THE KNOWLEDGE OF DIABETIC FOOT CARE AMONG NURSES AT TEACHING HOSPITAL, KARAPITIYA

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Diabetes Mellitus is a major cause of non-traumatic amputation, and every 30 seconds, a leg is amputated due to 'Diabetic Foot Ulcers' (DFUs) worldwide. 'Diabetic foot care' is essential to reducing diabetic foot complications. Nurses play a vital role in the care and prevention of diabetic foot complications, including 'diabetic foot ulcers'. Also, nurses' adequate knowledge of diabetic foot complications will ensure better patient care. The main objective is to assess the level of knowledge regarding 'diabetic foot care' among the nurses at Teaching Hospital, Karapitiya.

A descriptive cross-sectional survey design was conducted at the Teaching Hospital in Karapitiya. Data were collected using a pretested, validated, self-administered questionnaire that covered demographic factors such as age, gender, professional qualifications, nursing experience, foot care experience, formal training, and knowledge-updating sources, alongside knowledge of 'diabetic foot care'. A total of 100 nurses with more than one year of experience in diabetic foot care were selected through purposive sampling. Non-parametric tests and descriptive statistics were applied for data analysis. The SPSS Statistics 27 software program was used for data analysis.

Of the 100 nurses, only 54% had adequate knowledge of diabetic foot care. The mean of overall knowledge score among nurses was 58.87 (SD = 16.41). Nurses' knowledge of predisposing factors for ulcers is relatively high, with a mean knowledge score of 76.33 (SD = 24.2). However, knowledge regarding the characteristics of ulcers, complications of ulcers, and diabetic ulcer care was relatively low, with the mean scores of 52.66 (SD = 28.88), 53.66 (SD = 27.58), and 53.83 (SD = 20.9), respectively. Additionally, many nurses lacked adequate knowledge of the significance of mechanical off-loading (71%) and appropriate indications for hyperbaric oxygen therapy (73%). However, there was a very weak positive association between nurses' knowledge of diabetic foot care and demographic characteristics. A lack of formal diabetic foot care training was reported by 88%, and workshops were the primary source of information updates for 53% of nurses.

A significant proportion of nurses have inadequate knowledge of diabetic foot care, despite 54% demonstrating adequate knowledge. The lack of adequate training may be responsible for the underdevelopment of fundamental knowledge in diabetic foot care. Therefore, more frequent formal training in diabetic foot care is necessary to ensure nurses attain sufficient knowledge.

Keywords: Diabetic foot care, nurses' knowledge

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1. INTRODUCTION

The most prevalent non-communicable disease in Asia and the rest of the world is diabetes mellitus (Dinesh et al., 2016). Currently, diabetes mellitus is considered a global epidemic currently (Viswanathan, 2010; Cho et al., 2018). Over the past ten years, there has been a remarkable increase in the global prevalence of diabetes (Saeedi et al., 2019; Adeyemi et al., 2021). Diabetes Mellitus has a wide range of complications (Chellana et al., 2012). Among these complications, diabetic foot problems are largely preventable (Boulton et al., 2005; Hillson, 2015). Diabetic Foot Ulcer (DFU) is one of the most common complications associated with diabetic foot issues (Boulton et al., 2005).

Diabetes Mellitus is a major cause of non-traumatic amputation in developing countries, and 40–60% of all lower extremity non-traumatic amputations are performed in diabetic patients globally (Rajamani et al., 2009; Abbas, 2015). A major amputation occurs every 20 seconds globally as a result of DFUs (Ministry of Health: Sri Lanka, 2017). Additionally, Raghav et al. (2018) pointed out that every 30 seconds, a leg is amputated due to DFUs somewhere in the world. There is a 50% chance of re-amputation in the first two years following lower limb amputation, and 50% of patients may not survive three years after the procedure (Norvell and Czerniecki, 2020).) According to Ubayawansa et al. (2016), 37.6% of lower extremity amputations are associated with DFUs. Every seven seconds, a person dies from diabetes-related complications that could have been avoided (Anne and Antonio, 2015). Meanwhile, Kim and Han (2020) claimed that a lack of diabetic foot care awareness and skills contributes to DFUs and non-traumatic amputations. Nurses have a unique role to play in the management of diabetic foot problems, including patient care, health education, ulcer prevention, and rehabilitation (Aalaa et al., 2012). Hence, there is an urgent need to explore the knowledge of diabetic foot care among nurses.

