E-ISSN: 2616-3470
P-ISSN: 2616-3462

www.surgeryscience.com
2019; 3(4): 498-502
Received: 01-08-2019
Accepted: 03-09-2019

Dr. Sreenath GS
Additional Professor, Department of Surgery, Jawaharlal Institute of Postgraduate Medical Education and Research, Puducherry, India

Lakshanya Anandhan
3rd Year Medical Graduate, Department of Surgery, Jawaharlal Institute of Postgraduate Medical Education and Research, Puducherry, India

Dr. Rajagopalan G
DNB, Senior Resident, Department of Surgery, Jawaharlal Institute of Postgraduate Medical Education and Research, Puducherry, India

Dr. Elamurugan TP
Associate Professor, Department of Surgery, Jawaharlal Institute of Postgraduate Medical Education and Research, Puducherry, India

Dr. Sreenath GS
Additional Professor, Department of Surgery, Jawaharlal Institute of Postgraduate Medical Education and Research, Puducherry, India

Corresponding Author:
Dr. Elamurugan TP
Associate Professor, Department of Surgery, Jawaharlal Institute of Postgraduate Medical Education and Research, Puducherry, India

Evaluation of factors responsible for advanced foot infection at index presentation among diabetic patients in South India

Dr. Sreenath GS, Lakshanya Anandhan, Dr. Rajagopalan G, Dr. Elamurugan TP and Dr. Sreenath GS

DOI: https://doi.org/10.33545/surgery.2019.v3.i4i.290

Abstract
Introduction: Foot ulcer is one of the most common and deadest complications of diabetes mellitus. Studies from India have shown that nearly 40% of patients with diabetic foot infection present with advanced foot infection at index presentation. This study aims to assess the factors which lead to severe diabetic infection at presentation in south India
Methodology: The study was designed as Descriptive study and conducted in the Department of Surgery, JIPMER from June 2018 to July 2018. All patients more than 18 years of age presenting with Wagner's diabetic foot infection grade 3 or more for the first time to casualty or outpatient department was included in the study. Patients with vasculopathy or Peripheral vascular disease, neuropathic joint and coexisting venous pathology were excluded. Demographic parameters, diabetes disease characteristics and treatment details, diabetic foot infection characteristics and prior treatment details were obtained. Using a self-administered questionnaire, knowledge about diabetic foot care, practice of foot care, details of the nearest health facility and compliance to primary treatment after the onset of diabetic foot infection were assessed. These parameters were correlated with the severity of diabetic foot infection at presentation and assessed for statistical significance.
Results: A total of 60 patients presenting with Wagner's diabetic foot infection grade 3 or more for the first time were recruited in the study. The mean age of the patients included in the study was 53.92. 73% (44) of patients were men and 81.67% (49) belonged to low socioeconomic status. 31% (19) of the study population were illiterate. 51 patients (85%) had an index presentation at other health centers before coming to JIPMER. On assessing the knowledge of the patients out of a maximum score of 9, 26.67% (16) scored less than 3 while 31.67% scored above 6. On questioning about their practice of foot care, only 6 patients checked their feet once a week or less while no one checked it every day twice and 86.67% told that they checked only when they had a problem. More than 50% of the patients walk bare footed.
Conclusion: Higher grade diabetic foot infections are present in higher age group patients with long duration of diabetic and diabetic foot ulcers. Low socioeconomic status, inadequate knowledge of diabetic foot care and poor practice of diabetic foot care have been identified in patients with advanced diabetic foot infection.

Keywords: Diabetic foot, infection, foot ulcer

Introduction
In India, about 50.9 million people suffer from diabetes, and this figure is likely to go up to 80 million by 2025, making it the 'Diabetes Capital' of the world [1]. Foot ulcer is one of the most common and deadest complications of diabetes mellitus. The lifetime risk of a diabetic patient developing a foot ulcer is 15% [2]. Improper prevention of diabetic foot conditions can result in significant morbidity, decreased function and quality of life [3].

