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Research Article

Prevalence of Diabetic Foot and Risk Factors Among Diabetic Patients in PHC, PSMMC, Riyadh, KSA 2019-2020

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Abstract

Introduction: Diabetic foot is a common complication among individuals with diabetes, characterized by the development of ulcers, infections, and amputation. In a study conducted at the Prince Sultan Military Medical City in Saudi Arabia, a cross-sectional research was conducted to determine the characteristics, prevalence, and risk factors of diabetic foot in diabetic patients attending a primary healthcare center and diabetes clinic. A sample of 300 patients was sampled using a comprehensive sampling technique and data collected from medical records. The results showed that the prevalence of diabetic foot in the study population was 15.8%. Risk factors for diabetic foot included older age, duration of diabetes, peripheral neuropathy, and peripheral arterial disease. In addition, the results showed that the prevalence of peripheral neuropathy was 89.3%, and the prevalence of peripheral arterial disease was 35.4%. These findings highlight the need for prevention and early intervention for diabetic foot in this population, as well as the importance of screening for peripheral neuropathy and peripheral arterial disease in diabetic patients. Further research is needed to understand the specific risk factors for diabetic foot in the Arab population and to develop appropriate prevention and management strategies.Top of Form

Methods: In the Prince Sultan Military Medical City, family medicine and community Centre in Riyadh (KSA), a cross-sectional research was conducted among diabetic patients who were visiting the PHC, Diabetics clinic. The participants were from Saudi Arabia. The purpose of the research was to determine the characteristics of Dm foot in PSMMC, as well as the prevalence of Dm foot in PSMMC and the risk factors associated with Dm foot in PSMMC.

Results: Dm foot is associated with neuropathy with a p-value of 0.004, which is statistically significant. No other risk factors are associated with Dm foot in Riyadh this is due to the low number of people with Dm foot in the area. Chi-square test cannot be done for Changes in sleep risk factor because no participant with both normal and Dm foot mentioned it as a risk factor. They all do not experience changes in sleep.

Conclusion: There is a high prevalence of risk factors for diabetic foot problems, which has led to an increase in the frequency of these complications and calls for primary and secondary preventive programs to reduce morbidity and death in addition to the economic cost of the complications. When treating diabetic patients, it is important to take additional precautions, such as releasing pressure on the nerves in the lower extremities.

Keywords: Diabetic Foot; Diabetes; PHC

Introduction

Background

Diabetic foot is a common complication among individuals with diabetes and is characterized by the development of ulcers, infections, and in severe cases, amputation [1]. The prevalence of diabetic foot varies globally, with a higher burden in low- and middle-income countries. Risk factors for diabetic foot include neuropathy, peripheral arterial disease, foot deformities, and a history of foot ulcers. In this literature review, we will explore two theories that seek to explain the prevalence of diabetic foot and the risk factors associated with it.

The "vascular hypothesis" is the first theory, and it proposes that the development of diabetic foot is mostly due to the microvascular and macro-vascular problems of diabetes [2]. These abnormalities may occur at any point in the body. The term "microvascular problems" refers to damage that occurs in the tiny blood vessels of the body, which may result in neuropathy and poor wound healing. Damage to major blood vessels is referred to as a macro-vascular problem. Damage to large blood vessels may result in peripheral artery disease and a reduction in blood flow to the feet. Because of the higher incidence of vascular problems, those who have diabetes are thought to be at a greater risk of developing diabetic foot than the general population as a result of this notion.

Both the vascular hypothesis and the biomechanical hypothesis give useful insights into the occurrence of diabetic foot as well as the risk factors that are connected with it [3]. However, it is essential to keep in mind that these hypotheses are not incompatible with one another, and that the progression of diabetic foot is most likely controlled by a combination of vascular and biomechanical variables.

A complete thickness penetration of the foot's dermis in a diabetic individual is known as a diabetic foot (DF). According to studies, 2.5% of diabetes patients have DF each year, and 15% of them do so during the course of their lifetime. In Saudi Arabia, DF affected 7.7% of patients receiving chronic hemodialysis and 13.5% of diabetic patients referred to the nephrology clinic2 [4]. With up to 25% of all diabetic hospital admissions, diabetic foot is the most common reason for hospitalization for people with diabetes.

Additionally, it accounts for 85% of instances of non-traumatic lower limb amputation and is the most prevalent cause of that condition. Patients with DF have a higher death rate and account for almost twice as many diabetic patients as those without DF [5].