Many studies have been conducted to explore nurses' knowledge of diabetic foot care (Abdullah et al., 2017; Kumarasinghe et al., 2018; Kaya and Karaca, 2018; Buloala and John, 2018; Ng et al., 2020; Abate et al., 2020). Nurses should have adequate and up-to-date knowledge of diabetic foot care to provide better care (Stolt et al., 2015; Sukri et al., 2020). Previous studies have reported that many nurses were involved in diabetic foot care without having adequate knowledge (Haram et al., 2003; Shiu and Wong 2011; Shil, 2013; Qaddumi and Khawaldeh, 2014; Abate et al., 2020). **A** lack of knowledge among nurses regarding diabetic foot care leads to insufficient patient education (Kim and Oh, 2003; Qaddumi and Khawaldeh, 2014). Moreover, studies have identified the relationship between nurses' knowledge of diabetic foot care and the demographic factors of nurses such as nurses' age (Abate et al., 2020), professional qualification (Shil, 2013), duration of experience (Zarchi et al., 2014; Kumarasinghe et al.,2018) and special training opportunities (Waheida et al., 2015; Stolt et al., 2015; Kaya and Karaca, 2018) etc. However, many studies found that nurses working with DFU patients have not received special training in diabetic foot care (Nuru et al., 2015; Buloala and John, 2018; Kumarasinghe et al., 2018).

The main objective of this study is to assess the level of knowledge regarding diabetic foot care among the nurses at Teaching Hospital, Karapitiya. The secondary objective of this study is to identify the relationship between nurses' knowledge of diabetic foot care and their demographic factors such as gender, age, professional qualifications, working experience, diabetic foot care experiences, formal training in diabetic foot care, and the main source of knowledge updates.

2. METHODOLOGY

2.1 Study Design and Setting

The descriptive cross-sectional was conducted at the Teaching Hospital in Karapitiya.

2.2 Study Sample

A total of 100 nurses were selected as the sample of this study through purposive sampling. Inclusion criteria were nurses currently employed in surgical wards and vascular surgical clinics and have been directly involved in diabetic foot care management for more than one year.

2.3 Study Instrument

Data was collected by using a pretested, validated, self-administered questionnaire as used by Bilal et al. (2018), Kumarasinghe et al. (2018), and Ng et al. (2020). This initially was prepared in English before being translated into Sinhala, which is the language most commonly spoken by the majority employed in government hospitals in the country. The questionnaire was scheduled to comprise two sections. The first section of the questionnaire includes the demographic factors related to the participants, such as age, gender, professional qualifications, nursing experience, diabetic foot care experiences, formal training in diabetic foot care, and knowledge-updating sources used by them. By reviewing the appropriate literature on diabetic foot care, the second section of the questionnaire measures nurses' knowledge of diabetic foot complications (Coetzee et al., 2010; Kumarasinghe et al., 2018; Ng et al., 2020). In this section, there were fifteen multiple-choice questions (MCQs) covering the most important topics related to diabetic ulcers: (i) factors that predispose people to ulcers (questions 1-3), (ii) ulcer characteristics (questions 4-6), (iii) ulcer complications (questions 7–9), and (iv) diabetic ulcer care (questions 10–15). These questions had three answer options: "true" and "false".

2.4 Data collection

Prior permission was obtained from the institutional authority of the hospital for data collection. The questionnaires were distributed to each selected participant. On the same day that the questionnaires were delivered, the investigator collected the completed ones. The completed questionnaires were collected within about three hours.

2.5 Data Analysis

The Statistical Package for Social Sciences version (IBM SPSS Statistics 27) software program was used for data analysis. Frequencies and percentages were utilised to describe the demographic variables. Descriptive statistics were used to describe the frequencies, percentages, and means to analyse the knowledge scores. Spearman's correlation coefficient was used to determine the relationship between the knowledge and the demographic factors. Based on the mean score for each of the four domains, nurses' knowledge of wound care was divided into two groups. A knowledge score of $\geq$ mean was categorised as "good knowledge," while a score of $<$ mean was categorised as "poor knowledge."

2.6 Ethical Consideration

Ethical approval was obtained from the Ethical Review Committees of the International Institute of Health Sciences (IIHS). All participants were informed of the objectives of the study, and informed consent was gained from nurses who participated in the study. The privacy and confidentiality of each participant who took part in the study were ensured. Furthermore, all questionnaires were coded and did not bear nurses' names to continue confidentiality.

