Doi:http://dx.doi.org/10.5704/MOJ.1411.005

Knowledge and Practice of Diabetic Foot Care in an In-Patient Setting at a Tertiary Medical Center

AR Muhammad-Lutfi, MB BCh BAO, **MR Zaraihah,** MD, **IM Anuar-Ramdhan,** MMed Orth

Department of Orthopaedics ,Hospital Sultanah Nur Zahirah, Kuala Terengganu, Malaysia

ABSTRACT

Good knowledge and practice regarding diabetic foot care will reduce the risk of diabetic foot complications and ultimately amputation. This study is conducted to assess patients' knowledge and compliance of diabetic foot care.

A cross sectional study performed on patients who were admitted to HSNZ from the 1st September 2013 to 30th April 2014 for diabetic foot infections. They were interviewed with a questionnaire of 15 'yes' or 'no' questions on foot care knowledge and practice. Score of 1 was given for each 'yes' answer. The level of knowledge and practice, whether good or poor, was determined based on the median score of each category. The result was tested using a chi-square test in SPSS version 17.

A total of 157 patients were included in this study with a mean age of 56.33 years (31-77). There were 72 male (45.9%) and 85 female (54.1%) patients with the majority of them being Malays (154 patients, 98.1%). Majority of the patients (58%) had poor foot care knowledge while 97 patients (61.8%) had poor diabetic foot care practice as compared to the median score. Based on the chi square test of relatedness, there was no significant association between knowledge and practice with any of the variables.

In conclusion, the majority of patients admitted for diabetic foot infections had poor knowledge and practice of diabetic foot care. Education regarding foot care strategies should be emphasized and empowered within the diabetic population.

Key Words:
Knowledge and practice, diabetic foot care, in-patient, tertiary care centre

INTRODUCTION

Diabetes mellitus was found to have affected more than two million Malaysians between the ages of 20 to 79 in 2011 and the number is projected to increase by 50 percent by the year 2030 [1]. As the incidence increases, one would expect the number of diabetic complications including diabetic foot complications to rise in the years to come. This potentially devastating sequela causes significant mortality and morbidity and poses a substantial amount of financial burden on our healthcare. A study showed that 12 percent of diabetic related hospital admissions were due to diabetic foot complications [6]. In 2013 at a tertiary center in East Coast Malaysia, out of all these admitted diabetic patients, 11 percent ended up with a major limb amputation [8]. Foot complications increase the risk for amputation in diabetics by 12.3 folds as compared to the normal population [3]. The cost of managing an acute diabetic foot infection in a single admission is approximately RM 32,000 per year or RM190 per patient per year [9]. Diabetic foot complications also have a negative effect on patient's health related quality of life based on the SF36 questionnaire [10].

The common component causes of diabetic foot ulcer formation are trauma, neuropathy and deformity [4]. Education and awareness of diabetic foot ulcer pathway and the existing foot care measures that are intended to control them are paramount in foot ulcer prevention strategies. Nonetheless, having knowledge of the foot care alone will not be beneficial unless practiced with good compliance. Efforts have been made to increase public awareness of diabetic foot in the forms of health campaigns, public service advertisements and education by primary healthcare workers. However there are no studies in the literature that assess the current level of awareness of diabetic foot care in our diabetic patients.

The main objective of this study is to determine the level of knowledge and practice of foot care in diabetics who require admission for diabetic foot complications. We would also want to determine the factors associated with the different levels of knowledge and practice of foot care.

MATERIALS AND METHODS

This is a prospective cross sectional study performed between September 2013 until May 2014 on an in-patient population at Hospital Sultanah Nur Zahirah a tertiary medical center in Kuala Terengganu, Malaysia. A non-

Corresponding Author: Muhammad Lutfi Abdul Rashid, Department of Orthopaedics, Hospital Sultanah Nur Zahirah, Jalan Sultan Mahmud, 20400 Kuala Terengganu, Terengganu, Malaysia
Email: lutfi.rashid@gmail.com

randomized convenient sampling method was performed and an informed consent was obtained from the participants. The inclusion criteria was diabetic patients who required admission due to diabetic foot complications such as infected diabetic foot ulcers, cellulitis of the foot, foot abscesses, septic arthritis of the ankle joint, wet gangrene and necrotizing fasciitis of the foot. We excluded patients who were admitted for infection of the lower limb from the level of the calf cephalically such as intra-muscular abscess of the calf, septic arthritis of the knee, thigh abscess and infected transtibial or transfemoral amputation stump. Patients with poor conscious level and clinically delirious or demented were also excluded.

