RESEARCH BOOK

CARDIOVASCULAR RISK ASSESSMENT AND GLYCAEMIC CONTROL AMONG TYPE-2 DIABETES MELLITUS PATIENTS AT SELECTED PRIMARY CARE CLINICS (KK) AND DIABETIC SPECIALIST CLINIC (HOSPITAL-BASED) IN KUANTAN

DR FA'IZA ABDULLAH

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DEDICATION

This book is dedicated to my family and research members who have been working hard to make this study successful, especially to my dear hubby.

PREFACE

Cardiovascular risks assessment and good glycemic control are important for better risk reduction management in preventing and improving CVD outcomes. The Ministry of Health (Malaysia) has carried out tremendous efforts in improving diabetic care in primary and hospital settings. Therefore, it is imperative to revisit the current situation on cardiovascular disease risk assessment and glycemic control at both hospital-based and primary care clinics.

The study aimed to determine the assessment of CVD risk and glycemic control among T2DM patients at selected two public primary care clinics (PCCs) and one hospital-based diabetic specialist (endocrine) clinic (DMSC) in Kuantan, Pahang state. A prospective comparative study design was applied among 423 T2DM patients who sought treatment – 281 patients at two public PCCs and 153 at hospital DMSC. Data were collected from the face-to-face interview using a validated pretested questionnaire and patients' records at the 1st, 6-month, and 12-month visits. A cross-analysis was done to compare the patients' demographic characteristics, CVD risk factors assessment, and glycemic control between PCCs and DMSC.

This study highlighted a higher percentage of Chinese T2DM, and higher education groups attending hospital DMSC compared to PCCs, while Malay and dependents were seen more at the PCCs. A higher percentage of assessment on exercise (82% vs 62%), smoking status (63% vs 48%) and family history of CVD (80% vs 65%); and more referral to a dietician (61% vs 47%) and ophthalmologist (81% vs 61%) were found at the hospital DMSC. On average, the assessment for height, weight, body mass index (BMI), and waist circumference (WC) was 83.9%, 95.9%, 0.7%, and 1.6%, respectively. 1st visit reading of the HbA1C target achieved for PCCs and MOPD were 14.5% and 9.5%, which no difference at 12-month 16.5% and 4.5%, respectively. Among T2DM patients, 74.4% were associated with hypertension and 83.9% were overweight or obese. The average BP target achieved at 1st and 12-months was 21.3% and 29.2%, respectively (increment of 7.9%). No changes in lipid profile after one year were noted at both sites. On average, the target achieved at 12-month for TG, HDL-C, and LDL-C were 53.5%, 32.1%, and 43.5%, respectively.

Conclusion: Generally, assessments for CVD risks were sufficient except for BMI calculation and waist circumference measurement, which need to be enhanced further. Comorbidities: hypertension and obesity were highly associated with T2DM. Both primary and hospital-based specialist clinics have a small percentage of diabetes targets achieved, indicating the need for more enforcement to strengthen both pharmaco- and non-pharmacotherapy. In addition, this enforcement will also improve the BP and lipid profile targets achieved. Assessment and counselling on exercise, weight reduction, and smoking status, referral to a dietician, smoking cessation program for smokers, and an ophthalmologist, should be performed on every T2DM patient for better prevention and early intervention of its complications.

AUTHOR BIOGRAPHY

FA'IZA ABDULLAH is a lecturer with the Department of Family Medicine, Kulliyyah of Medicine, International Islamic University Malaysia. She obtained her FRACGP qualification as Family Medicine Specialist in the year 2016 from the Royal Australian College of General Practitioners (RACGP) and Malaysia Academy Family medicine (MAFP). Her research interests include non-communicable diseases and mental health at the workplace. Presently she is a fellow of the Royal Australian College of General Practitioners (RACGP), a fellow of the Academy of Family Physicians Malaysia (FAFP), and a member of the Malaysian Primary Care Research Group (MPCRG). She held a position as head of IIUM Family Health Clinic from 2017 until 2021 and is currently an office-bearer of the Malaysia Medical Association (MMA) Pahang Branch. As a clinical lecturer, she actively does research and writes health cases. She is also active in the Malaysia medical association organizing scientific meetings for doctors and conveying health information to the public as a guest on Radio PahangFM and moderator for public forums.

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May Allah grant His blessings on everyone who helped me throughout this journey.

FIGURES

TABLES

ABBREVIATIONS

ACS	Acute Coronary Syndrome
BMI	Body Mass Index
CAD	Coronary Artery Disease
CHD	Coronary Heart Disease
CPG	Clinical Practice Guideline
CVD	Cardiovascular Disease
DMSC	Diabetic Mellitus (Endocrine) Clinic
HPT	Hypertension
HTAA	Hospital Tengku Ampuan Afzan
MNHA	Malaysia National Health Accounts
NCVD-ACS	National Cardiovascular Disease-Acute Coronary Syndrome Registry
NHMS	National Health & Morbidity Survey
PCCs	Primary Care Clinics
T2DM	Type 2 Diabetic Mellitus
RA	Research Assistant
WC	Waist Circumference
ASCVD	Atherosclerotic Cardiovascular Disease

CHAPTER 1: INTRODUCTION / BACKGROUND

Diabetes mellitus (DM), defined as elevated fasting or post-prandial blood sugar or haemoglobin A1c, is increasing in prevalence globally as well as in Malaysia[1]. Diabetes is associated with increased morbidity and mortality due to its complications, counting diabetic retinopathy, neuropathy, nephropathy, and cardiovascular disease (CVD). Diabetes mellitus is associated with reduced longevity in which men and women with diabetes mellitus live an average of 7.5 and 8.2 years less, respectively, than those without diabetes mellitus[2]. The estimated prevalence of adults affected with diabetes by 2030 is reaching 439 million with an increment of 69% and 20% in numbers of adults with diabetes in developing countries and developed countries between 2010 and 2030, respectively[3]. Type 2 diabetes (T2DM) accounts for the majority of all cases of diabetes worldwide.

Cardiovascular Disease (CVD) is a significant cause of morbidity and mortality among diabetic patients1. Despite major advances in prevention and intervention of the disease, patients with diabetes still are at increased risk to develop CVD. The prevalence of CVD was higher in patients with Type 2 Diabetes Mellitus (T2DM) than in the normal population. According to the Framingham Heart Study, diabetes doubled the age-adjusted risk for CVD in men and tripled in women[3], and was found to be a stronger risk factor for CVD in women compared to men[4]. It was also found to be associated with a 2-4-fold increased risk of myocardial infarction, heart failure, strokes, and increased overall mortality[4].

Risk Factors- Cardiovascular Disease (CVD)

There are many risk factors for cardiovascular disease. CVD risk goes up with the number of risk factors DM patients have and how serious they are. Traditionally, CVD risk factors can be divided

into modifiable and non-modifiable risk factors. The non-modifiable risk factors cannot be changed, and the risk increases over time. Examples

1. sex – Coronary heart disease affects men and women. Obstructive coronary artery disease is more common in men[5].
2. age - In men, the risk for coronary heart disease increases around age 45. Before menopause, women have a lower risk of coronary heart disease than men. After around age 55, women's risk goes up.
3. Family History - A family history of early heart disease is a risk factor for coronary heart disease. This is especially true if your father or brother was diagnosed before age 55 or your mother or sister was diagnosed before age 65. Research shows that some genes are linked with a higher risk for coronary heart disease.
4. Race - South Asians (Indians) have a higher prevalence of CHD and CV mortality compared with Europeans[6].