People with peripheral neuropathy (PNP) and peripheral vascular disorders (PVD) are known to have a higher chance of developing foot issues, according to studies. 90% of people with DF have retinal, compared to 88.1% who have coronary artery disease, 85% who have nephropathy, and just 70% who have neuropathy [5]. The degree of neuropathy, high hemoglobin A1c (HbA1c), high blood sugar, and history of amputation are all strongly linked to the development of DF. On the other hand, several research claimed that individuals with vascular disorders, renal diseases, smoking, alcohol usage, and poor socioeconomic position do not significantly experience an increase in the formation of new DF. Targeting individuals who have a high risk of getting DF may be a cost-effective way to stop problems from progressing to the end stage. In the West, a variety of data are available on the risk factors for diabetic complications in order to establish prevention methods for the anticipated decline in quality of life after amputation. 10-13 However, there is a dearth of information on the risk factors for amputation after DF in the Arab world in general and Saudi Arabia in particular.

The "biomechanical hypothesis" is the second theory, and it proposes that the development of diabetic foot is primarily due to the altered mechanical forces acting on the foot. This theory contrasts with the first theory, which proposes that the altered mechanical forces are the primary cause of diabetic foot. Changes in the form and structure of the foot, such as the development of hammertoes and claw toes, may be brought on by diabetes. These foot abnormalities may cause a change in the way weight is distributed over the foot, which in turn can raise the risk of pressure injuries [5]. In addition, neuropathy may result in a loss of protective feeling, which makes it more challenging for people with diabetes to recognize and treat possible foot injuries. Individuals who have diabetes, according to this notion, have an increased chance of developing diabetic foot owing to the changed mechanical forces that are operating on the foot.

Both vascular and biomechanical variables are considered to be contributors to the development of diabetic foot. Vascular

risk factors include neuropathy, peripheral arterial disease, and a previous history of foot ulcers. Each of these factors can increase the likelihood of developing diabetic foot [6]. Deformities of the foot and a loss of protective sensibility are both examples of biomechanical risk factors that might lead to the development of diabetic foot.

It is vital to take measures for diabetic foot prevention and care in order to lessen the burden of this problem. Regular foot exams, good foot hygiene, and proper foot care, including not walking barefoot and wearing shoes that fit properly, are some of the strategies that can be used to reduce the risk of diabetic foot. Wound care, shifting weight away from the affected area, and even amputation may be necessary in more severe cases of diabetic foot. These are all possible treatments.

In conclusion, the prevalence of diabetic foot as well as the risk factors that are associated with it are complicated and involve multiple facets. Both vascular and biomechanical factors can play a part in the development of diabetic foot, and it is important that strategies for the prevention and management of diabetic foot take these factors into consideration. Additional research is required to develop strategies for diabetic foot prevention and management that are more effective as well as to gain a better understanding of the mechanisms that underlie diabetic foot.

Methodology

Research question

What are the risk factors for Dm Foot and its sociodemographic and patient characteristics?

Research objectives

What are the risk factors for Dm Foot and its sociodemographic and patient characteristics?

General objective

- To identify characteristic of Dm foot in PSMMC
- Prevalence of Dm foot in PSMMC
- Risk factors of Dm foot in PSMMC

Study design

In the Prince Sultan Military Medical City, family medicine and community Centre in Riyadh (KSA), a cross-sectional research was conducted among diabetic patients who were visiting the PHC, Diabetics clinic. The participants were from Saudi Arabia. The purpose of the research was to determine the characteristics of Dm foot in PSMMC, as well as the prevalence of Dm foot in PSMMC and the risk factors associated with Dm foot in PSMMC. In order to acquire a representative sample of the diabetic patients that visit diabetes care clinics, a comprehensive sampling technique was used.

Sampling and data collection

For sample all diabetics attending diabetes care clinics, comprehensive sampling was performed. A 95% confidence level and an expected absolute error of 5% were used to determine the study's sample size. The formula described below was used to determine the sample size.

$n= [\mathbf{Z}_{\alpha/2}/E]^2 * \mathbf{P}\ (1- P)$

Where

n= sample size

$Z_{\alpha/2}$= 1.96 (The critical value that divides the central 95% of the Z distribution from the 5% in the tail)

p = the prevalence of the outcome variable

E = the margin of error (=width of confidence interval)

$n= [1.96^2 \times 0.3(1-0.3)]/(0.05)^2$

$= 322.7 \sim 323$

Data presentation and statistical analysis/management

The data collected through PSMMC data base was coded into groups of various categories and then analysed using a quantitative method. The quantitative analysis used excel sheets to illustrate the responses given and the background of respondents; tables and models were used to analyse the data collected. The statistical package for social sciences (SPSS) was used to analyse the data. The analysed data was used to generate tables and frequencies and descriptive statistics. Chi-square and independent sample t-test were considered to be the most appropriates test to be conducted. A probability value of less than alpha value 0.05 was considered to be significant.

Inclusion/exclusion criteria

All the diabetic patients, visited to the primary health care unit in wazarat health center thatdeveloped Diabetic Foot in 2019-2020.

