

KNOWLEDGE AND APPLICATION OF FOOT CARE: A STUDY OF DIABETIC PATIENTS IN MAURITIUS

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ABSTRACT

Mauritius has a high prevalence of diabetes mellitus. Diabetic patients are often unaware of injuries to their feet. Early intervention is vital to prevent small injuries from turning into non-healing ulcers that could potentially result in gangrene and amputation. The aim of this study was to determine the knowledge of diabetic patients in Mauritius about foot care, the prevention of foot problems and their application of foot care practices. A quantitative descriptive survey was done.

A structured interview schedule was used to collect data from a convenience sample of 120 diabetic patients in five regional hospitals in Mauritius (n=120) during 2010. More than half of the respondents had not received any specific health education about foot care (62.5%; n=75). This could explain why many respondents did not adhere to basic precautions to prevent foot ulcerations such as checking water temperature, inspecting the soles of their feet, checking foot pulses and using moisturising cream. Of the respondents, 75.0% (n=90) were unaware that foot screening should be done annually while 46.7% (n=56) indicated that doctors did not inspect their feet during visits.

Foot care education should be considered as an important component of diabetic health education and should be tailored according to the needs of the individual patients. It is the responsibility of all health professionals to determine whether patients understand what is being taught and to determine to what extent this knowledge is put into practice.

KEYWORDS: diabetes mellitus, diabetic foot care, healthcare in Mauritius, peripheral neuropathy, peripheral vascular disease

INTRODUCTION AND BACKGROUND INFORMATION

Mauritius is an island situated off the south-western coast of Africa, east of Madagascar in the Indian Ocean. It has a surface area of 2 040 square kilometres, which is divided into nine districts and five health regions. The estimated population is 1 285 000 (Central Statistical Office, 2008:23). Non-communicable diseases account for the greatest proportion of the disease burden, with diabetes mellitus the highest, followed by hypertension, coronary diseases and cancer. The high prevalence of diabetes mellitus in Mauritius is the single largest contributing factor to coronary heart disease, strokes, kidney failure, and lower limb amputations.

There are approximately 134 000 diabetic patients in Mauritius and the number is expected to reach 235 000 by 2025 (Ministry of Health & Quality of Life [MOH & QOL], 2006). Hospitalisation of diabetic patients is mainly attributed to foot-related problems, mostly ulcers. Foot ulcers develop in approximately 15% of diabetic patients (Boulton et al., 2004:48).

Proper management of diabetes can prevent damage to the nerves leading to diabetic neuropathy (Cain & Driver, 2007:43). Combined with reduced blood circulation, neuropathy in the foot increases the chance of foot ulcers and eventually limb amputation. Foot ulceration and infection are important predictors of amputations (La Fontaine, 2007:24). It is estimated that up to 50% of all non-traumatic lower limb amputations are performed in diabetic patients (Viswanathan et al., 2006:702). There is no evidence of a single best diabetic foot management strategy (Al-Maskari & El-Sadig, 2007:62). According to Abu-Qamar (2006:205) and Michael (2006:913) diabetic foot care is complex and requires collaboration within the multidisciplinary healthcare team.

Foot problems include neuropathy, foot ulceration, infection and peripheral vascular disease. Peripheral neuropathy may be the most important precursor to ulcer development in diabetic patients. Neuropathy is characterised by a lack of sensation. The damage to sensory and motor nerves is one of the micro-vascular complications of diabetes mellitus (Walker, 2007:32). As the onset of neuropathy is insidious and almost unnoticed it is mostly recognised only after a non-healing trauma or ulcer prompted a person to seek medical advice. Proper foot screening can detect neuropathy. The most common problems observed in clinical settings may range from a simple injury to complex foot ulceration and gangrene. Foot infections are common because of compromised vascular supply secondary to diabetes (Burke & Cunha, 2008). The development of a foot ulcer is often the first step to amputation.

