FOOT PROBLEM AND FOOT CARE PRACTICES AMONG DIABETIC PATIENTS IN A PRIMARY CARE CLINIC, KUALA LUMPUR

NURJASMINE AIDA JAMANI, MD(UKM) DOCTOR OF FAMILY MEDICINE (UKM) (CORRESPONDING AUTHOR)
DEPARTMENT OF FAMILY MEDICINE, KULLIYYAH OF MEDICINE, INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA, JALAN SULTAN AHMAD SHAH, 25200 KUANTAN PAHANG, MALAYSIA
minaida@iium.edu.my

NOOR AZIMAH MUHAMMAD, MBBS (UNIV OF QUEENSLAND AUSTRALIA) M.MED (FAM MED) (UKM), PHD (COMMUNITY HEALTH) (UKM).
DEPARTMENT OF FAMILY MEDICINE, FACULTY OF MEDICINE, UNIVERSITI KEBANGSAAN MALAYSIA, JALAN YAACOB LATIFF BANDAR TUN RAZAK, CHERAS 56000 KUALA LUMPUR
drazimah@gmail.com

AIDA JAFFAR[3], MD (USM), M.MED (FAM MED),
PRIMARY CARE UNIT, FACULTY OF MEDICINE AND DEFENCE HEALTH, NATIONAL DEFENCE UNIVERSITY OF MALAYSIA, KEM SUNGAI BESI, 57000 KUALA LUMPUR
aidaupnm@gmail.com

SAHARUDDIN AHMAD[2]MD (UKM) M.MED (FAM MED)
DEPARTMENT OF FAMILY MEDICINE, FACULTY OF MEDICINE, UNIVERSITI KEBANGSAAN MALAYSIA, JALAN YAACOB LATIFF BANDAR TUN RAZAK, CHERAS 56000 KUALA LUMPUR
saha@ppukm.ukm.edu.my

NOORLAILI TOHIT[2]MD (UKM) M.MED (FAM MED), PHD (MONASH).
DEPARTMENT OF FAMILY MEDICINE, FACULTY OF MEDICINE, UNIVERSITI KEBANGSAAN MALAYSIA, JALAN YAACOB LATIFF BANDAR TUN RAZAK, CHERAS 56000 KUALA LUMPUR
laili@ppukm.ukm.edu.my

ABSTRACT

Foot problems are very common in diabetic patients but may go unnoticed by the patients and undiagnosed by the healthcare providers leading to substantial morbidity and amputations. The aims of this study were to assess patient's foot care practices, awareness on their foot condition as well as to determine the prevalence of diabetic foot problem and its associated factors. **Methods:** This was a cross sectional study conducted among diabetic patients in a primary care clinic in Kuala Lumpur. Patients with diabetes, aged more than 18 years were selected using systematic random sampling technique. Patients were requested to answer a set of self-administered pre-tested questionnaire that obtain information on their socio-demographic profiles, diabetic clinical data, awareness on their feet condition and foot care practice. A trained clinician examined patients' feet using a standard foot examination protocol. **Results:** A total of 166 patients with diabetes participated in this study. Nearly half of the patients (70, 42.2%) had diabetic foot problem but only 31 (18.7%) of them were aware of their foot condition. The three common problem were trophic changes of the skin (92.8%), followed with hair loss (71.1%) and callosity (65.7%). The independent associated factors for foot problem were increasing age (AOR=1.05, 95% CI 1.015-1.095; p<0.05) and lower education level (AOR=2.32, 95% CI 1.092-4.908; p< .05).

Many of the participants did not practice a proper foot care such as not using a proper foot wear, not inspecting their feet daily and thoroughly dry their feet. **Conclusion:** There was a high prevalent of diabetic foot problem in these patients especially among elderly and those with a lower education level but not many of them were aware of their problem. They were found to have poor foot care practice. Therefore, efforts need to be targeted on increasing patients' awareness on their foot condition and improve their understanding on foot care practice. In addition, it is important for health professionals to carry out regular foot examination as many of the diabetic patients may not aware of their problem.

