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A prospective study on outcomes of diabetic foot ulcer patients with and without amputation

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Abstract

Background: The rising prevalence of diabetic foot ulcer, the biggest risk of diabetes mellitus imposes great burden on world health system. Pressure on existing human and material health resources contributes to this burden. A foot ulcer occurs in majority of the patients with diabetes. Due to this higher prevalence of diabetic foot ulcers, amputation remains a hardship to patients with diabetes.

Our study highlights the early recognition and proper management of diabetic foot ulcer and thus minimizing the rate of amputation and hence the hardships, mortality and morbidity of the patients.

Methods: A retrospective study on pre-operative and post operative outcomes of patients with diabetic foot ulcer. A total of 54 patients were selected and using data collection proforma, details such as socio- demography, co-morbidities, social and medication history was collected from the case folders. Data were analysed using SPSS and results were presented in tables.

Result: Male patients were more prevalent among the 54 selected subjects during the study period. The most affected group was in the age range of 51- 60 years while the least affected group was those below 40 years of age. Most of the patients were relieved or cured without any amputation. 37% of diabetic foot ulcer patients' undergone amputation and Rays amputation was the common procedure presented in our study.

Conclusion: In diabetic foot ulcers, early recognition, comprehensive treatment and proper hygiene ensure rapid healing and prevent reulceration. This can safeguard patients from amputation.

Keywords: Diabetic foot ulcer (DFU), amputation, debridement

Introduction

Diabetic foot ulcers are complex, chronic wound that have long term impact on morbidity, mortality and quality of patient's life. The individuals with DFU have a greater risk of developing premature death, myocardial infarction and fatal stroke. DFU are most commonly caused by poor circulation, high blood sugar or hyperglycaemia, nerve damage and irritant or wounded feet. Poor circulation is a form of vascular disease in which the blood does not flow to your feet effectively. Hyperglycaemia can slow down the healing process. Nerve damage is a long term effect that reduces sensitivity to foot pain and results in painless wound that can cause ulcers.

DFU is characterized by a classical triad of neuropathy, ischemia, and infection. Due to the impaired metabolic mechanisms in DM, there is an increased risk of infection and poor wound healing due to a series of mechanisms which include decreased cell and growth factor response, diminished peripheral blood flow and decreased local angiogenesis. Thus, the feet are predisposed to peripheral vascular disease, damage of peripheral nerves, deformities, ulcerations and gangrene.

Neuropathy causes more than 60% of the foot ulcers and affects patients with both type 1 and type 2 DM. Rise in blood glucose levels leads to increased enzyme production such as aldose reductase and sorbitol dehydrogenase. These enzymes convert glucose into sorbitol and fructose. As these sugar products accumulate, the synthesis of nerve cell myo-inositol is decreased, affecting nerve conduction.

Compared to a healthy person's immune system, that of a patient with diabetes is much weaker. Thus, foot infection in a patient with diabetes is a limb threatening and debilitating condition. The hyperglycaemic state causes an elevation of pro-inflammatory cytokines and impairment of polymorphonuclear cell functions like chemo taxis, adherence, phagocytosis

intracellular killing. Besides that, high blood glucose is a good medium for the growth of bacteria. The predominant organisms in diabetic foot infections are mainly aerobic gram positive cocci like *S. aureus* and β - hemolytic streptococci but in one research conducted in India, gram-negative aerobes were the common microorganisms in diabetic foot.

Diabetic foot ulcer can be diagnosed from the history and physical examination of the patient, neurological testing, and investigations like glycosylated haemoglobin (HbA1C), ankle brachial index (ABI).

Management of diabetic foot includes debridement, offloading and infection control. Debridement consist of removal of all necrotic tissues, pre wound callus and foreign bodies down to viable tissues. Proper debridement is necessary to decrease risk of infections and reduces pre-wound pressure, which can impede normal wound contraction and healing. After debridement the wound should be irrigated with saline or cleansers and a dressing should be applied. The goal of tissue load management is to create an environment that enhances soft tissue viability and promotes wound healing. DFUS are usually polymicrobial and commonly encountered pathogens include Methicillin-resistant *Staphylococcus aureus*, enterobacteriaceae, and *Pseudomonas aeruginosa*. Antibiotics like cefotaxime, ciprofloxacin, amikacin are helpful in the treatment of diabetic foot infections.

Methodology

Study area: The study was conducted in the Department of Surgery, Rajah Muthiah Medical College Hospital, Annamalai University, Annamalai Nagar, Tamil Nadu, which is a 1400 bedded multi-speciality tertiary care teaching hospital located in rural South India.

Study population: The study includes 54 patients with diabetic foot ulcer from January to March 2016. The patients who are hospitalised for diabetic foot ulcer were included and the Patients were excluded if they underwent amputation for reasons other than wound ulcers and patients above the age of 80 years.

Study design: It was a retrospective study on outcomes of patients with diabetic foot ulcers. Records of the patients selected within the 3 months were assessed and analysed.