Peripheral vascular disease is more prevalent in patients with diabetes than in people without diabetes. The presence of lower ischaemia is characterised by a combination of clinical signs and symptoms like pain in the arch of the forefoot, absence of popliteal and posterior tibial pulses, absence of hair on the lower leg and thickened nails of the

toes (Benbow, 2005:4). Subsequently, any constant pressure exerted on the toes and sole of the foot may cause occlusion due to thrombosis of the artery supplying the toes which can lead to necrosis and gangrene of the toes. Peripheral vascular disease is a potential risk factor and makes the toes more susceptible to bacterial and fungal infections. Prevention of foot ulcers in high-risk individuals such as those with neuropathy, peripheral vascular disease or structural foot abnormalities is of primary importance and can be achieved through appropriate patient education, the use of emollients and the use of appropriately fitting shoes (Kruse & Elderman, 2006:92; Mouseley, 2007:28).

PROBLEM STATEMENT

A large number of Mauritian patients with diabetes attend health facilities with minor foot problems such as abscesses, non-healing ulcers, callus formation, ingrown toenails, cuts, burns and cracks which eventually become more serious foot problems that require specialised and costly treatment. If patients with diabetes receive adequate education on the importance and techniques of foot care and adhere to foot care guidelines proposed during health education, it may be possible to reduce the number of serious complications in diabetic patients due to foot problems.

The following question had to be answered:

“What is the level of knowledge of diabetic patients in Mauritius about foot care and how do they apply foot care to prevent foot problems?”

PURPOSE AND OBJECTIVES OF THE STUDY

The purpose of this study was to gain an understanding of the knowledge of diabetic patients in Mauritius about foot care and their application of foot care practices to prevent diabetic foot problems and complications in order to uncover shortcomings in diabetic health education. The objectives of the study were to:

- determine the diabetic patients’ knowledge about foot care and the prevention of foot problems in Mauritius;
- establish which foot care practices were applied by diabetic patients in Mauritius.

DEFINITIONS OF KEY CONCEPTS

Diabetes mellitus is defined as a group of metabolic disorders that is characterised by increased levels of glucose in the blood as a result of a defective or deficient insulin process (Smeltzer et al., 2008:1376).

Diabetic foot is defined as a constellation of pathologic changes affecting the lower extremity in diabetics, often leading to amputation due to complications (Medical Dictionary, 2013b).

Foot care involves all aspects of preventive and corrective care of the foot and the ankle; that is taking steps to avoid foot problems such as cuts, sores, bunions, calluses and infections, daily examination of the feet, toes and toenails and choosing the correct shoes (Medical Dictionary, 2013a).

Peripheral neuropathy is attributed to elevated blood glucose levels over a period of years. It most commonly affects the nerves of the lower extremities and both sides of the body symmetrically, and may spread in a proximal direction. Initial symptoms may include tingling, prickling or burning sensations but as the neuropathy progresses, the feet become numb (Smeltzer et al., 2008:1426).

Peripheral vascular disease refers to the presence of ischaemia in the lower leg which is characterised by a combination of clinical signs and symptoms such as the absence of pulses in the foot or no hair on the lower leg, thickened nails of the toes, pain in the foot (Benbow, 2005:4) and burning and itching feet (Smeltzer et al., 2008:2401).

RESEARCH METHOD

A quantitative, descriptive and contextual study was carried out in five regional hospitals in Mauritius to determine the knowledge of diabetic patients about foot care and to establish which foot care practices they applied.

Population

The population consisted of adult diabetic patients who were hospitalised in the five regional hospitals in Mauritius during March and April 2010. Inclusion criteria were: patients aged 25 or older and diagnosed with diabetes mellitus, receiving care as in-patients in regional hospitals and without significant complications of diabetes mellitus, such as blindness, renal failure or cardiovascular problems.

Sample

Non-probability, convenience sampling was used. Convenience sampling provides a means to conduct studies on topics that could not be examined through the use of probability sampling and is useful for descriptive and correlation studies (Burns & Grove, 2005:351). The sample included 120 respondents who met the inclusion criteria. Records of patients with diabetes mellitus who were admitted to the five regional hospitals were reviewed and those diabetic patients who met the inclusion criteria were invited to participate in the research.

Data collection

A structured interview schedule, developed by the researcher, was used to collect data during March and April 2010. The tool was divided into three sections namely a demographic section, a section on basic foot care knowledge and practices, and another section dealing with specialised foot care knowledge and practices.

All interviews were carried out in the wards of the five regional hospitals. The structured questions allowed a certain degree of control as all questions were asked in a consistent way while interviews enabled the researcher to further explain and repeat the questions when respondents requested clarifications. All interviews were conducted by one researcher.

