing Peripheral neuropathy and diabetic foot management was (0.767) To establish the reliability of the questions, the instrument was tested and retested on two times on the same population, and the cronbach alpha was more than the desired value of 0.7.

3- Administrative Design:

To carry out this study, the necessary approval was obtained from the hospital' director. A letter was hand out to them from the faculty of nursing, clarifying the purpose of the study to obtain the permission for conducting this study.

Ethical consideration:

Before the study started, the Ethical Committee of Beni Suef University's Faculty of Medicine approved the protocol. The study's goal and purpose were explained to the participating nurses by the researcher. The researcher promised to protect the subject data's confidentiality and anonymity. Nurses were told that they may choose whether or not to participate in the research and that they could leave at any moment without providing any information.

Statistical Design:

The statistical package for social science (SPSS) version (20) was used to summarize, classify, tabulate, and analyse the obtained data in order to evaluate nurses' knowledge, practice, and attitude about peripheral neuropathy and diabetic foot management. Tables and graphs were used to display the data. The following were included in the statistical analysis: percentage (%), the arithmetic mean ($\overline{X}$), standard deviation (SD) and chi-square (X2**&** P-value).

The observed differences and associations were considered as follows:

P. > 0.05 insignificant difference (No difference)

P. ≤ 0.05 significant difference

P. ≤ 0.01 moderate significant difference

P. ≤ 0.001 highly significant difference

- Standard deviation (SD) & arithmetic mean ($\overline{X}$) for quantitative data: age, years of experience.
- Frequency and percentage for qualitative data: gender, educational level, knowledge, practice and attitude.
- Test of association: Chi-square test to compare between two or more groups.

RESULTS

Table (1): revealed the percentage distribution of studied nurses' demographic characteristics. Regarding their ages, half of the studied nurses (50%) were aged between 20 and 25 years with mean age (26.72±4.83). Concerning their gender, more than two thirds of studied nurses (70%) were female. For their marital status, more than half of studied nurses (52%) were married. Pertaining to their educational qualifications, two thirds of studied nurses (66%) had technical nursing institute. For their working place, more than half of studied nurses (54%) were working in ICUs. Regarding their experience and training, three quarters of studied nurses had less than five years of experience and no training regarding care of diabetic food (74% and 76%) respectively.

Table (2): displayed the distribution of studied nurses' knowledge levels regarding diabetic neuropathy and diabetic foot management. About three quarters of studied nurses (70%) had unsatisfactory knowledge levels. And more than one quarter of studied nurses (30%) had satisfactory knowledge levels.

Figure (1): Illustrated that the distribution of studied nurses' knowledge levels regarding diabetic neuropathy and diabetic foot management. About three quarters of studied nurses (70%) had unsatisfactory knowledge levels. And more than one quarter of studied nurses (30%) had satisfactory knowledge levels.

Table (3): illustrated the distribution of studied nurse' practices levels regarding peripheral neuropathy and diabetic foot management. The majority of studied nurses (94%) had incompetent levels of practice regarding diabetic foot management.

Figure (2): illustrated the distribution of studied nurses' practices levels regarding peripheral neuropathy and diabetic foot management. The majority of studied nurses (94%) had incompetent levels of practice regarding diabetic foot management

Table (4): displayed the distribution of studied nurses' attitude regarding peripheral neuropathy and diabetic foot management. The majority of studied nurses (92%) had negative attitude. And the minority of studied nurses (8%) had positive attitude.

Figure (3): displayed the distribution of studied nurses' attitude regarding peripheral neuropathy and diabetic foot management. The majority of studied nurses (92%) had negative attitude. And the minority of studied nurses (8%) had positive attitude.

Table (5): summarized the correlation matrix between studied nurses' knowledge, practice ad their attitude regarding peripheral neuropathy and diabetic foot management. Using Pearson's correlation coefficients, there were moderate positive significant correlations between all variables

Table (5): revealed the relation between studied nurses' demographic characteristics and their knowledge regarding diabetic neuropathy and diabetic foot management. There were significant statistical relation between studied nurses' knowledge and their age, educational qualification, experience and training**.**

Table (7): summarized the relation between studied nurses' demographic characteristics and their practice regarding peripheral neuropathy and diabetic foot management. There were significant statistical relation between studied nurses' practice and their age, marital status, educational qualification, experience and training.

Table (8): showed the relation between studied nurses' demographic characteristics and their attitude regarding diabetic neuropathy and diabetic foot management. There were significant statistical relation between studied nurses' attitude and their age, educational qualification, experience and training

Table (1): Frequency distribution of studied nurses' demographic characteristics (n=50).

