

**KNOWLEDGE AND PRACTICE OF DIABETIC FOOT CARE AND THE
ASSOCIATED FACTORS FOR PRACTICE AMONG PATIENTS
ATTENDING OUTPATIENT CLINICS IN KUALA TERENGGANU,
TERENGGANU**

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ABBREVIATIONS

DM Diabetes Mellitus

WHO World Health Organization

IWGDF International Working Group on the Diabetic Foot

DFU Diabetic Foot Ulcer

CPG Clinical Practice Guidelines

ROC Receiver Operating Characteristic

NMRR National Medical Research Register

JKNT Jabatan Kesihatan Negeri Terengganu

ABSTRACT (ENGLISH)

Title of study

Knowledge and practice of diabetic foot care and the associated factors for practice among patients attending outpatient clinics in Kuala Terengganu, Terengganu.

Aim of study

To determine the proportion of good knowledge and practice of diabetic foot care and its associated factors for good practice among patients attending outpatient clinics in Kuala Terengganu, Terengganu.

Methodology

A cross sectional study was conducted involving 383 diabetic patients attending outpatient clinics in Kuala Terengganu who fit the inclusion and exclusion criteria and they were recruited using systematic sampling. A self-developed and preliminary tested administered questionnaire was administered and consisted of 3 domains assessing the sociodemographic data, knowledge and practices about diabetic foot care. Each knowledge and practice domain consist of 15 questions. Their score is classified as good knowledge, poor knowledge, good practice and poor practice. The score of more than 70% is considered as good knowledge and practice for both domain.

Results

Median age of the respondents was 60.0 (IQR 12). 70.2% of the respondent had good knowledge regarding diabetic foot care but only 58.7% had good practice about diabetic foot care. Mean (SD) for knowledge score was 11.3 (2.40) and 22.1 (4.39) for practice. The good practice of diabetic foot care has significant statistical association with sex ($p=0.014$), race ($p=0.028$) and level of knowledge of diabetic foot care ($p<0.001$).

Conclusion:

The level of knowledge and practice regarding diabetic foot care still under optimized among diabetic patients that attending outpatient clinics in Kuala Terengganu. Sex, race and level of good knowledge has significant association with good practice of diabetic foot care. The action need to be taken by healthcare providers in emphasizing the importance of good diabetic foot care practice as preventive measure to reduce the disease burden to the patients and healthcare system.

ABSTRAK (BAHASA MELAYU)

Tajuk kajian

Pengetahuan dan amalan penjagaan kaki dan faktor-faktor berkaitan dengan amalan penjagaan kaki yang baik di kalangan pesakit diabetes di klinik kesihatan di Kuala Terengganu, Terengganu.

Tujuan kajian

Untuk menentukan perkadaran tahap pengetahuan dan amalan penjagaan kaki yang baik dan faktor-faktor yang berkaitan dengan amalan yang baik di kalangan pesakit diabetes yang menghadiri klinik kesihatan di Kuala Terengganu, Terengganu.

Metodologi

Satu kajian keratan rentas telah dijalankan melibatkan 383 pesakit diabetes yang menghadiri klinik kesihatan di Kuala Terengganu. Mereka dipilih mengikut kriteria kemasukan dan pengecualian menggunakan pensampelan sistematik. Set soalan kaji selidik mengandungi 3 bahagian iaitu data demografi sosial, pengetahuan dan amalan penjagaan kaki diabetes. Setiap bahagian pengetahuan dan amalan mengandungi 15 soalan. Markah mereka dinilai kepada pengetahuan yang baik dan kurang baik, amalan yang baik dan kurang baik. Markah melebihi 70% dianggap pengetahuan dan amalan yang baik dalam kedua-dua bahagian.

Keputusan

Median umur adalah 60.0 (IQR 12). 70.2% mempunyai pengetahuan yang baik tentang penjagaan kaki diabetes tetapi hanya 58.7% mempunyai amalan penjagaan kaki diabetes yang baik. Min (SD) markah pengetahuan adalah 11.3 (2.40) dan min (SD) bagi amalan adalah 22.1 (4.39). Amalan penjagaan kaki diabetes yang baik mempunyai

kaitan dengan jantina ($p=0.014$), bangsa ($p=0.028$) dan tahap pengetahuan penjagaan kaki diabetes ($p<0.001$).

Kesimpulan

Tahap pengetahuan dan amalan penjagaan kaki diabetik masih di bawah tahap optimum bagi pesakit diabetes yang menghadiri klinik kesihatan di Kuala Terengganu, Terengganu. Jantina, bangsa dan tahap pengetahuan penjagaan kaki diabetik mempunyai kaitan yang signifikan dengan amalan penjagaan kaki diabetik yang baik. Tindakan perlu diambil oleh anggota kesihatan dalam penekanan mengenai kepentingan amalan penjagaan kaki diabetik sebagai langkah pencegahan untuk mengurangkan beban penyakit kepada pesakit dan sistem kesihatan.

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

Diabetes Mellitus (DM) is a non-communicable disease that is rising all over the world. This disease manifested in a form of chronic hyperglycaemic state in conjunction with other metabolic derangement. These can be due to insulin resistance as well as deficiency. In resistance state, the body cannot effectively use the insulin it produces whereby in deficiency state, the pancreas does not produce enough insulin to regulate the blood glucose in the body (WHO, 2016).