Reliability and validity of the instrument

Reliability refers to an instrument's accuracy and the consistency with which the data collection instrument yields the same results when implemented in the same situation or used by researchers in another study. Polit and Beck (2012:331–333) describe the use of correlation coefficients to compute reliability estimates which usually range between .00 and 1.00. The higher the coefficient, the more stable the measure. The most widely used method for evaluating internal consistency is the coefficient alpha or Cronbach's alpha. The interview schedule was developed after a literature review, in collaboration with experts, and pre-tested with five patients (not included in the actual study) to determine whether the instrument's items were clearly phrased and free from bias and whether it collected the type of information envisioned. Reliability of the instrument was established during the pre-testing of the instrument. Cronbach's alpha of 0.86 indicated the quality of the instrument as being acceptable, as advocated by Polit and Beck (2010:547, 549).

Ethical considerations

Permission to conduct the study was granted by the Ethical Committee of the MOH and QOL in Mauritius. Thereafter permission was granted by regional health directors to access patient records and to identify and approach eligible patients to participate in the study. All ethical principles were adhered to. The principle of autonomy was upheld and respondents' freedom to participate or withdraw was explained. A consent form explaining the rationale for the study, the procedures followed and their rights, was given to each eligible patient. Written consent was obtained from every respondent before data were collected. Participation was voluntary without coercion. Care was taken to explain the purpose of the study as well as patients' rights to participate in the study, or to decline or withdraw at any time, without incurring any negative consequences whatsoever. The principle of confidentiality was upheld. The responses to the items on the interview schedules were coded, but no names or identifying notes were recorded.

The researcher handled all the completed interview schedules, ensuring the anonymity of respondents and confidentiality of the data. The principles of beneficence and justice were upheld. Respondents were treated fairly and no harm was anticipated. The findings were used to make recommendations to enhance the knowledge of diabetic patients about foot care and thus prevent complications due to diabetic foot problems. Adherence to these recommendations could be beneficial to the well-being of people with diabetes.

DATA ANALYSIS AND DISCUSSION OF THE FINDINGS

The Statistical Package for Social Sciences (SPSS-17.0) was used for data analysis.

Demographic data

Fifty three percent (n=64) female and 47.0% (n=56) male patients participated in the study. Only 7.5% (n=9) of the respondents were older than 70 years, 39.2% (n=47) were in the age group 25–49 years and 53.3% (n=64) were between 50–69 years.

Of the respondents, 29.2% (n=35) were housewives and 7.5% (n=9) were unemployed, 10.0% (n=12) were pensioners while the majority (53.3%; n=64) were employed in the service sector, either public or private. Thirty-eight percent (n=46) of the respondents were educated up to primary level and another 38.0% (n=46) had studied up to the secondary level. Only 8.0% (n=10) of the respondents obtained an upper secondary level education and a further 3.0% (n=3) had tertiary level education. Thirteen percent (n=15) of the respondents were unable to successfully complete their primary level of education. Twenty percent (n=24) of the respondents had been treated for diabetes for up to three years while 80% (n=96) had been treated for longer than three years.

Findings related to health education

Most respondents (87.5%; n=105) received information about the management of diabetes after being diagnosed, while 12.5% (n=15) stated that they were not told how to manage their diabetes. According to Singh et al. (2005:218), poor compliance among diabetic patients is associated with poor outcomes of care and can be the result of ineffective health education. Education on the management of diabetes and basic foot care was given by doctors (24.2%; n=29) and nurses (61.7%; n=74). Only 0.8% (n=1) received information from a podiatrist and neighbour respectively, while 12.5% (n=15) of the respondents allegedly did not receive education from anyone in this regard. Shilubane and Potgieter (2007:63) maintain that healthcare professionals have a major role and responsibility to assist patients to acquire the essential knowledge, skills and attitudes to manage health-related issues themselves.

Maintaining good glycaemic control is a key aspect of diabetic management and the prevention of its complications. Just over half of the respondents (53.3%; n=64) stated that they had their blood glucose test done once per month while 20.0% (n=24) had their blood glucose tested weekly. Only 9.2% (n=11) had their blood glucose checked twice weekly while 6.7% (n=8) respondents tested their blood glucose levels every two weeks and 10.8% (n=13) indicated that they checked their blood glucose levels at other intervals. The National Diabetic Framework (MOH & QOL, 2006) recommends regular blood glucose tests, preferably once a week.