3. RESULTS

3.1 Nurses' Demographic Factors

Out of the 100 nurses who answered the questionnaire, 84% were female (n = 84), and the remaining 16% were male (n= 16). Half of the sample was in the 31- 40 years age category. According to professional qualifications, 81% held a nursing diploma, and 19% held a nursing degree. The

majority of the participants had 11-20 years of nursing experience, with 53% of respondents having more than 11 years of experience in nursing. In terms of experience in diabetic foot care, many nurses had less than 5 years of experience. Additionally, 88% of nurses had not received formal diabetic foot care training. Workshops were the most commonly utilised method for receiving updates on diabetic foot care. Nurses' demographic characteristics of the nurses are shown in Table 1.

Table 1: Demographic distribution of participating nurses

Variables	n	%	Variables	n	%
Gender			Foot care experience		
Female	84	84.0	below 5 years	42	42
Male	16	16	(6-10) years	28	28
Age (in years)			(11-20) years	22	22
below 30	18	18	More than 20 years	8	8
(31-40)	50	50	Foot care training		
(41-50)	24	24	Yes	88	88
(51-60)	8	8	No	12	12
Professional qualification			Knowledge source on DFC		
Diploma	81	81	Colleagues	8	8
Degree	19	19	Books	13	13
Nursing experience			Internet	18	18
below 5 years	21	21.0	Media	1	1
(6-10) years	26	26.0	Workshops	53	53
(11-20) years	39	39.0	Seniors	6	6
up to 20 years	14	14.0	Family	1	1

3.2 Nurses' Knowledge of Diabetic Foot Care

While 46% of nurses possessed inadequate knowledge, 54% demonstrated adequate knowledge of diabetic foot care (Table 2). The mean score of overall nurses' knowledge was 58.87 (SD = 16.41) (Table 3). Nurses' knowledge of predisposing factors for ulcers was relatively high. The mean knowledge score of predisposing factors for ulcers was 76.33 (SD = 24.2). However, knowledge of the characteristics of ulcers, complications of ulcers, and diabetic ulcer care was relatively low, and the mean scores being 52.66 (SD = 28.88), 53.66 (SD = 27.58), and 53.83 (SD = 20.9) respectively. Also, many nurses did not have adequate knowledge of the significance of mechanical off-loading (71%) and appropriate indications for hyperbaric oxygen therapy (73%) (Table 4).

3.3 Factors Associated with Nurses' Knowledge
It was identified that there is a very weak positive association between nurses' knowledge of diabetic foot care and demographic characteristics. Additionally, there were no significant p-values between nurses' demographic characteristics and their knowledge of diabetic foot care (Table 5).

Table 2: Nurses' knowledge levels on diabetic foot care

Variables	Poor knowledge		Good knowledge	
	n	%	n	%
Predisposing factors for ulcers	55	55%	45	45%
Characteristics of ulcers	45	45%	55	55%
Complications of ulcers	43	43%	57	57%
Diabetic ulcer care	43	43%	57	57%
Total	46	46%	54	54%

Table 3: The mean and standard deviation of nurses' knowledge of diabetic foot care

Variables	Mean	Standard deviation
Predisposing factors for ulcers	76.33	24.2
Characteristics of ulcers	52.66	28.88
Complications of ulcers	53.66	27.58
Diabetic ulcer care	53.83	20.9
Total	58.87	16.41

Table 4: Frequency and percentage distribution of nurses' knowledge of diabetic foot care

Item	Response rate	
	Correct (%)	Incorrect (%)
1. Neuropathy is a predominant factor responsible for diabetic ulcers	76	24
2. Sensory neuropathy results in unnoticed skin damages which lead to the formation of ulcers.	79	21
3. Autonomic neuropathy is associated with dry skin which predisposes to ulcer formation.	74	26
4. Diabetic neuropathic ulcers are typically found on weight-bearing areas of the foot.	71	29
5. Diabetic ischemic ulcers are less painful than diabetic neuropathic ulcers.	43	57
6. Neuropathy can be excluded if the foot skin is cool and pulses are absent.	44	56
7. The risk of amputation is higher when a diabetic foot ulcer is associated with limb ischemia.	85	15
8. The presence of slough is not an indication of infection in diabetic ulcers.	32	68
9. The presence of osteomyelitis impairs the healing of diabetic ulcers.	44	56
10. Wound healing progress is unsatisfactory if the wound bed appears pink.	85	15
11. Mechanical off-loading should be advised to facilitate ulcer healing.	29	71
12. Hyperbaric oxygen therapy is recommended for ulcer healing even in a well-perfused foot.	27	73
13. Infected, highly exuding wounds should be cleaned daily.	52	48
14. Iodine dressings are effective for wounds with clinical signs of infection.	54	46
15. Hydrogel dressings are useful to rehydrate the wound bed and control the moisture in wounds.	76	24