There are a few types of DM which is DM type 1, type 2 and gestational diabetes. In type 1, patient will have deficient in insulin production in the body. These group of people required daily administration of insulin to optimally regulate the glucose level inside their body. In DM type 2, the body ineffectively or insensitive to use the insulin to regulate the glucose level. Both groups may be presented with similar symptoms such as excessive urination, thirst, constant hunger, weight loss and fatigue. On the other hand, gestational diabetes is a temporary condition that occurs during pregnancy and it carries long-term risk of DM Type 2 to the patient (WHO, 2016). This chronic hyperglycaemic states later on will lead to multiple microvascular and macrovascular complications namely nephropathy, retinopathy, neuropathy and dermatopathy (MOH, 2015b).

Diabetic foot is one of the common complications due to long standing DM. It can be defined as infection, ulceration or destruction of tissues of the foot that related to diabetic neuropathy and/or peripheral arterial disease (MOH, 2018). Foot problems are

very common among DM patients and it cause substantial morbidity that later may lead to lower extremity amputation.

It is estimated that the lifetime prevalence of amputation in DM is about 6-43% which is 10-20 times higher than the non-diabetes population (Hasnain and Sheikh, 2009). It creates huge disease impact to the patient and healthcare sector. Hence, it is very important for primary care sector particularly family physician to recognize the contributing factors to the problem and early identification of patients at risk.

1.2 PREVALENCE OF DIABETES MELLITUS

Globally, there are increase in incidence and detection of DM. The prevalence has double since 1980 and its become the global emergency. The data from International Diabetes Federation had shown that the total number of adults age 20 till 79 years old with DM was 425 million in 2017 and they estimated that by year 2045, the number will escalate to 438 million (IDF, 2017b). One in two adults with DM are undiagnosed and it covers over 212 million people worldwide.

The number of death due to DM and its complications also increasing. There were about 1.5 million deaths worldwide directly cause by DM in 2012 and it was eight leading cause of death among both sexes and the fifth leading cause of death in women in 2012 (WHO, 2016).

In Malaysia, the survey done by the National Health and Morbidity Survey (NHMS) 2015 reported that DM prevalence figures of 17.5% among adults of 18 years and above (MOH, 2015a). It shown the rising number compared to the previous survey done in 2011 which had reported the prevalence figures of 15.2% in adults above the

age of 18 (MOH, 2011). In concern, 52% of those DM which above the age of 18 years old were unaware of their diagnosis (MOH, 2015b).

Apart from that, there is also the elevation of prevalence in DM type 2 among the young with 2% and 4.9% of those between ages 18-19 years and 20-24 years respectively. Furthermore, only 23.8% of patients in primary care and 12.7% in tertiary institutions able to achieve their specific glycaemic targets (MOH, 2015b).

As the diabetes pandemic progresses globally, so do foot complications and ulcers, which usually precede to most lower extremity amputations. If this issue become undetected or left untreated, it will lead to devastating impact on quality of life and causing significant burden on patient and health care cost.

1.3 DEFINITION OF DIABETIC FOOT AND DIABETIC FOOT CARE

According to World Health Organization (WHO) and International Working Group on the Diabetic Foot (IWGDF), they defined that diabetic foot is the foot of diabetic patients with occurrence of ulceration, infection and/or destruction of the deep tissues, associated with abnormalities neurologically and various degree of peripheral vascular disease in the lower limb (Liapis *et al.*, 2007).

Regarding diabetic foot care, there is no exact consensus of defining diabetic foot care. However, according to Guidelines for Diabetic Foot Care in year 2019 by the Journal of Wound Ostomy & Continence Nursing described that diabetic foot care consist of identification of the at-risk foot, education and practice of proper foot care including daily foot inspection, identification of any abnormalities of the foot, usage of emollient, correct cut of toenails, proper footwear and preventive measure to avoid injury to the foot in preventing diabetic foot complication (Beusher, 2019).

1.4 OVERVIEW OF DIABETIC FOOT RELATED PROBLEM.

As the number of DM patients escalating, there will be more of people having diabetic related complications including diabetic foot problem. Diabetic foot complication takes the greatest toll on patient because it will cause physical deformity and later will affect the patient's quality of life and mental health.

Most ulcer in diabetic patients are neuropathic in etiologic and located at periphery and plantar area (Ulbrecht *et al.*, 2004). Typically, it presented at the side of high mechanical loading that causing repetitive injury in patient with numbness and loss of pain sensation. With inadequate perfusion, due to hyperglycaemic state and increase in blood viscosity, it will cause impairment and delay healing of the ulcers.

Several risk factors are predictive for development of foot ulcers and amputation. Previous foot ulceration, peripheral neuropathy, foot deformity and vascular incompetency are among the important risk factors that required early recognition and management by healthcare provider (Wexler, 2019). The significance of these risk factors were demonstrated in the result of community-based study involving 1294 patients with underlying DM type 2 whereby lower limb amputation were associated with foot ulceration, neuropathy and vascular incompetency (Wexler, 2019).