Basic precautions taken by respondents to prevent foot injuries

Data from this section give an insight into respondents' knowledge about and application of basic precautionary foot care.

Table 1: Precautions taken by respondents in relation to foot care (n=120)

Precautions taken to prevent foot injuries	Never		Rarely		Sometimes		Always	
	n	%	n	%	n	%	N	%
Checking water temperature before washing feet	32	26.7	12	10.0	20	16.7	56	46.7
Avoid exposing feet to hot or cold surfaces	18	15.0	6	5.0	26	21.7	70	58.3
Checking footwear before and after use	31	25.8	16	13.3	29	24.2	44	36.7
Using protective footwear inside the house	9	7.5	9	7.5	33	27.5	69	57.5
Keeping the web spaces of the toes clean and dry	5	4.2	7	5.8	37	30.8	71	59.2
Wearing shoes when walking outside the house	2	1.7	8	6.7	24	20.0	86	71.7
Inspecting the soles of the feet	31	25.8	15	12.5	41	34.2	33	27.5
Inspecting between the toes	1	14.2	13	10.8	53	44.2	37	30.8
Using moisturising cream	63	52.5	14	11.7	31	25.8	12	10.0

The following practices were never, rarely or only sometimes performed by some respondents:

- checking of the water temperature (54.3%; n=64)
- checking of footwear (63.3%; n=76)
- inspecting the soles of the feet (72.5%; n=87)
- inspecting between toes (69.2%; n=83)
- application of moisturising cream (90%; n=108).

These are basic precautionary measures to prevent foot problems. Non-compliance with these practices could have a direct bearing on increased risk of injuries, leading to diabetic foot problems. The web spaces of the foot are susceptible to infections because of compromised vascular supply (Burke & Cunha, 2008), while ill-fitting shoes can contribute to peripheral vascular disease (Benbow 2005:3). Moisturising cream primarily helps to prevent dryness which can lead to cracks and fissures of the skin during the stage of autonomic neuropathy, resulting in fungal and bacterial infections (Edwards, 2008:22). It is strongly recommended that individuals with high risk of peripheral vascular diseases should use emollients (Kruse & Elderman, 2006:92; Mouseley, 2007:28). A large number of respondents (71.7%; n=86) put on shoes and slippers outside the house. It was noted that 25.8% (n=31) of the respondents never inspected the soles of their feet, which should have been performed daily, while 12.5% (n=15) rarely did so. These are routine activities which these patients ignored. Health professionals have to keep on educating diabetic patients about these precautionary measures during patients' clinic appointments.

Extended foot care practices

This section addressed practices beyond basic precautions carried out by respondents such as checking for sensation and foot pulses, cutting toenails correctly, and dealing with callus formation and small injuries.

Table 2: Practices related to cutting toenails, dealing with calluses and management of minor injuries (N=120)

	Frequency	Percentage	Cumulative percentage
Toenail cutting instruments			
Nail clipper	111	92.5	92.5
Sharp blade	2	1.7	94.2
Sharp scissors	5	4.2	98.3
Other	2	1.7	100.0
Total	120	100.0	
Toenail cutting methods			
Straight across	79	65.8	65.8
As short as possible	15	12.5	78.3
Just trimming	24	20.0	98.3
Just filing	1	0.8	99.2
Other	1	0.8	100.0
Total	120	100.0	
Treatment of calluses			
Scrape with blade	34	28.3	28.3
Excise with blade	6	5.0	33.3
Gentle filing	17	14.2	47.5
Seek medical help	63	52.5	100.0
Total	120	100.0	
Treatment of minor foot injury			
Self-treatment	48	40.0	40.0
Seek advice from health professional	35	29.2	69.2
Attend a health facility	36	30.0	99.2
Do not care for minor injury	1	0.8	100.0
Total	120	100.0	

Some respondents in this study (62.5%; n=75) indicated that they did not receive health education on the topic of foot care while 37.5% (n=45) had received such health education.

