Expert Opinion Article

Assessment of Attitude and Practice Regarding Diabetic Foot Ulcer Among Nurses in Jordan

Mohammad Ahmad Al-me'ani[1], Zeinab Hassan Al-Wahsh[2], and Julio Fernandez-Garrido[3]*

[1]Middle East University, Faculty of Nursing, Amman, Jordan
[2]School of Nursing, Hashemite University, Zarqa, Jordan
[3]*Faculty of Nursing and Podiatry, University of Valencia

*Corresponding Author: Julio Fernandez-Garrido
*Email: Julio.Fernandez@uv.es

ABSTRACT
Background: Diabetes mellitus (DM) is one of the leading causes of death worldwide, and diabetic foot ulcers (DFUs) are a chronic complication that can lead to amputations and reduce the quality of life for patients with diabetes.
Purpose: This study aimed to assess the attitudes and practices of Jordanian nurses regarding diabetic foot ulcers and to explore the potential relationship between these attitudes and nurses' clinical practices as well as their demographic characteristics.
Methods: We conducted a descriptive, cross-sectional study involving a sample of 256 nurses from nine public hospitals in central, northern and southern Jordan. Participants completed the "Diabetic Foot Ulcer Knowledge, Attitudes, and Practices Questionnaire."
Results: Half of the participants exhibited negative attitudes (52%; n = 132) and inadequate practices (50.4%; n = 129) regarding diabetic foot ulcers. Nurses' attitudes were influenced by age group (41–50 years; OR [odds ratio] = 3.891; p = 0.009) and training (OR = 0.576; p = 0.048). Additionally, training nurses through a diabetic foot ulcer course significantly improved their attitudes (p = 0.042). Furthermore, nurses' practices were influenced by gender (p = 0.040) and working area (OR = 5.712, p = 0.026). Statistical significance was established at p < 0.05.
Conclusion: Jordanian nurses demonstrate poor attitude and inadequate practices regarding diabetic foot ulcers. Thus, healthcare organizations should encourage nurses' participation in both theoretical and practical training programs to improve their competencies.

Keywords: diabetes mellitus, diabetic foot ulcer, diabetic foot care, nurse attitude, nurse practice.

1. Introduction

Diabetes mellitus (DM) is one of the leading causes of death worldwide[1] and is recognized as a major public health issue, affecting about 463 million people globally.[2] A chronic complication of this condition is diabetic foot ulcers (DFUs), and they can lead to amputations and impair the quality of life for patients with DM.[3] The prevalence of DFUs varies, ranging from 1.0% to 4.1% in the United States, 4.6% in Kenya, and 20.4% in the Netherlands.[4] In Jordan, a study by Yousef Al Ayed et al. involving 1,000 patients with DM found that 5.3% had DFUs , 1.7% had undergone amputations, and 17.2% were at risk for DFUs.[5] Nurses are integral members of diabetes treatment teams and play a crucial role in preventing DFUs as well as in the care and education of patients at risk .[6] This study is significant as it provides a Jordanian perspective on the roles of nurses in managing and controlling patients with DFUs in hospitals. In most Jordanian settings, DFUs care is delegated to nurses, often without supervision.[7] Numerous studies report that diabetic foot ulcer care is a neglected area in nursing curricula.[6,8] However, the attitudes and practices of nurses regarding diabetic

foot ulcers have not been extensively studied. Thus, this study aims to fill the gap specifically concerning diabetic foot ulcers among Jordanian nurses, providing university educators with a framework that underscores the importance of including this topic in nursing curricula and establishing more educational programs targeting it. Furthermore, the lack of studies on Jordanian nurses' attitudes and practices regarding DFU necessitates broadening the focus and making findings more generalizable, as only a few studies from other countries have examined nurses' attitudes and practices in this area.

