

Surgical Treatment of Diabetic foot infection in a Tertiary Care Hospital of Bangladesh

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ABSTRACT

Introduction: Diabetes Mellitus (DM) is a common metabolic disorder in Bangladesh. Diabetic patients are at increased risk of infection and ulceration. Diabetic foot infection occurs secondary to neuropathy, micro-vascular changes and impaired resistance to infection. It is not only associated with high morbidity and disability but also a great economic burden for the family and society. The aim of this study was to determine the demography of patients with diabetic foot infection as well as to explore the different surgical intervention. **Methods:** This cross-sectional type of descriptive study was carried out in the General surgery and Orthopaedic department of North Bengal Medical College Hospital, Sirajganj, Bangladesh from January, 2018 to December, 2020. Among the total (n-622) admitted diabetic patients, 296 patients with foot infection were enrolled for this study on the basis of selection criteria. Data was collected from the patient's register of operation theatre and admitted ward. Collected data was classified, edited, coded and entered into the computer for statistical analysis by using MS EXCEL. **Results:** Among total 622 diabetic patients, foot infected patients were 296 (47.58%). Diabetic foot infection was common in male (166, 56.08%) gender and majority (138, 46.62%) were in 51-70 years of age group. Maximum patients were managed by wound debridement (123, 41.6%) whereas major amputation was done in 13 (4.4%) cases. Most of the patients discharged from hospital within 1 to 10 days of surgical intervention and single operation was done in 227 (76.7%) cases. **Conclusion:** Foot infection is common in diabetic patients. Therefore, quick and efficient surgical treatment of diabetic foot infection is essential for both patient care and the avoidance of recurrent ulcers.

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INTRODUCTION

Diabetes mellitus (DM) is a metabolic disorder of endocrine system. The incidence of diabetes is rising day by day. In 2015, 415 million people had diabetes globally which was about 10% of the total adult population. This figure may reach up to 642 million by 2040.¹ In India, in 2017 an estimated 54.4 million (7.6%) people of working age had diabetes. Each year over seven lacs new patients are diagnosed; 12000 to 14000 of which are children, teenagers and young adults.² This life threatening disease can be controlled but still there is no cure.³

Prevalence of DM among rural and semi-urban regions was ranging between 7% to 20.3%.^{4,5} Patients with poorly controlled diabetes are prone to diabetic complications and increasing number of diabetic related microvascular and macrovascular complications.^{6,7} A Malaysian study in 2011 found that, 47% of the patients with diabetes suffered from diabetic foot complications.⁷ For better management of diabetic foot infection needs close monitoring and frequent follow-up. Otherwise there is possibility of economical inactivity. Diabetes is a major social and financial burden on health care facilities in all countries. In 2015, Diabetes caused five million death globally and estimated total healthcare expenditure of 12%.¹

Bangladesh has the largest diabetes prevalence among all nations, with a total population of more than 160 million.⁸ The international diabetes federation (IDF) estimated 8.4 million people with diabetes in Bangladesh and almost an equal number with undetected diabetes.⁸ In Diabetic patients, foot problems occur secondary to neuropathy, micro-vascular changes and impaired resistance to infection. Diabetic patients are also at increased risk of infection and ulceration. Following ulceration, may lead to major morbidity and amputation. Diabetic ulcers need to be treated promptly. After admission,

patients need urgent clinical and radiological assessment and also optimal management.⁹ The extend of tissue loss might be a reason to consider a major amputation. If multiple digits are involved or heel necrosis is present, a limb-salvage procedure is unlikely to be successful. A gangrenous forefoot is best treated with a major amputation.

The aim of this study was to determine the demography of patients with diabetic foot infection as well as to explore the different surgical intervention.

METHODS

This cross-sectional type of descriptive study was conducted in the General surgery and Orthopaedic department of North Bengal Medical College Hospital, Sirajganj, Bangladesh from January, 2018 to December, 2020. During this study period total number of admitted diabetic patients was 622. Among them, 296 patients with diabetic foot infection were enrolled for this study but foot infection due to trauma and burger's disease were excluded. Demographic information, length of stay in hospital, admission date, and diagnosis, type of surgical intervention and date of surgical intervention of the patients were obtained from the register book of both surgery and orthopaedic department. Hospital authority was informed about the study and permission was obtained. Detailed information was obtained in each case according to protocol. Collected data was classified, edited, coded and entered into the computer for statistical analysis by using MS EXCEL, p value was obtained from χ^2 test and $p < 0.05$ was considered statistically significant.

RESULTS

During the study period, among the total 622 diabetic patients, 296 (47.58%) were suffering from diabetic foot infection, those were subsequently underwent surgery (Table I).

Table I: Distribution of diabetic patients on the basis of foot infection (n-622)

Type of diabetic patients	Frequency	Percentage (%)
Diabetic patients with foot infection	296	47.58%
Diabetic patients without foot infection	326	52.42%
Total	622	100%

Out of 296, there were 166 (56.08%) males and 130 (43.92%) females and male: female ratio 1.28:1 (Figure1).

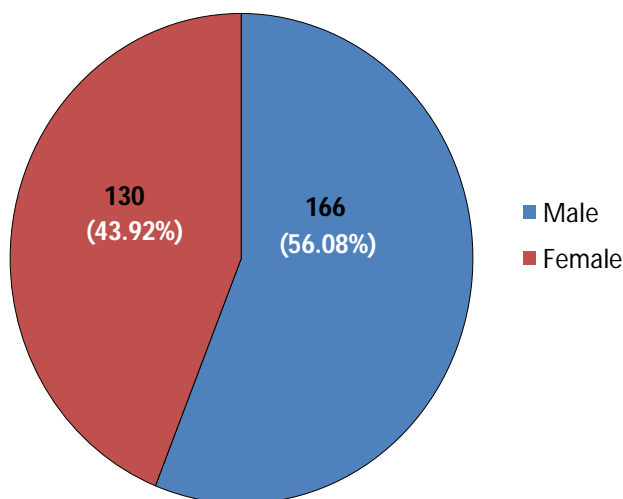


Figure 1: Sex distribution of diabetic patients with foot infection (n-296)

Majority of the diabetic foot infection patients were within 51-70 years of age group (Table II). The youngest patient who underwent surgery for diabetic foot infection was 8 years old and the oldest patient was 97 years old.