Most respondents (92.5%; n=111) used nail clippers to cut their toenails, but the way these were being cut varied. Of the respondents, 65.8% (n=79) cut their toenails straight across and 12.5% (n=15) as short as possible, while 20.0% (n=24) just trimmed their toenails. These approaches for cutting nails are safe for diabetic patients as they avoid causing small accidental injuries to the toes, provided the patients are skilful at doing so. Only 28.3% (n=34) of the respondents treated their calluses by scraping with a blade which requires skill and knowledge not to cause injuries to the feet. Five percent (n=6) excised their calluses with a blade while 14.2% (n=17) gently filed calluses. More than half (52.5%, n=63) sought medical help to treat calluses. If calluses are not treated at an early stage, and if continuous pressure is exerted on calluses, along with neuropathy, ulcer formation can be exacerbated (Edwards, 2008:22). Forty percent (n=48) of the respondents stated that they treated minor injuries themselves, while 29.2% (n=35) sought advice from health professionals and 30.0% (n=36) attended a health facility.

Table 3: Foot inspection practices (N=120)

	YES		NO		TOTAL	
	n	%	n	%	N	%
Do you check for sensation in your feet?	29	24.2	91	75.8	120	100
Do you know how to check for foot pulses?	8	6.7	112	93.3	120	100
Do you know that you should have your feet screened annually?	30	25.0	90	75.0		

Table 3 shows that many respondents (75.8%; n=91) did not check for sensation in their feet while only 24.2% (n=29) took this precaution. Regular checking for sensation in the feet, especially in the dorsum, forms part of foot care. Over time, diabetes mellitus tends to cause damage to the nerves leading to neuropathy, which is more marked in the peripheral part of the lower limbs among diabetics (Cain & Driver, 2007:43). Prevention of diabetic foot ulcers begins with screening for loss of protective sensation (Singh et al., 2005:219).

Most respondents (93.3%; n=112) did not know how to check the pulse in the dorsum of the foot. One simple way of clinically assessing blood circulation to the lower extremity is through palpation of the dorsalis pedis pulse. A weak pulse will indicate poor circulation, meaning fewer nutrients and less oxygen are available to the cells.

Seventy-five percent of the respondents (n=90) were not aware that they should have their feet screened at least once per year by a podiatrist or other health professional, while only 25% (n=30) were aware that this should be done. Changsun et al. (2009:295) found that many patients were not offered adequate foot-specific information during group lectures. Ideally foot screening should be carried out once or twice per year by a podiatrist. In Mauritius, there is a scarcity of podiatrists in both the public and private sectors, thus foot screening is usually carried out by trained nurses.

Frequency of foot inspection by medical practitioners

Almost half (46.7%; n=56) of the respondents stated that their feet were not inspected by their doctors during their clinic visits (see Figure 1) while 31.7% (n=38) indicated that doctors occasionally inspected their feet and 12.5% (n=15) indicated that foot inspections were seldom done. Only 9.2% (n=11) indicated that the doctors always inspected their feet during clinic visits. It is generally expected that inspection of the diabetic patients' feet should be routinely done when they are assessed by their doctors.

