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Prevalence of peripheral artery disease in patients with infectious diabetic foot ulcer in Imam Reza Hospital in Kermanshah during 2019–2020

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Abstract:

BACKGROUND: Diabetes mellitus (DM) is one of the main public health troubles diabetic foot ulcer (DFU) is one of the most important and relatively common causes of hospitalization. This study investigates the prevalence of peripheral artery disease (PAD) in Imam Reza Hospital of Kermanshah during 2017–2018.

MATERIALS AND METHODS: This study is descriptive-analytical. The study population was 196 cases with infectious DFUs admitted to Imam Reza Hospital of Kermanshah during 2019–2020. The presence or absence of PAD was assessed in these cases. The collected data were analyzed by SPSS software (version 18.0).

RESULTS: Among 196 patients studied, 120 (61.22%) patients had PAD. The prevalence of PAD was higher in men than in women and it was more common in Type 2 DM patients than in Type 1 DM patients. The majority of ulcers were located on the nonplantar surface of the foot. Moreover, the prevalence of PAD had a significant relationship by increasing the duration of diabetes ($P = 0.041$), history of amputation ($P = 0.002$), history of diabetic foot ($P = 0.006$), and peripheral neuropathy ($P = 0.005$).

CONCLUSION: A considerable number of diabetic patients with DFU had PAD. This necessitates more intense interventions to manage PAD as a strong risk factor for DFU in diabetics. Neurovascular assessment of diabetic patients and early diagnosis of PAD may be appropriate interventions to prevent development of DFUs. We recommend trial studies to find out the best methods to address early detection of PAD in diabetics.

Keywords:

Diabetes, diabetic foot ulcer, peripheral artery disease

Introduction

Diabetes mellitus (DM) is characterized by high levels of blood sugar and alternation in the metabolism of carbohydrate, fat and protein lead to dysfunction of eyes, kidneys, cardiovascular, and nervous system. Over the past decade, the incidence of diabetes has increased by about 6% annually and the world has

faced an epidemic of diabetes.^[1] The World Health Organization (WHO) predicts that by 2025, adults with diabetes will reach 300 million.^[2] DM is the most common causes of chronic renal failure and amputation in which diabetic foot account for 70% of all limb amputations.^[3] According to the WHO, a diabetic foot ulcer (DFU) has the potential for complications such as ulceration and wound infection as well as

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vascular and neurological defects, is termed diabetic foot.^[4]

In modern countries, 20% of health-care resources are an exclusively DFU. In developing countries, not only the problem is common but also treatment costs are even up to 40% of the resources allocated to health.^[5] DFU affects about 25% of patients throughout their lives and cost the health system about \$ 28,000. The average hospitalization of these patients is 4 weeks in Iran in which 15%–20% requiring amputation. Risk factors for DFU include diabetes for more than 10 years, peripheral artery disease (PAD), peripheral neuropathy, dialysis, previous amputation, ulcer, poor blood sugar control, male gender, foot deformity, and visual impairment.^[6] DFU can present under the form of cellulite, myositis, abscess, necrotizing fasciitis, and osteomyelitis and eventually lead to lower extremity amputation. In half of the DFU, 18 months after amputation, the remaining limbs leads to an infectious lesion, and 3 to 5 years after the first amputation, 50%–65% of amputations occur in the other organs.^[7]

DFU evaluation requires careful examination of clinical histories, examinations, and procedures. Proper screening of diabetic patients has a significant role in preventing lesions and their treatment.^[8]

Clinical examinations are essential for an effective treatment plan. For all diabetic patients, physicians should be examined at least once a year by their physician, even if they do not complain of foot problems.^[9,10]

Obviously, in patients with DFU, these examinations should be done further, although there is no specific universal guideline. Imaging X-ray, vascular, and neurological examinations are also used as a contributor to aid in a more accurate diagnosis and evaluation of lesions. In diabetic patients, who have symptoms of DFU, a simple X-ray of the foot will help.^[11] If there is evidence of foot ischemia in the history or clinical examination, a noninvasive vascular examination is recommended. Nerve conduction velocity is not needed for most cases if careful clinical examination is performed. On the other hand, most patients with neuropathic wounds have severe sensory neuropathy that can be easily detected on clinical examination.^[12]

