

Diabetic foot infection and surgical treatment in a secondary health care centre in Malaysia

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ABSTRACT

Introduction: Diabetic foot infection is often associated with high morbidity, disability and poor quality of life. This study focuses on the demography, the number of repetitive surgery and length of stay in hospital of patients with diabetic foot infection.

Method: This is a retrospective observational study. Patients who were admitted to the Orthopaedic ward of Hospital Segamat (HS), Johor, Malaysia from January 2016 to December 2018 and required surgical intervention were included in the study. Data was collected from the computer system of HS and medical notes of patients.

Results: 35.6% of the total orthopaedic emergency surgeries performed were for patients with diabetic foot infection, 25% of the surgical procedures performed were major amputations of lower limb and 40% of the patients with diabetic foot infection required more than one surgical operation.

Discussion: The demographics of the patients is consistent with the demographics of Malaysia where majority of them are Malays followed by Chinese, Indians and others. Despite being only 10% of total admission to the department, this group of patients contributed to 35.6% of the total emergency surgeries performed. The amputation rate in the centre is comparable to the other local studies. The average length of stay in hospital was found to be shorter compared to overseas due to different rehabilitation protocols.

KEY WORDS:

Diabetic foot wound, surgery, debridement, major amputation

INTRODUCTION

Diabetes mellitus (DM) is a non-communicable disease that has reached epic proportions globally including Malaysia. Local studies showed that the prevalence of population with DM among rural and semi-urban regions was ranging between 7% to 20.3%.^{1,2} Patients with poorly controlled diabetes are prone to diabetic complications and this is reflected in the increasing number of incidence of diabetic related microvascular and macrovascular complications.^{3,4} A Malaysian study conducted in 2011 found that 47% of the patients with DM suffered from complications of diabetic

foot.⁴ Foot infection in patients with diabetes entails the needs for close monitoring, frequent follow-up and the possibility of loss of livelihood due to disability. The primary objective of this study is to determine the demography of patients with diabetic foot infection who were admitted to the Orthopaedic ward of HS and those who required surgical intervention. The secondary objectives are to study: 1) the length of stay in hospital for this group of patients; 2) the types and number of surgical procedures; 3) the rate of major amputation of the lower limb among the patients; and 4) the rate of recurrent operation required for the patients.

MATERIALS AND METHODS

Diabetic foot infection is defined as bone or soft tissue infection on the foot caused by DM leading to hospitalisation and lower limb amputation.⁵ Major amputations is defined as amputation performed at the level below the knee, through the knee, above the knee or hip disarticulation.⁶ Patients who were admitted or transferred to the HS with diabetic foot infection and underwent surgical intervention are included in this study. Those excluded from this study were patients with foot ulcer without underlying DM who underwent surgery, patients who underwent surgical intervention due to trauma and patients with incomplete data. Patients with diabetic foot infection of both feet were considered as a single incidence (case). Patients who underwent any surgical interventions which were performed in the ward were not included in this study as the majority of these interventions were minor surgical procedures such as wound de-sloughing and superficial wound debridement which was done together with daily dressing. Amputation of the digits will include both disarticulation of the digits at any level and ray amputation at the metatarsal bones. Demographic information, length of stay in hospital, admission date, diagnosis, type of surgical intervention and date of surgical intervention of the patients was obtained from the computer system of the HS, the registry of ward admission and the registry of operation theatre. Case notes, operative notes and clinic notes on patients were reviewed in order to identify eligible cases and the causes of major amputations of lower limb. Ethical approval for the study was obtained from the Medical Research and Ethics Committee (MREC), Ministry of Health Malaysia for conducting this study.