Data Collection: Data was collected from the extracted folders of diabetic patients using a proforma which contains information on patient’s bio-data, socio-demography, social history, co-morbidities, and treatment and operation details.

Data Analysis: Data collated were entered into an Excel proforma, and analysed. Results were presented in frequency tables.

Results

A total of 54 diabetic foot ulcer patients attended the designated hospital from January to March 2016 were included in the study.

Table 1 represents the socio- demographic characteristics of all 54 patients. It shows that DFU was higher in males (66.67%) than in females (33.3). It also reveals that farmers (46.29%) were the most common occupational group affected and it was followed by housewives (27.77%).

Majority of patients attained primary education followed by secondary and finally tertiary.

Table 2 shows that all the patients had a history of diabetes more than 2 years and 50% of the patients had diabetes about 6 to 10 years. Most of the patients consume alcohol. Thus alcohol is a strong risk of developing foot ulcers.

Table 3 reveals that the most common co- morbidity was hypertension.

Table 4 indicates that 51- 60 age group patients were affected more with DFU while those with 40 years and below was least affected.

Table 5 reveals that the foot ulcers of most patients were relieved without amputation. Wound debridement was commonly executed in this study. It also shows that re-ulceration can occur both in the patients amputated and not.

Tables

Table 1: Socio-demographic variables of subjects

Socio-demographic values	Frequency	Percentage of patients
Gender		
Male	36	66.67
Female	18	33.3
Total	54	99.4
Occupation		
Farmers	25	46.29
Traders	5	9.25
Teachers	6	11.11
Housewives	15	27.77
Retired personnel	3	5.55
Total	54	100
Level of Education		
Primary	25	18.5
Secondary	10	46.2
Tertiary	19	35.18
Total	54	100

Table 2: Family and social history of diabetic foot ulcer patients

Category	Frequency
Duration of Dm	
1-5 Yrs	19
6-10Yrs	27
More than 10Yrs	8
TOTAL	54
Social History	
Smokers	6
Alcoholic	20
Alcoholic and smokers	13
Neither smokers nor drinks	15
Total	54
Medication History	
Patients on regular medication	35
Patients with irregular medication	19
Total	54

Table 3: Co- morbidities in the patients

Co-morbidities	No. of patients	% of patients
Hypertension	22	
Asthma	6	11.11
Respiratory Tract Infection	4	7.407
Congestive Cardiac Failure	5	9.25
Obesity	14	27.77
None	8	
Total	54	100

Table 4: Age wise distribution of diabetic foot patients

Age groups	Frequency	Percentage
Below 40Yrs	4	7.407%
40-50 Yrs	12	22.22%
51-60 Yrs	20	37.04%
61-70 Yrs	10	18.51%
71-80 Yrs	8	14.81%
Total	54	100%

Table 5: Management of DFU and re-ulceration

	Frequency
Conservative management	18
Wound debridement	24
Amputation	12
Amputation Types	
Ray amputation	8
Toe amputation	3
Above knee amputation	1
Total	54
Reulceration	
Patients with amputation	12
Patients without amputation	8
Total patients with re-ulceration	20

Discussion

Out of 54 subjects studied, male patients were more affected with diabetic foot ulcer. This data was in keeping with the study of Adebisi *et al* in their study on prevalence of diabetic patients at risk of developing complications. The socio-demographic suggest that occupation and education level was a determinant for diabetic foot ulcers. Farmers (46.29%) and housewives (27.77%) were the most affected groups. This may be due to improper hygiene. Level of education also plays a prevalent role in the management of DFU. Most of the patients included in the study only had primary level of education. This may be barrier for better understanding of the disease, better adherence to routine clinical check up and compliance to treatment.

The social history obtained from 54 patients shows that drinking of alcohol is a major risk for developing diabetic foot ulcer. Irregular medication or non-compliance to medication was also a predisposing factor. Co-morbidity is the occurrence of one or more chronic condition in the same person with an index disease. The most common co-morbidity among the selected candidates was hypertension followed by obesity. This was similar to the study on the pattern of dyslipidemia among Nigerians done by Okafor *et al*.

The study shows that the most of the foot ulcers were relieved without amputation. Conservative management, wound debridement, and various types of amputations such as rays amputation, below knee amputation, toe amputation were mainly executed for the management of DFUs. Reulceration in patients with and without amputation has no significant variation.

Conclusion

The result of retrospective study on diabetic ulcers indicates that the outcome obtained is related to poor glycaemia control, longer duration of diabetes. High foot pressure, poor hygiene also relates to the outcomes. The potential risk factors for diabetic foot ulcer have not been studied well. Smoking, alcohol and hypertension increase the risk for amputation.

Recommendations

- 1) Health workers should be educated enough to pass the right information to the public concerning the pattern of presentation of diabetes mellitus. This will enhance early detection and management.
- 2) People should be taught about the modifiable risk factors of the ailment such as obesity, sedentary lifestyle, alcoholism and smoking, and then encouraged to adopt healthy life style to prevent the onset of the disease and the development of chronic complications

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