

Mortality in diabetic foot patients

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Key words

- Amit Jain's classification
- Mortality
- Necrotizing fasciitis
- Ulceration

In order to analyse mortality due to diabetic foot complications, a cross sectional descriptive retrospective analysis of 37 patients was conducted over 5 years. The majority of patients had type 1 diabetic foot complications ($n=29$; 78.38%), using Amit Jain's classification. Necrotising fasciitis was the most common pathological lesion ($n=12$; 32.43%), followed by abscess ($n=7$; 18.92%). The most common cause of death was septic shock ($n=22$; 59.5%), followed by acute myocardial infarction ($n=8$; 21.6%). This is the first study to analyse mortality in people with diabetic foot in detail, and it is studied for the first time using the new Amit Jain's classification for diabetic foot. Type 1 diabetic foot complications were the most common cause for mortality.

The prevalence of diabetes mellitus has dramatically increased in past 20 years, and it is now one of the most challenging health problems of the 21st century, with the burden lying more on developing countries^[1-3].

Diabetic foot disease is a clinical triad of sensory neuropathy, trauma and deformity, along with infection and ischemia^[4,5]. It has major medical, social and economic consequences and causes significant morbidity and mortality^[4,5]. There is increased disability, increased cost of care and a reduction in the quality of life^[4,6]. Of all diabetes complications, diabetic foot is one of the most common causes of death, followed by diabetic ketoacidosis^[3].

Studies that have been done on diabetic foot mortality are either related to ulcer or lower limb amputation or on patients with or without foot disease^[6-8]. Although there has been discussion about mortality in diabetes in many studies,^[3,9] there are very few studies examining mortality in diabetic foot complications.

The aim of this study was to analyse mortality due to diabetic foot complications.

Methods

A cross sectional descriptive retrospective analysis was conducted at St John's medical college, Bangalore, India, a renowned tertiary care referral

teaching hospital of national repute. This was a 5-year study, from July 2010 to June 2015.

All the patients who died in the hospital due to diabetic foot problems were studied. Our institute has a well-maintained mortality register from which the patients for our study were obtained and subsequently studied. The overall mortality at our hospital ranges between 900 to 1,000 per year. We obtained an institutional ethics committee clearance for this study (IEC Study Ref No 11/2015).

Results

A total of 37 patients were included in this study, 31 males (83.8%) and six females (16.2%). The average ages of males was 58.13 years (range 45–70 years) and the average age of females was 59.5 years (range 55–65 years). A majority of patients ($n=14$; 37.8%) had diabetes between 1–10 years' duration.

Details of the patients' foot problems are shown in *Table 1*. The majority of patients had type 1 diabetic foot complications ($n=29$; 78.4%), using Amit Jain's classification. Four patients (10.8%) had type 2 and four patients (10.8%) had type 3 diabetic foot complications. Necrotising fasciitis was the most common pathological lesion ($n=12$; 32.4%), followed by abscess ($n=7$; 18.9%).

Surgery was performed on 28 patients (75.68%) during their hospitalisation. Of those who

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underwent surgery, 11 patients (39.3%) had it within 24 hours of admission, 14 patients (50%) between 1 and 3 days and three patients (10.7%) had surgeries 4–7 days after admission [Table 2].

Debridement was the most common surgical procedure, performed in 17 patients (60.7%). Ten patients (35.7%) had undergone amputation in this admission period, with six patients (21.4%) having a major amputation [Table 2].

Three patients (8.1%) died within 24 hours of admission, 17 (46%) died between day 1 and day 7, 14 (37.8%) died within 8–30 days, and three (8.1%) more than 1 month after hospitalisation [Table 3]. The most common cause of death was septic shock ($n=22$; 59.5%) followed by acute myocardial infarction ($n=8$; 21.6%).

The majority of patients ($n=20$; 54%) had symptoms of less than 1 week's duration and 20 patients (54%) had a history of fever.

Many patients had co-morbidities – hypertension ($n=29$; 78.4%), ischaemic heart disease ($n=12$; 32.4%), renal disease ($n=19$; 51.4%) and peripheral arterial disease ($n=4$; 10.8%). There were 17 patients (45.95%) on insulin, and 15 (40.54%) on anti-diabetic tablets alone at the time of admission.