KEYWORDS: Diabetic, foot, care, practice

INTRODUCTION

Diabetes mellitus causes significant mortality and morbidity and has affected many people globally. The prevalence of diabetes has continued to increase and largely contributed by our sedentary lifestyle. The global prevalence of type 2 diabetes was 171 million in 2000 and expected to increase to 366 million in 2030 (Wild et al. 2004). However, the rate is escalating faster than what was expected and data in 2014 has reported that the global prevalence of diabetes was 422 million or about 9% of the adult population (World Health Organization 2016). In the recent Malaysia National Health Morbidity Survey, the prevalence of diabetes among adults was 17.5% and higher in 70-74 years age group at 39% compared to 18-19 years age group at 5.5%. Based on ethnicity, the Indians had the highest prevalence at 22.1%, followed by the Malays at 14.6% and the Chinese at 12.0% (Institute for Public Health 2015).

Diabetes is a debilitating illness that carries risk for multiple complications and diabetic foot is one of it. Diabetic foot is often related to poor arterial perfusion, presence of venous stasis, peripheral neuropathy, poor skin condition of the feet and reduce resistance to infection. Diabetic foot is a spectrum of disease and ranging from foot at risk of ulceration, foot with ulcer up to a deformed foot like the osteoarthropathy Charcot foot (Levy and Valabhji 2004). Often, patients will present late with poor-healing foot ulcer from a trivial injury or infection or pins and needles of the feet. A local study has documented that the prevalence of diabetic foot ulcer in patient attending an outpatient clinic was 9.7% (Mimi, Teng, and Chia 2003). In cases when patients are not aware of having foot problem or did not receive appropriate medical attention, the condition may get worse and lead to foot amputation or even death. The risk for such complications is higher when patients have persistence hyperglycaemia and do not practice a proper foot care. Every 2% increase of HbA1c level would increase the risk for foot ulcer by 1.6 times and lower limb amputation by 1.5 times (Akbar Nighat 2004). The risk for amputation among diabetic patients is 10 to 20 times higher than non-diabetic population (World Health Organization 2016).

In other words, health professionals and patients need to work together to prevent diabetes complications including diabetic foot problem. It is the role of health professionals to diagnose early and to treat accordingly to prevent the foot problem from worsening and this can be done by regular foot examination at least annually during their follow up in the clinic (Kamaruddin et al. 2015). Most literature and clinical practice guidelines suggested that a specific examination on diabetic foot should include palpating the pulses, assessing level of sensation, presence of foot deformity, nail deformity and presence of active lesion (Boulton, Armstrong, Albert, Fryberg 2008). On the other hand, it is the responsibility of the patients to practice a proper foot care. Patients are recommended to inspect their feet daily and use appropriate indoor or outdoor foot wear (Kamaruddin et al. 2015). With a proper foot care, evidence from developed countries such as the United States of America, the United Kingdom and Australia has shown that the rate for amputation can be reduced up to 60% (World Health Organization 2016). As opposed to developing countries like in India and Pakistan, the foot care practice was low, they did not inspect their feet for cracks, fissure or trauma and were not aware of the importance of proper foot care (Hasnain and Sheikh 2009; Mehra, Thawait, Karandikar , Gupta 2008). Locally, a study conducted more than a decade ago had shown that only half of our diabetic patients could appreciate the importance of a good foot care practice (Harwant and Doshi 2000). Thus far, there were not many studies locally that have been

conducted to look into this issue despite numerous interventions and trainings have been conducted not only to patients but health professionals with the aim of improving the care of our diabetic patients. Hence, this study was conducted in order to assess patients' daily foot care practice and awareness on their foot status. This study also aimed to determine the prevalence of foot problem among them and to identify the factors associated with foot problem.

