

Original Article



Assessment of Foot Ulcer and Peripheral Neuropathy in Diabetic Patients

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Abstract

Background: One of the most common complications of diabetes mellitus in lower extremity is the diabetic foot ulcer. There are numerous risk factors, among those peripheral neuropathy is the most important risk factor for diabetic foot ulceration.

Objectives: To assess the diabetic foot ulcer, probable risk factors and the relationship of diabetic foot ulcer with peripheral Neuropathy.

Materials and methods: This cross sectional study was done in the department of General Surgery, Rangpur Medical College Hospital, Rangpur, Bangladesh between May, 2015 to November 2015. 50 patients with diabetic foot ulcer were selected by purposive sampling method.

Results: In this study, 60% of patients were above 60 years of age. 82% of patients were male and 18% were female. All patients were with uncontrolled diabetes mellitus and 80% of patients had blood glucose level between 11-20 mmol/L. HbA1c level found >7 in 68% of patients. 72% patients had history of trauma. 66% of the patients were smoker. None of the patients was alcoholic. Peripheral arterial disease was present in 24% patients. 72% patients had peripheral neuropathy.

Conclusion: This study may help to raise the awareness among patients and professionals, ultimately which will help to take initiatives for early diagnosis and treatment of high risk patients.

Key words: Diabetes mellitus, Diabetic foot ulcer, Peripheral neuropathy, Unperceived trauma

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Introduction

Diabetes mellitus is one of the most common non-communicable diseases globally. The prevalence of diabetes is increasing day by day. In 2014, the IDF estimated that 8.2% of adults aged 20-79 (387 million people) were living with diabetes, this compares with 382 million people in 2013, and the number of people with the disease was projected to rise beyond 692 million in 2035.¹ The diabetic foot ulcer is one of the most common complications of diabetes mellitus. The diabetic foot is defined as infection, ulceration and/or destruction of deep tissues associated with neurological abnormalities and various degrees of peripheral vascular disease (PVD) in the lower limb in patients with diabetes.² Risk factors identified for diabetic foot ulceration include peripheral neuropathy, vascular disease, limited joint mobility, foot deformities, abnormal foot pressures,

minor trauma, a history of ulceration or amputation, and impaired visual acuity.³ Approximately 45% to 60% of all diabetic ulcerations are purely neuropathic, while up to 45% have neuropathic and ischemic components.⁴

An internationally agreed simple definition of diabetic peripheral neuropathy (DPN) is, “the presence of symptoms and/or signs of peripheral nerve dysfunction in people with diabetes after the exclusion of other causes.”⁵ Peripheral sensory neuropathy in the face of unperceived trauma is the primary factor leading to diabetic foot ulceration.⁶ Motor neuropathy resulting in anterior crural muscle atrophy or intrinsic muscle wasting can lead to foot deformities such as foot drop, equinus, hammer toe, and prominent planter metatarsal heads,⁷ all has been implicated as a contributory cause of ulceration. The European Diabetes

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Prospective Complication Study reported that the development of DPN was highly correlated with both the duration and the level of HbA1c.⁸

Early detection of foot pathology, especially in high risk patients, can lead to earlier intervention and thereby reduce the potential hospitalization and amputation.⁹

Bangladesh is among the top 10 countries having the most number of people with diabetes¹. Rangpur is one of the lesser developed region of Bangladesh. Study information about foot ulcer and peripheral neuropathy in diabetic patients of this area is not available. This study was done for assessment of foot ulcer and peripheral neuropathy in diabetic patients that may help to early diagnosis and treatment of high risk patients that can lessen the period of hospital stay and lower the economic and social burden effectively and thus improve the quality of life.

Materials and methods

This cross sectional study was done in the department of General Surgery, Rangpur Medical College Hospital, Rangpur, Bangladesh between May, 2015 to November 2015. 50 patients with diabetic foot ulcer were selected by purposive sampling method. Main outcome variables were age of the patients, sex of the patients, duration of diabetes mellitus, status of diabetes, history of trauma, history of smoking, presence of peripheral neuropathy, peripheral vascular disease, random blood glucose level, HbA1c level. Physical examination was done to assess ulcer, presence of peripheral neuropathy or peripheral vascular disease. Peripheral vascular disease was assessed by palpation of peripheral pulses. Peripheral neuropathy was assessed by simple clinical methods, i.e. pin prick, cotton and tuning fork. After collecting information, data was checked, verified for consistency and edited for finalized result and presented in the form of Tables and charts.