Twelve patients (32.43%) had a history of some form of amputation, most commonly toe amputation (75%), with 10 patients (83.3%) having had an amputation performed elsewhere in the 5 year period before being admitted to our hospital.

Discussion

Foot ulcers and related complications are considered to be one of the most important cause of morbidity and mortality in patients with diabetes^[10]. Inpatient mortality due to diabetic foot problems ranges from 1.1% to as high as 25.4%^[11,12]. In one study,^[7] it was shown that in hospital mortality was 4.9% in diabetic patients with no foot disease, 8.4% in those with foot disease and 7.2% in those who had undergone amputation.

Our study showed for the first time that type 1 diabetic foot complications are the most common cause of mortality in diabetic foot patients, with necrotising fasciitis being the commonest pathological lesion, followed by abscess [Figure 1]. In studies carried out using Amit Jain's classification, the majority of patients treated in hospital have type 1 diabetic foot complications^[13–19].

Table 1. Patients' diabetic foot problems and duration of diabetes ($n=37$)

Foot involved	<i>n</i>	%
Left	18	48.7%
Right	15	40.5%
Bilateral	4	10.8%
Type of complications (Amit Jain's classification)		
Type 1 diabetic foot complications	29	78.4%
Type 2 diabetic foot complications	4	10.8%
Type 3 diabetic foot complications	4	10.8%
Pathological lesion type		
Cellulitis with abscess	2	5.4%
Cellulitis without abscess	5	13.5%
Necrotising fasciitis	12	32.4%
Abscess	7	18.9%
Wet gangrene	3	8.1%
Dry gangrene (type 2 complication)	2	5.4%
Non-healing ulcer (type 2 complication)	2	5.4%
Infected ulcer (type 3 complication)	4	10.8%
Duration of diabetes		
Less than 1 year	5	13.5%
1–10 years	14	37.8%
11–20 years	12	32.4%
>20 years	6	16.2%

Table 2. Patients who underwent surgery for diabetic foot complications ($n=28$)

Timing of surgery	<i>n</i>	%
Within 24 hours of admission	11	39.3%
1–3 days	14	50%
4–7 days	3	10.7%
Type of surgery		
Debridement	17	60.7%
Toe amputation	1	3.6%
Transmetatarsal amputation	3	10.7%
Below knee amputation	3	10.7%
Above knee amputation	3	10.7%
Flap surgery	1	3.6%

Table 3. Timing and causes of death (n=37)

Timing of death	n	%
Within 24 hours	3	8.1%
1–7 days	17	46%
8–30 days	14	37.8%
>1 month	3	8.1%
Cause of death		
Septic shock	22	59.5%
Myocardial infarction	8	21.6%
Respiratory complications	1	2.7%
Cardiac arrest	3	8.1%
Metabolic encephalopathy	1	2.7%
Multiple organ dysfunction syndrome (MODS)	1	2.7%
Aspiration pneumonia	1	2.7%

Mortality rates are believed to be higher in patients with amputations^[8]. In our study, 15.8% of patients who died had undergone a major amputation in the same admission, and 32.4% of these patients had already had some form of amputation prior to admission at our hospital, with 83.3% having had this amputation within the past 5 years.

Ischemia is not only a contributory factor for amputation in diabetic foot, but it is also a major factor contributing to increased mortality^[6]. In our study, 10.8% of the patients had underlying peripheral arterial disease. Hypertension, renal disease and ischemic heart disease were commonly associated comorbidities in patients in this study.

Conclusion

Mortality in diabetic foot patients has been rarely analysed in detail. This is the first study that analyses



Figure 1. Diabetic foot abscess involving the right sole. This is Amit Jain's type 1 diabetic foot complication.

mortality in diabetic foot in detail and also it is studied for the first time through the new modern classification for diabetic foot. Amit Jain's type 1 diabetic foot complications are the most common cause for mortality in diabetic foot patients and necrotising fasciitis is the most common underlying pathological lesion. The most common cause of death in diabetic foot patients in our study was septic shock (59.5%). The majority of patients (46%) died within a week of admission. ■

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