In most developed countries in the world, the annual incidence of foot ulceration amongst people with DM is about 2%. In these countries, DM is the common cause of non-traumatic amputation and accounted 1% of people with DM suffered with lower-limb amputation (IDF, 2017a). Local explorative study in year 2012 at Universiti Sains Malaysia Hospital reported that high prevalence of diabetic neuropathy which is one of the risk factor for diabetic foot complication (Abougambou and Abougambou, 2012).

A review has shown that up to 50% of patients with DM are asymptomatic for diabetic neuropathy. However, about 80% of non-traumatic lower limb amputations in patients with DM are preceded by a foot ulcer formation. 50% of them die within 5 years of developing the ulcer and up to 70% die within 5 years after the extremities amputation (NICE, 2015).

A study among diabetic patients that attending outpatient clinic in King Fahd Hospital in Saudi Arabia showed that diabetic foot ulcers were observed among 26% of them (Al-Hariri *et al.*, 2017). Prevention of ulceration especially in patient at risk is a goal but difficult to achieve. Among patient with history of previous ulceration, re-ulceration rates are as high as 28%-100% within 4 years (Ulbrecht *et al.*, 2004). So, these data shown that the important of early recognition of foot at risk and early intervention in preventing this complication occurrence.

1.5 BURDEN OF DIABETES MELLITUS AND DIABETIC FOOT COMPLICATIONS

Diabetes Mellitus carried a lot of complications to the patients if the glucose level is well controlled. It can cause blindness, kidney failure, lower limbs amputation and other long-term consequences that later causing impact significantly on the patients' quality of life. This diabetes complications creates burden to the patients. Apart from that, healthcare expenditure also will be affected because a lot of money will be spent to manage the complications.

The increment of the number for DM patients every year will cause the increase of healthcare expenditure to manage the disease. In 2006, the total healthcare expenditure by people with diabetes was 232 billion. However, the number raised exponentially. In 2017, the total healthcare expenditure was 727 billion and South East Asia region contributed about 16.5% of it (IDF, 2017b). The study done to compare the clinical

presentation and expenditure on hospital admission for inpatients with primary diagnosis of DM type 2 in Asia's countries showed that the hospital admission spending for diabetic inpatients with no complications ranged from 11 to 75% of per-capital income. However, the spending used for patient with complications ranged from 6% to over 300% more than spending for patient without complications treated at the same hospital (Goldhaber-Fiebert *et al.*, 2010).

In diabetic foot infection, the total cost usually includes acute management of infection as in-patient, continuing treatment as out-patient in primary care and other miscellaneous cost at home. A study done at Hospital Sultanah Nur Zahirah, Kuala Terengganu reported the total cost for managing 182 inpatients with diabetic foot infection over 1 year duration was USD 11 000 and 50% of the total expenditure was been used for antibiotic and 18% for wound dressing (Lam *et al.*, 2014). However, this data didn't include the cost for outpatient management and any hidden cost at home. Apart from that, a study by Mustapha in 2017 regarding economic analysis to estimate annual cost of diabetes mellitus to Malaysia showed that the estimated total cost of DM as RM2.04 billion annually in 2011 with estimated cost use for patient follow up was RM459 per year and RM5519 for foot amputation (Mustapha *et al.*, 2017).

Diabetic foot problem also cause impact on health-related quality of life. It will affect patients in term of physical and mental health aspect. A local study done 2011 demonstrated that diabetic foot problem is associated with severely impaired health related quality of life and mental health aspects (Mazlina *et al.*, 2011).

This had shown that DM had cause significant burden to the country and patients. It affects in term of financial burden to the country and at the same time to the patients financially, physically and emotionally. The significant burdens toward patients and the government as reported in the literature alarms us regarding the requirement to

strengthen the management of DM, delivering adequate education regarding knowledge of diabetic foot care to the patients and emphasizing the importance of practice in diabetic foot care in preventing these debilitating complications. The level of knowledge and practice of good diabetic foot care should be studied to identify factors associated and subsequently managed them to ensure that this complication can be avoided and improved their quality of life.

CHAPTER 2

LITERATURE REVIEW

2.1 OVERVIEW OF DIABETIC FOOT CARE

DM related lower extremity complication contribute to significant morbidity, mortality and cost around the globe. Data from previous research details that lifetime incidence of diabetic foot ulcer (DFU) in 19 – 34% (Armstrong *et al.*, 2017). Recently at International Symposium on the Diabetic Foot in May 2019 in Hague, Netherlands, IWGDF updated their evidence-based guidelines for prevention of DFU. This guideline will act as the guidance on prevention and management of diabetic foot disease. The development of the updates from the previous edition 2015 are based on a systemic review of the literature and they outline 16 specific recommendations which been divided into 6 area of focus (Rothenberg and Petersen, 2019) .

