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Original Research Article

Knowledge, attitude, and practice assessment in diabetic foot ulcer grading: a prospective cohort observational study

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ABSTRACT

Background: Diabetes is a group of disorders marked by chronic high blood sugar due to issues with insulin. It includes type 1, type 2, genetic and drug-induced types, and gestational diabetes. A serious complication of diabetes is diabetic foot ulcers (DFUs), caused by peripheral neuropathy, vascular problems, and infections, which can lead to severe outcomes like amputations.
Methods: A prospective cohort observational study was conducted over six months at a tertiary care teaching hospital involving 163 diabetic patients with foot ulcers, aged 20 to 80. The study assessed knowledge, attitude, and practices (KAP) regarding DFUs using a translated KAP questionnaire. Ulcer grades were classified using the Wagner system. Data were collected on socio-demographic factors, disease-related factors, and practices related to foot care.
Results: This study found most of the participants were under the age group of 41-50, with a higher prevalence of females, and predominantly had type 2 diabetes. Common co-morbidities included hypertension, eye issues, and cardiovascular disease. Ulcer grading showed that most patients had Wagner grade 2 ulcers. Many participants lacked awareness about diabetes-related foot risks. Although most were open to lifestyle changes, many had gaps in foot care, with few following recommended practices.
Conclusions: The study highlights the importance of better patient education and counselling to manage diabetic foot ulcers effectively. Although participants had a positive attitude towards foot care, there were significant gaps in their knowledge and practices. Healthcare providers, including pharmacists, need to improve education and communication to address these issues and help prevent severe complications.

Keywords: Diabetic foot ulcer, Diabetes mellitus, Knowledge attitude and practice assessment, Wagner's grading

INTRODUCTION

Diabetes is a group of heterogeneous disorders characterized by hyperglycemia and glucose intolerance due to insulin deficiency, impaired effectiveness of insulin action, or both.[1] It is classified into four types: type 1, which is insulin-dependent; type 2, which is noninsulin-dependent; type 3, which includes other forms such as genetic defects, diseases of the exocrine pancreas, and drug-induced diabetes; and type 4, which refers to gestational diabetes mellitus. It involves both impaired insulin secretion and action, often leading to hyperglycemia with symptoms like polyuria, polydipsia, weight loss, and blurred vision. Chronic hyperglycemia can cause growth issues, infections, and severe complications such as ketoacidosis, retinopathy, nephropathy, neuropathy, and cardiovascular diseases. The WHO reported 171 million diabetics in 2000, projected to reach 380 million by 2025. In India, diabetes affects 10-12% of urban and 4-6% of rural populations, with an estimated 40 million diabetics in 2007 expected

to rise to 70 million by 2025. By 2030, India, China, and the USA will have the highest numbers of diabetics, with India being the "diabetes capital" of the world.[2] Symptoms of diabetes include increased thirst and urination, hunger, fatigue, blurred vision, numbness, non-healing sores, unexplained weight loss, ketones in urine, and frequent infections. Causes include obesity, excess glucocorticoids, excess growth hormone, polycystic ovary syndrome, insulin receptor mutations, and lipodystrophy.[3] Type 1 Diabetes Mellitus (T1DM) results from genetic predisposition and autoimmune destruction of beta cells, often detected after significant damage. Environmental factors may also contribute, particularly in those with a genetic risk. Type 2 Diabetes Mellitus (T2DM) is linked to genetic factors, such as TCF7L2 variants, and is strongly associated with obesity and inactivity, leading to insulin resistance and high blood glucose levels. Elevated glucagon levels can further worsen hyperglycemia by increasing liver glucose production.[4]

