

Perception and Practices of Nurses about Diabetic Foot Care

Jharna Rani Das¹

ABSTRACT

Background & objective: Diabetic-foot care or diabetic foot ulcer (DFU) care is a vital aspect of care for diabetic patients. It is conceived that nurses placed in a diabetic hospital are knowledgeable and efficient in the management of diabetic ulcer care. But how efficiently they are providing this service has not yet been formally evaluated. The present study was undertaken to evaluate the nurses' "diabetic foot care behavior" at the BIRDEM (Bangladesh Institute of Research and Rehabilitation in Diabetes, Endocrine and Metabolic Disorders), Dhaka.

Methods: This study was carried out on nurses having at least one year of experience in "diabetic foot" care (preventive, curative and rehabilitative services) in BIRDEM General Hospital (the largest Diabetic Footcare Hospital in Bangladesh) between July 2019 to December 2019. A total of 207 Senior Staff nurses or nurses working in the surgical wards or in the outpatient departments (OPDs) were consecutively included in the study. A pre-structured questionnaire was used to assess the knowledge, attitude, and practices of nurses pertaining to diabetic foot care. The questionnaire, among others, included variables like age, gender, professional experience, and qualifications. The knowledge section comprised 15 items focusing on risk factors, descriptions, and the management of diabetic ulcers. The options provided for each question were "True," or "False,". A score of '1' was given for each correct answer and '0' for each wrong answers. All the 15 responses were then summed up to find the integrated score obtained by the respondents. The summed-up score was then converted into percentage of score obtained. The knowledge level of the respondents was evaluated in terms of Likert scale 0-4, where '0' means poor knowledge (knowledge score $\leq 60\%$) and '4' means highly satisfactory level of knowledge (knowledge score 91-100%) and '1', '2' and '3' means fair (knowledge score 61-70%), average (knowledge score 71-80%) and satisfactory knowledge (knowledge score 81-90%) respectively.

Results: About 50% of the respondents were 40 or > 40 years old with mean age of the respondents being 37.4 ± 10.4 years. The respondents were predominantly female (80%) married (75.4%). Approximately 80% of the respondents had diploma (basic nursing degree) degree alone, 14.5% obtained graduate (BSc Nursing) degree as well. Over half (51.1%) of the respondents had > 10 years of professional experience with average years of experience being 14.6 ± 0.7 years, but two-thirds (68.1%) had < 5 years and only 13% had > 10 years of wound-care experience. Nearly 40% had specific training on wound care. One-third (34.3%) of the nurses were placed in Internal Medicine Unit, 33.8% in Surgery Unit, 14.4% in Emergency Unit. Over two-thirds (68.6%) of the nurses were service nurses, 18.4% were supervisor, 3.9% were intensive care nurses and 8.2% were polyclinic nurses. The respondents' level of knowledge was evaluated in terms Likert scale 0 - 4 (as described in the Methods section). Accordingly 30% of the respondents had poor, 8% fair, 47.1% average 2.9% satisfactory and 12% highly satisfactory level of knowledge.

Conclusion: The study concluded that nurses generally possess an inadequate level of knowledge pertaining to DFUs, despite a positive attitude towards learning or acquiring knowledge about DFU and its care. A comprehensive educational program focusing on evidence-based practice is deemed necessary to ensure better clinical practices by the nurses.

Key words: Perception, practice, nurses, diabetic-foot care etc.

Author's information:

¹ Jharna Rani Das, Lecturer, Department of BIRDEM Nursing College, Shahbug, Dhaka

correspondence: Jharna Rani Das, Cell Phone: +880 1672063711, Email: jharnadas2511@gmail.com

INTRODUCTION:

Diabetes is an incurable, multifactorial disorder associated with chronic hyperglycemia and troublesome disruptions in carbohydrate, fat and protein metabolisms emanating from deficiencies or disruptions in insulin secretion or insulin inaction.¹ Diabetes is one of the most frequently diagnosed metabolic disorders and is now at pandemic magnitude with 1.4 million adults diagnosed each year. The number of diabetics diagnosed will be more than double by 2030.² According to the International Diabetes Federation (IDF),³ the South-East Asian Region consisting of Bangladesh, India, Sri Lanka, and Nepal is the home of more than 72 million adults with diabetes, which is expected to exceed 135 million by 2035.^{3,4} The disease usually presents with a multitude of chronic complications, which include, amongst others, neuropathy, coronary artery disease, cerebrovascular disease, and peripheral vascular disease.⁵ The high prevalence of diabetes has increased the importance of perception of its risk factors and complications. Approximately 10% of the patients have either one or both of peripheral neuropathy (PN) and peripheral vascular disease (PVD) when they are diagnosed with the condition,⁶ which may act as risk factors for diabetic foot disease. Diabetic foot refers to an area of necrosis or gangrene distal to the ankle in a diabetic patient.⁷

Diabetic foot complications are common concerns in diabetes management and are the leading cause of amputation in hospitals. The management of diabetic foot ulcers poses a challenge to the medical and nursing staff in a wound care center. Since diabetes is a chronic disease, cost associated with its management is very high.⁸ The disease inflicts immense socioeconomic burden and markedly reduce the quality of life of the suffering patients.⁹ It is of utmost need that the patients and healthcare professionals alike to have a comprehensive knowledge of foot care to prevent diabetic foot complications. Nurses should be able to impart quality care to their patients and be effectively able to control the progression of

the disease. The preventive strategy offered by nurses should ideally initiate from the identification of the patients and clinical examinations followed by briefing the patients with risk guidelines and appropriate care procedures.¹⁰

This work is currently being done by the nurses placed in the diabetic hospitals, like BIRDEM General Hospital. But how efficiently they are providing this service has not yet been formally evaluated. There is a paucity of data about wound-care practices among health care professionals in general and nurses in particular. Hence, the present study was intended to evaluate the knowledge, attitudes, and practices of nurses towards diabetic foot, at the BIRDEM General Hospital with ultimate aim to assess their "diabetic foot care behavior".

METHODS:

This descriptive study was conducted over a period of 6 months from July 2019 to December 2019 in the BIRDEM General Hospital (the largest Diabetic Footcare Hospital in Bangladesh), Dhaka on nurses having at least one year of experience in diabetic foot care or diabetic ulcer care (preventive, curative and rehabilitative services). Senior Staff nurses or nurses working in the surgical wards or in the outpatient departments (OPDs) and possess at least one year of clinical experience in diabetic ulcer care were consecutively included in the study. However, nurses who did not give voluntary consent to participate in the study were excluded. A total 207 nurses were included as respondent. Prior to commencement of study, approval was obtained from the Ethical Review Committee (ERC).

Non-probability convenient sampling was used and a pre-structured questionnaire was used to assess the knowledge, attitudes, and practices of nurses pertaining to diabetic foot care. The questionnaire was made bilingual (English and Bangla-the common language spoken by the general populace) to increase comprehension. A field testing was conducted to adapt the questionnaire to the field situation. The

questionnaire, divided in three sections, was derived from a similar study conducted on nurses working at two teaching hospitals in Pakistan¹¹ with slight modification to adapt to the need of the present study.

The data pertaining to general characteristics of nurses were obtained mainly through the first section of the questionnaire. It included variables like age, gender, professional experience, and qualifications. The purpose of the second section of the research instrument is to assess the level of knowledge possessed by nurses about diabetic foot ulcers and their management. The knowledge section comprised of 15 items focusing on risk factors, descriptions, and the management of diabetic ulcers. The options provided for response of each question were "True," or "False,,". A score of '1' was given for each correct answer and '0' for each wrong answers. All the 15 responses were then summed up to find the integrated score obtained by the respondents. The summed-up score was then converted into percentage of score obtained out of total knowledge score. The knowledge level of the respondents was then evaluated in terms of Likert scale 0-4, where '0' means poor knowledge (knowledge score \leq 60%) and '4' means highly satisfactory level of knowledge (knowledge score 91-100%) and '1', '2' and '3' means fair (knowledge score 61-70%), average (knowledge score 71-80%) & satisfactory knowledge (knowledge score 81-90%) respectively.