Examples of modifiable risk factors include diabetes, high blood pressure, high blood pressure, elevated total cholesterol, elevated LDL cholesterol, elevated triglycerides, obesity, cigarette smoking, and stress. Primary and secondary prevention of CVD should be emphasized on modifiable risk factors intervention. It can be changed through therapeutic lifestyle changes (TLC) and medication if required.

According to the Annual Report of the NCVD-ACS Registry 2015 - 2016, baseline characteristics of patients presenting with Acute Coronary Syndrome (ACS) in Malaysia were consistent throughout the years. 95% of patients had at least one of the common cardiovascular risk factors, and many of these were modifiable. Of these cardiovascular risk factors, 46.2% had DM, 64.7% had hypertension, 38.6% had dyslipidemia, 36.9% were current smokers, 13.2% had a positive family history of premature coronary artery disease[7]. This showed that a high proportion

of patients registered for acute coronary syndrome had DM, hypertension, and dyslipidemia. Moreover, patients presenting with ACS have a combination of other risk factors; 20.2% having one, 28.6% having two, 26.9% having three, and 19.4% having four or more associated risk factors (NCVD-ACS Registry 2015 – 2016). Another local study which was carried out in a public primary care clinic in Selangor showed that more than half of patients with T2DM (64.0%) had a co-morbid of hypertension, and half of them (50.5%) had dyslipidaemia[8]. Therefore, the risk of cardiovascular disease is substantially increased in T2DM subjects due to a complex combination of various modifiable and non-modifiable risk factors. Thus, cardiovascular risk factors assessment among T2DM in the clinical settings is an important role to be executed for better risk reduction management.

Cardiovascular Disease (CVD) and Diabetes

Heart disease is a broad term for various conditions that affect the heart's structure and function. Many different types of heart disease exist, such as coronary heart diseases, valvular heart diseases, congestive cardiac failure, and cardiomyopathy. The most common cause of heart disease is coronary heart disease; narrowing or blockage of the blood vessels that supply blood to the heart slowly over time. The arteries of the heart cannot deliver enough oxygen-rich blood to the heart, causing heart tissues ischemia or death and symptoms of heart injury, which is known as heart attack or acute coronary syndrome (ACS).

One of the revolting complications of DM is Coronary Heart disease or is also known as Coronary Artery Disease. It occurs in obstructive or non-obstructive forms. Ischemic Heart Disease remained as the principal cause of death in Malaysia, contributing 15.6% of all causes of death and principal causes of death for men[9]. Obstructive coronary artery disease occurs when the heart's arteries are more than 50% blocked. The blood flow may eventually be blocked entirely in one or more of the three large coronary arteries. However, the large arteries may be narrowed by plaque

not as much as they are in obstructive disease. Hence, it is known as nonobstructive coronary artery disease. In addition, small plaques can also develop in the small blood vessels in the heart, leading to coronary microvascular disease.

Symptoms of coronary heart disease may be different from one patient to another, even if they have the same type of coronary heart disease. They may not know they have coronary heart disease until they have chest pain, a heart attack, or sudden cardiac arrest. Cardiac autonomic neuropathy associated with diabetes can cause silent myocardial ischemia or infarct and may influence how patients perceive symptoms of heart attack (ACS). One study reported diabetic patients experienced significantly less chest pain and more unusual fatigue during ACS. The finding was similar to older patients with the same diabetes status who found less chest pain[10]. The above findings are alarming as diabetic patients may take their symptoms of heart disease lightly. They might ignore the symptoms or seek treatment for another reason, such as muscle fatigue.

People with type 2 diabetes mellitus (T2DM) have higher cardiovascular morbidity and mortality and are disproportionately affected by CVD compared with non-diabetic subjects[11]. Diabetes is also responsible for the two-four-fold rise in the occurrence of coronary artery disease (CAD) and stroke[12]. It means that having diabetes makes the person more likely to develop heart disease and have a greater chance of a heart attack and stroke. It has been described that those patients with T2DM and no previous history of CAD have a similar risk for cardiac events as subjects with a prior myocardial infarction[13]. This makes a patient have CVD equivalent to once he or she is diagnosed with DM.

DM can affect many major organs in the body, leading to a collection of serious complications when left untreated. In addition to heart disease, DM patients may also have the risk of other complications such as stroke, peripheral arterial disease, neuropathy, kidney disease,

diabetic foot, retinopathy, a dental problem, and sexual problem. Hence, comprehensive CVD assessment is beneficial for CVD risk reduction management and other organs complications.

Diabetes patients are at increased risk for CVD not only due to the pathophysiology of underlying diabetes that causes injury to the walls of the arteries or tiny blood vessels but also they may have the following conditions alongside that contribute to their risk of CVD. These conditions include:

- High blood pressure – already act as one major risk factor, and this combination substantially increases the CAD risk.
- Abnormal lipid profile – such as high cholesterol, LDL, and triglyceride. This triad of poor lipid profiles often occurs in patients with CVD.
- Obesity – has been associated with insulin resistance in which good weight control following appropriate diet therapy and exercise definitely will increase insulin sensitivity and certainly can improve cardiovascular risk.
- Lack of physical activity – in diabetes patients is important to be addressed. Regular exercise helps in diabetes and blood pressure control and good control of lipid profile. Thus, it will help in CVD risk reduction.
- Smoking in diabetes will further narrow small blood vessels, which worsens blood circulation and increases the risk of heart attack, stroke, and other diabetic complications on the kidney, eye, and foot.

The outcomes of this definitely will benefit all readers in analyzing CVD risks, glycemic control, and other comorbidities assessment among T2DM patients.

Guidelines by American Heart Association, Cardiovascular Disease and Diabetes 2015, mention a strong correlation between CVD and DM whereby adults with diabetes are two to four times more

likely to die from heart disease than adults without diabetes. At least 68% and 16% of people age 65 or older with diabetes die from some form of heart disease and stroke, respectively. Thus, the American Heart Association considers diabetes one of the seven major controllable risk factors for cardiovascular disease[14].

CVD and DM in MALAYSIA

The prevalence of Malaysian having CVD is increasing. The increase can see this in the number of patients undergoing PCI recorded in the NCVD-PCI Registry (n = 19,494) in the period from 2015 to 2016 compared to the period from 2013 to 2014 (n = 14,136)[7]. This increment reflected a greater absolute number of procedures being performed and the growing burden of coronary artery disease (CAD) in Malaysia. While the mean age of patients undergoing PCI (2015 to 2016) was approximately 57-58 years, and the majority (83.3%) were males[7]. The prevalence of pre-morbid established CVD risk factors was similar between the 2015 to 2016 period and previous data. Of these, 45.2% had diabetes, 54.8% had dyslipidemia, 68.1% had hypertension, and 62.6% were obese. Other CVD risk factors were active smokers (26.8%) and had a family history of premature cardiovascular disease (4.3%). Additionally, the prevalence of patients who had a history of myocardial infarction (MI) was 38.8%. Approximately a third of patients had more than three known cardiovascular risk factors at the time of PCI (16), including diabetes, hypertension, and dyslipidemia.

The National Health and Morbidity Survey reported that an estimated 73.0% of deaths in Malaysia was attributed to non-communicable diseases (NCD), with the largest crowd coming from cardiovascular (CV) death (13.2% in 2016)[1]. Diabetes has become one of the major causes of premature illness and death in most countries, including Malaysia in which CVD contributed between 50% to 80% of deaths[3].