Demographic Characteristics	No.	%
Age (years)		
– **20 < 25**	**25**	**50**
– **25 < 30**	**19**	**38**
– **30 < 35**	**3**	**6**
– **35 < 40**	**1**	**2**
– **≥40**	**2**	**4**
Mean±SD	**26.72±4.83**	
Gender		
– **Male**	**15**	**30**
– **Female**	**35**	**70**
Marital status		
– **Single**	**23**	**46**
– **Married**	**26**	**52**
– **Divorced**	**1**	**2**
Educational Qualifications		
– **Nursing Technical Institute**	**33**	**66**
– **Bachelor of Nursing**	**16**	**32**
– **Master Degree**	**1**	**2**
Work place		
– **Medical**	**10**	**20**
– **Surgical**	**7**	**14**
– **Diabetic Foot Clinic**	**6**	**12**
– **ICU**	**27**	**54**
Experience (years)		

– < 5	37	74
– 5< 10	10	20
– 10 < 15	1	2
– ≥ 15	2	4
Mean±SD	4.93±2.72	
Training about diabetic foot care		
– Yes	12	24
– No	38	76

Table (2): Frequency distribution of studied nurses' knowledge levels regarding diabetic neuropathy and diabetic foot management (n=50**).**

Nurses' Knowledge Levels	Unsatisfactory (<75%)		Satisfactory (≥75%)	
	No.	%	No.	%
– Definition of peripheral neuropathy (PN)	17	34	33	66
– Types of peripheral neuropathy	26	52	24	48
– Signs and symptoms of peripheral neuropathy	24	48	26	52
– Diagnosis of peripheral neuropathy	40	80	10	20
– Definition of diabetic foot ulcer	2	4	48	96
– Types of diabetic foot ulcer	40	80	10	20
– Classification of diabetic foot ulcer	25	50	25	50
– Grades of foot ulcer	46	92	4	8
– Standards for foot ulcer care	27	56	22	44
– Complications of diabetic foot ulcer	41	82	9	18
– Preventive measure	8	16	42	84
Nurses' Overall Knowledge Levels	35	70	15	30

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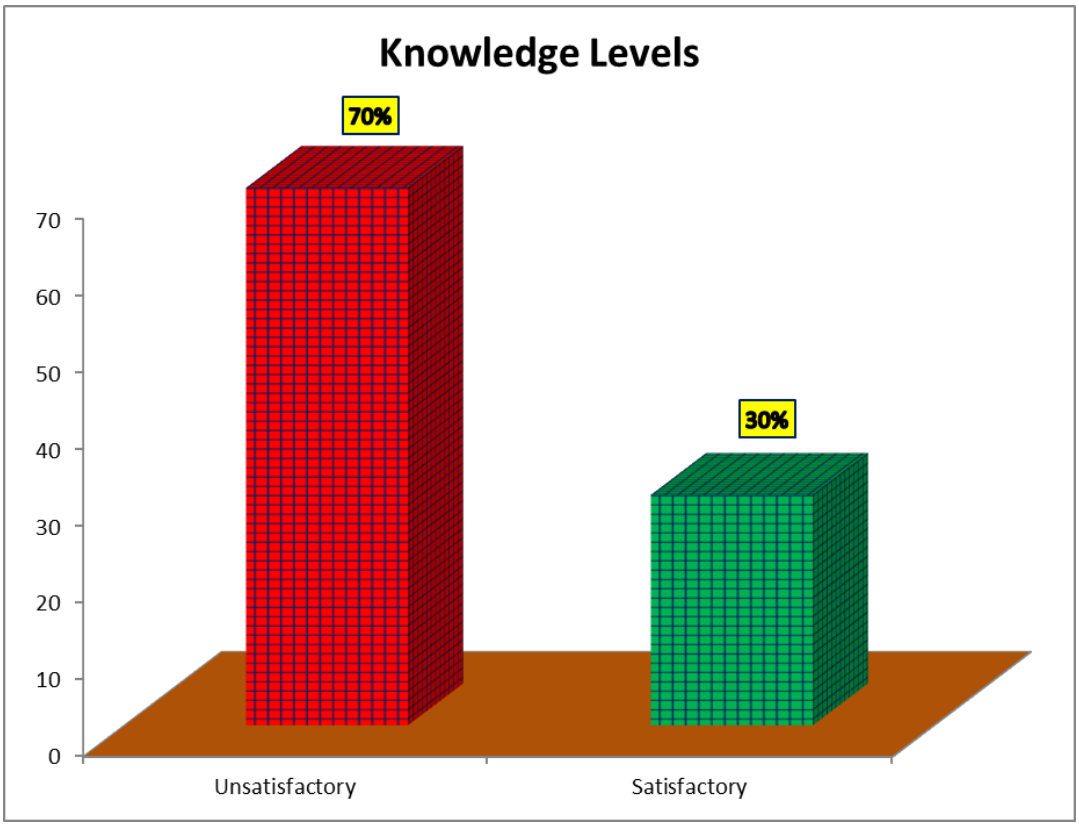

Figure(1): Frequency distribution of studied nurses' knowledge levels regarding diabetic neuropathy and diabetic foot management (n=50) .

Table (3): Frequency distribution of studied nurse' practices levels regarding peripheral neuropathy and diabetic foot management (n=50).