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Table I: Demography of the cohort who underwent surgical intervention for diabetic foot infection

Demographic Data		frequency, n	percentage, %
Gender	Male	355	59.66%
	Female	240	40.34%
Race	Malay	466	78.32%
	Chinese	67	11.26%
	Indian	57	9.58%
	Orang Asli	1	0.17%
	Others	4	0.67%
Age group	11-20	2	0.34%
	21-30	14	2.35%
	31-40	45	7.56%
	41-50	65	10.92%
	51-60	202	33.95%
	61-70	195	32.77%
	71-80	61	10.25%
	81-90	9	1.51%
	91-100	2	0.34%
Mean age = 58 years old, min = 18, max = 96			
Length of stay, days	1-10	605	76.10%
	11-20	116	14.59%
	21-30	37	4.65%
	31-40	15	1.89%
	41-50	9	1.13%
	51-60	4	0.50%
	>61	9	1.13%

Mean length of stay = 9 days, min = 1, max = 159

Table II: The number of patients who underwent major amputation of the lower limb from 2016 to 2018.

Major amputation	2016	2017	2018
Number of patients admitted with diabetic foot infection each year	203	285	184
Number of patients who underwent BKA	36	42	27
Number of patients who underwent AKA	10	28	8
Total amount of major amputation	46	70	35
Percentage of patients who underwent major amputation	22.66%	24.56%	19.02%

Table III: Patients admitted due to diabetic foot infection who underwent one or more surgical procedures for one single hospital admission

Repetitive surgery		frequency, n	percentage, %
Numbers of patients who underwent single surgery		354	59.50%
Numbers of patients who underwent more than 1 surgery		241	40.50%
Numbers of surgeries per admission	2	132	54.77%
	3-4	85	35.27%
	5-6	15	6.22%
	7 or more	9	3.73%

Average = 1-2 surgery, min = 1, max = 9

RESULTS

The data showed that a total of 6115 admissions were made to the orthopaedic wards of Hospital Segamat from January 2016 to December 2018. Out of 6115 admissions, 672 (10.9%) were patients admitted to the ward for diabetic foot infection and subsequently underwent surgery.

Patient Characteristics

Of the 672, 77 recurrent admissions were excluded for the purpose of demographic analysis. As such, there were 595 patients with 355 (59.66%) males and 250 (40.34%) females as (Table I). In all 499 were Malays (78.32%), 67(11.25%)

Chinese, 57 (9.58%) Indians, one (0.17%) Orang Asli and four (0.67%) patients from other ethnicities. Majority of the patients were from the age group of 51-60 years old followed by 61-70 years old and a mean of 58 years old. The youngest patient who underwent surgery for diabetic foot infection was 18 years old and the oldest patient was 96 years old. Mean length of stay in hospital was nine days and the longest stay in hospital recorded was 159 days.

Review of Surgical Procedures Done for Diabetic Foot Infections

Of the total of 2933 Orthopaedic emergency surgeries performed during the period study, 36% of the surgeries were

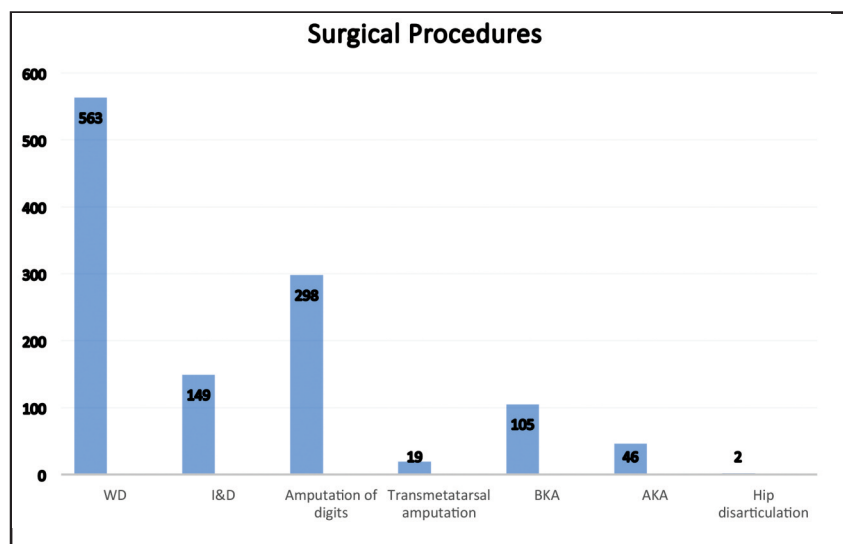


Fig. 1: The number of surgical procedures performed for diabetic foot infection from January 2016 to December 2018.

performed as part of the treatment for diabetic foot infection. Out of this 48% of the surgeries performed were for wound debridement to manage diabetic foot infection followed by 25% of amputations of the digits, 13% for incision and drainage of abscesses, 9% for below knee amputation (BKA), 4% for above knee amputation (AKA) and 0.17% for hip disarticulation (Figure 1).

