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Study of Incidence of Amputation in Patients with Diabetic Foot Ulcer

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ABSTRACT
Diabetic foot ulcer is a rising health problem with rising prevalence of diabetes. It is the most important cause of non-traumatic foot amputation. Diabetic foot ulcers are primarily due to neuropathy or ischemic and are frequently complicated by infection. Up to 85% of all diabetic foot related complications are preventable through a combination of good foot care and appropriate education for patients and health care providers. The baseline demographic data which includes age, sex, occupation, educational qualifications, habits (smoking/consumption of alcohol) and socioeconomic status were recorded. Duration of diabetes and treatment history of management of diabetes were recorded. Ulcers were scored by the below mentioned variables. Diabetic ulcer severity score (DUSS) were calculated by adding these separate scored variables to a theoretical maximum of 4. Majority of patients (48.8%) underwent debridement followed by Toe disarticulating, Ray amputation, Amputation below Ankle (39%), 6.1% of patients underwent below knee amputation and 6.1% underwent conservative management.

INTRODUCTION

The prevalence of diabetes in the world is rapidly increasing[1]. The number of patients with diabetes was about 415 million in 2015 and it is estimated that it will reach approximately to 600 million in 2035. Previous studies have showed that diabetic patients have up to a 25% lifetime risk of developing a foot ulcer[2]. The annual incidence of diabetic foot ulcers is 3% and the reported incidence in U.S. and U.K. studies showed up to 10%[3]. Foot ulcers occur in approximately 15% of patients with Diabetes which accounts for 25% of all hospital admissions and the hospital stay being 60% longer than the stay for other causes. The risk of amputation is 15-40 times higher in Diabetics than in other patients[4]. Diabetic foot ulcer is a rising health problem with rising prevalence of diabetes. It is the most important cause of non-traumatic foot amputation. Diabetic foot ulcers are primarily due to neuropathy or ischemic and are frequently complicated by infection. Up to 85% of all diabetic foot related complications are preventable through a combination of good foot care and appropriate education for patients and health care providers[5]. According to Wilman *et al*., diabetic foot ulceration is a one of the important worldwide health problems and approximately 15% of the 10 million diabetic patients in USA will develop foot ulcers at some time in their life time. The foot ulcer in this population is extremely debilitating and dramatically increases the risk of having lower extremity amputation. To date, DFU is considered as a major source of morbidity and a leading cause of hospitalization in patients with diabetes mellitus. It is estimated that approximately 20% of hospital admissions among patients with DM are due to diabetic foot ulcers[6]. On the other hand, once DFU has developed, there is a risk of ulcer progression that may ultimately lead to amputation. Overall, the rate of lower limb amputation in patients with DM is at least 15 times higher than patients without diabetes mellitus[7]. It is estimated that approximately 50-70% of all lower limb amputations are due to DFU. In addition, it is reported that every 30 seconds one leg is amputated due to Diabetic foot ulcer worldwide. Diabetic gangrene is usually caused by a combination of three factors-ischemic secondary to atheroma, peripheral neuropathy leading to trophic skin changes and immunosuppression caused by excess of sugar in the tissues which in turn predisposes to infection[8].

MATERIALS AND METHODS

Study Population: Patients with Diabetes Mellitus in the age group 20-80 years.

Study Design: A prospective, observational study.

Sample Size: sample size calculated was 82 and hence, 82 study subjects were considered for this study.

Inclusion Criteria:

- **Age Limit:** 20-80 years
- All subjects suffering from diabetes mellitus (as per WHO criteria) with foot ulcers
- Symptoms of Diabetes plus random blood sugars >200 mg/dl
- Fasting blood sugars >126 mg/dl or
- Two hour plasma glucose levels >200 mg/dl
- All diabetic foot ulcers irrespective of its duration
- Patients willing to participate in the study

Exclusion Criteria:

- Venous stasis ulcers with Diabetes mellitus
- Non diabetic neuropathic ulcers
- Ulcers above the ankle
- All non-diabetics with foot ulcers
- Patients not giving consent to participate in the study
- Patients with an immunocompromised state

A total of 82 diabetic patients with diabetic foot ulcers irrespective of the duration, attending surgical outpatient clinic or admitted to the Nijalinappa Medical College Bagalkot were studied based on the inclusion and exclusion criteria mentioned previously. The baseline demographic data which includes age, sex, occupation, educational qualifications, habits (smoking/consumption of alcohol) and socioeconomic status were recorded. Duration of diabetes and treatment history of management of diabetes were recorded. Ulcers were scored by the below mentioned variables. Diabetic ulcer severity score (DUSS) were calculated by adding these separate scored variables to a theoretical maximum of 4.