2. Methodology
2.1. Research Design

A cross-sectional, descriptive design was employed. The descriptive aspect enables the characterization of nurses based on key demographic variables and the assessment of their attitudes and practices related to DFUs. The cross-sectional aspect facilitates measurement of the attitudes and practices at a single point in time.[10] This design method enables data collection from numerous participants, and using questionnaires

minimizes the researcher's influence on participants, allowing for more freedom to provide honest and open responses.[10]

2.2. Study Setting
This study was conducted in nine selected government hospitals under the Ministry of Health (MOH) in the southern, middle, and northern regions of Jordan. Government hospitals were chosen for several reasons: (a) they have a large sample of nurses; (b) obtaining approval from the Research and Ethics Committee of the MOH is relatively straightforward; (c) government hospitals adhere to a uniform policy for nursing procedures, whereas military and private hospitals have varying policies; (d) government hospitals are part of a larger healthcare system in Jordan; and (e) nurses in government hospitals receive the same DFU treatment and prevention.

2.3. Sample Size
Using G*Power 3[11,12] with a minimal alpha significance level of 0.05, power of 0.95, and a medium effect size of 0.3, the required sample size was determined to be 285 participants. Ultimately, 256 nurses completed the questionnaires.

2.4. Population
The target population consisted of registered and practical nurses working in nine selected government hospitals of the MOH in Jordan.

2.5. Inclusion Criteria
a) Nurses with at least a diploma in nursing
b) Nurses with minimum three months of work experience

2.6. Exclusion Criteria
a) Nursing students
b) Administrative nurses who are not directly involved with patient care
c) Nurses unavailable for various reasons (annual leave, vacation, maternity leave, etc.)

2.7. Sampling
Convenience sampling was utilized to recruit participants due to the limited number of eligible nurses. This method involves selecting subjects who are suitable, available, or approachable. Participants were selected from nine government hospitals of the MOH located in the southern, middle, and northern regions of Jordan.[10]

2.7.1. Ethical Considerations
Before conducting this study, the researcher obtained approval from the Research and Ethics Committee of the MOH and subsequently arranged with the nursing directors of the selected hospitals to explain the study's purpose and data collection process. Informed consent was obtained from each nurse before participation, and they were informed of their right to refuse to participate or withdraw from the study at any time before its completion.

2.7.2. Data Collection Procedure
After obtaining permission, nurses were selected based on the inclusion and exclusion criteria. From those who agreed to participate, a signed consent form was obtained. Each participant received a packet containing a demographic data form and the Knowledge, Attitude, and Practice—Diabetic Foot Ulcers (KAP-DFUS) Questionnaire. The introductory page explained that participation was voluntary and that the questionnaire would take approximately 15 minutes to complete; participants were instructed not to mention their name or affiliation. Participants completed the questionnaire, which the researcher distributed, in nursing rooms or lecture halls at the target hospitals. Upon completion, the participants returned the questionnaires to the researcher. All data were collected by the same researcher.

2.7.3. Data Collection Questionnaire
The questionnaire for this study was adapted from the "Assessment of the Practice and Attitude of Nurses Regarding Diabetic Foot Care,"[3] as well as from other studies on the subject prevalent in the scientific literature.[4,12,13,14] The well-structured questionnaire assessing diabetic foot ulcer knowledge, attitudes, and practices comprised three sections. The first section sought demographic variables such as age, gender, experience in years, professional qualifications, area of practice, and training related to DFUs. The second section assessed nurses' attitudes toward DFUs and comprised 12 questions to be answered on a five-point Likert scale ranging from one (Strongly Disagree) to five (Strongly Agree). The third section evaluated the practice of nurses regarding DFUs, also comprising 12 questions to be answered on a five-point Likert scale ranging from one (Never) to five (Always). Since this was the first time the questionnaire was used in a Jordanian sample, its appropriateness (validity and reliability) for the intended population had to be determined. Content validity relates to how well question items correspond to the concept examined.[15] It also covers the adequacy of coverage of the content area being assessed.[10] The content validity of the instrument was determined based on the opinions of a panel of experts.[16] The research team consulted a panel of three experts from Jordan—one physician and two nurses working in diabetes clinics—to assess content validity. There are various methods for testing content validity, with the content validity index (CVI) being the most commonly used method for quantitative assessment.[17] The CVI includes a four-choice Likert scale for each questionnaire item as follows: 1 = not relevant; 2 = somewhat relevant; 3 = relevant but requiring minor change; and 4 = relevant. To

obtain CVI for the relevance and clarity of each item (I-CVI), the number of those who judged the item as relevant or clear (rating 3 or 4) was divided by the total number of content experts. For relevance, the CVI can be calculated for both the item levels (I-CVI). The I-CVI expresses the proportion of agreement on the relevance of each item, ranging from zero to one.[16] After the content validation process, the experts rated all items with a score of four, resulting in a total CVI of 1.00 for the tool.