The prevalence of diabetes is rising. This can be demonstrated by the increase in DM prevalence from 15.2% in 2011 to 17.5% in 2015. There was approximated 15% increase within the 5-year interval. The prevalence among males and females in 2015 was 16.5% and 18.3%, respectively. Although the prevalence among females is increasing and higher than the previous surveys, the male to female ratio was still almost about 1:1[1]. The overall prevalence of hypercholesterolemia (known and undiagnosed) and obesity among adults of 18 years and above increased from 35.1% in 2011 to 47.7% in 2015 and from 15.1% in 2011 to 17.7% in 2015, respectively[15]. Looking at the increment of national obesity, diabetes, and hypercholesterolemia prevalence discretely, assessment of CVD plays a significant role to assess the outcomes of CVD complications predominantly in diabetes patients.

HPT in T2DM

Patients with diabetes who also have hypertension are at increased risk of morbidity and mortality from cardiovascular events. However, blood pressure control is frequently suboptimal in the primary care setting. Large clinical trials support antihypertensive medications in these patients to reduce the risk of cardiovascular disease and death.

Prevalence of hypertension in the T2DM was also high, 72.1%[16] and it was higher with increasing age. One local study carried out in a public primary care clinic in Pahang by Fa'iza Abdullah et all (2017) found that 80.5% of T2DM aged >60 years were hypertensive. The study also found no significant difference in the glycemic control status after one year followed up in both controlled-BP and uncontrolled-BP groups[16]. Hence, the outcomes of this study of cardiovascular risk factor assessment such as blood pressure, lipid parameters, and glycemic control among T2DM patients are essential to be acknowledged and countered.

The Seventh Report of the Joint National Committee in 2003 on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure defines hypertension as systolic blood pressure (BP) ≥ 140 mmHg or diastolic BP ≥ 90 mmHg for adults ≥ 18 years of age. These thresholds are reduced to systolic BP ≥ 130 mmHg or diastolic BP ≥ 80 mmHg for individuals with diabetes or renal disease[17]. The diagnosis of hypertension in people with diabetes is made if the mean of two readings on at least two clinic visits is ≥ 130/80 mmHg[17].

The targets recommended by Malaysian Clinical Practice Guideline (CPG) on Management of Type-2 Diabetes mellitus 5th Edition (2015) have been consistent over the years that generally the target BP should be aimed at lower than 135 mm Hg and diastolic (DBP) lower than 75 mm Hg (<135/75)[18]. According to this CPG, pharmacological treatment should be initiated in patients with diabetes when the blood pressure (BP) is persistent >140 mm Hg systolic and/or > 90 mm Hg diastolic[19] (Level I). Therefore, the treatment goal is to aim for the systolic (SBP) of lower than 135 mm Hg and diastolic (DBP) lower than 75 mm Hg.[20] (Level I). Randomized clinical trials have demonstrated a reduction of coronary heart disease (CHD) events, stroke and nephropathy when lowering SBP to <140 mm Hg.[21](Level I).

The Importance Of Complete Cardiovascular Disease Assessment

Global Burden

Statistics from The International Diabetes Federation estimated diabetes worldwide to be 371 million in 2012 and expected diabetes to have risen to 552 million by 2030. Data computed in the Centers for Disease Control and Prevention (CDC's Division of Diabetes Translation), Unites States shows an increase of the number of people aged 35 years or older with diabetes with self-reported heart disease from 1997 to 2011 from 2.6 million to 5.0 million. According to the American Heart

Association, cardiovascular disease is the major cause of death and disability in people with type 2 diabetes, with at least 65% of diabetes dying from CVD[22].

T2DM itself is an independent CVD risk factor that accounts for the cause of death in approximately 65% of diabetic patients. It also acts as an independent risk factor for several forms of CVD. These patients sustained a worse prognosis for survival than CVD patients without diabetes[4]. Thus, it convinced the Scientific Advisory and Coordinating Committee of the American Heart Association that diabetes mellitus is a significant risk factor for CVD and emphasised its scientific and educational program[23].

Regarding specific CVD, myocardial ischemia due to coronary atherosclerosis commonly occurs in patients with diabetes[24]. As a result, multi-vessel atherosclerosis is often present before the ischemic symptoms occur, which delays the recognition of the disease and its early treatment and undoubtedly worsens the prognosis for survival of many diabetes patients[7].

Epidemiology of Diabetes in Malaysia

In Malaysia, the prevalence of diabetes for those≥ 18 years of age is increasing from 14.9% in 2006, 15.2% in 2011 were 7.2% known cases, and 8.0% undiagnosed. In 2015 prevalence of diabetes was 17.5%. More worryingly, likewise in 2011, the data showed that "undiagnosed diabetes was at 9.2% vs 8.3% "diagnosed diabetes". This data showed that more than half (>50%) of the diabetic population are undiagnosed. This can be simplified as for every single one "diagnosed diabetes", there is one "undiagnosed diabetes" (a ratio of 1:1) In Pahang the prevalence of adult diabetes (diagnosed and undiagnosed) at 14.8%[1].

Cardiovascular risks assessment and modification of CVD risk factors in diabetic patients are important for preventing and improving CVD outcomes. Studies have shown that multi-factorial interventions have proven to reduce the risk of non-fatal and fatal CVD among diabetic patients

through therapy targeting hyperglycemia, hypertension, and hypercholesterolemia[25]. Diabetic patients with long-term (9-10 years) good glycaemic control are associated with a significant reduction in cardiovascular events[26]. In general, treatment for hyperlipidemia and hypertension improve the outcome in diabetic patients. The effect of blood pressure-lowering had been shown to reduce the risk of both cardiovascular and total mortality, without adverse effect on the quality of life. Trials of antihypertensive drugs also showed a similar relative reduction in coronary heart disease risk of 15-25%[27]. The usage of statins for lipid-lowering in diabetic patients with no overt CVD has been proven to prevent CV events[27].

Locally, the glycaemic control and the management of the associated cardiovascular risk factors among patients with T2DM were still poor[28-30]. Following this, the Ministry of Health has carried out increasing efforts to improve chronic care management at the primary care level in the last decades. It is imperative to analyze the current cardiovascular disease risk factors assessment and the control of glycemia at primary care settings (PCCs) and hospital-based DM-specialist clinics (DMSC). This study aim is to determine the assessment done and control rate of CVD risk factors and glycemic control among T2DM patients at both public primary care clinics (PCCs)- KK Jaya Gading, KK Balok, and DM-specialist clinic (DMSC) for T2DM patients at a public hospital, HTAA in Kuantan, Pahang state.

With regards to the place of treatment, the majority sought treatment at MOH health clinics/primary care clinics (59.3%), followed by MOH public hospitals (20.0%), private clinics (15.1%), and private hospitals (3.6%). About 1.5% self-medicated by purchasing medications directly from pharmacies, and 0.5% opted for traditional and complementary medicine as their main mode of treatment[1].

Non-Communicable Diseases (NCDs) now contribute to an estimated 73% of total deaths in Malaysia, with the most significant contributor being cardiovascular diseases that include heart

attacks and strokes. Out of the total death, about 35% of deaths occur in individuals aged less than 60 years, which are mainly the most productive age group for the country. At least 63% of adults aged 18 years and above had at least one NCD risk factor (either overweight/obesity, high blood pressure, high blood sugar, or high blood cholesterol[1].