First recommendation is to identify the foot at-risk with comprehensive history and physical examination. Second recommendation is to regularly examine and inspecting the at-risk foot. This preventive routine is likely to reduce financial burden from diabetic foot complications. Recommendation 3 to 5 are to educate the patients, family and treating healthcare providers regarding diabetic foot care. This recommendation emphasizes on the importance of education regarding protection to the foot, not to walk barefoot and choosing a proper foot wear. They highlight on the frequency to educate the patient about appropriate foot wear is needed inside and outside the house (Rothenberg and Petersen, 2019). A study by Armstrong and colleagues reported that only 15% of patient used appropriate footwear in the house (Armstrong *et al.*, 2001). Recommendation 4 is about practice on diabetic foot care. They emphasize on instruct, encourage and remind the patients to inspect their foot and

the inside of the shoes daily, wash their foot and careful drying between the toes daily, use emollients to moist the dry skin every day, cut the toenails straight across, avoid using chemical or any other technique to remove callus or corns and adherence to annual foot exams (Rothenberg and Petersen, 2019). These recommendations are among the component that have been evaluated within this research. Recommendation 5 is concentrating on healthcare provider. They recommend the structured education to a person with diabetes who is at risk of foot ulceration about appropriate foot self-care. It can be in any forms either one-to-one approach, group education, videos or online. The DFU education must include self-examination teaching, footwear recommendation and guidance to seek medical treatment or professional help if develop any diabetic foot complication (Rothenberg and Petersen, 2019). In modern era with easy excess to online education materials, we as medical health provider can use this tool as part of our component in educating patients about diabetic foot care. YouTube is among the popular channel and frequently visited site for patients to get the information regarding disease and health. However, a study done by Smith and colleagues in 2019 regarding analysis of YouTube as a source of information for diabetic foot care found that 64.4% of the videos were classified as useful and the remaining 35.6% are non-useful or misleading (Smith *et al.*, 2019). So, healthcare provider should alert the patients regarding the possibility of misleading information and offer a curated verified list of videos to the patients.

Recommendation 6 is about instructing the patient with diabetes who is at moderate or high risk foot (IWGDF risk 2-3) to self-monitor foot skin temperature once per day to identify any early signs of foot inflammation (Rothenberg and Petersen, 2019). Recommendation 7 to 9 are stressing on wearing therapeutic foot wear that accommodates the shape and fit the foot properly for well distributed pressure and preventing foot ulcer (Rothenberg and Petersen, 2019). Recommendation 10 to 15 are about treating the risk factor for foot ulcer. They suggest early appropriate treatment for

any pre-ulceration sign, surgical intervention if indicated and perform foot and mobility-related exercise. The last recommendation no 16 is about integrated foot care which includes professional foot care, adequate footwear and structured education about self-care. Repetition must be done once every one to three months as necessary (Rothenberg and Petersen, 2019).

Diabetic foot guideline on footwear for DM patients from Australia based on the review from footwear publication, international guidelines and consensus from expert opinion listed 10 key recommendation in selecting most appropriate footwear to meet specific foot risk needs of an individual with DM. They recommend that every health professionals in managing DM patients should advice their patients to wear footwear that fits, protects and accommodates the shape of their feet comfortably. Patient needs to wear socks within their foot wear to reduce friction (Netten *et al.*, 2018). They also recommend about education of foot wear must involve patient, relatives and caregivers. For patients with moderate to high-risk foot, they recommend about getting customized footwear from trained professionals, motivation about wearing footwear consistently indoor or outdoor and perform regular self-foot examination. For people with foot deformity or pre-ulceration lesion, they need to wear medical grade footwear and custom made insoles. Every footwear must be reviewed regularly every 3 months to ensure fits, provide adequate support and offer protection to the foot (Netten *et al.*, 2018).

In Malaysia, Ministry of Health already developed a guideline “Garis panduan penjagaan kaki bagi pesakit diabetes peringkat komuniti” (MOH, 2012). This guideline come with the objective to ensure uniformity of diabetes foot care services in accordance with established standards. This guideline has become the reference in development of the questionnaire set for this study. In primary care clinic, all foot of DM patients need to be examine at least annually by healthcare provider for early recognition of at-risk foot (MOH, 2012).

Apart from that, our Ministry of Health also release second edition of Clinical Practice Guidelines (CPG) on management of diabetic foot in year 2018. This guideline recommends regarding assessment for diabetic peripheral neuropathy and peripheral arterial disease at diagnosis and at least annually (MOH, 2018). In term of prevention, they emphasize on patient education at least annually and more frequent in higher risk patients. Apart from that, good glycaemic control, appropriate footwear and preventive surgery also become among the component in prevention recommendation. Patients' education regarding the component of diabetic foot care also has been highlighted such as proper adherence to diabetic treatment, avoidance to smoking, daily foot inspection, washing foot and drying accordingly, application of moisturizer, correct technique of toenails cutting, never self-treat corns or calluses, proper choice of socks, not to walk barefoot, foot exercise to encourage blood circulation , periodic foot examination by healthcare worker and seek treatment if presence any calluses or sign of infection (MOH, 2018). This updated version of CPG is meant to address the main issues related to the aspect of care for diabetic foot and help to identify patients with diabetes at risk of foot complication. It shows that the importance of practicing the diabetic foot preventive measure which is self-diabetic foot care.

2.2 KNOWLEDGE OF DIABETIC FOOT CARE

Diabetes appears to dramatically increase the risk of lower extremity amputation because of infected, non-healing foot ulcers. Hence, it is very important for the patients to have a good knowledge and practice regarding foot care in prevention towards non-healing ulcer and amputation. Multiple studies had been done to asses regarding level of knowledge of diabetic foot care among DM patients either in outpatient and in-patient setting.