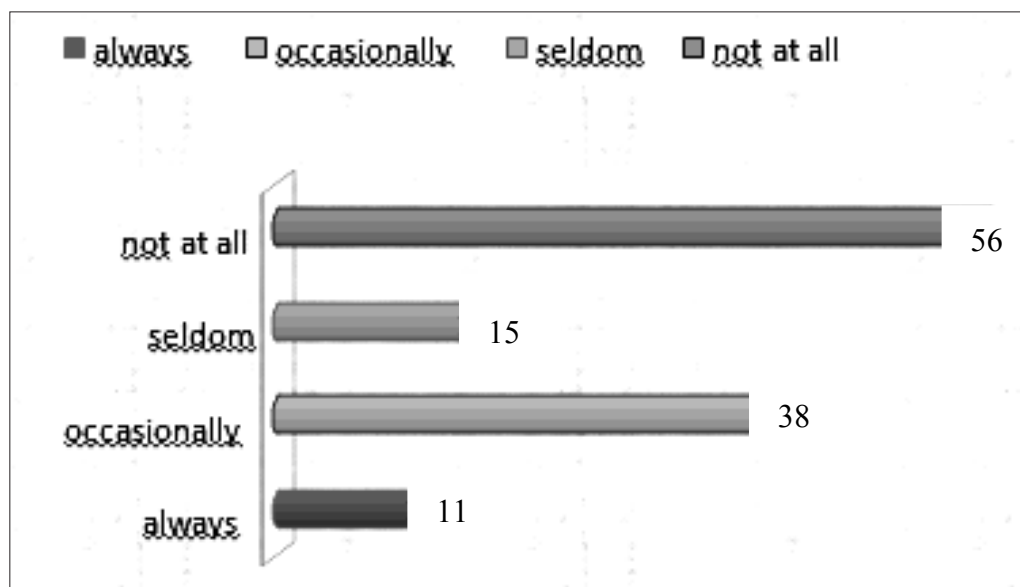


Figure 1: Foot inspection by physicians (n=120)

History of foot ulceration

Fewer than half of the respondents (32.5%; n=39) had experienced foot ulcers, while 67.5% (n=81) did not have any history of ulcers. Of these 39 respondents, only 30.8% (n=12) respondents did not receive treatment for their ulcers at the hospital. Out of these 12 respondents, 7.8% (n=3) three took care of their ulcers themselves, 5.1% (n=2) two received private treatment and 17.9% (n=7) and seven received treatment at a nearby health centre.

CONCLUSION

Most respondents acknowledged that they had received health education about the management of diabetes mellitus, mainly from nurses and doctors. Despite this acknowledgement diabetic patients lacked comprehensive knowledge about foot care thus impacting negatively on their performance of basic precautionary measures to prevent foot ulcers. This could be attributed to the finding that more than half of the respondents indicated that specific health education on foot care, and basic precautionary measures to prevent foot ulceration, were not included in their diabetic health education.

Although it is acknowledged that foot examination alone is not associated with a reduction in diabetes-related amputations, foot screening and other preventive measures significantly reduce the effects of diabetic foot-related problems (Chellan et al., 2012:300-301). A significant number of respondents never had their feet examined by their attending doctors and were unaware that they should have had their feet screened annually, preferably by a podiatrist. Health education for diabetic patients should be tailored according to the needs of each patient and should include foot care education as an important component.

RECOMMENDATIONS

Diabetic patients' health education should be comprehensive, include foot care education and be adapted to address the needs of the patients. The importance of regular monitoring of blood sugar levels should be emphasised. Health education for diabetic patients should highlight the importance of checking the water temperature before getting into a bath, checking the soles of the feet and checking footwear for fit and for foreign objects. In addition, daily washing of the feet and cleaning between the toes, using of emollients to moisturise feet and wearing slippers or shoes inside and outside the house should be emphasised to prevent foot injuries and possible ulcerations. Diabetic patients should receive information on how to check for sensation in the soles of the feet and how to detect the pulse in the dorsum of the feet. Advice on simple first aid measures could be very useful. Relevant information regarding diabetic foot care must address the following: treatment of any minor injury to the foot; identification of early callus

formation; and recognition of early signs of peripheral neuropathy of the foot and early signs of peripheral vascular insufficiency.

Concerted efforts should be made by health professionals who treat diabetic patients to attend refresher courses that address the principles of foot care and the prevention of foot problems and to receive training on foot examinations and the early detection of potential complications. The establishment of foot care clinics at primary healthcare level to enhance outreach to the communities should be considered.

Future research should endeavour to identify factors influencing compliance with treatment regimens among Mauritian diabetic patients and evaluate the effectiveness of existing foot care clinics in hospitals. Future studies should also endeavour to include non-hospitalised diabetic patients as they might maintain better practices than their hospitalised counterparts.

LIMITATIONS

The use of a convenience sample might be a source of bias. This study was limited to the Mauritian context therefore generalisability of its findings to a broader context will have to be considered with caution. Only diabetic patients admitted to hospitals were interviewed. Thus the findings cannot be generalised to non-hospitalised diabetic patients in Mauritius. It is possible that the non-hospitalised patients had more knowledge and maintained better foot care practices than the hospitalised patients. The study did not distinguish between the knowledge and practices of respondents according to the different hospitals where they were admitted. It is possible that knowledge of and adherence to foot care practices might have been better among patients at some hospitals where health education was prioritised. While acknowledging the limitations, the findings do provide insights into the knowledge and practices of foot care among Mauritian diabetic patients.

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