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RISK FACTORS FOR DIABETIC FOOT AND LOWER LIMB AMPUTATION

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Abstract

Introduction: Diabetic foot syndrome (DFS) is the major cause of hospitalization for diabetes-related complications. Protective sensation loss and impaired vision increase the susceptibility for minor feet trauma, which results in diabetic foot ulceration with or without subsequent infection. Peripheral arterial disease is a major cause of impaired ulcer, wound healing and gangrenous diabetic foot. The most important intervention to prevent diabetic foot ulceration and its consequences is early recognition of high-risk patients and their risk factors and referral to appropriate medical departments. There are various risk factors for major lower extremity amputations related to diabetic foot, which includes microvascular diseases, infections, long duration of diabetes, poor glycemic control, peripheral arterial disease, old age and associated cardiovascular comorbidities.

Material and Methods: This study was done on the review of medical records of consecutive type 2 diabetic patients. Admitted patients were treated and managed according to the standard protocol of the hospital. History, clinical and physical examination were carried out on each patient. Ulcer characteristics like infection and depth of the ulcer, site of ulcer were assessed. Associated diabetic neuropathy and peripheral arterial disease was assessed by a clinical method. Age, sex, body mass index (BMI), smoking, duration of diabetes, diabetic control therapy, associated hypertension, cardiac diseases were recorded. The glycated haemoglobin level (HbA1c) were recorded.

Results: A total of 128 patients with diabetic foot were included in the study of which 76(59.4%) were male and 52(40.6%) were female. Of the 76 male 6 (4.7%) had major amputation and out of 52 female 4(3.1%) had major amputation, thus total number of major amputations were 10(7.8%). Statistically significant difference was observed in HbA1C and duration of diabetes group in amputation. High HbA1C and more duration of diabetes was associated with the higher number of amputation. The rate of amputation was much higher among patients hypertension, smoking, cardiac diseases and stroke.

Conclusion: Poor glycemic controls and duration of diabetes are the important independent risk factors for diabetes-related major lower extremity amputations.

Keywords: DFS, BMI, smkoing, DM

INTRODUCTION

Diabetic foot syndrome (DFS) is the major cause of hospitalization for diabetes-related complications[i]. Studies report varying prevalence in type 2 diabetic patients of foot ulceration (2–7%) and of lower limb amputation (0.2–4%) in primary health care[ii], [iii], [iv],[3]. Protective sensation loss, and impaired vision increase the susceptibility for minor feet trauma, which results in diabetic foot ulceration with or without subsequent infection[v]. Peripheral arterial disease is a major cause of impaired ulcer, wound healing and gangrenous diabetic foot[vi]. In a review of

global variation in incidence which included European countries and the United States found that annual incidence of amputation ranging from 4.6 to 960/10,000 people with diabetes, but 85% of countries/states examined had an annual incidence, 100/10,000[vii].

Sepsis in the diabetic foot is mainly due to chronic hyperglycaemia and superadded infections[viii]. The most important intervention to prevent diabetic foot ulceration and its consequences is early recognition of high-risk patients and their risk factors and referral to appropriate medical departments[ix,x]. High risk patients can be identified from the history of a previous ulcer or amputation and clinical examination, impaired monofilament sensation and vibration perception, absent Achilles tendon reflex, callus foot deformities, and absent pedal pulse[xi, xii].

There are various risk factors for major lower extremity amputations related to diabetic foot, which includes microvascular diseases, infections, long duration of diabetes, poor glycemic control, peripheral arterial disease, old age and associated cardiovascular comorbidities[xiii].

In a study it was found that foot ulcers occur in about 4–10 % of people with diabetes. When foot ulcers do occur, the majority have a good outlook: 60–80 percent of foot ulcers will heal, 10–15 % will remain active and 5–24 % will eventually lead to limb amputation within 6–18 months of the initial evaluation[xiv]. Social factors, such as low socioeconomic status, poor access to healthcare services, and poor education about diabetes are also related to more frequent foot ulceration[xv].

MATERIAL AND METHODS

Present study was conducted in the department of Medicine and Orthopaedics in Darbhanga Medical College Laheriasarai Darbhanga and Hospital. This observational study was done on the review of medical records of consecutive type 2 diabetic patients admitted in the hospital. Type 2 diabetic patients with intermittent claudication or rest pain without feet infections or issue loss were excluded from this study. Written informed consent was obtained from each patient included in the study. Patients not willing to give informed consent were excluded from the study.