Patients' demographic data were collected for the purpose of analyzing the factors that were associated with knowledge and practice of diabetic foot care. Information such as age, gender, race and the duration since diagnosed with diabetes mellitus were collected together with educational level and household income per month in Malaysian Ringgit (RM); a local currency. Data regarding duration since diagnosed with diabetes, educational level and household income per month were then divided into two different groups, each. Duration since diagnosed with diabetes was grouped into more and less than 10 years. Educational level was divided into those who studied beyond the Malaysian Certificate of Education (SPM) at tertiary level and those who did not. As with household income the two groups were divided based on monthly income of more or less than RM2000, 00.

We used a diabetic foot care questionnaire designed by Hasnain *et al,*[2] which is a set of 15 'yes', or 'no' questions on knowledge and practice (Table II). The questionnaire was translated into local language of Bahasa Malaysia and was tested and validated. Medical personnel interviewed all patients during the completion of the questionnaire. It covered good foot care practice in the areas of feet washing techniques, skin and nail care and foot wear care. Each 'yes' answer carried one (1) point and zero point for a 'no'. The points were then added up for each of the knowledge and practice categories. The level of knowledge and practice, whether good or poor, was determined based on the median score of each category. Those who scored more than the median were considered as good and scores lower than the median were considered as poor. The association between duration since diagnosed with diabetes and other socio demographic factors with the level of knowledge and practice of foot care were tested using a chi-square test in SPSS version 17. All data generated and collected were tabulated using a normal frequency table.

RESULTS

A total of 157 patients were included in this study with a mean age of 56.33 years (range 31-77) with 94 patients (59.9%) e 55 years or older (Table I). There were 72 male (45.9%) and 85 female (54.1%) patients with the majority of them were Malays (154 patients, 98.1%). Only three patients were Chinese (1.9%) from the whole study sample. The mean duration since diagnosed with diabetes was 11.26 years (1-38). Most patients had diabetes for less or equal to 10 years (53.5%). A large majority of the patients earned less than RM2000,00 monthly (120 patients, 76.4%) and only 14 (8.9%) patients had received education beyond the SPM at tertiary level.

The responses for each foot care measure were generally good except for some in areas of feet washing technique and skin care of the feet (Table II). Application of talcum powder in the interdigital space has the lowest positive response with 23.6 percent for knowledge and 15.9 percent for practice. The other foot care measures that received poor responses were: the use of warm water for washing or bathing (47.8% for knowledge, 34.4% for practice); checking the temperature of water before using (31.2% for knowledge, 22.3% for practice) and not to apply lotion in the interdigital space (42.0% for knowledge and 42% for practice). Patients relatively gave satisfactory response to daily change of socks with 52.9 percent for knowledge, however its practice was only 40.8 percent, which was considered poor.

The majority of patients who were admitted for diabetic foot complications had poor foot care knowledge, with 58 percent of them scoring less than the median score of 10. In terms of practice, the number of patients with poor practice was also greater with 97 patients (61.8%) scored less than median score of nine. Based on the chi square test of relatedness (Table III) age, gender, household income per month, educational level and duration since diagnosed with diabetes had no significant association with knowledge and practice with none of the variables had p value of less than 0.05.

Table I: Sociodemographics of diabetic populations admitted for diabetic foot complication

Variable	n (%)
Age	
<55 years	63 (40.1%)
>55 years	94 (59.9%)
Gender	
Male	72 (45.9%)
Female	85 (54.1%)
Income per month*	
<RM2000	120 (82.2%)
>RM2000	26 (17.8%)
Educational level*	
Secondary or less	125 (89.9%)
Tertiary	14 (10.1%)
Duration of diabetes*	
<10 years	84 (53.5%)
>10 years	66 (46.5%)

* contains missing value, thus n≠157

Table II: Diabetic foot care questionnaire assessing knowledge and practice. The values are showing positive responses

Foot care measures	Knowledge (n=157)	Practice (n=157)
1. Importance of taking anti-diabetic treatment to prevent complication	147(93.6%)	130 (82.8%)
2. Daily washing of the feet	134 (85.4%)	127 (80.9%)
3. Using warm water for washing/bathing	75 (47.8%)	54 (34.4%)
4. Checking the temperature of the water before using	49 (31.2%)	35 (22.3%)
5. Drying the feet after washing	126 (80.3%)	117 (74.5%)
6. Talcum powder usage for keeping interdigital spaces dry	37 (23.6%)	25 (15.9%)
7. Keeping the skin of the feet soft to prevent dryness	98 (62.4%)	87 (55.4%)
8. Lotion not to be applied in the interdigital space	66 (42.0%)	66 (42.0%)
9. Daily change of socks	83 (52.9%)	64 (40.8%)
10. Trimming toe nails straight with care	84 (53.5%)	80 (51.0%)
11. Inspection of feet daily by respondents	110 (70.1%)	89 (56.7%)
12. Wearing comfortable coat shoes	111 (70.7%)	94 (59.9%)
13. Checking the inside of the shoes before wearing	105 (66.9%)	88 (56.1%)
14. Not walking barefoot	130 (82.8%)	121 (77.1%)
15. Warning signs for which consultation is required	125 (79.6%)	114 (72.6%)