Diabetic foot ulcers are one of the most significant and debilitating complications of diabetes mellitus (DM). The formation of DFUs is traditionally attributed to a combination of factors including oxygen deprivation from peripheral vascular disease, peripheral neuropathy, minor foot injuries, foot deformities, and infections.[2] Approximately 15-25% of diabetic individuals will experience chronic foot or lower extremity ulcers at some point in their lives. The development of these ulcers is influenced by multiple factors, with peripheral vascular disease, neuropathy, and retinopathy being the most significant contributors.[5] It presents a critical global health issue, with a 25% lifetime risk for diabetic patients and contributing to non-traumatic lower-extremity amputations, with one limb lost every 30 seconds worldwide and a high five-year mortality rate of 39% to 80%. In India, although the prevalence is lower at 3% compared to Western countries, the impact remains severe with significant hospitalizations and costs. DFUs are classified into neuropathic, ischemic, and neuroischemic types, with neuroischemia involving both diabetic neuropathy and impaired blood flow. Major risk factors include peripheral neuropathy and peripheral arterial disease (PAD), with additional contributions from smoking, hypertension, and hyperlipidaemia. Effective prevention and management are crucial, as up to 85% of DFU-related amputations can be avoided through better education and preventive care.[2]

The KAP study evaluates a community's understanding, feelings, and actions regarding specific topics, such as hypertension and diabetes. It assesses how well people know about these conditions, their attitudes towards them, and how they apply their knowledge and attitudes in their daily behavior.[6] It identifies essential self-care behaviours such as healthy eating, physical activity, blood sugar monitoring, medication adherence, problem-solving skills, healthy coping, and risk reduction that are linked to better disease management, glycemic control, and overall health quality.[7] Education and awareness about diabetic foot ulcer prevention and care are crucial for effective management and prevention strategies. However, knowledge alone is insufficient; consistent and compliant practice is essential. Despite efforts such as health campaigns and primary healthcare worker education, there is a lack of studies assessing the current awareness levels among diabetic patients. It is estimated that up to 50% of major amputations in diabetics could be prevented with better education and adherence to foot care practices.

This study aims to evaluate the KAP of patients with diabetic foot ulcers, focusing on their understanding and behaviours related to foot care and management. Additionally, the study seeks to classify the severity of diabetic foot ulcers by employing the Wagner classification system, providing insights into the relationship between patient knowledge and the grade of ulcer severity.

METHODS

Study design

A prospective cohort observational study, conducted over a 6-month period from April 2023 to October 2023 at a tertiary care teaching hospital, aimed to evaluate the quality of life for DFU patients by assessing their KAP regarding DFU.

Study population

The study involved 163 participants diagnosed with diabetes and DFU, aged between 20 and 80, including both genders. Exclusion criteria included patients with gestational diabetes and those unwilling to participate. The methodology included a literature review, designing a data entry form, and obtaining hospital consent.

Sample size determination

The sample size was determined using convenience sampling, as it allowed for the inclusion of all eligible patients diagnosed with diabetes and DFU who were available during the study period. This approach ensured a practical and feasible method of data collection, capturing a sufficient number of participants (163) to reflect the target population's characteristics within the 6-month duration, while considering the limitations of time and resources.

Data collection and analysis

Data collection was carried out using a KAP questionnaire, which comprised 21 yes/no questions and 2 scored questions on foot care practices. This questionnaire was translated into the local language and administered through verbal communication. The study also involved assessing ulcer grades using the Wagner classification. Data were collected on socio-demographic

and disease-related factors, and the results were evaluated and analysed. The study protocol was approved by the Institutional Review Board, ensuring that all ethical standards were met.

Microsoft Excel Office 2021 was used for the statistical analysis throughout the study.

RESULTS

Socio-demographic characteristics

This study, involving 163 subjects, reveals that the majority of patients were in the 41-50 years age group (38.05%). Gender-wise, 58.28% were female and 41.71% were male, indicating a higher prevalence of females. Regarding education, 44.17% of patients had secondary education, 34.96% had primary education, 10.42% were graduates, 9.81% were illiterate, and 0.61% were post-graduates. In terms of DM types, 96.93% had type 2 DM, and 3.06% had type 1 DM. Family history of DM was present in 65.64% of the study population (Table 1).

Table 1: Socio-demographic characteristics of diabetes patients.