Results

The number of the patients in this study was 50. Most of the patients (60%) with diabetic foot ulcers were above 60 years of age (Table-I). Most (82%) of the patients were male (Table-II). All of the participants described their status of diabetes mellitus as uncontrolled (Figure-1). The duration of diabetes is more than 10 years in majority of patients (Table-III). 80% of patients had random blood sugar level between 11-20 mmol/L (Figure-II). Estimation of HbA1c was done in 50 patients and HbA1c level was found more than 7 in 68% of patients (Table-IV). Out of 50 patients, 72% patients had the history of trauma and 28% patients were not exposed to trauma(Figure-III). 66% of the patients were smoker. None of the patients was alcoholic.

Among the peripheral arterial pulsations, pulsation of arteria dorsalis pedis was absent in 12 patients (24%),either in right or left side, other peripheral pulsations were present in all patients (Table-V). Peripheral neuropathy was assessed by presence or absence of superficial pain, light touch and vibration sensation. Most of the patients (72%) had peripheral neuropathy (Table-VI).

Table I: Age distribution of patients (n=50)

Age in years	Number of patients	Percentage (%)
18 -40	2	4
41 -60	18	36
>60	30	60

Table II: Sex distribution of patients (n=50)

Sex	Number of patients	Percentage (%)
Male	41	82
Female	9	18
Total	50	100

Figure 1: Distribution of patients by status of diabetes mellitus(n=50)

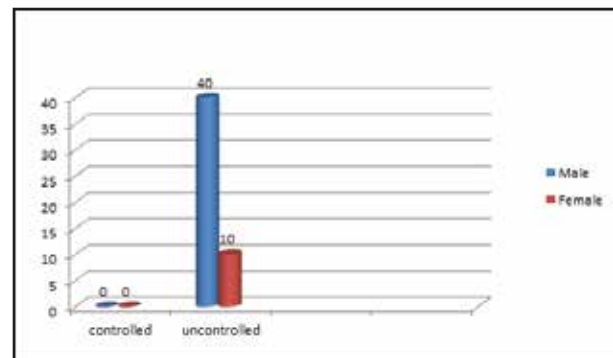


Table III: Distribution of patients by duration of diabetes mellitus(n=50)

Duration (in Years)	Number of patients	Percentage (%)
<5	6	12
5-10	20	40
>10	24	48

Figure 2: Random blood sugar level of the patients (n=50)

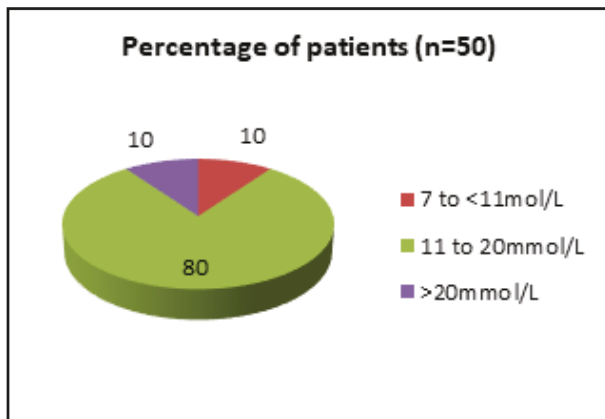


Table IV: Distribution of HbA1c among patients (n=50)

HbA1c level (in %)	Number of patients	Percentage (%)
<7	16	32
>7	34	68

Figure 3: Distribution of patients with history of trauma (n=50)

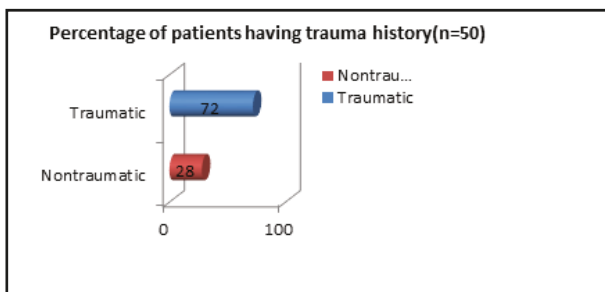


Table V: Distribution of patients by presence and absence of peripheral pulses (%)