METHODOLOGY

This was a cross sectional study conducted from November 2011 to March 2012 among diabetic patients in a primary care clinic in Kuala Lumpur. The inclusion criteria were all patients with diabetes registered to the clinic and aged of more than 18 years old. Pregnant women and patients with diagnosis or evidence of other causes of neuropathy were excluded from this study. Using a systematic random sampling technique, every fifth patient registered to diabetic clinic on data collection day and met the study criteria were invited to participate. If they agreed to participate, they were briefed on the study protocol and requested to give their written consent. The minimum sample required for this study was 166 patients with 95% confidence interval, 5% absolute precision, estimated prevalence of foot problem of 10% (Boulton, Vileikyte, Ragnarson-Tennvell 2005) and a dropout rate of 10%.

This study used a set of self-administered questionnaire which consisted of 2 parts. The first part was on patient's socio demographic data (age, gender, ethnicity, education level, work status) diabetic clinical data (body mass index, duration of diabetes, type of medication and recent HbA_1c), patient's awareness of foot problem and foot care practice. The patient's awareness of foot problem contained four questions that assessed patient's current awareness of having any diabetic related foot problem, skin condition, neuropathy complication and vascular complication using 5-point Likert scale from 1(not at all aware) to 5 (extremely aware). Those who chose 1 (not at all aware) or 2 (not aware) were categorized as not aware and those who chose 3 (somewhat aware), 4 (aware) and 5 (extremely aware) were categorized as aware. Questions for foot care practice contained 12 questions that assess patient's self-care practice for foot problems such as callus or warts, daily foot care practice and type of shoes with yes and no responses. These questions on patient's awareness and foot care practice were adapted with permission from Diabetic Resource Centre in Canada and had underwent standard translation procedure of forward and backward translation by language experts and medical doctors to our national language (Bahasa Malaysia). The content of the four items was reviewed by local experts whom include a diabetic nurse educator, an orthopaedic surgeon and a family physician. The Bahasa Malaysia version was pretested on 15 diabetic patients for its reliability testing and the Cronbach alpha was 0.64 for foot care practice and 0.83 for awareness of foot problem.

Once selected patients completed the set of questionnaire, they would return the questionnaire to the researcher and proceed with foot examination by an experienced clinician. The clinician had attended a special training by National Diabetic Foot Educator on standard foot examination procedure. The foot was assessed for any skin and structural changes (such as callus, corns and infections), vascular problem (skin colour, capillary refill time and presence of dorsalis and posterior tibialis pulses) and neurologically abnormality (sensation over non-callused plantar aspect of the feet). Diabetic foot problem was defined as presence of protective sensory loss with or without deformity, peripheral arterial disease or history of ulcer or amputation (Boulton, Armstrong, Albert, Fryberg 2008). These features were accurate in identifying those who are at risk of developing foot ulceration (Monteiro-Soares et al. 2012).

Data was entered into SPSS (Statistical Package for Social Sciences) version 20.0 and data was analysed descriptively in frequency and percentage of diabetic foot, awareness of foot problem and diabetic foot practice. Multivariate logistic regression was used to identify factors associated with diabetic foot. Confidence interval was set at 95% and *p*-value of less than 0.05 was considered as significant. This study was approved by the Research and Ethical Committee of researchers' institution (FF-414-2011) and

all participants had given their written consent. Those who refused to participate received similar standard care of treatment as those who agreed to participate.

RESULTS

A total of 180 patients were invited to participate but only 166 patients consented and completed the study. The mean age of the participants was 60.8 ± 10.3 years, there were slightly more females (52.4%) compared to males (47.6%). About half of them were Malays (53.4%) and had completed secondary level of education (50%). Majority of them were unemployed (68.1%) and had monthly income of less than RM 1500 (74.7%). The mean duration of diabetes was 6.9 (SD= 5.5) years and the mean glycaemic control (HbA1c) was 7.7 (SD=2.0) %. Most of the patients were on oral medication (79.5%) and majority of them were obese (48.2%).

Table 1 Awareness of having symptoms related to foot problem among the participants (n=166)

Foot symptoms	**Aware**	**Not aware**
	(n,%)	**(n,%)**
Any diabetic related foot problem	31 (18.7)	135 (81.3)
Any skin changes: ulcer, corns, or blisters	29 (17.5)	137 (82.5)
Any numbness	41 (24.7)	125 (75.3)
Any vascular related symptoms: tightness, heaviness, pain or cramps in feet or legs	44 (26.5)	122 (73.5)

The Table 1 is on participant's awareness of their foot problem. Majority of them (81.3%) were not aware of having any diabetic related foot problem. The prevalence of foot problem was 42.2% (n=31) and among these participants with foot problem (18/31, 58%) were not aware of it. The most prevalent symptoms were vascular related (26.5%) followed by numbness (24.7%) and skin changes (17.5%).