	Frequency (n=163)	Percentage (%)
Age distribution (in years)		
Less than 20	0	0
21-30	6	3.68
31-40	31	19.01
41-50	62	38.03
51-60	41	25.15
61-70	21	12.88
More than 70	2	1.22
Gender distribution		
Male	68	41.71
Female	95	58.28
Educational status		
Illiterates	16	9.81
Primary	57	34.96
Secondary	72	44.17
Graduate	17	10.42
Post graduate	1	0.61
Type of diabetes mellitus		
Type-I	5	3.06
Type-II	158	96.93
Duration of diabetes mellitus		
Less than 10	99	60.73
11-20	50	30.67
21-30	9	5.52
31-40	5	3.06
More than 40	0	0
Family history of diabetes	107	65.64

Co-morbidities

The co-morbidities observed among diabetic patients were primarily hypertension (40.49%), eye problems (36.80%), cardiovascular disease (7.36%), kidney problems (4.29%), thyroid disorders (3.68%), and other conditions (3.68%). It is represented in (Figure 1).

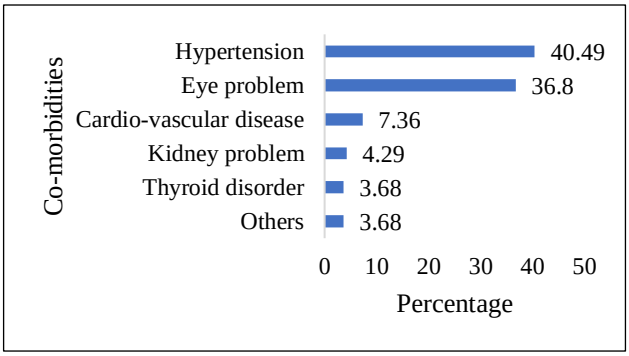

Figure 1: Comorbid conditions in diabetes mellitus patients.

Grading of ulceration

According to the Wagner grading system for foot ulcers in this study, 59 patients had no ulceration, while 104 patients presented with ulceration. Among those with ulceration, 7 patients (4.29%) were grade 1, 49 patients (30.06%) were grade 2, 32 patients (19.63%) were grade 3, 12 patients (7.36%) were grade 4, and 4 patients (2.45%) were grade 5. It is represented in (Figure 2).

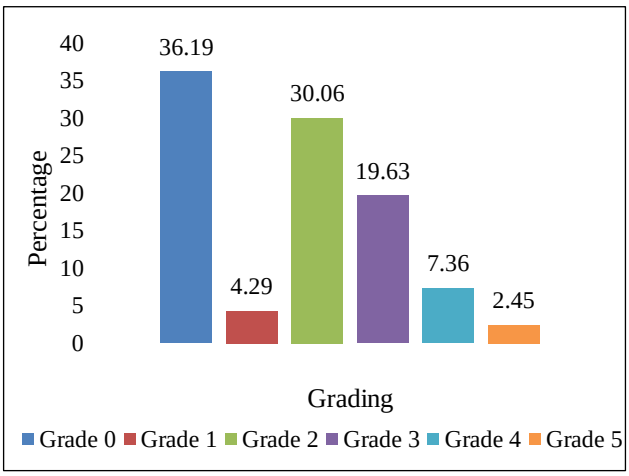

Figure 2: Wagner's grading system for diabetic foot ulcer.

Knowledge assessment on diabetic foot

In our study population, only 60 participants (36.80%) were aware that diabetes can reduce blood flow to the feet, while 103 (63.19%) were not. Additionally, 74 participants (45.39%) knew that diabetes can lead to foot ulcers, and 56 (34.35%) were aware of the potential for

gangrene, with 89 (54.60%) and 107 (65.64%) being unaware of these risks, respectively. Furthermore, 77 participants (47.23%) understood that diabetes could cause a lack of sensation in the feet, whereas 86 (52.76%) did not. Notably, an overwhelming 157 participants (96.31%) were unaware that smoking can reduce blood flow to the feet, and 142 (87.11%) did not know that foot infections can lead to foot wounds, thereby increasing the risk of foot ulcers. It is represented in (Table 2).

Table 2: Knowledge assessment on diabetic foot ulcer.