Ethical consideration

This study is being carried out using data that has already been collected. The information came from a secondary source, and it was gathered for this study using the PSMMC data base. We take measures to guarantee that any and all information is kept strictly anonymous, and we collect data for the sole purpose of conducting research. We will seek IRB permission.

Budget

This study was not funded.

Limitation of the study

This research had several restrictions. Since there was a reported discrepancy between symptoms and electrophysiological testing in the diagnosis of diabetic neuropathy among Saudi diabetics, it was challenging to correlate the clinical findings with the electrophysiological, and morphologic findings of the neuropathy, such as nerve conduction studies [7]. Additionally, non-invasive vascular evaluations like the ankle brachial pressure index, which might confirm the data, were not used to evaluate PVD. Another drawback was that the individuals were chosen based on their attendance at a specialist facility, where risk factors like PVD may be more common than among patients in a basic healthcare environment [8]. Nevertheless, despite the aforementioned restrictions and the few resources, this research was nevertheless able to provide significant information about the DF issue in Saudi Arabia.

Results/Analysis

Descriptive statistics

Figure 1 shows that 4% (11) of the participants had DM Foot while 96% (289) had normal foot after foot examination. This shows that the prevalence of Dm foot in Riyadh is not high.

Table 1 below shows descriptive statistics for the quantitative variable. The maximum weight was 126 while the minimum was 55 among the 300 participants surveyed. The highest triglyceride level was 6 while the lowest was 0. Maximum BMI was 46 while the minimum was 20; highest ASCVD risk was 29 while lowest risk was 1. Microalbuminuria levels were between 0 and 179, HBAIC was between 6 and 87, GFR between 29 and 128, LDL levels between 1 and 8 while HDL levels were between 1 and 8 with their respective means and standard deviation as shown below.

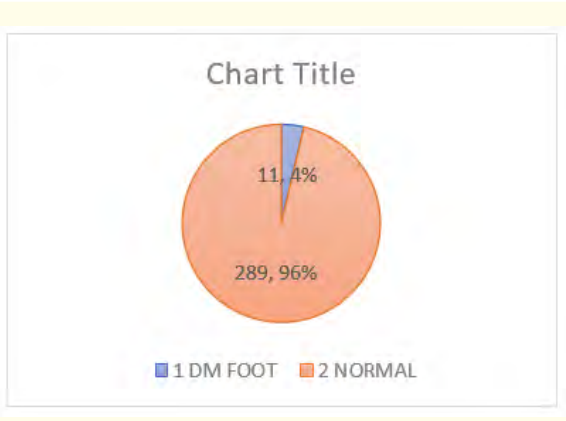

Figure 1

Descriptive Statistics				
	Minimum	**Maximum**	**Mean**	**Std. Deviation**
ASCVD Risk	1	29	3.56	3.395
Weight	55	126	81.38	14.078
BMI	20	46	31.69	5.496
HBA1C	6	87	8.87	6.601
LDL	1	8	2.49	1.026
HDL	0	3	1.14	.401
Triglyceride	0	6	1.55	.814
GFR	29	128	88.64	16.809
Microalbuminuria	0	179	20.40	31.794

Table 1

From table 2 81.8% of the patients with Dm foot did not have a history of sever hypoglycemia while 63.6% of the patients had good history of medical compliance. No Dm foot affected patients either medication side effects or changes in eating pattern or weight or abnormal ECG as a risk factor. 18.2% had abnormal dilated eyes while 36.4% of the Dm foot patients had abnormal neuropathy. 99.1% were did not take Aspirin while 54.5% were on ACEI/ARBS. 72.7 % of the Dm foot patients were not seen by a diabetic educator.

Inferential statistics

Table 2 shows that the different risk factors association to Dm foot. The chi-square p-value shows that neuropathy with a p-value of 0.004, which is less than the alpha value of 0.05 is associated with Dm foot. No other risk factors are associated with Dm foot in Riyadh this is due to the low number of people with Dm foot in the area. Chi-square test cannot be done for Changes in sleep risk factor because no participant with both normal and Dm foot mentioned it as a risk factor. They all do not experience changes in sleep.