Nurses' Practice Levels	Incompetent (<90%)		Competent (≥90%)	
	No.	%	No.	%
– Diabetic foot examination	46	92	4	8
– Foot ulcer care	48	96	2	4
Nurses' Overall Practice Levels	47	94	3	6

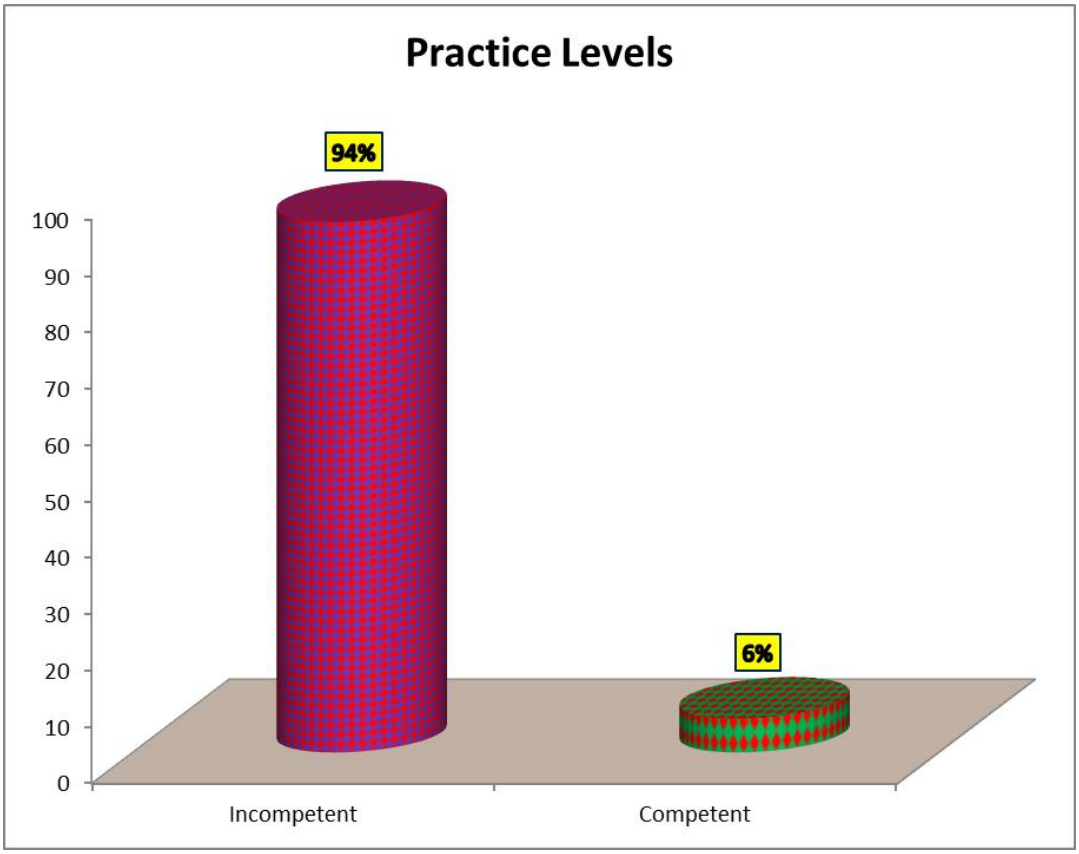

Figure (2): Frequency distribution of studied nurse' practices regarding peripheral neuropathy and diabetic foot management (n=50).

Table (4): Frequency distribution of studied nurse' attitude regarding peripheral neuropathy and diabetic foot management (n=50).

Nurses' Attitude Levels	Negative (<90%)		Positive (≥90%)	
	No.	%	No.	%
– Cognitive	48	96	2	4
– Emotional	49	98	1	2
– Psychomotor	42	84	8	16
Nurses' Overall Attitude Levels	46	92	4	8