Table III: Analysis of factors associated with the levels of knowledge and practice

Variables	Knowledge of foot care			Practice of foot care		
	Poor	Good	p-value*	Poor	Good	p-value*
Gender						
Male	48 (66.7%)	24 (33.3%)	0.931	42 (58.3%)	30 (41.7%)	0.246
Female	49 (57.6%)	36 (42.4%)		49 (57.6%)	36 (42.4%)	
Age						
<55 years	37 (58.7%)	26 (41.3%)	0.873	42 (67.7%)	21 (33.3%)	0.303
>55 years	54 (57.4%)	40 (42.6%)		55 (58.5%)	39 (41.5%)	
Income**						
<RM2000	69 (57.5%)	51 (42.5%)	0.485	72 (60.0%)	48 (40.0%)	0.884
>RM2000	13 (50.0%)	13 (50.0%)		16 (61.5%)	10 (38.5%)	
Educational level**						
Secondary	72 (57.6%)	53 (42.4%)	0.292	76 (60.8%)	49 (39.2%)	0.791
Tertiary	6 (42.9%)	8 (57.1%)		8 (57.1%)	6 (42.9%)	
Duration of diabetes**						
<10 years	33 (39.3%)	51 (60.7%)	0.259	53 (63.1%)	31 (36.9%)	0.617
>10 years	34 (51.5%)	32 (48.5%)		39 (59.1%)	27 (40.9%)	

* chi square test of relatedness
** contains missing value, thus n≠157

DISCUSSION

Based on the specific measures of foot care, the ones that received poorest responses were: using warm water for washing and bathing; checking the temperature of water before using; not applying lotion in the interdigital space; and application of talcum powder in the interdigital space. The first two were deemed crucial in diabetic foot care and the latter two might not be as important. Patient should not be using water that is too hot or too cold in washing and bathing as diabetic patients with neuropathy might not be able to feel any insult to their feet and this could lead to catastrophic consequences. Checking the temperature of water before using was also an important step that should be taught to patients so that scald injury could be avoided especially in the feet of diabetics. Keeping the interdigital space dry by applying talcum and avoiding application of lotion was also important to prevent fungal infections as part of foot care hygiene [13].

This study showed that the majority of patients who were admitted for diabetic foot infections had poor knowledge and poor practice of foot care. In terms of the foot care scoring based on the questionnaire, practice was shown to be lower than knowledge. Median score for knowledge and practice were 10 and 9 respectively. This is a reflection of poor compliance; patients already had a certain level of knowledge of foot care but the practice of that particular knowledge was not always carried out. This finding was comparable with other related studies, which also reported the same pattern of scoring for knowledge and practice of foot care; the score of practice was always poorer than the score of knowledge [2,5,14].

An important finding of this study was the non-association of the level of education with the level of knowledge of foot care in diabetic patients. Although the majority of patients who had poor knowledge and practice obtained education

only up to secondary level, there was no significant difference when compared to those who received education at tertiary level. Several studies that looked into knowledge and practice of diabetic foot care found that there was a significant association between the level of education with the level of diabetic foot care knowledge [2,5,14,15]. This difference could be explained by the lack of adequate promotion of diabetic awareness in our population. Both educated and less educated patients received inadequate information regarding diabetic foot care.

One might also argue that the population of Terengganu, which is predominantly Malays, has the tendency to believe more in alternative and traditional treatment than modern medicine. According to Ang *et al*, many of these patients would not accept the loss of a limb even if it were medically required and life saving[12]. Due to their religious beliefs, most of them would want to be buried as a whole person, hence would usually refuse amputation. This type of patients would then opt for alternative medicine with the hope of saving their limb.

Pollock *et al* reported that women have a significantly higher diabetic foot care knowledge score compared to men in a study conducted in Europe [7]. In some third world countries especially in certain parts of Africa and South Asia, due to socio-cultural beliefs, women were not allowed to attain higher educational status compared to their male counterpart. This had resulted in the discrepancy in the level of knowledge between males and females [5]. however, there is no association between gender and the level of knowledge and practice of diabetic foot care in the present study. In Malaysia, males and females are given the same opportunity for education.