A study done among diabetic patient in 5 tertiary medical centres in Jordan involving 1085 participants for knowledge and practice of diabetic foot care shown that 53.1% of the them possessed good knowledge in diabetic foot care (Abu-Qamar, 2014). They use interview-based study consist of 17 components involving knowledge and practice of diabetic foot care. Another study at Jinnah Hospital in India involving 150 diabetic patients reported that only 29% of the respondent in the study had good knowledge about foot care (Hasnain and Sheikh, 2009). It shown that almost majority (71%) of the respondents did not have good knowledge regarding self- foot care. Another study done in Hospital Hyderabad in 2008 regarding diabetic foot care also showed that only 38% of patients knew about foot care (Somroo *et al.*, 2011). Besides that, study done in in Tamil Nadu showed similar result which is, about 28% patients had good knowledge, 29.3% had satisfactory knowledge and 42.7% as poor knowledge about foot care (Bijoy *et al.*, 2012). These studies are using the similar questionnaire adapted from Hasnain et al (Hasnain and Sheikh, 2009). They distribute a set of questionnaires with 15 questions about diabetic foot care knowledge and practice.

One of the study done in India involving 203 diabetic patients in endocrinology clinic, Amrita Institute of Medical Sciences and Research Centre with or without diabetic foot ulcer had shown that patients without diabetic foot ulcer had good knowledge on diabetic foot care compared to patients with diabetic foot ulcer (86% versus 69.9%) ($p < 0.001$). (Chellan *et al.*, 2012). Another study on knowledge and practice diabetic foot care among patients attending three tertiary hospital in Nigeria at year 2011 also reported that only 30.1% out of 352 diabetic patients that enrolled in this study had good knowledge. (Desalu *et al.*, 2011).

The similar finding also been observed in district hospital in South Africa when they reported that respondents that involved in their study showed poor general knowledge of diabetes and foot self-care. Only 47.5% inspected their foot daily. Apart from that,

only 24.2% were aware of the need to perform foot-self-care (Dikeukwu and Omole, 2013).

Based on a study done in Indonesia in year 2015 among outpatient endocrine clinic in 1 tertiary hospital revealed that the predictors for diabetic foot ulcer risk factors included age and daily foot inspection (Yusuf *et al.*, 2016). Meanwhile the predictors for presence of diabetic foot ulcer were insulin, shoes factor, spiritual belief that diabetes was a disease and belief that diabetes was a temptation from god. From this finding, researchers recommended that education for high risk patients to understand positive foot care behaviour as essentially preventable strategies in preventing presence risk and diabetic foot ulcer (Yusuf *et al.*, 2016). So, daily foot inspection and proper shoes wearing are part of the good diabetic foot care.

In Malaysia, a cross-sectional study which was done in tertiary hospital, Hospital Kuala Lumpur in 2004 had shown that 25% of 100 respondents had poor knowledge regarding foot care. However, surprisingly they had higher score in practice of foot care. They are using a set of guided questionnaires including the Neuropathic Symptom Score and the sub-scale 1 and 2 of the Preventive Measure Scale, clinical assessment by the researchers and subjects' medical notes. In Preventive Measures Scale, it consists of 7 items of foot-care knowledge and 9 items of foot care practice. They were assessing about the necessity of special foot care in diabetes, daily inspection, daily feet washing, walking barefoot, adequate shoe fitting, doctor's visit for wound care and special shoes demands. This finding indicated that most of the patients was practicing diabetic foot care without knowing or understand the purpose behind it (Naicker *et al.*, 2009).

Other study done in tertiary hospital in Kuala Terengganu regarding knowledge and practice of diabetic foot care also reported that 58% of diabetic patients still have poor knowledge and 61.8% had poor practice towards diabetic foot care (Muhammad-Lutfi *et*

al., 2014). In this study, they used a set of diabetic foot care questionnaire designed by Hasnain et al (Hasnain and Sheikh, 2009). The questionnaire consists of 15 questions with the answer of “yes” and “no” on knowledge and practice. They translated the questionnaire into Bahasa Malaysia was tested and validated.

The importance of foot care knowledge in preventing diabetic foot ulcer is a widely-accepted fact. However, a study done among diabetic patients that attending primary care clinic in Tanzania showed that a high prevalence of diabetic foot. Apart from that, over half of the diabetic patients that involved in this study reported that they had never received any information regarding foot care. They also reported that foot self-care practices were not performed by many patients. Majority of them didn't inspect their foot regularly and 80% of them preformed risky behaviour such as cutting toenails with inappropriate instrument (Chiwanga and Njelekela, 2015).

Although patients received diabetic foot care education and had good knowledge about it, this still cannot guarantee that they had a good practice towards that. A study among diabetic patients that attending outpatient clinic in King Fahd Hospital in Saudi Arabia showed that majority of the respondents score good knowledge and favourable attitude towards diabetic foot care. However, the results demonstrated that despite these characteristics, high percentage of them ignored very important information and instructions before buying new shoes that suitable for diabetic patients (Al-Hariri *et al.*, 2017). Similarly, a study done in 2011 in Jordan showed discrepancy in between good knowledge and good diabetic foot care practice. Statistically, more than half out of 1085 respondents were within the good range of knowledge but only 6% of them were practicing good diabetic foot care (Abu-Qamar, 2014).