From the Table 2, in terms of foot care practice, high proportion of the participants did not practice a proper foot care. Many of them did not apply moisturiser to their feet (63.9%), wore shoes without socks (68.7%), walked barefoot (51.2%) and did not inspect inside the shoes before wearing them (45.2%). About half of them did not dry their feet thoroughly (45.2%) or inspect their feet daily (53.0%). In terms of type of shoes, two third used flip flops or thongs (68.7%), about half used sandal (47%) and only two patients had custom made shoes (1.2%).

Table 2 Foot care practice by the participants (n=166)

Foot care practice	Yes	No
	(n,%)	(n, %)
Checking temperature of water before soaking feet	124 (74.7)	42 (25.3)
Application of hot water bottle or heating pad to feet	19 (11.4)	147 (88.6)
Medicated products for warts, corns or calluses	139 (83.7)	27 (16.3)
Moisturizing creams or lotions usage in between toes	60 (36.1)	106 (63.9)
Ever walk around barefooted either indoor or outdoor	81 (48.8)	85 (51.2)
Wearing shoes without wearing any socks	52 (31.3)	114 (68.7)
Shoes inspection for foreign objects or torn lining	91 (54.8)	75 (45.2)
Sitting with leg crossed	56 (33.7)	110 (66.3)
Daily feet wash	161 (97.0)	5 (3.0)
Drying between the toes	91 (54.8)	75 (45.2)
Daily feet examination	78 (47.0)	88 (53.0)

Table 3 shows the result of foot problem from clinical examination. Majority of them had trophic changes of the skin (92.8%), followed with hair loss (71.1%), callosity (65.7%), loss of protective sensation (34.9%), foot deformity (15.1%), and toe amputation (1.8%). None of them were found to have vascular problem from clinical examination.

Table 3 Foot problem from clinical examination (n=166)

Foot findings	Present	Absent
	n(%)	n(%)
Skin abnormalities		
Dry skin	154 (92.8)	12 (7.2)
Hair loss	118 (71.1)	48 (28.9)
Dystrophic nail	61 (36.7)	105 (63.3)
Callosity	109 (65.7)	57 (34.3)
Intertrigo	32 (19.3)	134 (80.7)
Foot Deformity		
Claw toes/hallux valgus	25 (15.1)	141 (84.9)
Loss of protective sensation of the feet	58 (34.9)	108 (65.1)
Peripheral arterial disease	0 (0)	166 (100.0)
Toe amputation	3 (1.8)	163 (98.2)

The Table 4 shows the multivariate logistic regression analysis in order to identify factors that were associated with foot problem. The factors that were tested included age, gender, work status, level of education, body mass index, Hba1c and duration of illness. Increasing age (AOR=1.05, 95% CI 1.015-1.095; $p<0.05$) and lower level of education (AOR=2.32, 95% CI 1.092-4.908; $p < 0.05$) were significantly associated factors of developing foot problem.

Table 4 Factors associated with foot problem (n=166)

Variables		beta	Adjusted Odds Ratio	95% Confidence Interval	*p*-value
Age (years)		0.05	1.05	1.02-1.10	*0.01*
Gender					
	Male [Female]	-0.15	0.87	0.42-1.77	*0.69*
Level of education					
	Lower [Higher]	0.84	2.32	1.09-4.91	*0.03*
Employment status					
	Unemployed [employed]				
Duration of diabetes (years)					
	5-10 [less than 5]	-0.21	0.81	0.35-1.89	*0.63*
	More than 10 [less than 5]	0.11	1.12	0.48-2.62	*0.79*
Body mass index (kg/m^2)					
	Overweight [normal]	0.03	1.03	0.38-2.84	*0.95*
	Obese [normal]	-0.03	0.97	0.33-2.85	*0.96*
HbA1c (%)					
	More than 6.5 [at or less than 6.5]	0.37	1.45	0.66-3.18	*0.35*