Data were collected using a structured questionnaire (research instrument) containing all the variables of interest. Collected data were analyzed using SPSS (Statistical Package for Social Sciences) for Windows, version 25 (SPSS, Inc, Chicago, IL). The test statistics used to analyze the data were descriptive statistics (frequency, mean, and SD).

RESULTS:

About 50% of the respondents were 40 or > 40 years, 37.7% < 30 years and 12.6% 30 - 40 years old with mean age of the respondents being 37.4 ± 10.4 years. Female nurses formed the

majority (81.2%) with female to male ratio being 4:1. Over three-quarters (75.4%) of the respondents were married. Approximately 80% of the respondents had diploma degree alone, 14.5% obtained graduate (BSc Nursing) degree along with Diploma degree and 6.3% had other associate degrees as well (Table I). Over half (51.1%) of the respondents had > 10 years of professional (nursing) experience with average years of experience being 14.6 ± 0.7 years, while only 13% of them had > 10 years and two-thirds (68.1%) had < 5 years of wound-care experience with average experience being 4.6 ± 0.4 years. Nearly 40% had specific training on wound care. Nurses stratified by their placement at the time of interview shows that 34.3% were placed in Internal Medicine Unit, 33.8% in Surgery Unit, 14.4% in Emergency Unit. Over two-thirds (68.6%) of the nurses were service nurses, 18.4% were supervisor, 3.9% were intensive care nurses and 8.2% were polyclinic nurses (Table II).

Table I. Distribution of respondents by their demographic characteristics (n = 207)

Demographic variables	Frequency	Percentage	Mean \pm SD
Age (years)			
< 30	78	37.7	
30 - 40	26	12.5	37.4 ± 10.4
\geq 40	103	49.8	
Sex			
Male	39	18.8	
Female	168	81.2	
Marital status			
Married	156	75.4	
Unmarried	51	24.6	
Education			
Diploma alone	164	79.2	
BSc Nursing	30	14.5	
Associate degree	13	6.3	

As a part of assessing the perception (knowledge) of the nurses about "Foot-care", the respondents were asked to write "True" or "False" against the 15 statements described in the questionnaire. The frequency of right and wrong responses with

Table II. Distribution of respondents' profession-related variables (n = 207)

Profession-related variables	Frequency	Percentage	Mean ± SD
Nursing experience (years)			
< 5	52	25.1	14.6 ± 0.7
5 – 10	48	23.2	
> 10	107	51.7	
Wound-care experience (years)			
< 5	141	68.1	4.6 ± 0.4
5 – 10	39	18.8	
> 10	27	13.1	
Wound care training Placement Unit			
Internal Medicine	71	34.3	
Surgery	70	33.8	
Emergency Department	30	14.5	
Intensive Care	22	10.6	
Obstetrics/Neonatal	10	4.9	
Other Units	4	1.9	
Position			
Service nurse	142	68.6	
Supervisor	38	18.4	
Intensive care nurse	8	3.9	
Trainee nurse	2	1.0	
Polyclinic nurse	17	8.2	

In an opinion-seeking questionnaire, there were five options against each question. The recorded opinions were presented in table IV. In a question whether diabetic ulcer treatment is more important than to prevent it, over two-thirds (68.1%) strongly agreed to the statement, 4.8% agreed, 20.3% disagreed and 6.8% strongly disagreed. Majority (93.2%) of the respondents strongly agreed that diabetic ulcers to be assessed regularly, 4.8% disagreed and a few strongly disagreed (1.9%). Asked about whether diabetic ulcer care is too time-consuming 40% strongly agreed, 4.8% agreed, 42.5% disagreed, 4.8% strongly disagreed and some 7.8% neither agreed nor disagreed. Over 30% strongly agreed that diabetic-ulcer care is low a priority task for them, 31.9 and 33.8% disagreed and strongly disagreed respectively to the notion. Approximately 45% of the respondents disagreed and 22.8% strongly disagreed to the statement that they would "avoid caring diabetic ulcers even if they had opportunity to caring for diabetic ulcers". However, 28% of the respondents agreed to the statement. More than 60% strongly agreed and 10.6% agreed that they had enough time to

Table III. Distribution of nurses by true responses to the following statements (n = 207)