A recent study done in year 2017 regarding knowledge and practice of diabetic foot care among DM patients attending one tertiary hospital in Philippines involving 330

patients reported that 82.7% had good foot care knowledge. However, about 31.5% of the respondents gave an incorrect answer or “I don’t know” at item asked about lukewarm water should be used for washing the feet. More than half of the respondent did not aware that lotion should not be applied in between toes. They also illustrated the discrepancy between good knowledge (82.7%) and only 22% had good score on practice. This implies that adequate knowledge by itself does not necessarily translated to action (Magbanua and Rebecca, 2017)

Base on all the data available in the literature, it showed that the level of knowledge regarding foot care among diabetic patients were still poor. Effort are required to increase their knowledge and reduce the discrepancy in between knowledge and the exact practice of diabetic foot care.

2.3 PRACTICE OF DIABETIC FOOT CARE

One of the study done in India involving 203 diabetic patients in year 2012 reported that the incidence of diabetic foot ulcer also significantly low with only 9% among patients who practise diabetic foot care and higher 39.8% ($p < 0.001$) for those who not practise diabetic foot care respectively (Chellan *et al.*, 2012). This inverse relationship between diabetic foot ulcer and the knowledge of diabetic foot care as well as practice was observed. They conclude that apart from optimal glycaemic control in diabetic management, the patients must be well educated and motivated in practicing proper foot care practice and lifestyle modification in preventing the occurrence of diabetic foot ulcer (Chellan *et al.*, 2012).

Another cross-sectional study on knowledge and practice diabetic foot care among patients attending three tertiary hospital in Nigeria at year 2011 also reported 10.2% had good practice of diabetic foot care (Desalu *et al.*, 2011). Majority 78.4% of patients with

poor practice had poor knowledge of foot care. They found that only 40.9% of the respondents inspect their feet regularly, 33.5% trim their toenails correctly, 88.6% didn't measure their feet size before buying the footwear and 89.2% did not received advice when they last bought their footwear. They mentioned that self-reported barriers to practise foot care were lack of knowledge on foot care (33%), cited poverty (5.7%) and cited poor communication between patients and their physician (2.6%) (Desalu *et al.*, 2011).

A study among diabetic patients at diabetic clinic in Lahore assessing the knowledge and practice of diabetic foot care showed that only 14% of the respondents had good practice (Hasnain and Sheikh, 2009). Only half of them checking the water temperature before using (50.7%), 28% drying the feet after washing, and a very small percentage of 2.7% of them practiced applying talcum powder to keep the interdigital spaces dry. Other practices also showed a low percentage such as daily change of socks (21.3%), daily foot inspection (35.3%) and wearing comfortable shoes (21.3%) (Hasnain and Sheikh, 2009). Similar study that have been done in Hyderabad, Pakistan also reported that only 6% of the respondents with diabetes mellitus practise diabetic foot care (Somroo *et al.*, 2011).

A local study Kuala Terengganu, Malaysia in year 2013 involving 157 patients in in-patient setting that admitted due to diabetic foot complication described that 61.8% of them had poor practice towards diabetic foot care. Only 22.3% practise checking the temperature of the water before using, 15.9% practise applying talcum at interdigital space, 40.8% practice changing socks daily and 51% trim their toenails correctly (Muhammad-Lutfi *et al.*, 2014).

The similar cross sectional study aiming to determine the knowledge about foot care and its practice among Iranian people with type 2 DM attending diabetic clinic at 1

tertiary hospital revealed that the mean score was 8.3 (SD 2.6) with maximum possible practice score was 16 and ranged from 1 to 13. They described that the mean score of practice about foot care was higher in more educated patients than other groups ($p=0.004$). Majority of the respondents (70%) reported that they did not receive any advice or information on their foot care (Khamseh *et al.*, 2007).

Another study done among 772 veterans with diabetes regarding personal and treatments factors associated with foot self-care reported that the respondents practice foot self-care sub optimally (Johnston *et al.*, 2006). About 51.4% reported looking at the bottom of their feet more than once a week, but only 32.2% reported daily checks for cuts, calluses or sores. The barriers to foot self-care included inability to see the bottom of the feet (53%) because joint problems (77%), excess weight (42%), lack of mirror (13%) or footstool (10%) and decreased in vision acuity (34%) (Johnston *et al.*, 2006).

A recent study done in year 2017 regarding knowledge and practice of diabetic foot care among DM patients attending one tertiary hospital in Philippines involving 330 patients reported that 22.4% good foot care practice. From their study, they found out that majority of the respondents did not use lotion on their feet (60%), did not regularly inspect their foot wear (69%), walking barefoot (45%) and even 13% walking barefoot outside of the house (Magbanua and Rebecca, 2017).

Based on the available literature, the finding showed that the percentage of practice regarding proper diabetic foot care still unsatisfactory. Apart from that, certain literature showed discrepancy between knowledge of diabetic foot care and the exact practice of foot self-care. This finding showed that the good knowledge does not guarantee that the patients will practise good diabetic foot care.