Pulse	Right		Left	
	Present	Absent	Present	Absent
Arteria dorsalis pedis	92%	8%	84%	16%
Posterior tibial artery	100%	-	100%	-
Popliteal artery	100%	-	100%	-
Femoral artery	100%	-	100%	-

Table VI: Distribution of patients with peripheral neuropathy (n=50)

Changes	Number of patients	Percentage (%)
Loss of sensation	36	72
No loss of sensation	14	28

Discussion

Diabetes mellitus is a chronic metabolic disorder which is associated with numerous metabolic complications. An estimated 15% of patients with diabetes will develop a lower extremity ulcer during the course of their disease.¹⁰ Diabetic peripheral neuropathy (DPN) is the most common presentation of neuropathy in diabetes.

This study was conducted in the General Surgery Department of Rangpur Medical College Hospital between May, 2015 to November, 2015. As the study period was short, the sample was reduced to 50. Patients with diabetic foot ulcer were selected by purposive sampling method. In the 50 diabetic foot patients studied, 41 were men (82%) and 19 were women (18%) which is comparable with the study done by Bansal E et.al¹¹ (78.64% men and 21.36% women). Increased prevalence of diabetic foot ulcer in male may be due to increased exposure of males to trivial trauma to the foot whereas females are mostly indoors. Most of the patients belong to >60y age group (60%). In Bansal E et.al.¹¹ among those with diabetic foot ulcer 56.31% were in the age group of 51-70 years. Steffen C et.al,¹² in their study showed that the average age of patients with diabetic foot was 60 years.

The duration for which patient is suffering from diabetes is directly related to the degree of wounds and also indirectly making the patients more vulnerable to the complications of diabetes. In this study, 48% patients suffered from DM for >10 years. In Bansal E et.al,¹¹ 48.54% had diabetes mellitus for more than 10 years which is comparable to our study.

In this study, 80% of the patients had random blood sugar in between 11-20 mmol/L, 10% patients RBS 7-11 mmol/L and another 10% patients had >20 mmol/L. These results do not match with Bansal E et.al,¹¹ where random blood sugar >20 mmol/L was found in 67% patients. By measuring glycosylated hemoglobin (HbA1c), we are able to get an overall picture of patient's average blood sugar levels over a period of months. The higher the level of HbA1c, the greater the risk of developing diabetes related complications. In this study, HbA1c level was >7 in 68% of patients. In the study done by Bansal E et.al,¹¹ HbA1c was found >7 in 64% of patients. 72% of patients in this study had history of trauma that proclaims that minor trauma is also a vital risk factor for developing diabetic foot ulcer. Peripheral arterial disease rarely leads to foot ulcerations directly. However once ulceration develops arterial insufficiency will result in prolonged healing, imparting on elevated risk of ampu

tation.¹³ Among the study population, arteria dorsalis paedis was not palpable in 24% of patients, other peripheral pulsations were present in all patients. 24% of patients were hypertensive in this study. In Shahi SK et.al,¹⁴ the prevalence of hypertension was 29%.

In this study, 72% patients had neuropathy. In Shahi SK et.al.¹⁴ more than 75% of subjects had neuropathy and it matches with this study. Uncontrolled diabetes is responsible for peripheral neuropathy. So control of diabetes and early diagnosis of diabetic peripheral neuropathy can reduce the risk of diabetic foot ulcer.

This is a single centered study and sample size is small. So multi centered study with large sample size can reveal the real picture of diabetic foot complications.

Conclusion

Diabetic foot ulcer is the major medical, economic and social burden. From this study, it can be concluded that peripheral neuropathy in the face of unperceived trauma is the most common cause of diabetic foot ulcer. Other significant risk factors are increased age, long duration of diabetes mellitus and uncontrolled diabetes mellitus. Routine examination of foot of all patients with diabetes to early detection of peripheral neuropathy can reduce the complications of diabetic foot ulcer.

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