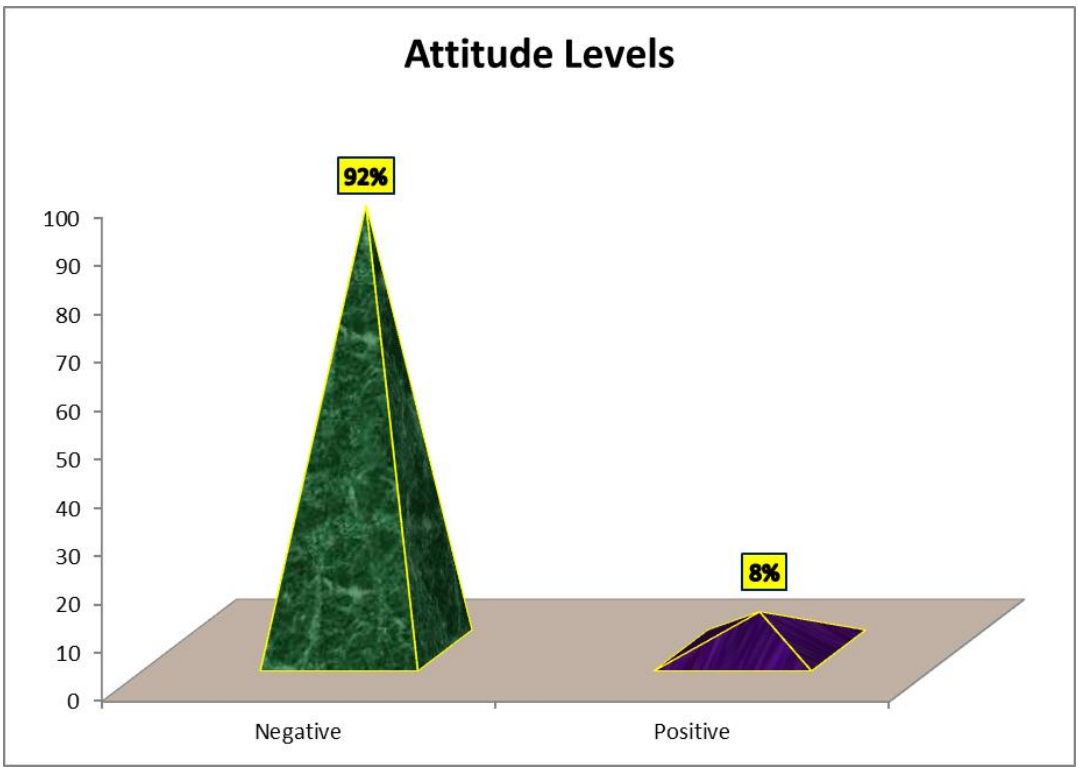

Figure (3): Frequency distribution of studied nurse' attitude regarding peripheral neuropathy and diabetic foot management (n=50).

Table (5): Correlation matrix between studied nurses' knowledge, practice and their attitude regarding peripheral neuropathy and diabetic foot management (n=50)

Variables		Total Practice	Total Attitude
Total Knowledge	***R***	0.543	0.492
	P-Value	0.000**	0.000**
Total Practice	***R***		0.346
	P-Value		0.001**

Table (6): Relation between studied nurses' demographic characteristics and their knowledge regarding diabetic neuropathy and diabetic foot management (n=50).

Demographic Characteristics	Knowledge Levels				χ^2	P-value
	Unsatisfactory		Satisfactory			
	No.	%	No.	%		
Age						
– 20 < 25	19	38	6	12	10.867	0.028*
– 25 < 30	15	30	4	8		
– 30 < 35	0	0	3	6		
– 35 < 40	0	0	1	2		
– ≥40	1	2	1	2		
Gender						
– Male	10	20	5	10	0.113	0.736
– Female	25	50	10	20		
Marital Status						
– Single	14	28	9	18	1.935	0.380
– Married	20	40	6	12		
– Divorced	1	2	0	0		
Educational Qualifications						
– Nursing Technical Institute	29	58	4	8	15.40	0.000**
– Bachelor of Nursing	6	12	10	20		
– Master degree	0	0	1	2		
Years of Experience						
– < 5	30	60	7	14	11.06	0.011*
– 5 < 10	5	10	5	10		
– 10 < 15	0	0	1	2		
– ≥ 15	0	0	2	4		

Training						
– Yes	6	12	6	12	10.10	0.001**
– No	29	58	9	18		

Table (7): Relation between studied nurses' demographic characteristics and their practice peripheral neuropathy and regarding diabetic foot management (n=50).

Demographic Characteristics	**Practice Levels**				χ^2	**P-value**
	Incompetent		**Competent**			
	No.	**%**	**No.**	**%**		
Age						
– 20 < 25	25	50	0	0	29.13	0.000**
– 25 < 30	19	38	0	0		
– 30 < 35	2	4	1	2		
– 35 < 40	0	0	1	2		
– ≥40	1	2	1	2		
Gender						
– Male	13	26	2	4	2.04	0.153
– Female	34	68	1	2		
Marital Status						
– Single	23	46	0	0	17.26	0.00**
– Married	24	48	2	4		
– Divorced	0	0	1	2		
Educational Qualifications						
– Nursing Technical Institute	33	66	0	0	18.97	0.000**
– Bachelor of Nursing	14	28	2	4		
– Master degree	0	0	1	2		
Years of Experience						
– < 5	37	74	0	0	50.00	0.000**
– 5 < 10	10	20	0	0		
– 10 < 15	0	0	1	2		
– ≥ 15	0	0	2	4		

Table (8): Relation between studied nurses' demographic characteristics and their attitude toward diabetic neuropathy and diabetic foot management (n=50).

demographic Characteristics	Attitude Levels				χ^2	P-value
	Negative		Positive			
	No.	%	No.	%		
Age						
– 20 < 25	25	50	0	0	21.27	0.000**
– 25 < 30	18	36	1	2		
– 30 < 35	2	4	1	2		
– 35 < 40	0	0	1	2		
– ≥40	1	2	1	2		
Gender						
– Male	13	26	2	4	0.828	0.363
– Female	33	66	2	4		
Marital Status						
– Single	21	42	2	4	0.105	0.949
– Married	24	48	2	4		
– Divorced	1	2	0	0		
Educational Qualifications						
– Nursing Technical Institute	32	64	1	2	13.04	0.001**
– Bachelor of Nursing	14	28	2	4		
– Master degree	0	0	1	2		
Years of Experience						
– < 5	36	72	1	2	17.75	0.000**
– 5 < 10	9	18	1	2		
– 10 < 15	0	0	1	2		
– ≥ 15	1	2	1	2		
Training						
– Yes	8	16	4	8	13.76	0.000**
– No	38	76	0	0		