2.4 ASSOCIATED FACTORS IN DIABETIC FOOT CARE PRACTICE

Based on the literature review on diabetic foot care knowledge and practice, overall studies shown that the level of both domains still poor. Enhancing of this practice is very important in preventing development of ulcer and other complication to the foot. Identification of the associated factors that may be related to the level of knowledge and practice of diabetic foot care is very important in implementing or planning the proper intervention in increasing the awareness, knowledge level and practice.

A study done at Jinnah Hospital in Lahore India reported literacy has significant association with knowledge ($p=0.0001$) and practices ($p=0.0001$) of diabetic foot care. However, income per capita shown no association with knowledge ($p=0.23$) and practice (0.25). Similarly, sex did not carry significant association in relation to knowledge ($p=0.21$) and practice ($p=0.25$) (Hasnain and Sheikh, 2009).

Another study done in Jordan at year 2011 also establish similar significance association between level of education and knowledge ($p<0.001$) as well as practice ($p<0.006$). However in this study, no statistical significant association between age group and gender with level of knowledge or practice of diabetic foot care (Abu-Qamar, 2014).

A study in Tamil Nadu in 2012 also reported that literacy status had significant association with knowledge ($p\text{-value}<0.001$) regarding foot care. Besides that, income of the patients also carried significant association with knowledge ($p\text{-value}<0.001$). The demographic data such as sex, age and history of foot infections had shown no significant statistical association. They also reported that patient counselling effectiveness had highly significant ($p=0.0001$) improvement in knowledge. They concluded that well-structured counselling regarding diabetic foot care can have

significant impact on the improvement of their knowledge (Bijoy *et al.*, 2012). A study in Nigeria also reported that illiteracy and low economic status were significantly associated with poor knowledge and practice of diabetic foot care (Desalu *et al.*, 2011).

Another study in Jeddah City, Saudi Arabia involving DM patients from 7 primary health care clinics also reported that practice score was significantly lower with lower education level. The significant relation of having lower knowledge or behaviour score in the jobless patients and the significant positive relation between the education level and behaviour score, indicates that the lower economic status is a risk factor for patients to have inadequate diabetic foot care knowledge and practice (Qadi and Al Zahrani, 2011). This issue will put them at higher risk to develop diabetic foot complication. They also mention that the positive correlation between the foot-care knowledge and behaviour score confirms the importance of diabetic foot care knowledge as the first step in improving foot care practice among diabetic patients. Apart from that, the absent of significance difference of knowledge and practice between patients with and without diabetic foot complications could be attributed that the most patients who developed diabetic foot complications will be keener in looking after and checking their feet. They concluded that there is the need in intensification of diabetic foot care educations programs to diabetic patients. The program should be in conjunction with continuous program of identification of patients at risk to prevents these complications (Qadi and Al Zahrani, 2011).

A recent study done in year 2017 regarding knowledge and practice of diabetic foot care among DM patients attending one tertiary hospital in Philippines involving 330 patients reported that patients who were self-employed twice as likely to have a practice score more than 70% compared to unemployed patients (OR 2.22, 95% CI, 1.16 to 4.23; $p=0.016$). Regarding duration of illness, patient who had DM more than 10 years less likely to have good practice scores (OR 0.50, 95% CI, 0.28 to 0.90; $p=0.021$). The good

practice also been observed in those with a family history of DM (OR 0.49, 95% CI, 0.29 to 0.83; $p=0.008$). Patients who do not have current foot problems also were observed to more likely to have good practice scores (OR 1.78, 95% CI, 1.05 to 2.99; $p=0.031$) (Magbanua and Rebecca, 2017).

But, a study done in tertiary hospital in Kuala Terengganu, Malaysia showed non-association of the level of education with the level of knowledge of foot care in diabetic. Majority of the respondents who had poor knowledge and practice obtained education only up to secondary level but there was no significant difference when compared to those whose received tertiary level of education (Muhammad-Lutfi *et al.*, 2014). This difference could be explained by the inadequate promotion diabetic awareness in their population including both educated and less educated patients. Apart from that, they found that there was no significant association in between patients' demographics data with the level of knowledge and practice of diabetic foot care (Muhammad-Lutfi *et al.*, 2014).

A cross sectional study aiming to determine the knowledge about foot care and its practice among Iranian people with type 2 DM attending diabetic clinic at 1 tertiary hospital described that the mean score of practice about foot care was higher in more educated patients than other groups ($p=0.004$) (Khamseh *et al.*, 2007). The possible explanation is that educated patients compared with illiterate patients can obtain and read necessary information more easily. More than half of them were unaware that smoking can affect the circulation to the feet. Apart from that, culture may play an important role in adherence to practice of diabetic foot care. Although all the participants that involved in this study were Muslim and they should wash their feet three to five times a day, they mentioned that they did not inspect their feet attentively (Khamseh *et al.*, 2007).