Chronic diseases place a substantial economic burden on society. Unquestionably in Malaysia, diabetic treatment and managing diabetic complications are complex and costly, leading to an increasing burden of NCDs health expenditure[1]. Current health expenditure (CHE) per capita is defined as Per capita current expenditures on health expressed in a respective currency in Ringgit Malaysia. Based on Malaysia National Health Accounts (MNHA) Health Expenditure reports, the total health expenditure for Malaysia increased from RM35,231 million in 2010 to RM49,731 million in 2014. Current health expenditure indicates increasing the resources channelled to the health relative uses. It shows the importance of the health sector in the whole economy and indicates the societal priority which health is given by the country[31].

Malaysian Diabetes Clinical Audit 2011 by MOH showed the percentage of meeting the target of CVD risk factors modifiable variables in diabetes patients during follow-up is as low as 16.3% to 66.5%. Modifiable variables are Body Mass Index (BMI), waist circumference, lipid profile, BP (Systolic BP & Diastolic BP), and HbA1c. It is challenging to diagnose CVD in the early stages; it is nevertheless important to identify risk factors early; monitor and manage them by encouraging lifestyle changes or prescribing medication where appropriate, and have good CVD risk factors regularly monitored to reduce its complications.

Hence, it is essential to address the outcomes of this study of cardiovascular risk factor assessment done and glycaemic control among Type-2 diabetes mellitus patients at public Primary Care (PCCs) and DM-specialist clinic (DMSC), HTAA. The outcome of this study can be used to improvise a better diabetes assessment at both settings to achieve excellent glycaemic control.

Moreover, the educational programs can be incorporated during the diabetes monitoring to instill self-empowerment in diabetic patients.

Hypothesis:

There may be differences between public primary care clinics (PCCs) and hospital-based DM-specialist clinics (DMSC) in practice patterns regarding assessment on modifiable CVD risk factors and glycemic control levels among patients with type-2 diabetes.

Research Question

1. How does the clinic provides the CVD risk assessment to T2DM patients at primary care (PCCs) and hospital-based DM-specialist clinic (DMSC)?

2. Is there any difference in practice between the public primary care clinics and DM-specialist clinics regarding the assessment rate of modifiable CVD risk factors.

3. Is there any difference in glycaemic control level between the public primary care clinics and DM-specialist clinics, among T2DM patients?

Objectives

The study aims to determine the cardiovascular disease (CVD) risk factors assessment level and glycaemic control rate among Type-2 DM patients who are seeking treatment at selected public primary care clinics (PCCs) and hospital-based DM-specialist clinics (DMSC), HTAA.

Specific Objectives are:

1. To determine the proportion of T2DM patients who have been assessed for modifiable CVD risk factors – low-density lipoprotein (LDL-C), high-density lipoprotein (HDL-C), Triglyceride (TG), Blood Pressure (BP), Body Mass Index (BMI), waist circumference (WC).

2. To determine the proportion of T2DM patients who have achieved the target (target-achieved rate) for blood glucose and other modifiable CVD risk factors.
3. To compare the proportion of CVD risk factors assessment done for T2DM patients between public primary care clinics (PCCs) and hospital-based DM-specialist clinics (DMSC).

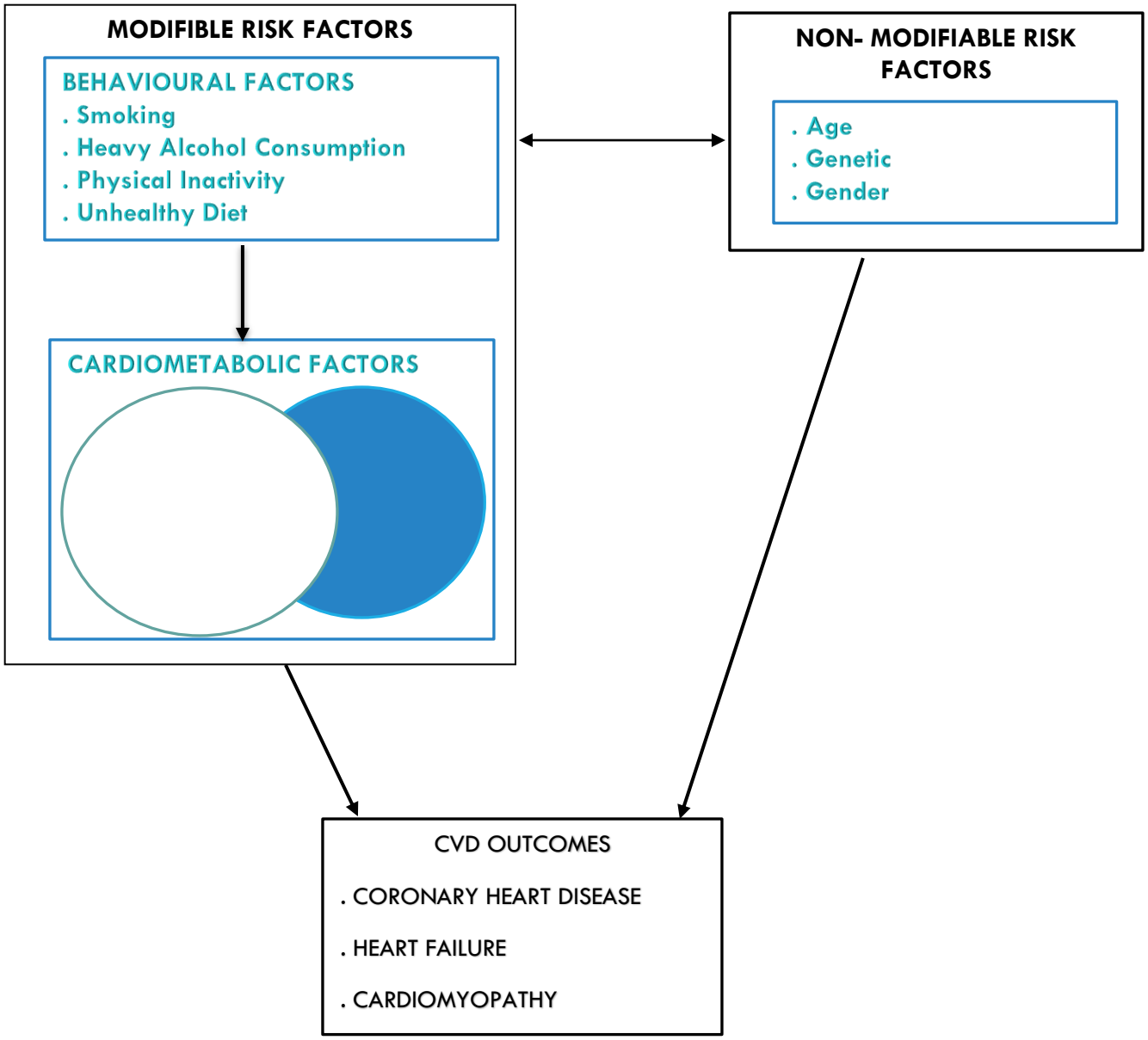
Research Site

Data from Health Informative Centre, Ministry of Health 2016 stated the number of health clinics per 100,000 population for Pahang state was 34.21. Kuantan district has 11 public primary care clinics (PCCs) known as 'klinik kesihatan' and one public hospital known as Hospital Tengku Ampuan Afzan (HTAA).