Rapid diagnosis and control of foot ulcer factors in diabetic patients are consequential. An annual examination of the lower extremities should be carried out on these clients. The evaluation of small and large arterial blood flow is performed by physical examination, vascular Doppler ultrasound, and oxygen pressure measurement.^[13] Controlling blood sugar and stopping smoking can slow the progression of vascular disease

and neuropathy. Vasodilators such as calcium-channel blockers as well as aspirin and pentoxifylline are effective. Infected foot ulcer is one of the most common complications of diabetes that approximately 25% of people develop it throughout their lives. PAD is present in more than half of diabetic foot patients.^[14] Therefore, with regards to the significance of the problem, identifying and treating PAD is a significant necessity in diabetic foot patients and is one of the most important strategies in reducing amputation.^[15] Therefore, the present study aimed to investigate prevalence of PAD in patients with infectious DFU in Imam Reza Hospital in Kermanshah during 2019–2020.

Materials and Methods

This study was a descriptive-analytical study. The study population was 196 patients with DFU presented to Imam Reza Hospital in Kermanshah during 2019–2020. All patients were recruited in the study with written agreement and were assessed by an international protocol that incorporated the diagnosis, treatment, and determination of vascular status. At first, a list was created that included variables such as age, sex, heart failure, end-stage renal disease, PAD, wound size, peripheral neuropathy, and type of diabetes, duration of diabetes, history of DFU, wound location, and amputation histories from the patients' records. If the diagnosis of PAD was confirmed by arterial Doppler ultrasound, the patient underwent angiography and revascularization if necessary. Topical dressing and wound debridement were also performed. Diabetes control procedures were performed for all patients, and appropriate antibiotics were administered as well as vasodilators, such as calcium blockers and pentoxifylline have been recommended in the treatment of wound ischemia.

The collected data were entered into SPSS Statistics software (version 23.0, SPSS Inc., Chicago, IL, USA). Statistical analysis was performed. As most data were scored as categories, the data are expressed as frequencies. Comparisons between groups were made using the Chi-square (χ^2 test); statistical significance was defined as a $P < 0.05$.

The study protocol was reviewed and verified by the Research Deputy of Kermanshah University of Medical Sciences (Code: 97263).

Results

The prevalence of peripheral artery disease

Our result demonstrated that between 196 clients, 120 cases (61.22%) had PAD, which indicates there is a significant relationship between DFU and PAD ($P < 0.05$).

Sex and age and outcome

The prevalence of PAD in each group was evaluated, and the results were analyzed in SPSS software. Between 196 patients, 67 (34%) were female and 129 (66%) were male. According to the report, the prevalence of PAD in patients with DFU was higher in men than women, but there was no significant relationship between the variables. In addition, our study reveals that from 196 patients, 168 (85.71%) were over 45 years and 28 (14.2%) were between 25 and 45 year. According to the results, the prevalence of PAD was higher in the 55–65 ages than other groups and there was a significant relationship between the age of patients and prevalence of PAD ($P < 0.05$) [Figure 1].

Type and the duration of diabetes, site of ulcer and the duration of wound incidence and outcome

It was demonstrated that from 196 patients, 5 (2.55%) had Type 1 diabetes and 191 (97.45%) had Type 2 diabetes, respectively. There was a significant relationship between the prevalence of PAD and Type 2 diabetes ($P < 0.05$).

Furthermore, the prevalence of PAD according to the duration of diabetes (year) was studied separately, 62 cases had diabetes over 10 years and 41 cases had 5–10 years, and 17 cases had <5 years, respectively. There was a significant relationship between the variable and the prevalence of PAD ($P < 0.05$).

In this study, the locations of the wounds were divided into three sections: Plantar, nonplantar, and heel. The prevalence of PAD in each group was assessed separately. The prevalence of PAD was 68 in the plantar foot, 41 in the nonplantar foot, and 11 cases in the heel, respectively. The highest prevalence of PAD in DFU was in the heel and nonplantar area, but there was no significant relationship between the variables.