2.7.4. Pilot Testing
A pilot test of the entire survey was conducted before actual data collection. The questionnaire was tested for face validity with an initial sample size 10% of the total sample size (n = 23), with participants recruited from outside this study using the same criteria adopted for the main study. The results of the pilot study indicated that all items were easy to read and understand, with a Cronbach's alpha value of 0.728 for the knowledge section, 0.816 for the attitude section, and 0.897 for the practice section. The overall Cronbach's alpha value for the total questionnaire was 0.837, which is considered acceptable according to Polit and Beck.[10]

3. Results
3.1. Description of the Study Sample
The demographic characteristics of participants who completed the self-reported questionnaire are presented in Table 1.

Table 1: Demographic Characteristics of Participants (n = 256)

Demographic Variables	Frequency	Percentage (%)
<u>Age</u>		
20–30	75	29%
31–40	156	61%
41–50	25	10%
51–60	0	0%
>60	0	0%
<u>Gender</u>		
Male	122	48%
Female	134	52%
<u>Professional Qualifications</u>		
Diploma	52	20.3%
Bachelor's Degree	186	72.7%
Postgraduate Diploma / Higher Diploma	11	4.3%
Master's Degree	6	2.3%
PhD	1	0.4%
<u>Professional Experience</u>		
<1 year	3	1%
1–10 years	140	54%
11–20 years	99	39%
21–30 years	14	6%
>30 years	0	0%
<u>Area of Practice</u>		
Surgical Ward	74	29%
Medical Ward	85	33%
ICU	72	28%
Diabetic Foot Clinic	12	5%
Outpatient Clinic	13	5%
<u>Course Training in DFU</u>		
Yes	148	58%
No	108	42%

3.1.2. Attitude Levels
A descriptive statistical analysis was conducted to assess nurses' attitudes toward DFUs. The results indicated that the overall attitude of nurses toward DFUs was negative (52%; n = 132), with 48% exhibiting a positive attitude (n = 124), as illustrated in Table 2.

Table 2: Attitude Levels (n = 256)

Attitude Levels	Frequency	Percentage (%)
Positive Attitude	124	48%
Negative Attitude	132	52%

Note: Attitude levels based on median = 46

3.1.3 Practice Levels

A descriptive statistical analysis was conducted to assess nurses' practices regarding diabetic foot ulcers. The results indicated that 129 nurses (50.4%) exhibited insufficient practice, while 127 (49.6%) demonstrated sufficient practice.

Table 3: Practice Levels (n = 256)

Levels of Practice	Frequency	Percentage (%)
Sufficient Practice	127	49.6%
Insufficient Practice	129	50.4%

Practice levels based on median = 46

3.2.1. Relationships Between Attitude and Demographic Characteristics

To further investigate the association between demographic variables and attitudes toward diabetic foot ulcers, a binary logistic regression model was conducted. To meet the assumption of minimal mutual correlation among independent variables in the binary logistic regression model, mutual correlation was tested. Only age group and years of experience were found to be significantly correlated (Spearman's rho = .587, p = .000). Therefore, the experience variable was excluded from the model, and the age group variable was retained. All other assumptions were met.

Table 5 below shows the results of the binary logistic regression model, where the recoded attitude score (negative, positive) was entered as the dependent variable, and gender, age group, professional qualifications, area of practice, and training were dummy-coded and entered as independent variables. For gender, male was considered the reference; for age group, 20–30 years was considered the reference; for professional qualifications, diploma was considered the reference; for area of practice,

surgical ward was considered the reference; and for training, not having done any training courses was considered the reference.

The odds ratio for the age group (41–50; OR = 3.891; p = .009) was statistically significant, indicating that a nurse aged 41–50 is 3.891 times more likely to have a positive attitude regarding DFUs than a nurse aged 20–30. Furthermore, the odds ratio for nurses who never received training (OR = .576; p = .048) was statistically significant, suggesting that a nurse who has not received training is approximately twice as likely to have a negative attitude regarding DFUs than a nurse who has received training. All other odds ratios were not found to be statistically significant.