Kuantan is the capital city of the state of Pahang on the east coast of Peninsular Malaysia. It is located near the mouth of the Kuantan River. Kuantan is the 18th largest city in Malaysia based on the 2010 population and the largest city on the East Coast of Peninsular Malaysia, with approximately 427,515. The population is composed of 78.5% Malay, 17.9% Chinese, 3.3% Indian, and 0.3% other race-based on the Department of Statistics Malaysia 2010 census.

Two public primary care clinics among the highest diabetic attendees and situated within a 15km radius from Kuantan city, and a hospital-based DM Specialist clinic (HTAA) were chosen for the study.

Figure 1: Conceptual Framework Of Risk Factors Of Cardiovascular Diseases (CVD)



CHAPTER 2: METHODOLOGY

A prospective cohort study was carried out among adult T2DM patients at two public primary care clinics (PCCs), Klinik Kesihatan (KK) Jaya Gading and KK Balok, and one DM-specialist clinic (DMSC), Hospital Tengku Ampuan Afzan (HTAA) from July 2014 to December 2015. The T2DM patients were recruited at the 1st visit (0-month) and were followed up for one year (at 12-month visit) during the study duration. The reference population was T2DM patients in Kuantan District. The T2DM patients who fulfilled the inclusion criteria, which include 18 years old and older, on active follow-up, and can give informed consent, were selected for this study. Exclusion criteria include T2DM patients with chronic (severe) complications such as congestive cardiac failure (CCF), renal failure, limb amputation, or those who had dementia or refused to participate.

A list of patients was obtained from the respective clinics, and simple random sampling was applied to select the respondents. To prevent observers' effect (Hawthorne effect); the tendency for personnel at the study sites to change their behaviour simply as a result of being observed (in this study are medical officers from the clinic understudy), the nature of the study will be blinded for them.

Sample Size Calculation

"Epi-info Statcalc software" was used to calculate the sample size for the study. For calculation, 95% confidence interval (1- α), 80% of the power of the test (1- β) and estimated 50 % of CVS risk assessment in MOPD-specialist clinic, HTAA and that of public primary care clinics (PCCs) 35% were used. The result of the calculation as shown in the following calculation.

Table 2.1: Sample Size Calculation

An unmated cohort of Public Primary care clinics (PCCs) and DM-specialist clinic (DMSC), HTAA. (2 PCCs and 1 DMSC)								
Confidence Interval	Power of test	PCCs: MOPD	Estimated CVS risk assessment at DMSC	Risk	Odds	Sample size		
						PCCs	MOPD	Total
95	80	1:1	50%	1.43	1.86	182	182	364
95	**80**	**2:1**	**50%**	**1.43**	**1.86**	**272**	**136**	**408**
95	80	3:1	50%	1.43	1.86	360	120	480

A total size of 408 was calculated for the study (95 % CI, Power of test 80%, and unexposed (Primary care clinics): exposed (hospital-based DM-specialist clinic) with a ratio = 2:1 that was 272:136 respectively. By including 10% drop out was 40, the actual sample size calculated was 448 (PCCs = 299 and DMSC = 149 patients). Thus, the actual recruited T2DM patients from two public primary care clinics (PCCs) and DM-specialist clinics (DMSC) were 281 and 153.

Research Tools

Research tools are the semi-structured questionnaire, measuring tape, height, and weight scale. It was an interview-guided questionnaire. A pretested semi-structured questionnaire was used to collect the information needed. This newly developed questionnaire was based on the Malaysian Clinical Practice Guideline (CPG) Management of Diabetic 2009, which contained two domains:

1. Demographic data on the socio-demographic characteristic of the respondents include age, sex, ethnicity, education level, and clinical information such as comorbidity and duration of T2DM).

2. Assessment on the cardiovascular disease (CVD) risks factors which include:

   All parameters include the history of smoking, family history of CVD and exercise status, waist circumference (WC), and body mass index (BMI) measurements at 1st visit 0-month.

   Blood pressure measurement and glycemic control assessment either fasting blood sugar (FBS) or random blood sugar (RBS) on 1st visit 0-month, 2nd visit 6-month and 3rd visit 12-month.

   Assessment on blood investigations includes haemoglobin A1c (HbA1C) and fasting lipid profile on 1st visit 0-month and 3rd visit 12-month.

The respondents' medical records were also reviewed to assure the completeness of the data. For example, the assessment was considered to be performed if there was documentation of the parameter in the record. All missing assessment parameters values were done and completed by the research assistant (RA), who was a staff nurse competent in this field for further data analysis.

A pilot study was conducted before the actual study for the feasibility and reliability of the questionnaire and was improved upon the study design before the performance of the actual study.

During the study year, baseline data were collected from the selected respondents using guided interview questionnaires at the beginning 1st visit 0-month. Then, these selected respondents were followed-up twice, at 6-month and 12-month to assess the CVD risk assessment and glycemic control whether they were done, and the outcomes whether they achieved their targets. Data on specific interventions for tertiary prevention on CVD such as diet counselling by the dietician, diabetic education by diabetic educator, smoking cessation program, ophthalmologist referral, and cardiology referral were also collected.

The patients were followed up for one year as all CVD assessments should be done annually, and glycaemic control monitoring should be done every three months. Frequency of CVD risk assessment and target-controlled of T2DM were According to Malaysia CPG - Management of T2DM 2009.

Clinical Monitoring Protocol [20]

Test	Initial Visit	Follow-up visit	Quarterly visit	Annual visit
Eye: visual acuity fundoscopy				
Feet: pulses neuropathy				
Weight				
BMI				
Blood Pressure				
Blood Glucose				
HbA1c				
Cholesterol/HDL cholesterol				
Triglycerides				
Albuminuria*				
Creatinine/BUN				
ECG				
Urine microscopy				

= Conduct test
= No test required
= Conduct test if abnormal first visit

* Microalbuminuria if resources are available

Adapted from the International Diabetes Federation Western Pacific Region (IDF-WPR) Type 2 Diabetes Practical Targets and Treatment, Fourth Edition, 2005.

Figure 2.1: Clinical Monitoring Protocol According to the CPG Management of T2DM 2009

Statistical Analysis

Data analysis of this study of CVD risk assessment and target-controlled of T2DM patients have referred accordingly to Malaysia CPG - Management of T2DM 2009 and improvised according to Malaysia CPG – Management of T2DM 2015.

Data was entered and analyzed using Statistical Program for Social Sciences (SPSS) version 22. Data checking and cleaning were performed before analysis. Primarily, epidemiological variables, smoking status, glycemic control, and CVD risk assessment data were analyzed by applying a descriptive analysis of SPSS and Stata-IC12 software. X^2 test, independent samples paired-'t' test, and ANOVA were used to assess the statistically - significant differences of CVD risk factors assessment between the 2- public primary care clinics (PCCs) and MOPD-specialist clinic, HTAA.

CHAPTER 3: RESULTS

Among 434 participants, more female, Malays, and aged group 40-60 years old of T2DM patients attended both settings for their diabetic follow-up. Table 3.1 demonstrates a significantly higher percentage of Chinese and higher education groups (secondary and tertiary level) of T2DM was observed to seek treatment at the DM-specialist clinic (DMSC) compared to Primary Care clinics (PCCs). However, more dependents, pensioners, and self-employment were attending primary care clinics as shown by figure 3.1.