Studies from India have shown that nearly 40% of patients with diabetic foot infection present with advanced foot infection at index presentation.[2] As a result it has been observed that in developing countries the rate of amputation is high when compared to the developed countries. The reason for this is could be various factors. Poor awareness about foot care, delay in seek of medical care, unavailability of proper medical facility and poor compliance with the primary treatment, etc. have been identified as the reason for severe infection or advanced infection at index presentation [4, 5]. A lower education level, lower socioeconomic status, lower level of social support (whether by family members or other forms of caregivers), higher presence of

misperceptions, poor attitude, non-synergistic worldviews, religious or cultural beliefs, lower general degree of self-care, higher level of occupational barriers (such as job commitments and job requirements) and lower degree of follow-up or retention of care within the healthcare system were considered to be modifiable predisposing barriers to eventual proper diabetic foot care. This study aims to assess the factors which lead to severe diabetic infection at presentation in south India

Materials and methods

The study was designed as Descriptive/ Observational study and conducted in the Department of Surgery, JIPMER from June 2018 to July 2018. All patients more than 18 years of age presenting with Wagner's diabetic foot infection grade 3 or more for the first time to casualty or outpatient department was included in the study. Diabetic foot infection patients with vasculopathy or Peripheral vascular disease, neuropathic joint and coexisting venous pathology were excluded. Using a data collection proforma following details were collected from the patient by direct interview as well as from the case records. Demographic parameters, diabetes disease characteristics and treatment details, diabetic foot infection characteristics and prior treatment details were obtained. Using a self-administered questionnaire, knowledge about diabetic foot care, practice of foot care, details of the nearest health facility and compliance to primary treatment after the onset of diabetic foot infection were assessed. These parameters were correlated with the severity of diabetic foot infection at presentation.

Results

A total of 60 patients presenting with Wagner's diabetic foot infection grade 3 or more for the first time were recruited in the study. The mean age of the patients included in the study was 53.92. 73% (44) of patients were men and 81.67% (49) belonged to low socioeconomic status. 31% (19) of the study population were illiterate and only 41% had education up to high school. 78.33% of the patients have a health facility within 10 kms from their residence while 43.3% came from more than 100kms to JIPMER.

56.67% (34) of the patients had diabetes mellitus diagnosed before 5 years or earlier. All of them had type 2 DM and 40% were on insulin treatment before the onset of infection. Most of them (83.3%) were on regular follow up, mostly monthly once. The duration of the foot infection for 70% of the patients at index presentation was within 2 weeks and 61.67% (37) of them had spontaneous lesions. 51 patients (85%) had an index presentation at other health centers before coming to JIPMER out of which 41(68.3%) had gone to a private health care centre. A few (8) had taken herbal or home remedies before approaching a health facility. Most (86.67%) had investigations done on index presentation.

On assessing the knowledge of the patients out of a maximum score of 9, 26.67% (16) scored less than 3 while 31.67% scored above 6. 78.33% (47) knew the importance of taking antidiabetic treatment to prevent complications. Most of them knew they had to wash their feet daily (91.67%) and to trim their nails straight with care (85%). However only 28.33% (17) knew they had to wash their feet with warm water and 21.67% (13) knew they had to have their feet inspected once a day. Around half of the patients (51.67%) knew about the warning signs for which consultation is required.

On questioning about their practice of foot care, only 6 patients checked their feet once a week or less while no one checked it every day twice and 86.67% told that they checked only when they had a problem. While 93.3% (56) washed their feet daily, 63.3% (38) dried well between their toes. Only one patient used a moisturising cream on their foot while 21.67% told that they applied coconut oil regularly and 60% of the patients did not use any moisturising creams. 23.33% (14) have soaked their feet. Most of them (85%) cut their own toenails while the family members cut for the rest of them. 43.33% (26) of them wore rubber slippers while 10% (6) used diabetic footwear and 11.66% did not wear any kind of footwear. 73.33% (44) of the patients believed that they have taken care of their feet in the correct way.

Discussion

Advanced cases of diabetic foot infection form a major percentage of diabetic foot infection in most of the government hospitals in India. Nearly 40% of people present with advance foot infection needing some of surgery in the emergency like debridement or Amputation [4].