Moreover, the duration of wound incidence was divided into; <1 week, 1 week to 3 months, and more than 3 months. The prevalence of PAD was evaluated in each group separately. According to the results, the highest duration of ulcer in patients with PAD was between 1 week and 3 months with significant relationship between the variables ($P < 0.05$) [Table 1].

Wound size and outcome

In our study, 196 patients with DFU were divided into three groups based on the size of the wound and then the prevalence of PAD in each group was analyzed. None of the patient had below 1 cm, 66 cases had 1–5 cm, and more than 54 cases had 5 cm wound size. There was a significant difference between the wound size and PAD variables ($P < 0.05$).

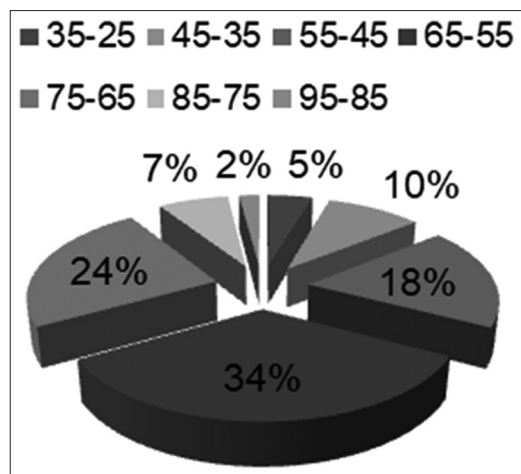


Figure 1: The prevalence of diabetic foot ulcer according to age

Table 1: The prevalence of peripheral artery disease based on type and the duration of diabetes (year); wound location and the duration of wound incidence

Variables	PAD, prevalence (%)		P
	Negative	Positive	
Type of diabetes			
Type 1	4 (80)	1 (20)	0.075
Type 2	72 (37.7)	119 (62.3)	
Sum	76 (38.78)	120 (61.22)	
Duration of diabetes (years)			
<5	22 (56.4)	17 (43.6)	0.041
5-10	21 (33.9)	41 (66.1)	
>10	33 (34.7)	62 (65.3)	
Sum	76 (38.78)	120 (61.22)	
Wound location			
Plantar (not heel)	35 (34)	68 (66.1)	0.751
Nonplantar	38 (48.1)	41 (51.9)	
Heel	3 (21.42)	11 (78.57)	
Sum	76 (38.78)	120 (61.22)	
The duration of wound incidence			
<1 week	8 (61.5)	5 (38.5)	0.046
1 week to 3 months	59 (35.8)	105 (64.2)	
>3 months	9 (47.4)	10 (52.6)	

PAD=Peripheral artery disease

Concurrent factors (peripheral neuropathy, history of diabetic foot ulcer, history of amputation, presence of heart failure, and chronic renal failure)

Our study demonstrated that from 196 patients, 139 cases (70.91%) had peripheral neuropathy, 110 (56.12%) had the history of DFU, 49 (25%) had the history of amputation, 47 (23.97) had the presence of heart failure and 43 (21.93%) had chronic renal failure. The history of amputation in DFU was the most important factor in the concurrent variables of PAD and there was a significant relationship between the variables ($P < 0.05$) [Table 2].

Table 2: The distribution of PAD in patients with diabetic foot ulcer according to the desired variables

Valuable	PAD, prevalence (%)		P
	Negative	Positive	
The presence of chronic kidney failure			
Positive	16 (37.2)	27 (62.8)	0.811
Negative	60 (39.2)	93 (60.8)	
History of DFU			
Positive	33 (30)	77 (70)	0.006
Negative	43 (49.4)	43 (50.6)	
History of amputation			
Positive	10 (20.4)	39 (79.6)	0.002
Negative	66 (45.2)	81 (54.8)	
The presence of heart failure			
Positive	14 (29.8)	33 (70.2)	0.147
Negative	62 (41.6)	87 (58.4)	
Peripheral neuropathy			
Positive	44 (31.9)	95 (68.1)	0.005
Negative	32 (53.7)	25 (46.3)	

DFU=Diabetic foot ulcer, PAD=Peripheral artery disease

The outcome of each of the 196 ulcers was noted after a minimum follow-up, 40 patients 33.33% underwent angiography and revascularization procedure. Several factors prevented PAD patients from angiography included: High patient creatinine, drug sensitivity, as well as neuropathy in heel ulcer cases, and diffuse atherosclerosis in the lower extremity vessels.