Table 3.1: Demographic Background among T2DM at Primary Care clinics (PCCs) and DM-specialist clinic (DMSC)

Demographic Variables	T2DM Patients		Total (N = 434) n (%)	p-value
	PCCs n = 281 n (%)	DMSC n = 153 n (%)		
Gender				
- Male	104(37.0)	63(40.6)	167(38.3)	0.535
- Female	177(63.0)	92(59.4)	269(61.7)	
Ethnic Groups				
- Malay	263(94.0)	109(71.0)	**372(85.3)**	**0.00***
- Chinese	13(5.0)	**30(20.0)**	43(9.9)	
- Indian	3(1.1)	16(10.3)	19(4.4)	
- Others	2(0.7)	0(0)	2(0.5)	
Age Group years				
- ≤ 40	14(5.0)	**29(19.0)**	43(9.9)	**0.00**
- 40-60	158(56.2)	73(47.3)	231(53.2)	
- ≥ 60	109(38.8)	51(33.3)	160(36.9)	
Education Level				
- Not in school	32(11.4)	6(3.9)	38(8.7)	**0.00**
- Primary School	130(46.3)	42(27.1)	172(39.4)	
- Secondary school	104(37.0)	**80(51.6)**	184(42.2)	
- Tertiary Level	15(5.3)	**27(17.4)**	42(9.6)	

* Comparisons were analyzed using fisher's exact test. Unknown patients were not included in statistical analysis

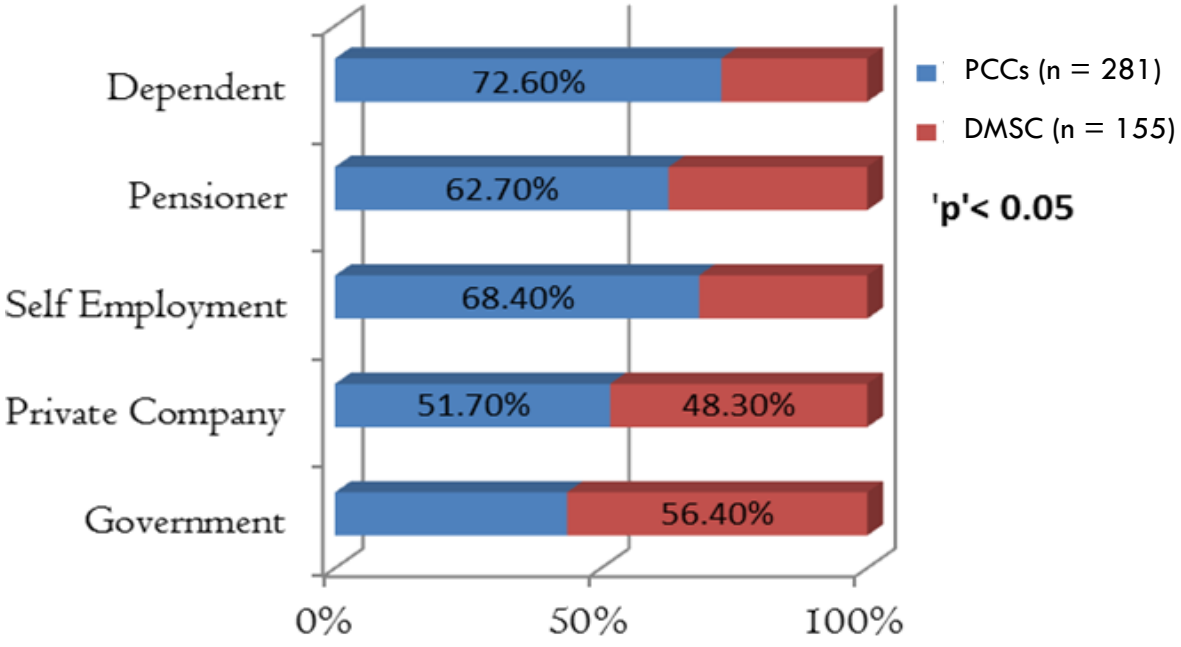


Figure 3.1: Percentage Distribution of Occupational Variety among T2DM At Primary Care clinics (PCCs) and DM-specialist clinic (DMSC) N=434

Regarding comorbidity among T2DM patients at 1st visit assessment, generally, there was no significant difference in comorbidities associated with T2DM patients in both settings except for dyslipidemia and other diseases. However, the higher percentage of T2DM patients at DM-specialist clinic compared to PCCs have concomitant dyslipidemia (40.5% vs 21.7%) and other diseases (18.9% vs 11.3%) such as thyroid diseases, lung diseases (asthma/ COPD), or osteoarthritis as shown in table 3.2.

Table 3.2: Distribution of Co-morbidity Associated with T2DM at Primary Care clinics (PCCs) and DM-specialist clinic (DMSC).

Co-morbidity	PCCs n=281 n (%)	DMSC n=153 n (%)	Total N (%)	'P" Value
Hypertension Present Absent	 208(74.0) 73(26.0)	 115(75.2) 38(24.8)	 323(74.4) 111(24.6)	 0.444
Dyslipidaemia Present Absent	 61(21.7) 220(78.3)	 62(40.5) 91(59.5)	 123(28.3) 311(71.7)	 **0.000**
Ischemic Heart Disease Present Absent	 12(4.3) 269(95.7)	 12(7.8) 141(92.2)	 24(5.5) 410(94.5)	 0.093
Obesity* Present Absent / Not Documented	 12(4.3) 269(95.7)	 13(8.5) 140(91.5)	 25(5.8) 409(94.2)	 0.085
Nephropathy Disease Present Absent	 38(13.5) 243(86.5)	 15(9.8) 138(90.2)	 53(12.2) 381(87.8)	 0.286
Retinopathy Present Absent	 5 (1.8) 276(98.2)	 2(1.32) 151(98.68)	 7 (1.61) 427(98.39)	 1.000***
Neuropathy Present Absent	 15(5.34) 276(94.66)	 10(6.54) 143(93.46)	 25(5.76) 419(94.24)	 0.540***
Other** Present Absent / Not Documented	 31(11.3) 250(88.7)	 29(18.9) 114(81.1)	 60(13.8) 374(86.2)	 **0.022**
* Diagnosed and documented in the patients' record as obese **Other Diseases as documented in the patient's record *** Fisher exact test				

From the study, the percentage of T2DM patients having hypertension (HPT) as one of the comorbidities is high in both settings averages 74.4%, which is alarming. An average of 12.2% of T2DM patients were suffering from nephropathy. The percentage of obesity being diagnosed among T2DM patient were low as most of the BMI values of T2DM patients were not documented. Added report of obesity among T2DM patients at both settings was illustrated further after body mass index (BMI) calculation done by appointed research assistance (RA) on table 3.4A, table 3.4B,

and table 3.4C. Regarding CVD risk assessment, less than 10% was done for waist circumference (WC) measurement and body mass index (BMI) calculation at both settings. A higher percentage of height and weight assessments are done at Primary Care Clinics. However, a higher assessment rate was done at the DM-specialist clinic (DMSC) on exercise, smoking status, and family history of CVD. The CVD risk assessment is shown in table 3.3.