In our study the average age of the patient with high grade diabetic foot infection was 53.92 yrs. Duration of diabetes and decreased immune response in the elderly population can be the reason for the development of deeper infection. Irregularity in the treatment or intake of the medications of diabetes due to poor memory may also lead to advanced foot infection. Studies have shown that diabetic foot infections are as such common in the elderly age group [6-7]. The gender distribution in our study population was found to be more skewed towards the male gender. This also a universal phenomenon as male gender is the working member of the family and he is exposed to various external factors which can lead on to development of foot infection. Few studies have shown that the male gender tend to overlook on the early lesions which can predispose to development of foot infection [6, 7]. They also tend to not take adequate care of the foot infection due to economic constraints in the family.

In our study nearly 55% percent of the population from the rural back ground. Diabetic foot infection is generally seen higher in the rural population due to the lack of awareness on the diabetic foot care and inadequate knowledge on diabetic foot infection[9]. Advance diabetic foot infection is also common in the rural population as their knowledge on the diabetic foot infection and its treatment modality is poor. They are also poor in knowledge about the warning signs of the advanced foot infection and end up in late stage of the disease [9, 10]. Few studies have also shown that rural population tend to present with late stage of foot infection and even with systemic complications [5, 6].

One another reason for late presentation of diabetic foot infection identified could be poor accessibility to medical care services [5, 6]. The reason for poor access can the distance from the nearest health facility, the cost of the travel and availability of proper transport facility for regular checkup. Diabetic foot infection is a condition which requires regular follow visit to monitor the progress of the infection. In our study we found that the nearest health facility of majority of the patients was less than 10 kms. This shows that though there is an accessible health care service these patients present with late infection due to poor awareness about the diabetic foot infection

In our study population more than 50 % of the patients have had diabetes for more than 5 years. Diabetic foot infection rate progressively increases with the increase in the duration of the diabetes mellitus infection [3, 4]. Our study also shows that use of OHA drugs and insulin were equally distributed in the study subjects. Studies have shown that patients with prolonged duration of diabetes, irregular sugar control and on insulin

therapy have higher risk of developing advanced foot infection [5-7].

Inadequate treatment, inappropriate use of antibiotics, poor wound dressing or wound care, irregular follow up visits in long duration diabetic foot ulcer are some of the predisposing factors for development of advanced foot infection. In our study population we found that majority of the patients had ulcer for more than 10 days and 80% of the people had gone for regular follow up for the foot infection. It is to be noted that though the patients had gone on regular follow up more than 50 % of the patients s have gone to multiple hospitals before reaching the tertiary care center. Regular follow with one hospital would help them identifying the advanced infection at an early stage thereby aiding in early referral to a higher center for ideal management. Visit to multiple hospitals leads to inappropriate or inadequate medication and loss of precious time in a=identifying deeper infection.

Knowledge of patients about the diabetic foot infection and diabetic foot care has been identified as the single important factor predicting the prognosis of the diabetic foot infection [8-13]. Several studies have been done to assess the knowledge of patients on diabetic foot infection in and around the world [8-10]. In our study we found that nearly 70 % patients had less than adequate knowledge about diabetic foot care. Low awareness of the study population may be attributed to the fact major part of the study patients were from a rural background and almost 60% of them had poor education status. Though most of them had correct responses to common facts about diabetic foot like, importance of regular treatment of diabetes, daily washing of feet and trimming of nails regularly, responses were poor regarding adequate precautions to prevent development of infection. Precautionary measures like not walking barefoot, using warm water for washing the foot etc. were not clear among majority of the patients [12]. Awareness on the warning signs of the diabetic foot infection was found to very poor in the study population. Other similar studies have also identified similar results [8, 13].