Statements	Right responsesn (%)	Wrong responsesn (%)
Neuropathy is the predominant factor responsible for diabetic ulcers	131(63.3)	76(36.7)
Sensory neuropathy results in unnoticed skin damages, which lead to the formation of ulcers	185(89.4)	22(10.6)
Autonomic neuropathy is associated with dry skin, which predisposes to ulcer formation	99(47.8)	108(52.2)
Diabetic neuropathic ulcers are typically found on weight-bearing areas of the foot	187(90.3)	20(9.7)
Diabetic ischemic ulcers are less painful than diabetic neuropathic ulcers	101(48.8)	106(51.2)
Neuropathy can be excluded if the foot skin is cool and pulses are absent	181(87.4)	26(12.6)
The risk of amputation is higher when diabetic foot ulcer is associated with limb ischemia	97(46.9)	110(53.1)
Presence of slough is not an indication of infection in diabetic ulcers	81(39.1)	126(60.9)
Presence of osteomyelitis impairs the healing of diabetic ulcers	181(87.4)	26(12.6)
Wound healing progress is unsatisfactory if the wound bed appears pink	75(36.2)	132(63.8)
Mechanical offloading should be advised to facilitate ulcer healing	103(49.7)	104(50.3)
Hyperbaric oxygen therapy is recommended for ulcer healing even in a well perfused foot	187(90.3)	20(9.7)
Infected, highly exuding wounds should be cleansed daily	203(98.1)	4(1.9)
Iodine dressings are effective for wounds with clinical signs of infection	191(92.3)	16(7.7)
Hydrogel dressings are useful to rehydrate the wound bed and control the moisture in wounds	177(85.5)	30(14.5)

Table IV. Distribution of nurses by their opinion to the following statements

Statements	Frequency	Percentage
Diabetic ulcer treatment is more important than ulcer prevention		
Strongly agree	141	68.1
Agree	10	4.8
Disagree	42	20.3
Strongly disagree	14	6.8
Is it necessary to assess diabetic ulcers regularly		
Strongly Agree	193	93.2
Disagree	10	4.8
Strongly disagree	4	1.9
Diabetic ulcer care is too time-consuming for you to carry out		
Strongly Agree	83	40.1
Agree	10	4.8
Neither agree nor disagree	16	7.8
Disagree	88	42.5
Strongly disagree	10	4.8
In comparison to other nursing care services, diabetic ulcer care is a low priority task for you		
Strongly Agree	63	30.4
Agree	6	2.9
Neither agree nor disagree	2	1.0
Disagree	66	31.9
Strongly disagree	70	33.8
If you have the opportunity, would you like to avoid caring for diabetic ulcers		
Strongly Agree	58	28.0
Agree	11	5.3
Neither agree nor disagree	2	1.0
Disagree	93	44.9
Strongly disagree	43	20.8
Do you have enough time to advise each patient individually on how to look after their ulcers		
Strongly Agree	126	60.9
Agree	22	10.6
Neither agree nor disagree	16	7.7
Disagree	38	18.4
Strongly disagree	5	2.4
Is it not your responsibility to educate patients with diabetic ulcers on how to reduce recurrences		
Strongly Agree	93	44.9
Agree	56	27.1
Disagree	46	22.2
Strongly disagree	12	5.8
Should you think about pain when cleaning diabetic ulcers		
Strongly Agree	139	67.1
Agree	22	10.6
Disagree	44	21.3
Strongly disagree	2	1.0
Do you like to care for diabetic ulcers in your practice		
Strongly Agree	170	82.2
Agree	29	14.0
Neither agree nor disagree	4	1.9
Disagree	4	1.9
Are you satisfied caring for diabetic ulcers		
Strongly Agree	144	69.6
Agree	49	23.7
Disagree	14	6.8