Additionally, the overall binary logistic regression model was statistically significant, with Pearson's Chi-square (df) = 16.918 (12), p = .016, and R2 = .085, indicating that the combination of these demographic variables (gender, age group, professional qualifications, area of practice, and training) explains approximately 8.5% of the variance in attitude scores regarding DFUs among nurses..

Table 5. Binary Logistic Regression for Attitude and Demographic Variables

Independent Variable		B	Odds Ratio	P Value
Gender	Female	-.353	.702	.198
Age Group	31–40	.227	1.254	.443
	41–50	1.359	3.891	.009*
Professional Qualification	B.Sc.	.338	1.402	.322
	Higher Diploma	-.511	.600	.531
	M.Sc.	.357	1.429	.693
	Ph.D.	21.642	000	1.000
Area of Practice	Medical Ward	-.329	.720	.328
	ICU	-.376	.687	.280
	Diabetic Foot Clinic	.122	1.130	.872
	Outpatient Clinic	-.290	.749	.657
Ever Had Training	No	-.552	.576	.048*

Model's R² = .085; Pearson's Chi-square (df) = 16.918 (12); and p = .016

3.2.2 Relationships Between Practice and Demographic Characteristics

To further investigate the association between demographic variables and practices regarding DFUs, a binary logistic regression model was conducted. To meet the assumption of minimal mutual correlation among independent variables

in the binary logistic regression model, mutual correlation was tested. Only age group and years of experience were found to be significantly correlated (Spearman's rho = .587; p = .000). Therefore, the experience variable was excluded from the model, and the age group variable was retained. All other assumptions were met.

Table 7 below shows the results of the binary logistic regression model, where the recoded practice score (Insufficient, Sufficient) was entered as the dependent variable, and gender, age group, professional qualifications, area of practice, and training were dummy-coded and entered as independent variables. For gender, male was considered the reference; for age group, 20–30 years was considered the reference; for professional qualifications, diploma was considered the reference; for area of practice, surgical ward was considered the reference; and for training, not having done any training courses was considered the reference. The odds ratio for nurses working in the diabetic foot clinic (OR = 5.712; p = .026) was statistically significant, indicating that they are 5.712 times more likely to follow sufficient practices in DFU care than nurses in medical wards. All other odds ratios were not found to be statistically significant. Furthermore, the overall binary logistic regression model was statistically significant (Pearson's Chi-square (df) = 18.983 (12); p = .009; R2 = .095), indicating that the combination of these demographic variables (gender, age group, professional qualifications, area of practice, and training) explains approximately 9.5% of the variance in practice scores regarding DFU among nurses

Table 7. Binary Logistic Regression for Practice and Demographic Variables

Independent Variable		B	Odds Ratio	P Value
Gender	Female	-.422	.655	.123
Age Group	31–40 years	.422	1.526	.157
	41–50 years	.671	1.956	.173
Professional Qualification	B.Sc.	.531	1.701	.122
	Higher Diploma	-.768	.464	.392
	M.Sc.	-.890	.411	.446
	Ph.D.	21.945	000	1.000
Area of Practice	Medical Ward	-.292	.747	.383
	ICU	-.353	.703	.312
	Diabetic Foot Clinic	1.743	5.712	.026*
	Outpatient Clinic	.461	1.586	.476
Ever Had Training	No	.047	1.048	.866

Model's R^2 = .095; Pearson's Chi-square (df) = 18.983 (12); and p = .009

4. Discussion
4.1. Demographic Characteristics of Participants
Most nurses in the present study were female (n = 134, 52%). This pattern aligns with findings from other international studies, which report that the percentage of female participants ranges from 91% to 96%.[13] Approximately 71% of the nurses in the study sample were over 30 years old. These findings are consistent with other studies observing that about 50% of nurses are older than 30.[3] Our data show that 55% of the nurses had 1–10 years of professional experience, similar to findings of a Nigerian study where 22% of nurses had 6–10 years of experience, 21% had 11–20 years, and 51% had over 20 years of experience.