Following good practices of foot care has been shown to reduce the development of foot infection. Various studies have shown the importance of following adequate foot care practice. In our study practice of diabetic foot care has been found to be very poor [9, 10]. More 50 % of the study population still walk bare footed or do not have a regular foot wear. This finding may due to the nature of work they are involved in. Majority patients in the study group are occupied as agriculture labourers and work in fields. Stress must be made on the regular use of outwears in all places of work there by decreasing the chance of trauma leading on to florid infection. Regular inspection and care of the foot has been found to be missing in nearly 6 percentage of the patients. Regular inspection of the webspaces and drying up of the web spaces must be practiced to present maceration of the skin crease and development of the infection. Moisturing the foot has been found to prevent dryness of the skin which leads to cracks and breaks in the skin. Cracks in the heel have been shown to one of the commonest predisposing skin lesions in many studies. In our study we have found that though the patients have some knowledge on the diabetic foot care, practice of diabetic foot care has been very poor.

Table 1: Demographic characterictics of patients with high grade diabetic foot infection

Parameter		N(%)
Age	<20 yrs	0
	20-40	6 (10)
	40-60	36 (60)
	>60	18 (30)
Gender	Male	44 (73.3)
	Female	16 (26.67)
Address	Rural	38 (63.33)
	Urban	22 (36.67)
Socioeconomic status	Low	49 (81.67)
	Moderate	11 (18.33)
	High	0
Education status	illiterate	19 (31.67)
	upto primary school	11 (18.33)
	upto higher secondary	25(41.67)
	graduate	5(8.33)
Income	<2000 rs	49(81.67)
	>2000	11(18.33)
Distance from nearest health facility	<10 Km	47(78.33)
	>10 km	13(21.67)
Distance from JIPMER	<10 Km	5(8.33)
	>10 km	10(16.67)

Table 2: Diabetes and diabetic foot disease characteristics of patients with high grade diabetic foot infection

Parameter		N (%)
Duration of diabetes	<1 yr	14(23.33)
	1-5 yrs	12(20)
	>5 yrs	34(56.67)
Type of Dm	I	0
	II	60(100)
Treatment of Diabetes	OHA	36(60)
	Insulin	24(40)
Follow up details	Regular	50(83.33)
	Irregular	10(16.67)
Duration of Diabetic foot	<1 week	13(21.67)
	1-2 week	29(48.33)
	>2 weeks	18(30)
Mode of Onset	Spontaneous	37(61.67)
	Trauma	23(38.33)
Osteomyelitis	Present	48(80)
	Absent	12(20)
Systemic complications	Present	32(53.33)
	Absent	28(46.67)

Table 3: Treatment characteristics of Diabetic foot infection at index presentation

Parameter		N (%)
Patient who had a index presentation before coming to JIPMER	yes	51(85)
	No	9(15)
Place of Index treatment	JIPMER	9(15)
	Other Government Hospital	10(16.67)
	Private	41(68.33)
	Herbal-YES	8(13.33)
Investigations at index presentation	Done	52(86.67)
	Not done	8(13.33)
Treatment Prescribed at Index presentation	Oral drugs only	7(11.67)
	Injections	53(88.33)
Follow up after index presentation	Regular	50(83.33)
	irregular	10(16.67)
Visits to other hospitals before coming to JIPMER	<2	26(43.33)
	>2	34(56.67)

Table 4: Knowledge score of patients with high grade diabetic foot infection

Knowledge score (out of 9)	N (%)
<3	16(26.67)
3-6	25(41.67)
>6	19(31.67)

Table 5: Knowledge response of patients with high grade diabetic foot infection

Knowledge questions	Yes (%)	No (%)
Importance of taking antidiabetes treatment to prevent complications	47(78.33)	13(21.67)
Daily washing the feet	55(91.67)	5(8.33)
Using warm water for washing/bathing	17(28.33)	43(71.66)
Checking temperature of water before using	17(28.33)	43(71.66)
Drying the feet after washing	43(71.67)	17(28.33)
Trimming nails of feet straight with care	51(85)	9(15)
Inspection of feet once a day by respondents	13(21.67)	47(78.33)
Not walking bare foot	47(78.33)	13(21.67)
Warning signs for which consultation is required	31(51.67)	29(49.33)