DISCUSSION

Patients' foot problem and awareness on their foot condition

There was a low awareness on foot problem among the participants. Majority of them were not aware of having foot diabetic related problem despite about a quarter or less of them complained or aware of having diabetic foot symptoms such as numbness, intermittent claudication or having any skin changes. In other words, people with diabetes may not recognise that they have diabetic foot problem despite experiencing symptoms related to it. Similar finding was also shown in other studies, there was a low level of awareness on foot condition among diabetic patients (Hasnain and Sheikh 2009; Pollock, Unwin 2004; Harwant, Doshi 2000). In actual, 42.2% were clinically diagnosed to have diabetic foot problem. This is really alarming as among those who did not complained or were not aware of having diabetic foot problem, nearly half of them were actually having foot problem. In parallel, among those who were diagnosed clinically to have diabetic foot problem less than one fifth of them were aware and admitted of having foot related problem. This may be due to our incomplete diabetic education program that does not put emphasis on diabetic foot care or failure of our doctors and diabetic nurse to diagnose early and perform regular annual foot examination as recommended by the local guideline.

From clinical examination, the top most problem with the skin of their feet was dry skin or xerosis. In comparison to a study conducted among diabetic patients in Serbia, less than a quarter of their patients had dry skin (Pavlovic et al. 2007). Another common problem found in these patients was hair loss and callosity. This is concurrent with a few earlier studies that showed callosity as a common foot problem among diabetics (Malgrange, Richard 2003; Mehra, Thawait, Karandikar, Gupta 2008). Xerosis and callosity in turn will predispose them for future fissures and ulceration (Malgrange, Richard 2003; Tatjana 2006). About a third of the participants of these studies also found to have sensory loss of their foot which predisposes them for callus formation and later feet injury. The risk is higher when high proportion of them preferred to walk barefooted especially in their own house and they also did not wear

a proper foot wear when they were outside of their home. Many of them wore slippers or open sandals and not custom made shoes for diabetics.

The prevalence of intertrigo or fungal infections in this study was low, less than a fifth was clinically positive for this. This is concurrent with other studies that showed the prevalence of fungal infection was up to 15%. However, the fact that a third of them were found to have abnormal nails warrants further attention. An earlier local study had shown that fungal infection was positive in 81.5% of diabetic patients with or without nail changes and the odds to have fungal infection was higher in abnormal nails (Leelavathi et al. 2013).

Interestingly, substantial proportion of them complained or admitted of having vascular symptoms such as tightness, heaviness, pain or cramps in feet or legs but none of them were shown to have vascular problem from clinical examination. The vascular examination was only based on the presence of distal pulses, capillary return time and skin colour without proper documentation using Doppler ultrasound or ankle-brachial pressure index.

Two factors that were found to significantly increase the likelihood for foot problem were increasing age and having low level of education. Age as a predisposing factor of foot problem is supported by a few earlier studies (Malgrange, Richard 2003; Mansour 2006; Mugambi-Nturibi et al. 2009). One of the reasons is because with increasing age, it increases the likelihood for foot deformity (Mugambi-Nturibi et al. 2009). Further, increasing age was found to be associated with presence of peripheral neuropathy (Faridah 2009; Mimi, Teng, and Chia 2003). Thus, the combination of foot deformity and peripheral neuropathy will further predispose elderly people for foot problem. In addition, increasing age is also associated with lower protective immunity and hence increase the likelihood for them to have infection and in the context of foot problem, it increases the likelihood of bacterial or fungal infection on the feet (Saunte et al. 2006; Wijesuriya et al. 2014).

The second factor found to be associated with foot problem was having lower education. This is concurrent with a few studies done in Iraq and Taiwan, diabetic patients with lower education level were associated with development of foot problem. People of higher education tend to have greater opportunity to learn and know more about their diabetes and care including foot care. They are more likely to practice a proper diabetes self-care (Ayele et al. 2012).