Table 3.3: CVD Risk Assessment Done among T2DM at Primary Care Clinics (PCCs) and DM-specialist clinic (DMSC) (N=434) at 1st Visit

CVD Risk Assessment Done (By Medical Staff)	**PCCs n = 281 n (%)**	**DMSC n= 153 n (%)**	**Total N= 434 N (%)**	**P value**
Height** (Documentation at 1st time entered in the diabetic record)	**270(96.1)**	96 (61.2)	366(83.9)	**0.00**
Weight (at 1st Visit 0-month assessment)	**274(97.5)**	144(92.9)	418(95.9)	**<0.025**
BMI Assessment				
Done	1(0.4)	2(1.3)	**3 (0.7)**	0.285*
Not done	280(99.6)	151(98.7)	431(99.3)	
WC Assessment				
Done	2(0.7)	5(3.3)	**7(1.6)**	0.102*
Not done	279(99.3)	148(96.7)	427(98.4)	
ECG Assessment				
Done	131(46.6)	77(50.3)	208(47.9)	0.482
Not done	150(53.4)	76(49.7)	226(52.1)	
Other CVD Assessments				
Family History of CVD in 1st Degree Relative				
Done	193(64.1)	**122(79.7)**	305(70.3)	**0.002**
Not done	98(34.9	31(20.3)	129(29.7)	
Exercise Status Assessment				
Done	175(62.3)	**128(83.7)**	303(69.8)	**0.000**
Not done	106(37.7)	25(16.30	131(30.2)	
Smoking status Assessment				
Done	135(48.0)	**96(62.7)**	231(53.2)	**0.004**
Not done	146(52.0)	57(37.3)	203(46.8)	

* Comparisons were analyzed using fisher's exact test.
** Done at least one time before the data collection.
Unknown patients were not included in statistical analysis
BMI – Body Mass Index WC – Waist Circumference

BMI status and waist circumference measurement were categorized according to the Malaysian CPG of Obesity 2004, CPG of Diabetes 2009, and International Diabetes Federation criteria for ethnic or country-specific values for waist circumference. The recommendation of WC for men is < 90cm and women < 80 cm. The South Asians classification of BMI and WC has a lower cutoff for overweight, obese categories, and WC than the World Health Organization (WHO) classification. WC was measured at the midpoint between the lowest rib and the iliac crest, and a trained staff nurse did it as a research assistant (RA).

As shown in table 3.4A, we found that more than 80% of T2DM participants in both settings were overweight (average pre-obese + obese = 83.9%). 46% of T2DM patients were obese with a BMI of more than 27.5 kg/m^2. About 75.0% of T2DM patients have waist circumference (WC) more than recommended for the individuals, leading to a greater risk of developing CVD complications.

Table 3.4A: Distribution of BMI and WC Status as Modifiable CVD Risk Factors Among T2DM At Primary Care clinics (PCCs) and DM Specialist Clinic (DMSC) N=434 at 1st 0-Month visit (Done by RA)

CVD Modifiable Risk factors (BMI & WC)	PCCs n(%)	DMSC n(%)	Total	'P" Value
BMI Status (kg/m^2)				
• Underweight (<18.5)	4(1.5)	2(1.7)	6(1.5)	
• Normal (18.5-22.9)	44(16.2)	15(12.7)	59(15.1)	
• Pre-Obese(23-27.4)	92(33.8)	47(39.8)	139(36.8)	0.174*
• Obese-I(27.5-34.9)	108(39.7)	39(33.1)	147(36.4)	
• Obese-II (35-39.9)	17(6.2)	6(5.0)	23(5.6)	
• Obese-III(≥40)	7(2.6)	9(7.6)	16(5.1)	
Central Obesity status according to WC (≥90 in male, ≥ 80 in Female)				

• Central Obesity • Normal	279(75.2) 70(24.8)	113(75.3) 37(24.7)	22(75.1) 107(24.9)	1.000

For the non-modifiable CVD risk assessment, this study found that in both genders, 74% has one major risk factor when their age exceeded for male 45-years old and female 55-years old. In addition, 60% had an additional major risk factor presence when there was a family history CVD event in the 1st-degree relative, as shown in table 3.4B.

Table 3.4B: Non-Modifiable CVD Risk factors Assessment among T2DM at Primary Care Clinics (PCCs) and DM-Specialist Clinic (DMSC) (N=434) (Done by RA)

Non-Modifiable Risk factors Assessment at 1st Visit Data Collection	**PCCs n=281 n (%)**	**DMSC n=153 n (%)**	**Total N=434 N(%)**	**p-value**
Age as a Risk Accordance to gender. *(≥45 years - Male & ≥ 55 years Female)* • **Risk Present** • **Risk Absent**	215(76.5) 66(23.5)	106(69.3) 47(30.7)	**321(74.0)** 13(26.0)	0.110
Family History of CVD in 1st-degree relative • **Present** • **Absent**	161(57.3) 120(42.7)	102(66.7) 51(33.3)	**263(60.6)** 171(39.4)	0.064

This study showed a higher percentage of T2DM patients engaged with regular exercise at PCCs compared to DMSC (77.6% vs 27.1%). Data collection for exercise status was done by a research assistant (RA) using standard questions based on Malaysian CPG on Obesity, 2004. Regular exercise was defined as 150 minutes of moderate-intensity exercise within one week which can be divided into; either (i) 3 sessions per week with 1 hour per session or (ii) 5 sessions per week with 30 minutes per session.

Table 3.4C: Exercise and Smoking Status among T2DM at Primary Care Clinics (PCCs) and DM-Specialist Clinic (DMSC) (N=434) (Done by RA)

Exercise and Smoking Status at 1st Visit Data Collection	PCCs (281) n (%)	DMSC (153) n (%)	Total N = 434 n (%)	'P-value
Exercise Status				
Done regularly	218(77.6)	81(27.1)	299(69.1)	**0.000**
Sometimes	57(20.3)	63(41.4)	120(27.7)	
Never	6(2.1)	8(5.3)	14(3.2)	
Smoking status				
Non-smoker	198(70.5)	115(75.2)	313(72.1)	
Ex-smokers	38(13.5)	25(16.3)	63(14.5)	0.80
Current smokers	45(16)	13(8.5)	58(13.4)	

Almost 100% of the assessment done for the blood pressure measurement was done at both settings. There is no significant difference in the CVD assessments done for lipid profiles such as total cholesterol and triglyceride between Primary Care clinics and DM-specialist clinics (>95% assessment). Though 1st visit 0-month of assessment for HDL-C and LDL level were found to be lower percentage at PCCs than DMSC (86% vs 95%); at the 12-month visit, the rate of assessments done was no different.

A significantly higher percentage of glycemic monitoring was done for FBS or RBS at PCCs for all three visits at 0, 6, 12 – months compared to the DMSC (99%-100% vs 80-83% respectively). However, we found that a lower percentage of HbA1c was done at the Primary Care clinics at 12-month visits (85.5% vs 95.7%). All data is shown in table 3.5.