4.1.1. Attitudes Toward Diabetic Foot Ulcers
According to the results of the current study, the overall attitude of nurses toward diabetic foot ulcers was negative (52%, n = 132), while 48% exhibited a positive attitude (n = 124). This contrasts with a study conducted in Pakistan by Munawar,[3] which revealed that nurses' attitudes toward DFUs were generally positive. Another study among nurses in Pakistan indicated that the average attitude score was between 12 and 48 and that the general attitude toward DFUs was positive.[4] Other studies have shown similar results; for example, a Sri Lankan study conducted in 2018 found that the overall attitude of nurses toward caring for patients with DFUs was positive.[18] However, contrasting findings have emerged in other studies, where attitude scores ranged from 12 to 48, with some indicating a positive overall attitude.[13]

The nurses in the present study exhibited a negative attitude toward DFUs, possibly influenced by patients' failure to follow foot care practices for long, poor patient motivation to maintain normal blood glucose levels, and negative attitudes of patients toward infection, injury, and other symptoms. These factors contribute to an increased workload for nurses, leading to frustration. Nurses should be encouraged to provide knowledge and information to patients regarding foot care to prevent complications. Educational strategies should be implemented in Jordanian universities to raise awareness for effective DFU care. If nurses have adequate knowledge of DFUs, it can foster a positive attitude toward patients, resulting in improved practices in DFU care.

4.1.2. Practices
This study found that half of the nurses (n = 129, 50.4%) exhibited inadequate practices, while 127 (49.6%) nurses demonstrated adequate practices regarding diabetic foot ulcers. This is consistent

with previous studies, where a total of 12 questions about practice were posed; practice scores of six or less indicated poor practices, whereas scores above six indicated appropriate practices; 62% of nurses followed poor practices.[4] These findings are in line with those of a Saudi Arabian study, which found that nurses practiced poor levels of screening for DFUs.[7] Further, in a study conducted in Australia, healthcare practitioners self-reported foot assessment practices before training (n = 246). Of these participants, 125 were nurses. According to the findings, foot assessment practices significantly increased from 34% before training to 95% after training (p < 0.001).[19]

Several factors contribute to the insufficient level of DFU care practices in Jordanian clinics: (a) perception of DFU dressing as time-consuming; (b) unavailability of resources; (c) inadequate diabetes knowledge; (d) lack of support from administrators; (e) the training course being only focused on general wound care; (f) unqualified individuals providing DFU care; (g) lack of initiative from the participants to undergo DFU training; (h) participants' lack of motivation to pursue diabetic foot ulcer training; (i) participants experiencing professional burnout, and (j) DFU training course not meeting quality standards.

4.1.3. Relationship Between Demographic Variables and Attitudes Toward Diabetic Foot Ulcers

This study investigated the association between demographic variables and attitudes toward diabetic foot ulcers through a binary logistic regression model. The odds ratio for the age group 41–50 (OR = 3.891; p = .009) was statistically significant, as was the odds ratio for nurses who had never received training (OR = .576; p = .048). A similar study by Bilal et al.[13] in Pakistan indicated no statistically significant correlation between nurses' attitudes, gender, and wound care experience. However, a significant correlation was found between nurses' attitudes and age (p = 0.022). The results of the current study align with findings reported by Nisa et al.,[4] which found no statistically significant correlation between nurses' attitudes and their years of experience or gender. However, a significant difference was observed between nurses' attitudes and age (p = 0.022), with nurses under 40 exhibiting more positive attitudes than older nurses.

4.1.4. Relationship Between Demographic Variables and DFU Practices

The odds ratio for nurses working in diabetic foot clinics (OR = 5.712; p = .026) was statistically significant. Several studies conducted in Middle Eastern countries, such as Saudi Arabia, have found that nurses with bachelor's degrees exhibited poor practices regarding diabetic foot ulcers (n = 30, 6.7%), while those with higher diplomas demonstrated better practices (36.7%).[7]

5. Conclusion

Jordanian nurses exhibited negative attitudes and insufficient practices regarding diabetic foot ulcers. To encourage their participation in UPD training, health care organizations should promote theoretical and practical training programs aimed at improving nurses' attitudes and practices. This study highlights the need for continuous training in nursing practice in Jordan, enabling nurses to become active members of their respective healthcare teams.

Authors' Contributions

All authors share equal responsibility for the study design, data analysis, and manuscript writing and revision. All authors read and approved the submitted version of the manuscript.

Data Availability

All data included in this study are available upon request from the authors.

Conflict of Interest Statement

The authors declare that they have no conflicts of interest.

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