DISCUSSION

Diabetic neuropathy is one of the most prevalent chronic complications in people with type 1 or type 2 diabetes, in addition to prediabetics and juvenile diabetics, with an estimated lifetime prevalence of more than 50%.DPN is uncommon in recently diagnosed and early-stage type 1 diabetes patients (within 10 years). The prevalence rises with disease duration, reaching up to 34% after about 25 years. In addition to DPN risk factors (e.g., glycemic control, age, and diabetes duration), racial or ethnic minority. (**Pop-Busui et al., 2022).**

Diabetic neuropathy is a common, debilitating illness with substantial treatment costs. Evidence supports the use of particular anticonvulsants and antidepressants to treat diabetic peripheral neuropathy pain. All the latest recommendations recommend a personalized approach with a low-dose start that is targeted to maximize response while minimizing side effects (**Khdour, 2020).**

Every year, over 18.6 million people worldwide suffer with diabetic foot ulcers, with 1.6 million in the United States alone. These ulcers cause 80% of lower extremity amputations in diabetics and are associated with an elevated risk of amputation and

mortality. First-line treatments for diabetic foot ulcers include surgical debridement, lowering weight bearing pressure, treating lower extremity ischemia and foot infection, and referring patients to multidisciplinary care early (**Armstrong et al., 2023).**

This study is a descriptive research study that seeks to assess nurses' knowledge, practice, and attitudes regarding diabetic peripheral neuropathy and diabetic foot management, in the outpatient diabetic foot clinic, medical and surgical departments, and intensive care unit of Beni-Suef University Hospital. Our objectives were to evaluate critical care nurses' knowledge, practice, and attitudes toward diabetic peripheral neuropathy and diabetic foot management.

With regard to the demographics of the nurses involved in this study, the findings showed that half of the nurses were in the 20–25 age range. This explains why the majority of those nurses were young, recent graduates who could handle the demands of working in the critical care unit and other departments. In line with that study, a study titled "Evaluation of Nurses' Knowledge Regards Diabetic Foot Care Management at Teaching Hospital in Al-Nasiriya city," **Kassar (2021),** reported that more than three-quarters of the participants were Yemeni females between the ages of 20 and 25.

Contradict with the study resuls, **Niyongabo (2022),** In a study titled **"**Nurses' Knowledge, attitudes and practice regarding pressure ulcers prevention and treatment. reported that The participant's age ranged from 22 to 54 years (X = 37.48 years).

Related to gender, the present study results showed that, about two third of the studied nurses were females. Which could be interpreted that old perception that nursing profession is caring job that more suitable for females more than males. A greater percentage of nurses in Egypt were females, which could be attributed to the fact that nursing studies in Egyptian universities were open to females until fifteen years ago. This finding is congruent with that found by **Abate et al. (2020),** in a study titled "Nurses' knowledge and attitude toward diabetes foot care in Bahir Dar, North West Ethiopia." According to Heliyon, more than half of the responses were female. And **Kassar (2021),** who reported that the majority of studied sample were females.

For their marital status, more than half of studied nurses were married. Also **Kassar (2021),** who reported that more than half of nurses are married. And inconsistent with the study result **Kaya (2018),** who found that three quarter of nurses are single.

In relation to educational level, the current study found that more than half of the nurses studied had a technical nursing diploma, with the remainder holding a nursing bachelor's degree. This may elaborate on the current state of nursing qualification, as bachelor nursing works as an administrator rather than a practitioner, in contrast**, Kassar (2021),** who reported that more than half of the study nurses had attended nursing school. This finding contradicts **Abate et al. (2020)**, who discovered that nearly all of the subjects worked with a bachelor's degree.

In the context of years of experience, the current study found that almost three-fourths of the nurses studied had less than five years of experience. In line with the study outcome, **Kassar (2021),** who revealed that more over two-thirds of the nurses had less than five years of experience. This finding is contradicted with many studies as; **Sukri (2020),** in a study titled 'Knowledge and attitude of nurses towards diabetic foot care in a secondary health care center in Malaysi", who found that less than half of sample size has 10 years' experience. Additionally, **Abate et al. (2020),** found that less than two third of participant had more than five years of work experience.

Regarding For their working area, more than half of studied nurses were working in ICUs. This finding is contradicted with **Abate et al. (2020),** who reported that the most of nursing working in the medical department.