Major Amputation of Lower Limb

There were 151 patients with diabetic foot infection who underwent major amputation of the lower limb. The percentage of patients who underwent major amputation of the lower limb in years 2016, 2017 and 2018 were 22.66%, 24.56% and 19.02% respectively as shown in Table II. Twenty-eight per cent of the patients who underwent major amputation had the amputation performed during their first admission to the hospital.

Patients Requiring One or More Surgical Procedures

In all 241 of the patients who admitted to the hospital due to diabetic foot infection required more than one surgery for each admission. A total of 217 (90%) of the said patients underwent two to four surgeries for each admission. The maximum number of surgeries performed for one single admission recorded was nine (Table III).

DISCUSSION

Diabetic foot infection 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.⁷ In addition, the treatment of diabetic foot infection consumes significant manpower, time and resources. In this study, patients with diabetic foot infection who were admitted to HS and underwent surgical intervention constituted only 10% of the total admissions to the orthopaedic ward. However, the number of surgeries performed for this group of patients

contributed up to 35.8% of the total orthopaedic emergency surgeries. This shows that the medical treatment provided to this relatively small group of patients used up substantial amount of resources such as time of operation, pharmaceutical costs, physiotherapy, dressing materials and general diabetic care given the high number of operations required for this group of patients.

The demographics of the patients who underwent surgery for diabetic foot infection is consistent with the demographics of Malaysia where majority of them are Malay followed by Chinese, Indian and others. Majority of the patients with diabetic foot infection who underwent surgical intervention were between the age group of 51 to 70 years old as also found in another study.⁸ The average length of stay in hospital reported in this study of 9 days is shorter than a study conducted in Australia.⁹ This is likely due to the different of rehabilitation protocol and postoperative physiotherapy provided to the patients perhaps mainly our patients were provided follow ups as outpatients.

The number of major amputations of lower limb performed in HS is comparable with other tertiary centres in the country although ours is a secondary care hospital. It is reported that there was a total of 151 patients who underwent major amputation of the lower limb throughout the study period whereas Hazmy et al., 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.¹⁰ Another Malaysian study conducted by Yusof et al., reported 67 cases of major amputations due to diabetic foot complications from 2013 to 2015 in Hospital Universiti Sains Malaysia.¹¹ The high amputation rate is likely due to lack of awareness regarding diabetic foot care and late presentation to hospital. Ugwu et al., reported that 79% of the patients with diabetic foot ulcer already had advanced stage ulcers (Wagner grades>3) when presented to the hospital and majority of the ulcers were infected at the

time of admission.¹² It is suggested that studies to be conducted in Malaysia to focus on factors such as duration of symptom of infection prior to admission and types of ulcer during admission in order to identify areas which require further improvement in the prevention of diabetic foot infection.

STUDY LIMITATIONS

We may have missed cases during identifying sample patients for this study by solely relying on the hand-written ward registry and the database of the hospital computer. The clinical condition and staging of the diabetic foot during admission was not included in this study as there was limited information in the case and clinic notes. 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.

CONCLUSIONS

This study is intended to be a pilot study to understand the burden of treatment of diabetic foot infection and it serves as a reference for future studies on secondary health care centres which compare the rate of diabetic foot infection among different ethnicities in Malaysia. The long duration of average length of stay in hospital, and the large numbers of surgical procedures performed reflect the tremendous burden and resources required to cure the preventable complication of DM. In addition, the high number of patients who require more than one surgery for one single admission and the high major amputation rate significantly lower the quality of life of the patients.^{13,14} In conclusion, this study shows the extensive impact of diabetic foot infection in a secondary healthcare centre. Hence, it is strongly suggested that all medical personnel should employ a more aggressive approach especially at the initial stage of DM to prevent it from reaching the stage of devastating complications.

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CONFLICT OF INTEREST

This study has no conflict of interest.

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