2.5 RATIONALE OF THE STUDY

Diabetes mellitus is largely a self-care disease and requires active involvement of the patient in the management. One of the major complications of diabetes is foot ulceration which can lead to limb amputation. The prevalence of foot ulceration in patients attending a diabetic outpatient clinic in Malaysia has been reported as 6%. Foot complications have been found to account for 12% of all diabetic hospital admissions, which in turn made up 17% of all hospital admissions at Hospital Kuala Lumpur, Malaysia (MOH, 2018). The study done at tertiary centre in Terengganu showed 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 (Lam *et al.*, 2014)

In primary care setting, every diabetic patient should be educated regarding foot care and foot examination annually by healthcare providers. Efforts have been done by primary healthcare workers to increase the public awareness regarding diabetic foot. Having knowledge of foot care alone will not be beneficial unless practiced with good compliance. However, there are limited local studies available in the literature that assess the level of knowledge and practice of diabetic foot care and its associated factors among diabetes patients in primary care setting.

Diabetic foot ulcers are associated with significant morbidity and mortality, yet they are one of the most preventable long-term complications of diabetes mellitus. Early detection of peripheral neuropathy and patient's education regarding foot care and footwear is crucial in reducing risk of any injury that can lead to ulcer formation (Nongmaithem *et al.*, 2016).

In previous study in Terengganu which was done within the inpatient setting where the patients received the specialized care from orthopaedic department (Muhammad-

Lutfi *et al.*, 2014). In primary care setting, they are using patient-centered care approached which emphasize the patients regarding the important of self-care and regular follow up in the clinic. Treatment and care of the patients should take into account individual needs and preferences (NICE, 2015). The value of this study is to assess the level of knowledge and practice of diabetic foot care among the patients in primary care setting, identify the associated factors and we can compare the level of knowledge and practice of diabetic foot care between primary care and inpatient setting patients.

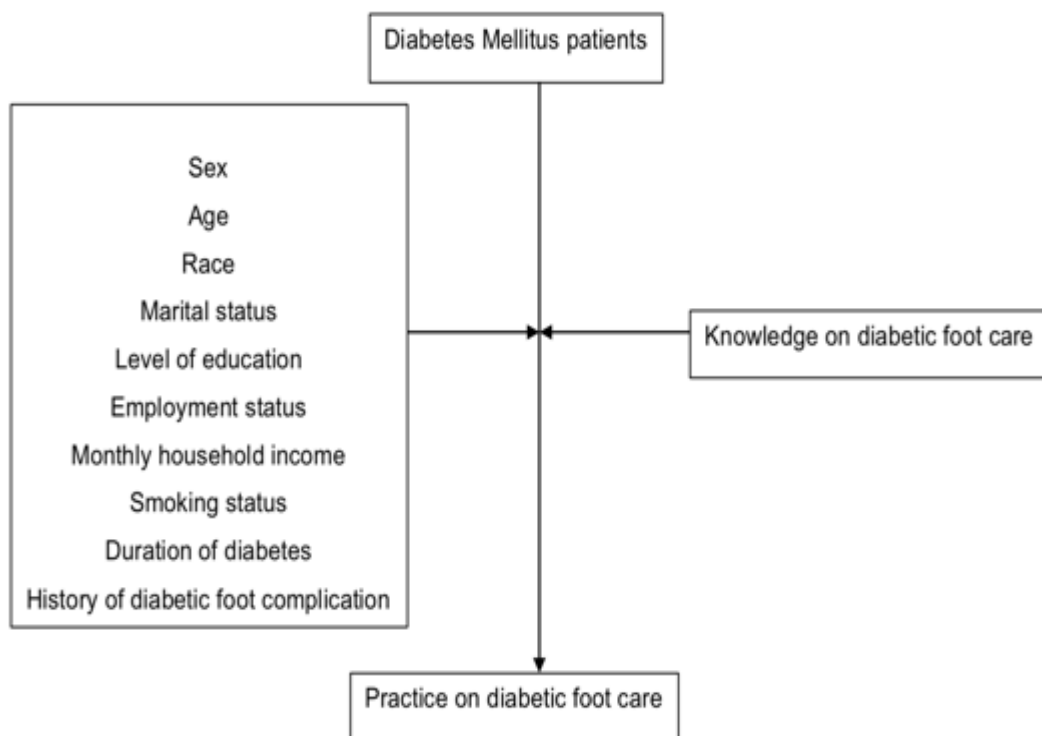


Figure 1: conceptual framework of study

CHAPTER 3

OBJECTIVES

3.1 GENERAL OBJECTIVE

To determine the proportion of good knowledge and practice of diabetic foot care and its associated factors for good practice among DM patients attending outpatient clinics in Kuala Terengganu, Terengganu.

3.2 SPECIFIC OBJECTIVES

1. To determine the proportion of good knowledge on diabetic foot care
2. To determine the proportion of good practice on diabetic foot care
3. To identify the associated factors for good practice in diabetic foot care

among patients attending outpatient clinics in Kuala Terengganu, Terengganu.

3.3 HYPOTHESIS

1. Sociodemographic data (age, monthly income, duration of diabetes, sex, race, marital status, level of education, employment status, smoking status, and history of diabetic foot complication) have significant association with good practice of diabetic foot care.
2. Good knowledge have significant association with good practice of diabetic foot care.

3.4 DEFINITION OF OPERATIONAL TERMS

Outpatient clinic is defined as health clinic facilities that run under Ministry of Health, Malaysia.

Duration of illness is defined as duration of DM since diagnosis in year.

Good knowledge is defined as score more than 70% in knowledge domain of the questionnaire

Good practice is defined as score more than 70% in practice domain of the questionnaire