Regarding Training about diabetic foot care the current study showed that three quarters of studied nurses had no training regarding care of diabetic food .in the same line **Kaya (2018), r**eported that less than two third of sample had no training program regarding diabetic foot. On the opposite side

Abate et al. (2020), who reported that less than two third of nurses were educated in the regular program. Additionally **Kielo-Viljamaa et al. (2021),** in a study titled **"**The development and testing of the C/woundComp instrument for assessing chronic wound-care competence in student nurses and podiatrists", who reported that The majority of nurses stated that they had received both practical and theoretical wound-care demonstrating during their study. Furthermore, nearly half of the student nurses reported receiving little or no practical wound care training throughout their clinical experiences.

Part II: Nurses' knowledge regarding peripheral neuropathy and diabetic foot management.

In concerning to overall nurse knowledge, the current study found that three-quarters of the nurses' tested had inadequate knowledge of peripheral neuropathy and diabetic foot management. This deficiency of nurses' knowledge is reflected in the reality that more than half of the investigated nurses are at the institution level and have no training courses. Nurse supervision is lacking, as is an orientation program before to work, also care conferences during work, the absence of a procedure book specifically designed for critical care areas, and a lack of direction, resulting in nurses who are not prepared or knowledgeable enough to provide evidence-based or specific care.

Furthermore, the study discovered that the level of nursing education has a significant impact on knowledge level. Other key factors for this information gap include: more than two-thirds of the study nurses had less than five years of experience. Additionally, there is a shortage of continuing education and standardized policies and standards for diabetic foot inspection and management.

These results are consistent with **Felix (2021),** in a study titled **"**Knowledge of primary care nurses before and after educational intervention on diabetic foot" who stated that the majority of nurses with different educational levels, irrespective of their years of experience had unexpectedly unsatisfactory knowledge scores about diabetic foot management. In accordance with current study findings, **Abdullah (2017),** in a study titled "Capacity building for nurses' knowledge and practice regarding prevention of diabetic foot complications", also found that knowledge of evidence-based strategies regarding peripheral neuropathy and diabetic foot management is significantly low among the majority of nurses working in in Jeddah hospital.

In the same line **Abate (2020),** who stated that led than half of nurses have unsatisfactory knowledge scores about diabetic foot management. Also **Bagweneza (2019),** in a study titled Diabetes health education: nurses' knowledge of essential components at a Rwandan hospital. At a Rwandan hospital reported that nurses exhibited poor knowledge of diabetes health education.

Conversely, the study disagreed with **Kumarasinghe (2018),** in a study titled **"**Nurses' knowledge on diabetic foot ulcer disease and their attitudes towards patients affected: A cross-sectional institution-based study", who stated that the majority rated as satisfactory knowledge scores.

Part III: Nurses' practice regarding peripheral neuropathy and diabetic foot management.

In regarding to total nurses' practice, the current study found that more than three-quarters of the nurses' investigated had an inadequate level of practice in diabetic foot assessment and foot ulcer management. This might be ascribed to a variety of factors, including the fact that more than half of the investigated nurses were diploma holders and had recently graduated, as well as inadequate availability of training courses in diabetic foot assessment and foot ulcer care.

Lack of in-service training prior to work in the critical care unit, absence of a professional role model and guidance, practice in ICUs not based on research findings, fear of unpredictable adverse effect and undesirable patient outcomes, particularly in infected wounds with bad odor, and lack of supplies and equipment (such as monofilament sterile gloves and vaseline

gauze) which are necessary for correct application of certain procedures such as diabetic foot examination and foot ulcer care are all contributing factors. In addition to this lack of infection control methods for the treatment of foot ulcers, there is a shortage of nursing staff, which increases workload, results in a lack of close nursing supervision, and deters nurses from receiving financial compensation or motivation. Inadequate policies and procedures are the most frequent obstacles.

This finding is consistent with **Abdullah's (2017**), who revealed that nurses' practice of diabetic foot assessment is low. Diabetic foot inspection includes pain, soreness, cuts, blisters, toe infection, nail disorder, previous foot ulcer, and amputation. Palpation (dorsalis pedis, posterior tibial, temperature, and capillary refill), auscultation, sensory reflexes, and footwear.

Furthermore, the study's findings underscored the importance of planning and carrying out a program for diabetic foot management. There is also a demand for nurse training programs in infection control and prevention.

Concerning the nurses' practice in relation to diabetic foot examination, the current study revealed that, only less than half of the studied nurses had competent level of practice while the rest had incompetent level of practice. This may be due to unavailability supplies and equipment which necessary for diabetic foot examination as monofilament and Tuning fork, absence of written educational guidelines regarding steps, indications and importance of foot examination and increased work load leading to negligence of foot examination prior to caring of ulcer.

Nurses' attitude regarding diabetic neuropathy and diabetic foot management

Regarding total nurses' attitude, the results of the current study revealed that. The majority of studied nurses had negative attitudes towards peripheral neuropathy and diabetic foot management. while the minority of them had positive attitudes towards peripheral neuropathy and diabetic foot management .This finding could be attributed to many reasons as Lack of knowledge about diabetic foot ulcers (less than three-quarters of study nurses had inadequate knowledge about DFU), lack of critical care unit experience, a lack of in-service training and educational courses on evidence-based guidelines, and a lack of consistent protocols and guidelines for DFU care.