Admitted patients were treated and managed according to the standard protocol of the hospital. History, clinical and physical examination were carried out on each patient. Ulcer characteristics like infection and depth of the ulcer, site of ulcer were assessed. Associated diabetic neuropathy and peripheral arterial disease was assessed by a clinical method. Age, sex, body mass index (BMI), smoking, duration of diabetes, diabetic control therapy, associated hypertension, cardiac diseases were recorded. The glycated hemoglobin level (HbA1c) were recorded.

Lower extremity amputation was defined as resection of any segment of the lower extremity with removal of the bone. Minor amputation was defined as any amputation that preserves the ankle joint with an intact healed wound. Major amputation was defined as any amputation that interferes with the ankle joint[xvi, xvii, 18].

Data Analysis:

Statistical analysis was done using SPSS software. Data were described using frequencies, percentages, and means. *P*-value ≤0.05 was considered statistically significant.

RESULTS

A total of 128 patients with diabetic foot were included in the study of which 76(59.4%) were male and 52(40.6%) were female. Of the 76 male 6 (4.7%) had major amputation and out of 52 female 4(3.1%) had major amputation, thus total number of major amputations were 10(7.8%)

Table 1: Major amputation

	Male	Female	total
Amputation	6 (4.7%)	4(3.1%)	10(7.8%)
No amputation	70(54.7%)	48(37.5%)	118(92.2%)
Total	76(59.4%)	52(40.6%)	128(100%)

Table 2: Major amputation according to patients' demographic and clinical characteristics

Variable	Major amputation				Number of patients with diabetic foot		*P*-value
	No		Yes				
	n	%	n	%	n	%	
Sex							1
Male	70	92%	6	8%	76	59%	
Female	48	92%	4	8%	52	41%	
Age group							0.6815
≤60 years	98	92%	8	8%	106	83%	
>60 years	20	91%	2	9%	22	17%	
Body mass index							0.4551
≤25 kg/m^2	25	89%	3	11%	28	22%	
>25 kg/m^2	93	93%	7	7%	100	78%	
Duration of diabetes							0.0052
<10 years	89	97%	3	3%	92	72%	
≥10 years	29	81%	7	19%	36	28%	
HbA1c							0.0001
<8.5%	17	71%	7	29%	24	19%	
≥8.5%	101	97%	3	3%	104	81%	
Hypertension							0.5137
No	54	90%	6	10%	60	47%	
Yes	64	94%	4	6%	68	53%	
Smoking							0.7548
No	65	93%	5	7%	70	55%	
Yes	53	91%	5	9%	58	45%	
Cardiac diseases							0.0346
No	79	96%	3	4%	82	64%	
Yes	39	85%	7	15%	46	36%	
Stroke							0.0523
No	109	94%	7	6%	116	91%	
Yes	9	72.2	3	25%	12	9%	

Statistically significant difference was observed in HbA1C and duration of diabetes group in amputation. High HbA1C and more duration of diabetes was associated with the higher number of amputation. The rate of amputation was much higher among patients hypertension, smoking, cardiac diseases and stroke.

DISCUSSION AND CONCLUSION

The most common and significant risk factors for foot ulceration are diabetic neuropathy, peripheral arterial disease, and consequent traumas of the foot. In 90 % of the cases neuropathy is the common factor, motor neuropathy causes muscle weakness, atrophy, and paresis while sensory neuropathy leads to loss of the protective sensation of pain, pressure, and heat. Autonomic dysfunction causes vasodilation and decreased sweating, resulting in a loss of skin integrity, which provides a site vulnerable to microbial infection[xviii].

Risk factors for foot ulceration are previous history of foot ulceration or amputation, visual impairment, diabetic nephropathy, poor glycemic control, and cigarette smoking. Some studies have shown that foot ulceration is more common in men with diabetes than in women[xix],[15]. Similar results were observed in our study amputation and foot ulcers were more common in males as compared to females.

A Major lower limb amputation was observed in 10(7.8%) in our study of which 6 (4.7%) were male and 4(3.1%) were female. Amputation rate in diabetic foot in other studies were from 4.25 to 27%[xx]. Statistically significant relation was observed in amputed patients with higher level of HbA1C and long duration of diabetes. Similar results were observed in other studies[xxi],[xxii]. Associated cardiovascular factors, infections old age and male gender are risk factors observed in our study. Similar risk factors were reported by other authors[xxiii],[xxiv].

To conclude poor glycemic controls and duration of diabetes are the important independent risk factors for diabetes-related major lower extremity amputations.

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