advise each patient individually on how to look after their ulcers. In contrast, 20.8% disagreed or strongly disagreed to the statement. About 45% and 27% of the respondents strongly agreed and agreed respectively that “educating the patients with diabetic ulcers on how to reduce recurrences were their responsibility”. However, 22.2% and 5.8% disagreed & strongly disagreed respectively to the statement. Two-thirds (67.1%) of the respondents strongly agreed and 10.6% agreed that they should think about pain when cleaning diabetic ulcers, which some respondents (22.3%) disagreed. Majority (96.2%) strongly agreed or simply agreed that they are interested to take care of “diabetic-foot” in their professional life. In response to a question whether the respondents were satisfied taking care of diabetic ulcers, 70% nodded they were so. The respondents’ level of knowledge was evaluated in terms Likert scale 0-4 (as described in the Methods section). Accordingly 30% of the respondents had poor, 8% fair, 47.1% average 2.9% satisfactory and 12% highly satisfactory level of knowledge. The mean knowledge score was $72.4 \pm 12.9\%$ (Fig.1).

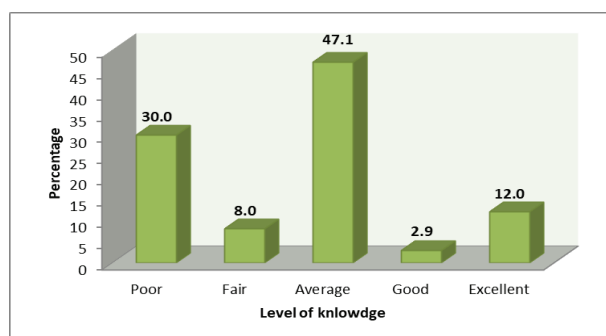


Fig. 1: Distribution of respondents by their level of knowledge about diabetic ulcer

DISCUSSION:

In the present study female respondents formed the main bulk with female to male ratio being 4:1. The present data revealed a wide gender gap, with females comprising a major portion of the interviewed nurses. This pattern of gender disparity has been observed in many nursing studies worldwide¹² and the reason of this disparity might be that the nursing profession is

preferred by the females. Furthermore, approximately 53% of the nurses were older than 30 years of age.

Although the nurses were more experienced in general nursing care, they were not enough skilled in specialized care of “diabetic foot” or “diabetic ulcers” as our data indicate that more than half (51.1%) of the nurses possessed more than 10 years of experience in general nursing care, but only 13% of them had wound care experience of more than 10 years. However, 40% of our nurses had specific training wound care. A similar study conducted in Pakistan showed that 46.8% of the nurses possessed wound care experience of more than 5 years, but not even 1% of their sampled population had received formal wound care training.¹¹ A similar finding was reported by a Swedish study where nurses lacked comprehensive wound care training despite a decade of professional experience.¹³ A study in Ethiopia revealed that more than 90% of participants did not have any wound care training.¹² This is a worrisome finding because a lack of training can serve as a potential barrier for nurses to translate their bookish knowledge on ulcer care into practice.¹⁴

As respondents’ level of knowledge about “diabetic foot ulcers (DFUs)” was evaluated, it was revealed that 47.1% had average, 38% below average (30% poor and 8% fair) 15% had satisfactory or highly satisfactory (2.9% good and 12% excellent) level of knowledge with mean knowledge score being 72.4%. A survey conducted in BIRDEM General Hospital, Bangladesh in 2014 revealed that the mean knowledge score of nurses concerning the prevention of diabetic foot ulcers was only 52.6%.¹⁵ As the current study finding showed a much higher mean knowledge score than the study conducted in the same hospital 6 years back, it clearly indicates improvement in knowledge of the nurses about diabetic foot ulcer care. However, the current level of knowledge revealed by our study is inappreciable because the nurses employed in BIRDEM General Hospital are

expected to possess comprehensive knowledge on diabetic foot ulcer" care, for the hospital is specialized in "diabetes care". In Macdonald's study, a higher proportion of the participants (54%) was adequately knowledgeable (knowledge score ranged from 80-100%).¹⁶

In the present study 80% of the respondents had basic degree (Diploma) alone, 14.5% secured graduate (B Sc Nursing) and 6.3% had other associate degrees as well along with basic degree. Over two-thirds (68.1%) had < 5 years of wound-care experience and nearly 40% had specific training on wound care. In Billal's¹¹ study only 14.0% of the nurses had a basic degree, whereas 53.2% of the participants had wound care experience of 5 or < 5 years. It can also be argued that basic nursing degrees and diplomas are not centered around updated information pertaining to ulcer care.¹⁴