Knowledge assessment questions	Yes		No	
	Total	%	Total	%
Foot ulcer due to reduced blood flow	60	36.80	103	63.19
Lack of sensation in feet	77	47.23	86	52.76
Foot ulcers	74	45.39	89	54.60
Gangrene risk	56	34.35	107	65.64
Foot care information	142	87.11	21	12.88
Effect of smoking	6	3.68	157	96.31
Loss of sensation and foot ulcers	31	19.01	132	80.98
Reduced blood flow and ulcers	26	15.95	137	84.04
Knowledge on infection and wounds	21	12.88	142	87.11
Way of trimming nail	149	91.41	14	8.58

Table 3: Attitude and practice assessment on diabetic subjects.

Assessment questions	Yes		No	
	Total	%	Total	%
Attitude assessment questions				
Willing to change habits to prevent complications	133	81.59	30	18.40
Self-foot care and regular podiatrist visits	116	71.16	47	47
Willing to use special footwear	144	88.34	19	19
Will you wear footwear indoors	124	76.07	39	39
Leading a normal life with proper management	163	100	-	-
Practice assessment questions				
Foot hygiene	19	11.65	144	88.34
Moisturising	48	29.44	115	70.55
Foot injury check	62	38.03	101	61.96
Podiatrist consultation	18	11.04	145	88.95
Nail care	149	91.41	14	8.58
Shoe/socks marks check	70	42.94	93	57.05

Attitude and practice assessment on diabetic foot ulcer

The attitude questionnaire revealed that 81.59% of participants were open to changing their food habits and exercising regularly to prevent diabetes complications. Additionally, 71.16% recognized the importance of self-foot examination and podiatrist consultations, while 28.83% were unaware of these practices. Furthermore, 88.34% were willing to use special footwear, and 76.07% were willing to wear footwear indoors as recommended by a podiatrist. Notably, 100% believed they could lead a normal life if they managed their diabetes properly, with 95% demonstrating a positive attitude towards foot care. Practice assessment results show that, only 11.65% washed their feet daily, and 29.44% regularly moisturized dry areas. Daily foot injury checks were done by 38.03%, and a mere 11.04% would consult a podiatrist for abnormalities, with most preferring self-management. While 91.41% regularly cut their toenails straight, 57.05% did not check for marks left by shoes or socks. It is represented in (Table 3).

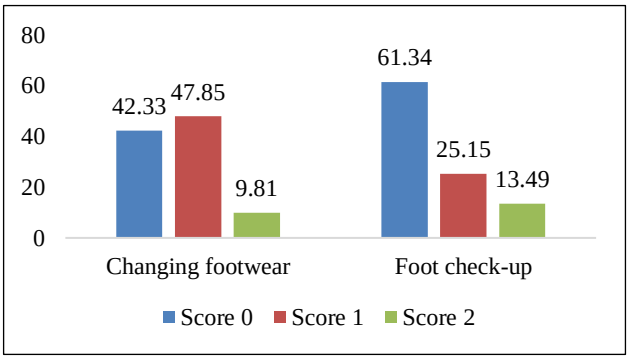

Figure 3: Practice assessment scoring in diabetic foot ulcer.

Note: The scores represent different criteria for "Changing Footwear" and "Foot Check-up" and is represented below: Changing footwear: Score 0-once damaged, Score 1-once in a year, Score 2-more than once in a year. Foot check-up: Score 0-only during illness, Score -once in a year or 6 months, Score 2-once in a month.

Practice assessment scoring

The study found that 42.33% of participants replaced their slippers only when damaged, 47.85% changed them once a year, and just 9.81% replaced slippers two or more times a year. Regarding foot checkups, only 13.49% visited a podiatrist monthly, while 25.15% did so annually, and 61.34% only sought foot care during illness. It is represented in (Figure 3).