RESULTS AND DISCUSSIONS

Majority of patients had DUSS score 1 (57.3%), followed by score 2 (17.1%), score 0 (14.6%) and score 3 (11%). None of the patient had score 4. Majority of patients (48.8%) underwent debridement followed by Toe disarticulating, Ray amputation, Amputation below Ankle (39%), 6.1% of patients underwent below knee amputation and 6.1% underwent conservative management. Patients were followed up for 6 months, 75.6% of ulcers healed, where as 19.5% were non healing, 4.9% of patients required below knee amputation. Early Minor amputation can prevent a later major amputation. Eight (66.7%) of 12 patients with score 0 had minor amputation, 16 (34%) of 47 patients with score 1 had minor amputation, 5 (35.7%) of 14 patients with score 2 had minor amputations, 3 (33.3%) of 9 patients with score 3 had minor amputations. In a study by Shiva Kumar T., Srinivas Arava, Pavan B. M., Guru Kiran C. S., Chandan G. B., Naveen Kumar M. Seven (15.90%) of 44 patients with score 1 had minor amputation, 14 (66.66%) of 21

Table 1: Distribution of patients according to the DUSS Score (N = 82)

DUSS Score	No.	Percent
0.	12	14.6
1.	47	57.3
2.	14	17.1
3.	9	11.0
4.	0	0

Table 2: Distribution of patients according to the treatment (N = 82)

Treatment	No.	Percent
Conservative	5	6.1
Debridement	40	48.8
Toe disarticulation, Amputation Below Ankle	32	39.0
Ray Amputation, Below Knee Amputation	5	6.1

Table 3: Distribution of patients according to the Follow up (N = 82)

Follow Up	No.	Percent
Healing	62	75.6
Non Healing	16	19.5
Amputation	4	4.9

patients with score 2 had minor amputation, 10 (71.42%) of 14 patients with score 3 had minor amputations, 3 (42.85%) of 7 patients with score 4 had minor amputations. Minor amputations were more common in patients with DUSS Score of 2 in our study [9]. In a study by Shiva Kumar T., Srinivas Arava, Pavan B. M., Guru Kiran C. S., Chandan G. B., Naveen Kumar M, the probability of healing with score 0 was 100%, 84% probability of healing for score 1 while that of score 2 had 19% probability of healing. Patient with DUSS 3 and 4 had 0% probability of healing, which is comparable to our study.

The original study of Diabetic ulcer severity score was done by Beckert *et al*.[10] and it was a prospective study done with 1000 patients with diabetic foot ulcers. Overall 37 of 82 people had amputations in our study. Major amputation (below or above knee amputation) was done for 32 patients in our study. Minor Amputation (toe or forefoot amputations) was done in 5 patients in our study. In the original study by Beckert *et al*.[10] Patients with a score of 0 had no risk of major amputation, while patients with a score of 1 had a 2.4%, patients with a score of 2 had a 7.7%, patients with a score of 3 had an 11.2% and patients with a score of 4 had a 3.8%. In comparison in our present study, at the end of follow up period 0 out of 12 (0%) with score 0, 0 out of 47 with score 1 (0%), 0 out of 14 with score 2 (0%), 4 out of 9 (44.44%) people with score 3 had major amputations.

CONCLUSION

Majority of patients (48.8%) underwent debridement followed by Toe disarticulating, Ray amputation, Amputation below Ankle (39%), 6.1% of patients underwent below knee amputation and 6.1% underwent conservative management.

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