Original Article

Management of diabetic foot ulcer in Babol, North of Iran: an experience on 520 cases

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Abstract

Background: Foot ulcers (FU) are a significant complication of diabetes mellitus (DM) and a preceding factor leading to lower extremity amputation. The aim of this study was to evaluate the management of diabetic foot ulcer (DFU) in Babol, north of Iran.

Methods: Five hundred twenty cases of diabetic foot ulcer that were hospitalized in two main teaching hospitals of Babol University of Medical Sciences from March 2005 to September 2011 were evaluated. Glycemic control, wound and foot care, ulcer treatment and site of amputation were determined and the collected data were analyzed.

Results: Four hundred forty seven (84%) had inappropriate glycaemic control. Three hundred-sixty-four (70%) received oral anti-diabetic drugs. Ulcer care was proper and improper in 46% and 54% of cases, respectively. Quality of foot care was inappropriate in 66% of patients. Most patients were treated surgically (85%) including debridement (28%) and amputation (57%). Major amputations were the most common (63%) and below knee amputation was more predominant (61%).

Conclusion: The results show that diabetic foot ulcer management is not appropriate in this region, and the rate of amputation is relatively high. Improvement and organization of existing facilities are recommended.

Keywords: Diabetes Mellitus, Foot ulcer, Management, Amputation

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Lower extremity complications in persons with diabetes have become an increasingly significant public health concern in both the developed and the developing world. Of all diabetics, 15% of them are going to suffer from a foot infection during their life, with an annual incidence of 1-4%, preceded by a foot ulcer in more than 80% of cases. Diabetic foot ulcers (DFUs) pose a therapeutic challenge to surgeons, especially in the developing countries where health care resources are limited and the vast majority of patients present to health facilities late with advanced foot ulcers. The morbidity and mortality associated with diabetic foot lesions remain extremely high and management needs to be optimized to ensure best outcome (1-5). Good diabetes and foot care in many instances may prevent ulcer or increase the potential to heal the patients with foot ulceration. It is accepted that the institution of rapid access to expert multidisciplinary services is an essential component of care (6-9). This study was carried out to evaluate the management of DFU in Babol, north of Iran.

Methods

This retrospective study was conducted on 520 cases of diabetic foot ulcer who were hospitalized in two teaching hospitals of Shahid Beheshti and Shahid Yahyanejiad, affiliated with Babol University of Medical Sciences from March 2005 to September 2011.

Data Including glycemic control, ulcer and foot care, ulcer treatment and site of amputation were recorded. Glycemic control assigned as inappropriate for patients who had improper blood sugar control, and appropriate for those who had proper blood glucose control based on fasting blood glucose and HbA1c measurements (10). Orally treated diabetic patients were those who consumed oral medication such as metformin, glibenclamide or both and parenterally treated patients were under insulin therapy. The kinds of ulcer care were classified according to how the wounds were treated such as proper irrigation and dressing, self dressing or no treatment. The quality of wound care was rated as good, fair and poor for patients who had proper, intermediate and improper wound care, respectively.

With regard to the kind of treatment, the patients who had no surgical intervention and received just medical therapy including anti diabetic medication and appropriate antibiotics under the supervision of an infectious disease specialist according to the recommended guidelines assigned as nonsurgical group (11, 12). The ones who underwent removal of necrotic and infected tissues composed debridement group, and the amputation group were those who did not respond to medical therapy and debridement, or amputation was inevitable due to deep infection, or gangrene, or for life saving. The pattern of amputation was categorized in major (above the ankle joint) and minor (through or distal to the ankle joint) based on the level of amputation (13). Collected data were analyzed by SPSS.18.

Results

Five hundred and twenty patients were enrolled in this study. Among them, 343 (66%) were females and 177 (34%) were males with the mean age of 57.8±11.20 years. Approximately, two thirds of the patients (67%) were above 55 years, and one third (33%) under 55. The pre-hospitalization characteristics of cases are shown in table 1. Eighty six percent had poor glycaemia control. Seventy percent had oral medication. Ulcer care and quality of foot care were not optimized in 54% and 66%, respectively. The management of all the (without the) subjects is presented in table 2.

Mostly (85%) were treated surgically, 57% were amputated. Major amputations were the most common (63%) and bellow knee amputation was more prevalent (61%).

Table 1. Pre-hospitalization Characteristics of diabetic foot ulcer in 520 cases.

Characteristic	N (%)
Glycemia control	
- Inappropriate	447 (86)
- Appropriate	73 (14)
- Orally	364 (70)
- Parenterally	156 (30)
Quality of ulcer care	
- Proper irrigation plus dressing	240 (46)
- Self dressing	176 (34)
- No care	104 (20)
Quality of foot care	
- Good	177 (34)
- Fair	192 (37)
- Poor	151 (29)

Table 2. Management of diabetic foot ulcer in 520 cases.