Table 6: Response on Practice of Diabetic foot care of patients with high grade diabetic foot infection

Practice Questions	Yes %	No %
Can you reach and see the bottoms of your feet?	44(73.33)	16(26.67)
Do you examine your feet?	8(9.33)	52(86.67)
Do you wash your feet every day?	56(93.33)	4(6.67)
Do you dry well between the toes?	38(63.33)	22(36.67)
Do you use a moisturizing cream on your feet?	YES-1(1.66) Coconut Oil- 13(21.67)	46(76.67)
Do you cut your own toenails?	52(86.67)	8(13.33)
Do you ever soak your feet?	14(23.33)	46(76.67)
Do you always test water temperature before your foot in?	16(26.67)	44(73.33)
Do you use medicated products corns or calluses?	2(3.33)	58(96.67)
Do you put moisturizing creams or lotions between your toes?	5(8.33)	55(91.67)
Do you ever walk around in your bare feet?	34(56.67)	26(43.33)
Do you sit with your legs crossed?	45(75)	15(25)
Do you think you have taken care your feet in correct way?	44(73.33)	16(26.67)

Conclusion

Higher grade diabetic foot infections are present in higher age group patients with long duration of diabetic and diabetic foot ulcers. Low socioeconomic status, inadequate knowledge of diabetic foot care and poor practice of diabetic foot care have been identified in patients with advanced diabetic foot infection.

References

1. Andrew J, Gunne R, Jan A. The global burden of diabetes foot disease. Lancet 2005; 366:1719-24.
2. Diabetes in India from http://www.diabetesfoundationindia.org/about.htm
3. Rerkasem K, Kosachunhanun N, Tongprasert S *et al*. Reducing lower extremity amputations due to diabetes: the application of diabetic-foot protocol in Chiang Mai University Hospital. Int J Low Extrem Wounds. 2008; 7(2):88-92.
4. Al-Wahbi AM. Impact of a diabetic foot care education program on lower limb amputation rate. Vasc Health Risk Manag. 2010; 6:923-934.
5. Rastogi A, Bhansali A. Diabetic Foot Infection; An Indian Scenario. The Journal of Foot and Ankle Surgery (Asia-Pacific). 2016; 3(2):71-79
6. Mahakalkar CC, Kaple MN, Janardhan J, Jain N, Jaipuria P, Wagh DD. Pattern of diabetic foot - presentation and complications in rural Indian population. International

Journal of Research in Medical Sciences. 2015; 3(4):948-953.
7. Guell C, Unwin N. Barriers to diabetic foot care in a developing country with a high incidence of diabetes related amputations: an exploratory qualitative interview study. BMC Health Serv Res. 2015; 15:377.
8. Weerasuriya N, Siribaddana S, Wijeweera I, Dissanayeka A, Wijesekera J, Fernando DJ. The prevalence of peripheral neuropathy in newly diagnosed patients with non-insulin-dependent diabetes mellitus. Ceylon Med J Mar 1998; 43(1):19-21.
9. Barbui EC, Cocco MI. Knowledge of the diabetic patient on foot care. Rev Esc Enferm USP. 2002; 36(1):97-103.
10. Ikpeme A, Udosen AM, Ngim NE *et al*. Foot care practices among Nigeria diabetic patients presenting with foot gangrene: African journal of diabetic medicine. 2010; 18(2)
11. Khamseh ME, Vatankhah N, Baradaran HR. Knowledge and practice of foot care in Iranian people with type 2 diabetes. Int Wound J. 2007; 4(4):298-302.
12. Jayasinghe SA, Atukorala I, Gunethilleke B, Siriwardena V, Herath SC, De Abrew K. Is walking barefoot a risk factor for diabetic foot disease in developing countries? Rural Remote Health. 2007; 7(2):692.
13. Chamil Vidusha Madushan Jinadasa, Madawa Jeewantha. A study to determine the knowledge and practice of foot care in patients with chronic diabetic ulcer. International Journal of Collaborative Research on Internal Medicine & Public Health. 2011; 3:189-191.