

Risk Factors for Diabetic Foot Complications

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Abstract: ***Background:** Foot complications are common in diabetic patients and are considered one of the most expensive diabetes (DM) complications to treat. The aim of this study was to determine the prevalence and risk factors for foot complications. **Methods:** The study was conducted by interviewing random diabetic patient at outpatient and inpatient department at King Fahad Hospital Hofuf (Saudi Arabia) during 2013/2014. All completed an interviewer-administered questionnaire and underwent medical assessment including foot examination and assessment of presence of peripheral neuropathy (PN) and peripheral vascular disease (PVD). **Results:** 50% of the study populations were diagnosed to have DM without presenting with symptoms of diabetes and 34% had hypertension. The majority (90%) had type 2 DM. Of the total sample, 38% had Peripheral Neuropathy and 13% had Peripheral Vascular Disease. 5% had different level of lower extremities amputation. Significant factors for Peripheral Neuropathy and Peripheral Vascular Disease were: male gender, poor level of education, increased duration of diabetes, type 2 DM and presence of hypertension. **Conclusion:** Diabetic foot complication increasing with increased duration of the disease, accompanied by other diseases and lack of personal hygiene.*

Keywords: Diabetic Foot, Complication, Risk factors, Saudi Arabia, Alahsaa

1. Background

Peripheral neuropathy (PN) and peripheral vascular disease (PVD) are well known common long-term complications of diabetes, and although a proportion of people with PN and PVD have severe and debilitating pain, many are asymptomatic. However, despite the lack of symptoms, people with PN and PVD are known to be at high risk of foot complications including foot ulceration, infection and amputation. PN and PVD are the main causes of non-traumatic lower limb amputation.

Complications affecting the lower limbs are among the most common manifestations of diabetes; it was reported that 15% of diabetic patients will eventually suffer from foot ulceration during their lifetime. These complications are a frequent cause of hospitalization and disability; with 1 in 5 hospitalizations among diabetics directly related to foot ulcers. Moreover, according to some conservative estimates, the treatment costs of these complications account for approximately 25% of total hospital costs of diabetes care, the true costs of which might be an order of higher magnitude.

It is generally upheld that effective prevention of diabetic foot requires in-depth knowledge of the pathogenesis and clinical correlates of the complication; neither of which is well understood so far.

Targeting patients at increased risk for developing foot ulcer is believed to constitute a cost effective strategy to control progression to end stage complications. Evidence in the literature suggests that the early detection and treatment of diabetic foot complications could reduce the prevalence of ulceration by 44% to 85%.

2. Methods

2.1 Overall Design

100 patients were interviewed randomly during their visit to outpatient and inpatient department.

2.2 Data Collection

After receiving informed consent, diabetic patients were interviewed about DM type, duration, treatment profile, level of control, presence or absence of chronic DM complications including previous ulcer/amputation of the lower limbs and presence of vascular symptoms of cramps and/or claudications, neuropathic symptoms of tingling, numbness, and burning sensation with a 'stocking and glove' distribution.

Both feet were examined for signs of vasculopathy and neuropathy including skin status (color, thickness, dryness, cracking, trophic changes, decreased hair growth), the nail status (color, thickness, trophic changes), and the presence of deformities (such as claws and hammer toes), edema, infection, ulceration, callus and blistering. Gangrene and amputation were also noted.

PN was assessed by vibratory, monofilament, muscle strength and tendon reflex testing. Pressure, pain, vibration and joint position sensitivities were evaluated bilaterally. For pressure perception, the 10 g Semmes-Weinstein monofilaments was used on 4 sites of the foot. These sites were without callus, notably the pulps of the hallux and metatarsal heads of first, third and fifth toes. The site was considered sensate if the patient responded, "yes" upon contact with the monofilament and insensate if there was no response.

For vibration perception, a 128 Hz tuning fork was applied at 3 sites on the foot, the pulp of the hallux, the lateral and the medial malleoli. The patient was asked to describe what he felt. If he/she described a feeling of vibrations, the site concerned was considered normal. If he/she described anything other than vibrations, the site concerned was considered abnormal. In addition, pin-prick perception (using standard neurotips) on the dorsal surface of the great toe and the index finger were evaluated. Neuropathy was further assessed by examining the tendon reflexes bilaterally and testing for muscle strength by examining for extension of the knee and dorsiflexion of the foot.