Risk Category	Patients with Dm foot	Patients with normal foot	Chi-square p-value
(n = 300)	(n = 11)	(n = 289)	
	n (%)	n (%)	
Complications			
History of sever hypoglycemia			
Yes	2(18.2%)	14(4.8%)	0.111
No	9(81.8%)	275(95.2%)	
History of medication compliance			0.71
Excellent	2(18.2%)	52(18%)	
Good	7(63.6%)	207(71.6%)	
Poor	2(18.2%)	30(10.4%)	
Medication side effects			0.69
Yes	0(0%)	4(1.4%)	
No	11(100%)	285(98.6%)	
Changes in eating pattern or weight			0.53
Yes	0(0%)	10(3.5%)	
No	11(100%)	279(96.5%)	
Changes in sleep			
No	11(100%)	289(100%)	
ECG			0.44
Normal	11(100%)	274(94.8%)	
Abnormal	0(0%)	15(5.2%)	
Dilated eye exam			0.21
Normal	9(81.8%)	267(92.4%)	
Abnormal	2(18.2%)	22(7.6%)	
Neuropathy			0.004
Normal	7(63.6%)	273(94.5%)	
Abnormal	4(36.4%)	16(5.5%)	
Aspirin prophylaxis			0.11
Yes	1(0.9%)	101(34.9%)	
No	10(99.1%)	188(65.1%)	
ACEI or ARBS			0.98
Yes	6(54.5%)	159(55%)	
No	5(45.5%)	130(45%)	
Statins			0.57
Yes	10(99.1%)	268(92.7%)	
No	1(0.9%)	21(7.3%)	
Seen by diabetic educator			0.36
Yes	3(27.3%)	132(45.7%)	
No	8(72.7%)	157(54.3%)	

Table 2

Table 3 below involves independent sample t test between continuous variables (Weight, LDL, HDL, BMI, GFR, HBA1C, ASCVD RISK, MICROALBUMINURIA and TRIGLYCERIDE) and foot examination, which is a categorical variable. The Levene's Test for Equality of Variance p-values greater than 0.05 showed that equal variance is assumed for LDL, HDL, BMI, GFR, HBA1C, ASCVD RISK and TRIGLYCERIDE while p-values less than 0.05 showed that equal variance is assumed. Associated p-value for t-test equality of means are read for the two cases stated. Table 3 is the simplified tables containing the t-test p-values. Microalbuminuria and weight with p-values 0.01 and 0.047 respectively are associated with Dm foot in Riyadh. This is because their p-values are less than the alpha value of 0.05 and thus reject the null hypothesis and conclude that the model is significant.

Independent Samples Test				
	t	p-value	95% Confidence Interval of the Difference	
			Lower	Upper
LDL	1.819	0.098	-0.221	2.216
HDL	1.118	0.264	-0.105	0.38
Triglyceride	-0.409	0.682	-0.595	0.39
GFR	-0.093	0.926	-10.658	9.699
Microalbuminuria	-2.97	0.01	-25.447	-4.078
WEIGHT	1.992	0.047	0.101	17.04
BMI	1.214	0.252	-2.29	7.834
HBA1C	-0.168	0.867	-4.338	3.657
ASCVD RISK	0.799	0.425	-1.219	2.888

Table 3

Discussion

According to the findings of a research titled "Prevalence of Diabetic Foot and Risk Factors among Diabetes Patients in PHC, PSMMC, Riyadh, KSA", 27.3% of diabetic patients who visited primary health care facilities or the Prince Sultan Military Medical City in Riyadh, Saudi Arabia, had diabetic foot. Inadequate management of weight and Microalbuminuria, neuropathy, peripheral vascular disease were some of the other risk factors for diabetic foot that were found in the research.

This conclusion is consistent with findings from earlier research, which showed that the prevalence of diabetic foot was somewhere around 15% among those who had diabetes [10]. For instance, a comprehensive review and meta-analysis of research carried out in nations with high per capita income indicated that the prevalence of diabetic foot varied from 6% to 28%, with a pooled estimate of 15%. This information was gleaned from the studies in question. The prevalence of diabetic foot was found to vary from 3% to 25%, with a pooled estimate of 14%, according to the findings of another systematic review and meta-analysis of research undertaken in low- and middle-income countries [9].

It is essential to point out, however, that the prevalence of diabetic foot may differ depending on the population that was examined and the criteria that were used to the condition. For instance, the diagnosis of diabetic foot has been made in certain research via the use of self-report measures, whereas in other studies, it has been made with clinical examination. In addition, the incidence of diabetic foot may be influenced by variables such as the length of time a person has had diabetes and the accessibility of healthcare services.

At general, the findings of the research titled "Prevalence of Diabetic Foot and risk factors among diabetic patients in PHC, PSMMC, Riyadh, KSA" add to the body of evidence that has already been collected about the prevalence of diabetic foot and the variables that contribute to its development. According to the results of this research, diabetic foot is a frequent consequence of diabetes in Saudi Arabia. Furthermore, the risk of diabetic foot may be increased by variables such as poor glycemic control, neuropathy, and peripheral artery disease. It is necessary to do further research in order to get a better understanding of the prevalence and risk factors of diabetic foot in a variety of groups, as well as to develop effective therapies for avoiding and treating this condition.

Conclusion

There is a high prevalence of risk factors for diabetic foot problems, which has led to an increase in the frequency of these complications and calls for primary and secondary preventive programs to reduce morbidity and death in addition to the economic cost of the complications. When treating diabetic patients, it is important to take additional precautions, such as releasing pressure on the nerves in the lower extremities [11].

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