Table II: Distribution of diabetic patients according to age group

Age group in year	Diabetic foot infection		p-value
	Yes	No	
≤ 30	14 (4.73%)	12 (3.68%)	0.82594 ^{ns}
31-50	136 (45.95%)	152 (46.63%)	
51-70	138 (46.62%)	150 (46.01%)	
≥ 70	08 (2.70%)	12 (3.68%)	
Total	296 (100%)	326 (100%)	

* χ^2 test –ns (not significant)

Postoperative hospital stay was 1 to 10 days in majority of the patients (207, 69.9%) and the longest stay was >50 days in two cases (Table III).

Table III: Length of hospital stays after operation

Hospital stay (in days)	Frequency	Percentage (%)
1-10	207	69.9%
11-20	63	21.3%
21-30	20	6.8%
31-40	01	0.3%
41-50	03	01%
>50	02	0.7%
Total	296	100%

Out of 296 patients, wound debridement surgery was performed in 123 (41.6%) patients to manage diabetic foot infection followed by incision and drainage in 82(27.7%) and rest of the patients were managed by different types of amputation. Above and below the knee amputation was considered as major amputation which was done in only 13 (4.4%) cases (Table IV).

Table IV: Different types of surgical procedure performed in patients (n-296)

Name of surgery	No of patient	Percentage (%)
Wound debridement	123	41.6%
Incision and drainage	82	27.7%
Amputations of the digits	66	22.3%
Transmetatarsal amputation	17	5.7%
Below knee amputation	10	3.4%
Syme's amputation	4	1.4%
Above knee amputation	3	1%
Chopart amputation	2	0.7%
Lisfrance amputation	2	0.7%
Boyd's amputation	1	0.3%
Pirogofit amputation	1	0.3%

***Multiple response**

Single operation was done in most of the cases (227, 76.7%) but multiple operations were done in 69 (23.3%) cases (Table V).

Table V: Distribution of patients according to number of surgery

Number of surgery	Frequency	Percentage (%)
Single	227	76.7%
Multiple	69	23.3%
Total	296	100%

DISCUSSION

Diabetic foot infection is a bone or soft tissue infection of foot caused by uncontrolled Diabetes Mellitus (DM). It is one of the main causes of morbidity and disability among diabetic patients. A study showed that patients with diabetic foot complications had severely impaired quality of life both mentally and physically.¹⁰ In addition, the treatment of diabetic foot infection is complicated where required more time and resources.

In this study, male patients (166, 56.08%) were more than female (130, 43.92%). Wui et al.¹¹ showed that, there were 355 (59.66%) males and 250(40.34%) females. Males are more prone to develop diabetic foot infection due multiple causes like diabetic neuropathy, smoking, stress, poor glycaemic control and peripheral vascular diseases etc.

In this study, the minimum age of the patient was 8 years and maximum age was 97 years, among them the majority surgical intervention was performed between the age group 51-70 years. This finding is consistent with the finding of

Mazlina et al.¹² They observed maximum patients were in between the age group of 51 to 60 years and youngest and oldest patients were 18 and 98 years respectively. Diabetic foot infection is common in elderly patients due to peripheral neuropathy, foot deformities and peripheral arterial disease etc.

Kool et al.¹³ reported most frequent (76.10%) duration of hospital stay was around 10 days and maximum duration was 159 days. This result is almost similar with our study. The duration of hospital stay differs due to the different rehabilitation protocol and postoperative physiotherapy.

In this study, most common surgery was wound debridement (123, 41.55%) and major amputations were done in 13(4.4%) cases from 2018 to 2020. Hazmy et al.¹⁴ reported 186 cases of major amputations of the lower limb due to diabetic ulcers or gangrene for the period from 1997 to 1999 in Seremban Hospital, Malaysia. Yusof et al.¹⁵ reported 67 cases of major amputations due to diabetic foot complications from 2013 to 2015 in Hospital University Sains

Malaysia. The more incidences of major amputations in these studies^{14,15} were due to lack of awareness regarding diabetic foot care, uncontrolled diabetes and late presentation. Major amputation was less incident in our study, may be due to limited number of complicated cases. Ugwu et al.¹⁶ reported that 79% of the patients with diabetic foot ulcer had advanced stage ulcers (Wagner grades >3) and majority of the ulcers were infected at the time of admission. Diabetic foot ulcers were not only associated with uncontrolled DM but also other comorbidities like atherosclerosis, neuropathy etc.¹⁷⁻²⁰

Multiple surgical procedure was performed in 69(23.3%) of cases in this study. Wui et al.¹¹ reported 241(40.50%) cases were managed by multiple surgical procedures. This is likely due to emergency life saving surgeries were done at admission and later definitive surgery was done after haemodynamic stable condition.

The clinical condition and staging of the diabetic foot infection was not mentioned in this study as there was no clinical record in the registry. We believe that this study can be further improved by using a standardized staging tool to describe the condition of diabetic foot prior to surgical intervention.

CONCLUSION

Foot infection is common in diabetic patients. Successful outcomes of surgery require a multidisciplinary team approach to manage properly. All initial stage of diabetic patients may be treated in more aggressive approach to avoid devastating complications.

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