Our study has shown that there was no significant association between patients' demographics with the level of knowledge and practice of diabetic foot care. Based on our current practice, there are no established guidelines or programs in educating patients during admission or prior to discharge. Although they had multiple admissions for diabetic foot complications, the level of knowledge and practice remained poor. The role of physicians in passing the knowledge to patients is very important in improving the awareness and good practices of foot care. Poor communication between healthcare workers and patients and little amount of time allocated to educate patients due to a busy clinic schedule are usually the reasons for inadequate patient education [5,12,13]. In addition to that, physicians should always be up to date with the latest information regarding foot care and consistently reinforce the importance of compliance in patients. This should be a routine practice for all diabetic patients in both in and out patient setting. Education of good diabetic foot care practice will increase patient's confidence in managing their illness [11].

The results of this study should be a reminder for clinicians; nurses and other health care personnel on the importance of improving foot care knowledge and promoting compliance among diabetics. The limitation of this study was that our sample consisted of predominantly Malay patients with a very small number of Chinese patient and no other ethnic groups. This sample does not represent the actual population of Malaysia that consists of several ethnicities. Another limitation was our inability to include all patients that were admitted to our center as the study sample included only diabetic patients who were admitted to the wards of Orthopaedics Department.

CONCLUSION

Knowledge and practice of foot care in the majority of diabetic patients who were admitted for diabetic foot infections were poor. There is no significant association between patients' demography with the different levels of knowledge and practice of foot care. Educational programs focusing on awareness of diabetic foot care must directly involve the community, and thereupon in order to reduce the incidence of diabetic foot complications. This should be done in primary care up to tertiary care centers as a multidisciplinary effort.

REFERENCES

1. International Diabetes Federation. IDF Diabetes Atlas, 6th edition. Brussels, Belgium: International Diabetes Federation [Internet]. 2013 [updated 2013 November 25, cited 2013 December 24]. Available from: http://www.idf.org/diabetesatlas
2. 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(10): 687-90.
3. Morris AD, McAlpine R, Steinke D, Boyle DI, Ebrahim ER, Vasedev N, Stewart CP. Diabetes and lower-limb amputations in the community. A retrospective cohort study. DARTS/MEMO Collaboration. Diabetes Audit and Research in Tayside Scotland/Medicines Monitoring Unit. *Diabetes Care.* 1998; 21(5): 738-43.
4. Reiber GE, Vileikyte L, Boyko EJ, del Aguila M, Smith DG, Lavery LA, Boulton AJ. Causal pathways for incident lower-extremity ulcers in patients with diabetes from two settings. *Diabetes Care.* 1999; 22: 157-62.
5. Desalu OO, Salawu FK, Jimoh AK, Adekoya AO, Busari OA, Olokoba AB. Diabetic foot care: Self reported knowledge and practice among patients attending three tertiary hospitals in Nigeria. *Ghana Med J.* 2011; 45(2): 60-5.
6. Ministry of Health Malaysia. MOH/P/PAK/84.04 (GU) *Clinical Practice Guidelines; Management of Diabetic Foot.* Malaysia: MOH; A 2004
7. Pollock RD, Unwin NC, Connolly V. Knowledge and practice of foot care in people with diabetes. *Diabetes Res Clin Pract.* 2004; 64(2): 117-22.
8. Shaid NJ. Prevalence of lower extremity amputation among patients with diabetes mellitus: A 9-year review in Hospital Sultanah Nur Zahirah. *Presented at the 5th Terengganu Scientific Conference.* Malaysia, 2014 .
9. Lam AWC, Zaim MR, Helmy HH, Ramdhan IMA. Economic Impact of Managing Acute Diabetic Foot Infection in a Tertiary Hospital in Malaysia. *Mal Orthop J.* 2014; 8: 46-9.
10. Mazlina M, Shamsul AS, Saini Jeffry FA. Health Related Quality of Life in Patients with Diabetic Foot Problems in Malaysia. *Med J Malaysia.* 2011; 6: 234-8.
11. Bazian Ltd, Education to prevent foot ulcers in diabetes. *Evidence-Based Healthcare & Public Health.* 2005; 9: 351-8.
12. Ang CL, Lim YJ. Recurrent Admissions for Diabetic Foot Complications. *Mal Orthop J.* 2013; 7: 21-6.
13. Mason J, O'Keefe CO, Mcintosh A, Hutchinson A, Booth A, Young RJ. A Systemic Review of Foot Ulcer in Patients with type 2 Diabetes Mellitus. I: Prevention. *Diabet Med.* 1999; 16(10): 801-12.
14. Chellan G, Srikumar S, Varma AK, Mangalanandan TS, Sundram KR, Jayakumar RV, Bal A, Kumar H. Foot care practice – The key to prevent diabetic foot ulcers in India. *Foot (Edin).* 2012; 22(4): 298-302.
15. Lamchahab FZ, El Kihal N, Khoudri I, Chraibi A, Hassam B, Ait Ourhroui M. Factors influencing the awareness of diabetic foot risks. *Ann Phys Rehabil Med.* 2011; 54(6): 359-65.