DISCUSSION

The development of diabetic foot ulcers is primarily driven by a combination of peripheral neuropathy, peripheral vascular disease (PVD), foot deformities, and reduced resistance to infection. Diabetic neuropathy leads to nerve damage that causes foot deformities, loss of sensation, and skin breakdown, all of which increase the risk of ulcers. PVD exacerbates the problem by reducing blood flow, impairing wound healing, and contributing to ischemia. Other factors such as previous ulcers, poor glycaemic control, and socioeconomic challenges also play significant roles in DFU development.[8]

In our study, we found that females are more affected by diabetic foot ulcers than males. Our study results align with those of Muhammad-Lutfi et al, who also found a higher prevalence of DFU among females.[9] This higher prevalence among women may be influenced by factors such as hormonal changes, a longer duration of diabetes, and potential delays in seeking medical care. The age group of 41 to 60, which is generally at higher risk for DFU, sees an even greater impact. Our study results are relevant to those of Renuga et al, particularly in terms of the higher prevalence of diabetic foot ulcers (DFUs) within the 41 to 60 age group.[10]

Type 2 diabetes emerged as significantly more prevalent among patients with DFU compared to type 1 diabetes in our study. This observation aligns with broader population trends, where type 2 diabetes is not only more common, particularly among older adults, but also associated with a prolonged disease course that predisposes patients to a higher risk of complications.[11] The chronic nature of type 2 diabetes, combined with comorbidities such as obesity, hypertension, and dyslipidaemia, exacerbates the progression of conditions like peripheral neuropathy and PVD, both of which are key contributors to DFU development.[12] The distribution of the ulcer sites among the study population reflected this trend. The majority of patients presented with Wagner grade 0 ulcers, followed by grade 2, and grade 3 ulcers. Fewer patients were classified with grade 1, grade 4, and the most severe, grade 5 ulcers, which is relevant to the study results of Akber et al.[13] These findings highlight the importance of early detection and management of diabetic foot ulcers, as higher Wagner grades are associated with more severe complications and a greater likelihood of amputation.

While assessing the knowledge of the condition among participants, this study found that only 25-35% were aware of diabetic foot care and the risks associated with DFU. In contrast, a substantial 65-75% lacked sufficient awareness and understanding of these crucial aspects. This gap in knowledge mirrors the findings of Hasnain et al, emphasizing the critical need for targeted education and awareness initiatives to improve foot care practices and reduce the incidence of DFUs among diabetic patients.[14] An impressive 95% of individuals demonstrate a positive attitude towards foot care, reflecting a strong commitment to maintaining and enhancing their foot health through proactive practices and awareness. Similarly practice assessment reveals that participants regularly trim their toenails straight, reflecting a generally positive practice that helps prevent ingrown toenails and other foot-related issues. However, there is a significant gap in foot care practices concerning the assessment of potential pressure marks from footwear. Specifically, 93 participants do not check if their shoes and socks leave marks on their feet, while 70 participants actively engage in this practice. This disparity highlights a critical area for improvement, as failing to monitor pressure marks can lead to unnoticed foot problems, such as ulcers or infections, especially in individuals with diabetes or other conditions affecting foot health.

Healthcare providers play a crucial role in enhancing patient awareness and promoting effective foot care practices. Effective communication between healthcare professionals and patients is essential for fostering proper understanding and adherence to foot care protocols. Unfortunately, inadequate patient education often results from suboptimal communication, which can be attributed to the limited time available due to the demanding schedules of healthcare workers. This time constraint, coupled with a lack of structured communication strategies, frequently hinders the comprehensive education of patients. Addressing these challenges by prioritizing patient education and implementing systematic communication methods can significantly improve patient outcomes and promote better foot care practices.[15]

Limitations

This study has certain limitations. The use of a small sample size may limit the generalizability of the findings to a broader population. Additionally, the study was conducted in a single tertiary care hospital, which may not fully represent the diverse patient demographics and healthcare settings.

CONCLUSION

In conclusion, this study highlights the critical need for enhanced patient education and counselling in managing diabetic foot ulcers. Effective counselling plays a pivotal role in improving patient understanding, correcting misconceptions, and promoting better self-care practices. With physicians often constrained by heavy patient loads, clinical pharmacists are well-positioned to address gaps in foot care education. Ongoing support and counselling are essential to improve patient outcomes and reducing the overall healthcare burden associated with diabetic foot ulcers.

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