Characteristic	N (%)
Kind of treatment	
▪ **Nonsurgical**	**78 (15)**
▪ **Surgical**	**442 (85)**
- Debridement	144 (28)
- Amputation	298 (57)
Pattern of amputation	
▪ **Major**	**188(63)**
- Above Knee	6 (2)
- Below knee	182 (61)
▪ **Minor**	**110 (37)**
- Ankle	12 (4)
- Trans metatarsal	45 (15)
- Transphalangeal	53(18)

Discussion

The major part of the burden of people with diabetes mellitus is their impaired quantity and quality of life. This is due to acute and chronic complications of which diabetic foot ulceration (DFU) takes the greatest toll (1, 8). The complex pathology of DFU requires expert and in-depth assessment and management to achieve the best outcomes (14). About two thirds of our cases were females and above 55 years. This is in contrast with the general consensus (15-19). This difference may be attributed to epidemiological characteristics of this area such as engagement of women in

agricultural and animal husbandry work in this region, plus the impression of O Desalu et al. that indicated women and those above the age of 50 were less knowledgeable about foot care, although these associations were not statistically significant. Also in some third world countries, due to socio-cultural beliefs, women are not allowed to attain higher educational status compared with their male counterparts in the family, eventually resulting in women to have less knowledge of DM foot care (20).

Glycaemia control was shown to be effective in foot ulcer development and its healing (19, 21). In this study, glycaemia control was inappropriate in 86% of cases and glycemia was treated mostly (70%) with oral anti diabetic agents that is in contrast with Ali SM et al. and is consistent with Nierenberg G et al.'s findings (15, 22).

Regular foot care is known as an important preventive measure to increase the potential of healing diabetic foot ulcer (6, 23). This study revealed that the majority of cases had improper quality of ulcer and foot care (54% and 66%, respectively). This poor level of foot care practice in this study is in agreement with previous studies (24-30). The rate of amputation in our cases was high (57%) that is not consistent with general consensus. Several studies showed the rates of amputation between 10-36.7% (10, 15, 30, 31, 33). The rates of major and minor amputations in the current study were 63% and 37%, respectively while Viswanathan V. et al.'s findings indicate 29.1% and 70.9% (34). The distribution of amputation in our cases also is not compatible with the results of other researches (31, 34), but there is rather an agreement about the high rate of below knee amputation (61% versus 51.9% and more than 50%).

The reasons for high rates of amputation in the present study may be attributed to the geographical characteristics of this region because the hospitals in which the study was performed are referral surgical hospitals in this area that serve to more than 1.5 million people living in the central part of Mazandran province north of Iran, and most of the people in this region are involved in agricultural and animal husbandry work which are riskful work for development of DFU. Also, the patients who are referred to these hospitals mostly suffer from severe foot ulcer and gangrene, their limbs are not salvageable and amputation is inevitable. Also, the majority of cases are associated with comorbidities or high and uncontrollable blood glucose that amputation is life saving for them. According to the findings of this study, diabetic foot ulcer management is not optimized in this region, and the rate of amputation is high. As a result, improvement and organization of existing facilities are recommended to decrease the risk of limb amputation, and the cost that accompanies limb loss in this prevalent condition.

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References

1. Wu SC, Driver VR, Wrobel JS, Armstrong DG.Foot ulcers in the diabetic patient, prevention and treatment. Vasc Health Risk Manag. 2007; 3: 65-76.
2. Ogbera AO, Fasanmade O, Ohwovoriole AE, Adediran O. An assessment of the disease burden of foot ulcer in patients with diabetes mellitus attending a teaching hospital in Lagos, Nigeria. Int J Low extreme wounds 2006; 5: 244-9.
3. Chalya PL, Mabula JB, Dass RM, et al. Surgical management of Diabetic foot ulcers: A Tanzanian university teaching hospital experience. BMC Res Notes 2011; 4: 365.
4. Viswanathan V. The diabetic foot: perspectives from Chennai, South India. Int J Extrem Wounds 2007; 6: 34-6.
5. Blanes JI, Lozan F, Calara A, et al. Consensus document on treatment of infections in diabetic foot. Rev Esp Quimioter 2011; 24: 233-62.
6. Fletcher J. Full nursing assessment of patients at risk of diabetic foot ulcers. Br J Nurs 2006; 15: S18-21.
7. Cavanagh PR, Lipsky BA, Bradury A, Botek G. Treatment for diabetic foot ulcer. Lancet 2005; 366: 1725-35.
8. Singh N, Armostrong DG, Lipsky BA. Preventing foot ulcers in patients with diabetes. JAMA 2005; 293: 217-8.
9. Ko IS, Lee TH, Kim GS, Kang SW, Kim MJ. Effects of visiting nurses individually tailored education for low-income adult diabetic patients in korea. Public health Nurs 2011; 28: 429-37.