Discussion

The aim of the present study was to assess the prevalence of DFU in Imam Reza hospital in Kermanshah. This study was performed on 196 patients with infectious DFUs.^[16] In our study, 120 cases (61.22%) had PAD, which indicates there is a significant relationship between DFU and PAD.^[17] In patients with DFU, the prevalence of PAD varies substantially between several studies; ranged from 10% to 60%.^[18,19]

Similar to Franklin *et al.* who found a higher prevalence of neuropathy in men, we found differences between men and women for neuropathy. Our results have shown that 66% of patient was male that could be a reflection of the male/female ratio of new foot ulcers occurring in the community. Our study was also consistent with Franklin *et al.* that demonstrated 73% of DFU patients were male with the average age of 64.3 years and National Center for Diabetes and Endocrinology in 2012, which indicate that 49% of patients were men.^[20] As observed in other studies, the prevalence of neuropathy increased with age. In another study carried out by Fincke *et al.*, the different types of DFU were more common in men and the average age of the patients was 68.1 years. This is due to the fact that men pay less attention to self-care.^[21]

As expected, 2.55% of patients had Type 1 and 97.44% had Type 2 diabetes in this study that demonstrates a significant relationship between the prevalence of PAD and Type 2 diabetes ($P < 0.05$). We revealed that the duration of diabetes had also a significant effect on the outcome of DFUs. Among 196 clients, 65.3% of patients had diabetes for more than 10 years showing that the rate of DFU and peripheral artery involvement was significantly increased by the duration of diabetes. Our finding was consistent with the previous study carried by Dehkhoda *et al.* that reported 68.75% of patients had diabetes for more than 10 years.^[22] Previous studies have demonstrated the inhibitory effects of diabetes and the duration of diabetes may be as important as overall blood glucose control.^[23] In contrast, a study of diabetic patients attending hospital clinics reported an overall prevalence of 32% in Type 2 diabetic patient. Unfortunately, Hospital clinic-based studies may not reflect the true prevalence of lower-extremity complications in diabetic patients in the community and this is especially true of Type 2 diabetic patients. In contrast to Type 1 diabetic patients, a large proportion of Type 2 diabetic patients (50% of whom are aged over 65 years) are cared for in the community by their general practitioners.^[24]

Our overall prevalence rate of the wound area is similar to that observed in Prompers *et al.*, which the ulcers are mainly based on heel and nonplantar area and are associated with more extensive tissue loss as they were also deeper and larger. Moreover, the duration of the wound had a significant effect on the prevalence of DFU. According to the results, the highest duration of ulcer in patients with PAD had a significant relationship ($P < 0.05$). Furthermore, 66 cases (57%) had 1–5 cm and more than 54 (43%) cases had 5 cm wound size with a significant difference between the wound size and PAD ($P < 0.05$).^[16]

In our study, among 196 patients, 49 (25%) had the history of amputation, 47 (23.97%) had the presence of heart failure and 43 (21.93%) chronic renal failure in the past with significant relationship between variables ($P < 0.05$). Al Kafrawy *et al.* revealed that 42% of patients had a history of previous amputation.^[25] In the present study, 70.91% of patients had neuropathy and there was a significant relationship between neuropathy and PAD. Forouzandeh *et al.* revealed that 23.9% of the patients had neuropathy whether Bakri *et al.* denoted that this percentage is 14.9%.^[14,26] Our finding was consistent with the results of above studies, and therefore, the presence of vasculopathy may be an important risk factor for predicting the need for amputation in diabetic patients.