An individual analysis of the knowledge domains revealed that majority of the nurses possessed a good knowledge of ulcer care, although they demonstrated a poor level of knowledge about ulcer characteristics and its complications. The assessment of knowledge on individual assessments can reflect the primary focus of nursing curricula at tertiary care hospitals. The assessment of knowledge on individual items helps assess the primary features of the nurses' routine practices. Only 40% percent of the nurses were aware that slough presence is indicative of infection in diabetic ulcers. Routine practices have been found to influence nurses' clinical acumen and are not commonly updated. This complacency in clinical practice can be attributed to the general lack of knowledge in the nursing workforce.¹⁷

A question intended to evaluate the risk assessment for amputations in diabetic foot ulcers was answered incorrectly by 53% of the nurses, which is quite consistent with the findings of Billal et al.¹¹ An even poor knowledge of risk assessment was reported in a Nigerian study where 73% of participants had incorrect responses.¹⁴ This is in contrast to a multicenter study conducted in Sweden, which reported high scores for risk

assessments in pressure ulcers.¹³ It is eminent that nurses specialize in evidence-based practice to comprehensively prevent and manage diabetic foot ulcers. Over half (50.3%) of the nurses were unaware of the significance of mechanical offloading for the healing of DFUs, which indicates that evidence-based practice has not been emphasized in the nursing curriculum. The study on nurses' knowledge conducted by Sharmistha et al¹⁵ in Bangladesh also agreed that their clinical settings did not primarily focus on evidence-based care.

Several studies have reported a significant link between wound care training and the knowledge possessed by nurses.¹² An Ethiopian study on pressure ulcer prevention observed higher levels of knowledge in nurses who had received formal wound care training.¹² A possible explanation could be greater clinical exposure acquired through training, which facilitates learning. We did not conduct analytical tests to find the associations of nurses' knowledge with gender, professional qualifications, and age. Various nursing studies have explored nurses' self-perception of knowledge and the common sources used by them to enhance their knowledge. In Billal's¹¹ study more than 70% of the nurses identified their knowledge as satisfactory. A potential explanation could be that nurses might not be aware of the limitations in their current knowledge, which may have created a false sense of confidence upon themselves.¹⁸

The present study recognized a positive attitude among nurses towards ulcer care. Several studies have also recognized similar attitudes among nurses towards ulcer care.¹² It has been established that attitude is an important factor in determining the intention of an individual.¹⁷ A positive attitude, for instance, can markedly increase preventive measures for a disease.¹⁹ Nevertheless, it is important to recognize contrasting results. A clinical study done in Saudi Arabia reported unsatisfactory scores for nurses' attitude with 45% of the participants having belief that prevention of ulcers is a time-consuming

process.²⁰ A shortage of staff can push ulcer care and prevention down the priority list, which is reflected in the present study, for one-third of our nurses perceived DFU care as a low-priority task.

CONCLUSION:

The study concluded that nurses generally possess an inadequate level of knowledge pertaining to DFUs, despite a positive attitude towards learning or acquiring knowledge about DFU and its care. Only one in six (15%) nurses had satisfactory or highly satisfactory level of knowledge about DFUs, although they are placed in a specialized Diabetic Hospital since long. A comprehensive educational program focusing on evidence-based practice is deemed necessary to ensure better clinical practices by the nurses. Evidence-based clinical practice relies heavily on research. Nurses should be made aware of the importance of research in their professional practice and be equipped with opportunities and technical know-how to conduct research of their own.

REFERENCES:

- World Health Organization 2007. Definition, diagnosis & classification of diabetes mellitus and its complications: Report of a WHO consultation. Part 1, Diagnosis and classification of diabetes mellitus, Retrieved. 22 May 2014.
- American Diabetes Association, 2011, January 26. Diabetes Statistics. Retrieved from American Diabetes Association, Available from: <http://www.diabetes.org/diabetes-basics/diabetes-statistics/?loc=DropDownDB>.
- IDF. Aguirre F, Brown A, Cho NH, Dahlquist G, Dodd S, Dunning T, et al. Diabetes Atlas. 6th ed. 2013.
- Ramachandran A, Mary S, Yamuna A, Murugesan N, Snehalatha C. High prevalence of diabetes and cardiovascular risk factors associated with urbanization in India. *Diabetes Care* 2008;31(5):893-8.
- Cade WT. Diabetes-related microvascular and macrovascular diseases in the physical therapy setting. *Phys Ther* 2008;88(11):1322-35. doi: 10.2522/ptj.20080008
- Andrew J, Gunne R, Jan A. The global burden of diabetes foot disease. *Lancet* 2005;366:1719-1724. Doi:10.1016/S0140-6736(05)67698-2
- Schaper NC, Andros G, Apelqvist J, Bakker K, Lammer J, Lepantalo M et al. Specific guidelines for the diagnosis and treatment of peripheral arterial disease in a patient with diabetes and ulceration of the foot 2011. *Diabetes Metab Res Rev* 2012;28:1719-1724. Doi: 10.1002/dmrr.2252.
- Centers for Disease Control And Prevention. U.S. national diabetes fact sheet: National estimates and general information on diabetes and prediabetes in the United States. [Internet].2011. [Cited. 4/17/2019];Available from: https://www.cdc.gov/diabetes/pubs/pdf/ndfs_2011.pdf
- Gilpin H, Lagan K. Quality of life aspects associated with diabetic foot ulcers: a review. *The Diabetic Foot Journal* 2008;11:56-62.
- Santos ICRV, Nunes ENDS, Melo CA, Farias DG. Amputations for diabetic foot and social factors: implications for nursing preventive (Article in English, Portuguese). *Northeast Network Nursing Journal* 2011; 12:684-91.
- Bilal M, Haseeb A, Rehman A, Hussham Arshad M, Aslam A, Godil Set al. Knowledge, Attitudes, and Practices Among Nurses in Pakistan Towards Diabetic Foot. *Cureus* 2018;10(7):e3001. DOI 10.7759/cureus.3001.
- Nuru N, Zewdu F, Amsalu S, Mehretie Y. Knowledge and practice of nurses towards prevention of pressure ulcer and associated factors in Gondar University Hospital, Northwest Ethiopia. *BMC Nursing* 2015,14:34. 10.1186/s12912-015-0076-8
- Gunningberg L, Martensson G, Mamhidir AG, Florin J, Athlin AM, Baath C. Pressure ulcer knowledge of registered nurses, assistant nurses & student nurses: a descriptive, comparative multicentre study in Sweden. *Int Wound J* 2015;12:462-468. 10.1111/iwj.12138
- Uba MN, Alih FI, Keveer RT, Lola N. Knowledge, attitude and practice of nurses toward pressure ulcer prevention in University of Maiduguri Teaching Hospital, Borno State, North-Eastern, Nigeria. *Int J Nurs Midwifery* 2015;7:54-60.
- Sharmisthas S, Wongchan P, Hathairat S. A survey of nurses knowledge regarding prevention & management of diabetic foot ulcer in Bangladesh. *BIRDEM Med J* 2014,4:22-26. 10.3329/birdem.v4i1.185492
- Mc Donald ME. Systematic Assessment of Learning Outcomes: Developing Multiple-choice Exams. McDonald ME (ed): Jones & Bartlett Learning, Sudbury, MA; 2002. Bilal et al. *Cureus* 2018;10(7): e3001. DOI 10.7759/cureus.3001 12 of 13
- Moore Z, Price P. Nurses' attitudes, behaviours and perceived barriers towards pressure ulcer prevention. *J Clin Nurs* 2004;13:942-951.

18. Mc Intosh C, Ousey KJ: A survey of nurses' and podiatrists' attitudes, skills and knowledge of lower extremity wound care. *Wounds* 2008,4:59-68.
19. Maylor M, Torrance C. Pressure sore survey part 3: locus of control. *J Wound Care* 1999;8:101-105. 10.12968/jowc.1999.8.3.25856
20. Kaddourah B, Abu-Shaheen AK, Al-Tannir M. Knowledge and attitudes of health professionals towards pressure ulcers at a rehabilitation hospital: a cross-sectional study. *BMC Nursing* 2016;15:1-6.10.1186/s12912-016-0138-6