10. Koenig RJ, Peterson CM, Jones RL, et al. Correlation of glucose regulation and hemoglobin HbA1c in diabetes mellitus. N Engl J Med 1976; 295: 417-20.
11. Leese G, Nathwani D, Young M, et al. Use of antibiotics in people with diabetic foot disease: A consensus statement. Diabet foot J 2009; 12: 1-10.
12. Peferborough and Stamford Hospitals, NHS foundation trust. Clinical guidelines for the in-patient management of diabetic foot infections. August 2007. Avaliable at: http://footindabertes.org/system/files/ clinical+gudilines+fat the + in patient + management of + diabetic+ foot+ infections. Pdf. Accessed on Feb 28 2012.
13. Svensson H, Apelqvist J, Larsson J, Lindholm E, Eneroth M. Minor amputation in patients with diabetes mellitus and severe foot ulcers achieves good outcomes. Source Wound Care 2011; 20: 261-2, 264, 266 passim.
14. Roberts P, Newton V. Assessment and management of diabetic foot ulcers. Br J Community Nurs 2011; 16: 485-90.
15. Ali SM, Basti A, Mumtaz S, Hydrie MZI, Sheikh T. Diabetic foot ulcer a prospective study. J Pak Med Assoc 2001; 51: 78-81.
16. Qari FA, Akbar D. Diabetic foot: presentation and treatment. Saudi Med J 2000; 21: 443-61.
17. Zafar A. Management of diabetic foot- two years experience. J Ayub Med Coll Abbottabad 2001; 13: 14-6.
18. Altindas M, Kilic A, Cinar C, Bingol UA, Ozturk G. The epidemiology of foot wounds in patients with diabetes: a description of 600 consecutive patients in Turkey. J Foot. Ankle Surg 2011; 50:146-52.
19. Jeffcoate WJ, Chipchase SY, Ince P, Game FL. Assessing the outc ome of the management of diabetic foot ulcers using ulcer-related and person-related measures. Diabetes Care 2006; 29: 1784-7.
20. Desalu OO, Salawu FK, Jimoh AL, et al. Diabetic Foot Care: Self Reported Knowledge and Practice Among Patients Attending Three Tertiary Hospital in Nigeria. Ghana Med J. 2011; 45: 60–5.
21. Chalya PL, Mabula JB, Dass RM, et al. Surgical management of Diabetic foot ulcers: A Tanzanian university teaching hospital experience. BMC Res Notes 2011; 4:365.
22. Nierenberg G, Eidelman M, Stein H. Inpatient survey and the Dynamics of the complicated diabetic foot. Diabet Med 2000; 17: 282.
23. Bardwell J. Role of poor glycaemic control in foot ulceration. Community Nurse 1999; 5: 41-4.
24. Pino AE, Taghva S, Chapman C, Bowker JH. Lower-limb amputations in patients with diabetes mellitus. Orthopedics 2011; 34: e885-92.
25. Lawall H.The diabetic foot. MMW Fortschr Med 2006; 148: 42-4, 46. [In German]
26. Pollock RD, Unwin NC, Connolly V. Knowledge and practice of foot care in people with diabetes. Diabetes Res Clin Pract 2004; 64: 117–22.
27. Khamseh ME, Vatankhah N, Baradaran HR. Knowledge and practice of foot care in Iranian people with type 2 diabetes. Int Wound J 2007; 4: 298–302.
28. Hasnain S, Sheikh NH. Knowledge and practices regarding foot care in diabetic patients visiting diabetic clinic in Jinnah Hospital, Lahore. J Pak Med Assoc 2009; 59: 687–90.
29. Viswanathan V, Shobhana R, Snehalatha C, Seena R, Ramachandran A. Need for education on foot-care in diabetic patients in India. J Assoc Physicians India 1999; 47: 1083–5.
30. Real JT, Walls M, Ascaso P, et al. Risk factors associated to hospitalization in diabetic patients with foot ulcers. Med clin (Barc) 2001; 117: 641-4. [In Spanish]
31. Gürlek A, Bayraktar M, Savaş C, Gedik O. Amputation rate in 147 Turkish patients with diabetic foot: the Hacettepe University Hospital experience. Exp Clin Endocrinol Diabetes 1998; 106: 404-9.
32. Oyibo SO, Jude EB, Tarawneh I, et al. The effects of ulcer size and site, patient's age, sex and type and duration of diabetes on the outcome of diabetic foot ulcers. Diabet Med 2001; 18: 133-8.
33. Zubair M, Malik A, Ahmad J. Incidence, risk factors for amputation among patients with diabetic foot ulcer in a North Indian tertiary care hospital. Foot Edinb 2012; 22: 24-30.
34. Viswanathan V, Kumpatla S. Pattern and causes of amputation in diabetic patients--a multicentric study from India. J Assoc Physicians India 2011; 59: 148-51.