According to Marie DFU, diabetes is the most common reason for hospitalization and is often the main cause

of amputation.^[17] In the present study, 51 (25%) patients had amputation and 40 (33.33%) angiography was performed. These results, reflecting the average patient with a DFU in Kermanshah, contain an important message: Many patients with DFUs are severely ill, and this is reflected by the severe underlying pathology and the presence of disabling comorbidity.^[25,27,28] Follow-up data on these patients, could give us more insight into the implications of the severity of this disease for clinical outcome, resource utilization and quality of life. Fluorescence angiography is a safe, rapid, reproducible and time-effective minimally invasive procedure that provides objective data on the functional perfusion to a region of interest on the lower extremity and was done in 33.33% of patients and prevented from limb amputation. Results of this vascular assessment are valuable when data from other studies are limited.

Conclusion

In this study, all patients were evaluated by an infectious disease specialist and a specialist in the vascular surgeon, which is one of the strengths of this study. One of the limitations in this study is the lack of extensive native studies within this field to allow comparisons of study. Hence, further studies are recommended in the future, and it is recommended to increase the accuracy of study results with higher sample size, There are also several studies on the relationship between the pattern of peripheral arterial involvement and risk factors for DFU to reduce the deleterious effects of DFU in society and reduce the incidence of amputation. It is recommended that in future studies the role of education of diabetic patients by health-care providers regarding early recognition of neurovascular complications of DM be investigated.

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Conflicts of interest

There are no conflicts of interest.

References

1. Tol A, Sharifirad G, Shojaezadeh D, Tavasoli E, Azadbakht L. Socio-economic factors and diabetes consequences among patients with type 2 diabetes. *J Educ Health Promot* 2013;2:12.
2. Frykberg R, Habershaw G, Chrzan I. Epidemiology of the diabetic foot: Ulcerations and amputations. In: Veves A, editor. *Contemporary Endocrinology: Clinical Management of Diabetic Neuropathy*. Totowa, NJ: Humana Press 1998; 1998. p. 273-90.
3. Freikberg RG. Diabetic foot disorders: A clinical practice guideline. *J Foot Ankle Surg*. 2006;45:S1-66.
4. Reiber G, Boyko E, Smith D. Lower extremity foot ulcers and amputations in diabetes. In: Harris M, Cowie C, Stem M, editors. *Diabetes in America*. 2nd ed. Washington DC: NIH Publication; 1995. p. 409-28.
5. Mohammadi M, Ziapoor A, Mahboubi M, Faroukhi A, Amani N, Hydarpour F, Anbari SZ, Esfandnia A. Performance evaluation of hospitals under supervision of kermanshah medical sciences using pabonlasoty diagram of a five-year period (2008-2012). *Life Sci J*. 2014;11:77-81.
6. Abbott CA, Vileikyte L, Williamson S, Carrington AL, Boulton AJ. Multicenter study of the incidence of and predictive risk factors for diabetic neuropathic foot ulceration. *Diabetes Care* 1998;21:1071-5.
7. Walters DP, Gatling W, Mullee MA, Hill RD. The distribution and severity of diabetic foot disease: A community study with comparison to a non-diabetic group. *Diabet Med* 1992;9:354-8.
8. Ramsey SD, Newton K, Blough D, McCulloch DK, Sandhu N, Reiber GE, *et al.* Incidence, outcomes, and cost of foot ulcers in patients with diabetes. *Diabetes Care* 1999;22:382-7.
9. Holzer SE, Camerota A, Martens L, Cuedon T, Crystal-Peters J, Zagari M. Costs and duration of care for lower extremity ulcers in patients with diabetes. *Clin Ther* 1998;20:169-81.
10. Kaboudi M, Dehghan F, Ziapour A. The effect of acceptance and commitment therapy on the mental health of women patients with type II diabetes. *Ann Trop Med Public Health* 2017;10:1709-13.
11. Larijani B, Forouzandeh F. Diabetic foot disorders. *Iran J Diabet Metabol* 2003;2:93-103.
12. Muthiah A, Kandasamy R, Nagulan S, Madasamy A. A study on diabetic foot and its association with peripheral artery disease. *Int Surgery J* 2017;4:1217-21.
13. Elgzyri T, Larsson J, Thörne J, Eriksson KF, Apelqvist J. Outcome of ischemic foot ulcer in diabetic patients who had no invasive vascular intervention. *Eur J Vasc Endovasc Surg* 2013;46:110-7.
14. Forouzandeh F, Aziz Ahari A, Abolhasani F, Larijani B. Evaluation of foot neurovascular status in diabetic patients referred to diabetes clinic of Dr. Shariati Hospital, 2003-2004. *Iran J Diabet Metabol* 2005;4:43-51.
15. Mashayekhi M, Larijani B, Mohajeri M, Rambod K. Frequency of amputation in patients with diabetic foot ulcers were hospitalized in Shariati Hospital in 2002-2011 years. *Iran J Diabet Lipid Disord* 2013;12:543-54.
16. Prompers L, Schaper N, Apelqvist J, Edmonds M, Jude E, Mauricio D, *et al.* Prediction of outcome in individuals with diabetic foot ulcers: Focus on the differences between individuals with and without peripheral arterial disease. The EURODIALE study. *Diabetologia* 2008;51:747-55.
17. Azar FE, Solhi M, Darabi F, Rohban A, Abolfathi M, Nejhadadgar NJD. Effect of educational intervention based on PRECEDE-PROCEED model combined with self-management theory on self-care behaviors in type 2 diabetic patients. *Diabet Metabo Syndrome: Clin Res* 2018;12(6):1075-8.
18. Abbott CA, Carrington AL, Ashe H, Bath S, Every LC, Griffiths J, *et al.* The north-west diabetes foot care study: Incidence of, and risk factors for, new diabetic foot ulceration in a community-based patient cohort. *Diabet Med* 2002;19:377-84.
19. Hinchliffe RJ, Forsythe RO, Apelqvist J, Boyko EJ, Fitridge R, Hong JP, Katsanos K, Mills JL, Nikol S, Reekers J, Venermo M. Guidelines on diagnosis, prognosis, and management of peripheral artery disease in patients with foot ulcers and diabetes (IWGDF 2019 update). *Diabetes/Metabolism Research and Reviews*. 2020;36:e3276.
20. Franklin GM, Shetterly SM, Cohen JA, Baxter J, Hamman RF. Risk factors for distal symmetric neuropathy in NIDDM. The san luis valley diabetes study. *Diabetes Care* 1994;17:1172-7.
21. Fincke BG, Miller DR, Turpin R. A classification of diabetic foot infections using ICD-9-CM codes: Application to a