Diabetic Neuropathy Symptoms (DNS) along with the Diabetic Neuropathy Examination scores were used together to define and assess neuropathy. Neuropathy was considered to be present if DNS score was >0 and/or the DNE score was >3. Lower limb ischemia was ascertained by the examining physician through palpation of the dorsalis pedis and the tibialis posterior pulses when one or more foot pulses were judged absent with or without symptoms of lower-limb claudication and/or amputation or gangrene were present.

2.3 Information that was collected or assessed of each subject in our study includes

Gender, Age, Nationality, Duration of diabetes, Treatment, Compliance, Coexisting disease, History of lower limb surgery, Intermittent claudication, Rest pain, Neuropathic symptoms, History of trauma, Previous hospitalization, Local examination. University of Texas classification, Right foot examination, Left foot examination, Peripheral pulses, Femoral Popliteal, Dorsalis pedis, Posterior tibial, Ankle brachial index, transcutaneous pa O₂, Neurological examination: pressure, Vibration, Foot deformities and Amputation

2.4 University of Texas classification:

This classification used during the study

	0	I	II	III
A	No open lesion	Superficial ulcer	Ulcer deep to fascia, tendon or joint	Ulcer penetrating joint or bone
B	+infection	+infection	+infection	+infection
C	+ischemia	+ischemia	+ischemia	+ischemia
D	+ischemia and infection	+ischemia and infection	+ischemia and infection	+ischemia and infection

2.5 Statistical Analysis

Data were analyzed using the Statistical Package for Social Sciences (SPSS) software.

3. Result

The descriptive analysis of the sample showed that 55% were males, 40% were aged 60 years or above, 100% were Saudi and most of patients (63%) were illiterate. Of the total sample 12.8% were current smokers.

Of the total sample, 38% had PN and 13% had PVD. Trophic skin and nail abnormality were present in 3% of the sample population and symptoms including cramp-like-pain in legs or feet, tingling, numbness, and burning sensations with a "stocking and glove distribution" were frequently reported in 35% of them. 5% of the total sample had different levels of foot amputation and only one case had previous history of lower extremity ulceration.

4. Discussion

It is known that PVD and PN are potential risk factors for foot complications. Indeed, with the high prevalence rates of DM and the high rates of PVD and PN among patients which has been revealed in this study, it is vital to observe for diabetes foot complications.

The results of this study showed that the overall prevalence of PN was 38%, which was higher than the equivalent rates reported in other populations. Comparatively, the rate revealed for PVD (13%) was far lower than that reported in other populations. However, the fact that 35% of the sample population reported to have symptoms of neuropathy and/or vasculopathy and 3% had trophic skin and nails, is a clear indication that they are at increasing risk of developing foot complications in the future. The high prevalence of PN compared with the relatively low prevalence of PVD in the study population can be due to methodological biases for diagnosing neuropathy. Although the sensitivity and specificity of the DNS score were high when defined using other standard clinical methods. However, symptom scores may be less reliable due to their subjectivity.

The results also showed that history of previous leg ulceration, deformity, gangrene and amputation were infrequently reported in the population; an issue which might reflect a systematic sampling bias due to the fact that the majority of the sample populations (82%) were recruited from outpatient department.

The main risk factors for PN and PVD and thus potentially for foot complications were male gender, poor level of education, increased disease duration (10–12 years), type 2 DM, presence of hypertension. The results are consistent with findings elsewhere. It is known that the risk of ulcers and lower limb amputations is higher in males, in patients with diabetes duration of 10 years or more, those who have poor glycemic control or have other cardiovascular, retinal or renal complications.

Indeed, the fact that the majority of the surveyed population (63%) were illiterate and that 62% of them were of poor glycemic control and the fact that poor foot care is common among patients.

Similarly, the analysis revealed that hypertension is the only modifiable risk factor for PVD in the study population, and the result is consistent with findings elsewhere.

5. Conclusion

The study emphasizes the importance of early detection for PVD and PN among diabetic patients using simple methods.

As with early detection you can intervene to minimize the complication.

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