This finding is consistent with **Abate (2020),** who stated that more than half of nurses the nurses participated in this study had never awareness about diabetic foot examination and care. As well they emphasized on the need of in service education. In contrary with this study result **Kumarasinghe (2018**), who demonstrated that nurses' overall attitude toward caring for patients with diabetic ulcers was favorable, advise each patient individually on how to care for their ulcers. It is my obligation to educate diabetic ulcer patients on how to prevent re-ulceration.

In contrast to the study outcome, **Kielo-Viljamaa et al. (2021),** who stated that, overall, individuals had positive attitudes regarding chronic wound care. However, the experts' attitude was more positive on the majority of the areas which can be associated to their wound care experience and knowledge. Additionally, having a more positive attitude about holistic treatment and economics was linked to a participant's theoretical competency. Understanding the importance of preventive and holistic wound care may help to explain positive attitudes in general.

Part VI: relations between nurses' demographic characteristics, nurses' knowledge, practice and atittude regarding peripheral neuropathy and diabetic foot management.

The results of the current study shown that there was there were moderate positive significant correlations between all variables knowledge, attitudes, and practices of peripheral neuropathy and diabetic foot management.

-Accordingly, These results are consistent with **Fujii (2020**), in astudy titled ' Foot care knowledge and practices among Japanese nurses and care workers in home

care and adult service center: a cross-sectional study. BMC nursing"'who stated that there is a significant corelation between overall knowledge and practice score was observed among both nurses (0.331; p = 0.017) and care workers (0.339; p = 0.000).

In contradict to study**, Kumarasinghe (2018),** nurses' attitude were not different significantly based on their gender or wound care experience. There was no association between nurse knowledge and attitudes

Also, **Niyongabo et al. (2022),** the study found a significant negative association between nurses' knowledge and attitudes (r = -0.479, p = 0.015). There was no significant correlation between nurses' knowledge and practice (r = 0.304, p = 0.140), nor between nurses' attitudes and practice (r = -0.333, p = 0.103).

Concerning the relation between studied nurses' demographic characteristics and their knowledge regarding diabetic neuropathy and diabetic food management, there were significant statistical relation between studied nurses' knowledge and their age, educational qualification, experience and training.

This was proven by **Kumarasinghe (2018**), who reported that no relationships were seen between knowledge and their gender, age, professional experience, and whether they had attended wound care training.

This result is countered by **Kassar (2021),** who stated that there is no significant relationship between knowledge levels and gender, social status, number of years of work experience.(P value = 0.712) at the ($p < 0.05$).

In accordance with **Abate (2020),** who indicated that learning institution and age had a significant influence on nurses' knowledge levels. Nurses who graduated from a government institution had a knowledge level that was more than three times higher than that of private school graduates. Nurses under the age of 30 had more than twice the knowledge of diabetes foot care as those aged 30 and up.

Pertaining to the relationship between the investigated nurses' demographic variables and their practice of diabetic foot treatment, there was a significant statistical relationship between the researched nurses' practices and their age, marital status, educational qualifications, experience, and training.

These results are consistent with **Fujii (2020**), Found that, there is significant correlation between working experience and practice scores have been observed,

Concerning the relation between studied nurses' demographic characteristics and their attitude toward diabetic neuropathy and diabetic foot management, there were significant statistical relation between studied nurses' attitude and their age, educational qualification, experience and training

This finding contradicts **Kumarasinghe's (2018),** who indicated that nurses' attitude did not differ significantly based on their gender or wound care experience. No relationship was found between nurses' knowledge and attitudes

CONCLUSION

Based on the result of the current study and research questions, it can be concluded that:

The majority of the study nurses had unsatisfactory knowledge and most of them had incompetent level of practice, also the majority of studied nurse had negative attitude. And the minority of studied nurses had positive attitude regarding diabetic neuropathy and diabetic foot management. As well as, there were moderate positive significant correlations between all variables. There were significant statistical relation between studied nurses' knowledge and their age, educational qualification, experience and training. Moreover, there were significant statistical relation between studied nurses' practice and their age, marital status, educational qualification, experience and training. There were significant statistical relation between studied nurses' attitude and their age, educational qualification, experience and training.

RECOMMENDATIONS

Based on the current study's results the following recommendations are proposed:

• Regular in-service education and training to improve knowledge and practice for diabetic foot examinations.

• To avoid diabetic foot ulcers, all nursing staff should follow a diabetic foot ulcer checklist.

• To generalize the results, the study should be performed on a large scale and in various hospital settings.

• Future research should assess nurses' knowledge, practices, and attitudes towards diabetic foot examination and care before and after implementing an educational program.

REFERENCES

Abate, T. W., Enyew, A., Gebrie, F., & Bayuh, H. (2020). Nurses' knowledge and attitude towards diabetes foot care in Bahir Dar, North West Ethiopia. Heliyon, 6(11).