Table 5 Correlation and p-value between demographic factors and nurses' knowledge of diabetic footcare

Demographic Factor	Spearman Correlation	p-value
Gender	0.057	0.833
Age	0.046	0.377
Professional qualification	0.17	0.277
Nursing experience	0.043	0.511
Foot care experience	0.038	0.823
Foot care training	0.093	0.898
Knowledge source	0.023	0.692

4. DISCUSSION

As to the study's findings, 54% of nurses had adequate knowledge, whereas 46% had poor knowledge. Many studies have indicated similar results both locally and globally. Moreover, the mean of overall nurses' knowledge was 58.87 (SD = 16.41). Kumarasinghe et al. (2018) conducted a study in Sri Lanka and revealed that 57.8% of nurses had adequate knowledge of diabetic foot care. In a study from Pakistan, only 54% of the nurses had adequate knowledge of diabetic foot care (Munawar et al., 2019). Additionally, another Pakistani study conducted by Bilal et al. (2018) mentioned that 57% of the nurses had good knowledge of diabetic foot care. A Malaysian study indicated that over 57% of nurses scored an inadequate score in the knowledge section (Ng et al., 2020). Bangladeshi nurses have extremely low knowledge regarding diabetic foot care, according to a survey conducted by Sharmisthas et al. (2014). Furthermore, even though every Jordanian nurse had a degree, they all exhibited remarkably poor knowledge scores (Qaddumi and Khawaldeh, 2014).

Moreover, Oyetunde and Famakinwa reported that the nurses' knowledge in the selected areas of diabetic patient education was inadequate in Nigeria.

In this study, most nurses could not correctly determine mechanical off-loading (71%) and misidentified hyperbaric oxygen therapy (73%). Similar findings were also indicated in studies from other contexts. The studies conducted by Kumarasinghe et al. (2018), and Bilal et al. (2018) reported that nurses did not have adequate knowledge of the significance of mechanical off-loading. Munawar et al. (2019) mentioned that it is widely recognized that nurses with a focus on evidence-based practice are adept at the meticulous prevention and treatment of diabetic foot ulcers.

The results show that most nurses had poor knowledge of predisposing factors to ulcers, while an average number of nurses had good knowledge of ulcer characteristics, ulcer complications, and diabetic ulcer care. This is similar to the findings of Ng et al. (2020), which revealed that the majority of nurses had poor knowledge of predisposing factors to ulcers. However, Kumarasinghe et al. (2018) stated that many nurses possessed a good knowledge of diabetic ulcer care, but their knowledge of ulcer characteristics and ulcer complications was poor.

This study found no significant relationship between nurses' knowledge of diabetic foot care and demographic characteristics such as gender, age, professional qualification, nursing experience, foot care experience, foot care training, and information sources. Similarly, Kumarasinghe et al. (2018) did not identify the knowledge-related factors associated with the nurses' age, professional qualifications, and whether or not they had received wound care training. A few studies done in Bangladesh and Denmark did not identify a correlation between nurses' knowledge level and years of working experience (Sharmisthas et al., 2014; Zarchi et al., 2014). However, Kumarasinghe et al. (2018) and Bilal et al. (2018) emphasized that significant associations were observed between nurses' knowledge and years of nursing experience, as well as years of diabetic ulcer care experience.

5. CONCLUSIONS
Overall, many of the nurses had adequate knowledge of diabetic foot care. However, a significant proportion reported inadequate knowledge. There was no significant relationship between nurses' knowledge and demographic factors. Nurses' lack of knowledge of diabetic foot care negatively impacts the healthcare system. Inadequate training can also be attributed to a lack of fundamental knowledge of diabetic foot care. Therefore, more frequent formal training in diabetic foot care would be needed to ensure adequate knowledge.

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