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- large computerized medical database. *BMC Health Serv Res* 2010;10:192.
22. Dehkhoda S, Arianpour N, Akbarzadeh M. Evaluation of effective factors in treatment outcome of diabetic foot in diabetic patients referring to Taleghany Hospital-Tehran from. *Ann Militar Health Sci Res* 2011;9:99-104.
 23. Lavery LA, Armstrong DG, Peters EJ, Lipsky BA. Probe-to-bone test for diagnosing diabetic foot osteomyelitis: Reliable or relic? *Diabetes Care* 2007;30:270-4.
 24. Kumar S, Ashe HA, Parnell LN, Fernando DJ, Tsigos C, Young RJ, *et al.* The prevalence of foot ulceration and its correlates in type 2 diabetic patients: A population-based study. *Diabet Med* 1994;11:480-4.
 25. Al Kafrawy NA, Mustafa EA, Abd El-Salam AE, Ebaid OM, Zidane OM. Study of risk factors of diabetic foot ulcers. *Menoufia Med J* 2014;27:28.
 26. Bakri FG, Allan AH, Khader YS, Younes NA, Ajlouni KM. Prevalence of diabetic foot ulcer and its associated risk factors among diabetic patients in Jordan. *Jordan Med J* 2012;171:1-16.
 27. Dinh MT, Abad CL, Safdar N. Diagnostic accuracy of the physical examination and imaging tests for osteomyelitis underlying diabetic foot ulcers: Meta-analysis. *Clin Infect Dis* 2008;47:519-27.
 28. Schade V, Andersen C, Omana-Daniels R. How fluorescence angiography illuminates the potential for limb salvage. *Podiatr Tod* 2015;28:20-4.