Abdullah, W. H., Al-Senany, S., & Al-Otheimin, H. K. (2017). Capacity building for nurses' knowledge and practice regarding prevention of diabetic foot complications. International Journal of Nursing Science, 7(1), 1-15.

Al-Jasim, A., Al-Kubaisy, O., & Al-Khafaji, A. (20 20): Knowledge, Attitude And Practices Of Diabetic Foot Patients Admitted To The Surgical Wards At Baghdad Teaching Hospital: A Cross-Sectional Study Al-Jasim. *World Journal Of Medical Education And Research*, *23*(1).

Armstrong, D. G., Tan, T. W., Boulton, A. J., & Bus, S. A. (2023). Diabetic foot ulcers: a review. *Jama*, *330*(1), 62-75.

Bagweneza, V., Musabirema, P., Mwiseneza, M. J., Collins, A., & Bhengu, B. R. (2019). Diabetes health education: nurses' knowledge of essential components at a Rwandan hospital. *Rwanda Journal of Medicine and Health Sciences*, *2*(2), 172-177.

Bilal, M., Haseeb, A., Rehman, A., Arshad, M. H., Aslam, A., Godil, S., ... & Ahmad, H. (2018): Knowledge, Attitudes, And Practices Among Nurses In Pakistan Towards Diabetic Foot.

Bodman MA, Varacallo M. (2023): Peripheral Diabetic Neuropathy. In: Statpearls [Internet]. Treasure Island (FL): Statpearls Publishing; 2024 Jan-. Available From: Https://Www.Ncbi.Nlm.Nih.Gov/Books/NBK442009/

Felix, L. G., Mendonça, A. E. O. D., Costa, I. K. F., Oliveira, S. H. D. S., Almeida, A. M. D., & Soares, M. J. G. O. (2021). Knowledge of primary care nurses before and after educational intervention on diabetic foot. Revista gaucha de enfermagem, 42, e20200452.

Fujii, K., Komoda, T., Maekawa, A., & Nishikawa, M. (2020). Foot care knowledge and practices among Japanese nurses and care workers in home care and adult service center: a cross-sectional study. BMC nursing, 19, 1-15.

Jia, H., Wang, X., & Cheng, J. (2022): Knowledge, Attitudes, And Practices Associated With Diabetic Foot Prevention Among Rural Adults With Diabetes In North China. Frontiers In Public Health, 10.

Kassar, A. K., & Khudur, K. M. (2021). Evaluation of Nurses' Knowledge Regards Diabetic Foot Care Management at Teaching Hospital in Al-Nasiriya city. *Annals of the Romanian Society for Cell Biology*, 12500-12506.

Kaya, Z., & Karaca, A. (2018). Evaluation of nurses' knowledge levels of diabetic foot care management. *Nursing research and practice*, *2018*.

Khdour, M. R. (2020). Treatment Of Diabetic Peripheral Neuropathy: A Review. Journal Of Pharmacy And Pharmacology, 72(7), 863-872.

Kielo-Viljamaa, E., Suhonen, R., Ahtiala, M., Kolari, T., Katajisto, J., Salminen, L., & Stolt, M. (2021). The development and testing of the C/WoundComp instrument for assessing chronic wound-care competence in student nurses and

podiatrists. International Wound Journal, 18(1), 62-78.

Kumarasinghe, S. A., Hettiarachchi, P., & Wasalathanthri, S. (2018). Nurses' knowledge on diabetic foot ulcer disease and their attitudes towards patients affected: A cross-sectional institution-based study. Journal of clinical nursing, 27(1-2), e203-e212.

Nather, A. A. (2023). *Understanding Diabetic Foot: A Comprehensive Guide for General Practitioners*. World Scientific.

Nicoletti, C. (2020). Diabetic Foot–Clinical. *Microvascular Disease in Diabetes*, 157-172.

Niyongabo, E., Gasaba, E., Niyonsenga, P., Ndayizeye, M., Ninezereza, J. B., Nsabimana, D., ... & Abakundanye, S. (2022). Nurses' Knowledge, attitudes and practice regarding pressure ulcers prevention and treatment. *Open Journal of Nursing*, *12*(5), 316-333.

Oh, J. (2020). Clinical Spectrum And Diagnosis Of Diabetic Neuropathies. The Korean Journal Of Internal Medicine, 35(5), 1059.

Parliani, N. (2021). *Diabetic Foot Ulcer and Its Risk Factors Based on Evidence Based Research*. CV Jejak (Jejak Publisher).

Pop-Busui, R., Ang, L., Boulton, A. J., Feldman, E. L., Marcus, R. L., Mizokami-Stout, K., ... & Ziegler, D. (2022). Diagnosis and treatment of painful diabetic peripheral neuropathy.

Statistics Office at Beni-Suef University Hospital 2023.

Sukri, M. B., Singh, A., Singh, L. H., bin Abdul Wahid, A. M., & Ortho, M. S. (2020). Knowledge and attitude of nurses towards diabetic foot care in a secondary health care centre in Malaysia. Med J Malaysia, 75(4), 391.