Patients' daily foot care practice

Overall, participants of this study showed a poor foot care practice. Substantial proportion of them did not practice what has been recommended by our local guidelines such as keeping the skin supple and moist by applying moisturiser to their feet, to protect their feet by wearing a proper shoes and sock, inspect the inner part before wearing their shoes and not to walk barefooted all the time. A similar finding was found in India with about half of their diabetic patients walked without foot wear either indoor or outdoor (Mehra, Thawait, Karandikar, Gupta 2008). Nevertheless, this result must be interpreted cautiously as the question asked "Do you ever walk around in your bare foot either indoor or outdoor?" Patients may answer yes even if it is only once although it is not their daily practice to walk barefoot especially out of their home. Walking barefooted is highly related to Asian culture in which we often take off our shoes when we enter our home.

About half of them did not do daily foot inspection. The proportion of patients whom did not do the daily feet inspection was lower than the proportion found in a study in India whereby nearly all of the patients did not do the daily inspection (Mehra, Thawait, Karandikar, Gupta 2008). Similarly, an earlier local study also showed there was low daily foot inspection in which less than a tenth of patients did the daily feet inspection (Harwant and Doshi 2000). However, there is still a need for improvement as studies have shown the practice of daily inspection will increase early detection of foot problem and it is included as one of important item in the guideline in preventing foot ulceration or amputation (Balducci,

Stefano, Sacchetti, Massimo, Haxhi, Jonida, Orlando, Giorgio, D'Errico, Valeria, Fallucca, Sara, Menini, Stefano, Pugliese 2014). In addition, although many of them admitted of washing their feet daily but less than half of them thoroughly keep their feet dry by drying the interdigital spaces. Similar finding was found in the study in India, where three quarter of their patients washed their feet daily but only a few who dried the feet well (Mehra, Thawait , Karandikar, Gupta 2008). This needs to be corrected as leaving the spaces dampen will increase the risk of having infection especially fungal infection (Tatjana 2006). In addition, only about a third of the participants apply moisturizers to their feet. This is concurrent with a study done in Pakistan, 40% of their diabetics patients did not use moisturizer (Hasnain and Sheikh 2009). Using moisturizer is important in foot care in order to keep the skin supple and prevent cracks or hardened skin.

Many of them used flip flops or thongs or sandals and only 2 had custom made shoes. This is concurrent with the finding found among diabetic patients in India in which sandals was a common type of foot wear and orthotic or custom made shoes was not popular (Chandalia et al. 2008). In contrast, a study among diabetic patients in the United States showed only a third of their patients used improper footwear such as sandals, thongs or slip-ons (Reiber et al. 2002). Thus, it is high time for us to educate our diabetic patients on the importance of a proper and safe foot wear and care practice.

A few factors may limit the generalization of the findings in this study. This study was conducted in a single primary care clinic in Kuala Lumpur and thus the findings may not reflect other diabetic patients from other part of Malaysia especially in terms of their awareness of foot problem or foot care practice. As other centres or clinics may have different intervention program to improve the foot care among their diabetic patients. As mentioned also, the presence of vascular problem was based on physical examination without supported by the arterial-brachial pressure index or Doppler ultrasound. The fact that there were patients who experienced or aware of having vascular symptoms calls for further verification. Perhaps future study may want to verify the sensitivity and specificity of physical examination in detecting peripheral vascular disease.

CONCLUSION

Despite being in urban area, substantial proportion of patients did not practice a proper foot care and were not aware of their foot condition warrant a medical attention and intervention. Diabetic patients need to be well informed and make them aware on the symptoms such as intermittent claudication or feet numbness as features of foot problem. They need to be encouraged to share such symptoms with their doctors so that a proper clinical assessment can be carried out and necessary intervention and advices to be instituted on them. In addition, there is still a need for improvement especially in daily foot care and a proper foot wear among our diabetic patients. Hence, this information need to be disseminated among our health care professionals especially those who are involve in managing diabetes patients need to be reminded on the importance of the regular annual foot examination.

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