Table 3.5: CVD Risk Assessment Done among T2DM at Primary Care Clinics (PCCs) and DM-Specialist Clinic (DMSC) (N=434) at 1st, 2nd, and 3rd Visits

CVD Risk Assessment Done (By Medical Staff)	PCCs n = 281 n (%)	DMSC n= 153 n (%)	Total N= 434 N (%)	P-value

Blood Pressure Assessment '0' month – 1st visit • Done • Not done '6' month – 2nd visit • Done • Not done '12' month – 3rd visit • Done • Not done	 280(99.6) 1(0.4) 257(100) 0(0) 237(100) 0(0)	 152(99.3) 1(0.7) 117(99.2) 1(0.8) 102(99.2) 1(0.8)	 432(99.5) 2(0.5) 374(99.7) 1(0.3) 339(99.1) 3(0.9)	 1.000* 0.315* 0.028*
Glycemic Control **Fasting Blood Sugar (FBS) or Random Blood Sugar (RBS)** '0' month – 1st visit • Done • Not done '6' month – 2nd visit • Done • Not done '12' month – 3rd visit • Done • Not done **Hemoglobin A1c (HbA1c)** '0' month – 1st blood result • Done • Not done '12' month – 2nd blood result • Done • Not done	 **278(98.9)** 3(1.1) **257(100)** 0(0) **236(100)** 0(0) 269(95.7) 12(4.3) 206(85.5) 35(14.5)	 122(79.7) 31(20.3) 99(83.2) 20(16.8) 89(83.2) 18(16.8) 147(96.1) 6(3.9) 111(95.7) 5(4.3)	 400(92.2) 34(7.8) 356(94.8) 20(5.3) 325(94.8) 18(5.2) 416(95.9) 18(4.1) 317(88.8) 40(11.2)	 **0.00*** **0.00*** **0.00*** 1.00 **0.007**
Lipid Profile Assessment **Total Cholesterol (TC)** '0' month – 1st blood result • Done	 273(97.2)	 150(98.0)	 423(97.5)	 0.754*

• Not done	8(1.1)	3(2.0)	11(2.5)	
'12' month – 2nd blood result				
• Done	212(88.0)	104(90.4)	316(88.8)	0.595
• Not done	29(12.0)	11(9.6)	40(11.2)	
Triglyceride (TG)				
'0' month – 1st blood result				
• Done	273(97.2)	150(98.0)	423(97.5)	0.754*
• Not done	8(1.1)	3(2.0)	11(2.5)	
'12' month – 2nd blood result				
• Done	212(88.0)	104(90.4)	316(88.8)	0.595
• Not done	29(12.0)	11(9.6)	40(11.2)	
High-Density Lipoprotein (HDL-C)				
'0' month – 1st blood result				
• Done	244(86.4)	147(96.1)	391(90.1)	**0.002**
• Not done	37(13.2)	6(3.9)	43(9.9)	
'12' month – 2nd blood result				
• Done	200(83.0)	102(88.7)	302(84.8)	0.206
• Not done	41(17.0)	13(11.3)	54(15.2)	
Low-Density Lipoprotein (LDL-C)				
'0' month – 1st blood result				
• Done	242(86.1)	146(95.4)	388(89.4)	**0.003**
• Not done	39(13.9)	7(4.6)	469(10.6)	
'12' month – 2nd blood result				
• Done	199(82.6)	102(88.7)	301(84.6)	0.159
• Not done	42(17.4)	13(11.3)	55(15.4)	
* Comparisons were analyzed using fisher's exact test. Unknown patients were not included in statistical analysis				

Regarding BP target achievement among T2DM, the study showed no significant difference between PCCs and DMSC. According to Malaysian Clinical Practice Guideline (CPG) Management of Diabetic 2009 for target, BP among diabetes was ≤ 135/75. The increment in percentage (%) target BP achieved after one year among T2DM was low, about 7.9%; (from 21.3% at 1st visit 0-month visit to 29.2% at 12-month visit). This study found that 59.2 % have never been good BP

control within that one year of the study period from BP not-achieved at 1st visit to BP Not-Achieved at 12-month visit and 11.5% of T2DM patients deteriorating from BP achieved at 1st visit 0-month to BP not-achieved at 12-month. In addition, only 9.8% sustained the target BP throughout the one year of data collection (achieved-to-achieved). Distribution of BP status as modifiable CVD risk factors among T2DM according to the respective group and time taken is shown in table 3.6A.

Table 3.6A: Distribution of BP status as modifiable CVD risk factors among T2DM at Primary care clinics (PCCs) and DM-Specialist clinic N=434 within one-year follow-up.

CVD Modifiable Risk Factors (BP status)	PCCs n(%)	DMSC n(%)	Total n (%)	'P" Value
Target Achieved ≤135/75mmHg at '0' month – 1st visit				
Achieved	59(21.1)	33(21.7)	92(21.3)	1.000
Not Achieved	221(78.9)	119(78.3)	340(78.7)	
Target Achieved ≤135/75mmHg at '12' month – 3rd visit				
Achieved	70(29.5)	29(28.4)	99(29.2)	0.897*
Not Achieved	167(70.5)	73(71.6)	240(70.8)	
Target BP Changes Groups within one year (from 1st visit- to - 3rd visit 12-month)				
Achieved – to – Achieved	26(11.0)	7(6.9)	33(9.8)	0.534
Not Achieved – to - Achieved	44(18.6)	22(21.6)	66(19.5)	
Achieved - to - Not Achieved	25(10.6)	14(13.7)	39(11.5)	
Not achieved – to – Not Achieved	141(59.7)	59(57.8)	**200(59.2)**	

On average, the percentage (%) increment on the target glycemic for FBF/RBS among T2DM achieved from 1st visit to one year of this study period was very low, an increment of 1.3% only (23.2% at 1st visit to 24.5% at 12-month visit) and no increment for HbA1c level (12.7% at 1st visit to 12.3% at 12-month). However, there was a significant difference in the HbA1c target achieved between PCCs and DMSC at the 12-month visit, whereby a higher percentage of the HbA1c target was achieved seen at PCCs (16.5% vs 4.5%). These findings are elaborated further in table 3.6B.

Table 3.6B: Distribution of Glycemic control status as modifiable CVD risk factors among T2DM at Primary care clinics (PCCs) and MOPD-Specialist Clinic (MOPD) n=434 within one-year follow-up.

Modifiable Risk Factors (Glycemic Control)	PCCS n(%)	DMSC n(%)	TOTAL	'p' VALUE
Target Achieved- (FBS 4.4-6.1 /RBS 4.4-8.0 mmol/L)				
at '0' month – 1st visit				0.798
Achieved	66(23.7)	27(22.1)	**93(23.2)**	
Not Achieved	212(76.3)	95(77.9)	307(76.8)	
at '6' month – 2nd visit				
Achieved	74(28.8)	22(22.2)	96(27.0)	0.232
Not Achieved	183(71.2)	77(77.8)	260(73.0)	
at '12' month – 3rd visit				
Achieved	62(26.2)	18(20.2)	**80(24.5)**	0.313
Not Achieved	175(73.8)	71(79.8)	246(75.5)	
Target Glycaemic Changes Groups for FBS/RBS within 1-year (from 1st visit- to - 3rd visit)				
Achieved – to – Achieved	28(11.9)	9(11.1)	37(11.7)	
Not Achieved – to - Achieved	34(14.5)	8(9.9)	42(13.3)	
Achieved - to - Not Achieved	27(11.5)	8(9.9)	35(11.1)	0.668
Not achieved – to – Not Achieved	146(62.1)	56(69.1)	202(63.9)	
Target Achieved- (HbA1C ≤6.5%)				
at '0' month – 1st result				0.168
Achieved	39(14.5)	14(9.5)	**53(12.7)**	
Not Achieved	230(85.5)	133(90.5)	363(87.3)	
at '12' month – 2nd result				
Achieved	34(16.5)	5(4.5)	**39(12.3)**	**0.002**
Not Achieved	172(83.5)	106(95.5)	278(87.7)	
Target Glycaemic Changes Groups for HbA1c within 1-year (from 1st visit- to - 3rd visit 12-month)				
Achieved – to – Achieved	**21(10.4)**	**5(4.5)**	26(8.4)	
Not Achieved – to - Achieved	**12(6)**	**0(0)**	12(3.9)	
Achieved - to - Not Achieved	8(4)	6(5.5)	14(4.5)	**0.006***
Not achieved – to – Not Achieved	160(79.6)	99(90)	259(83.3)	
*Fisher's exact test				

Diabetes mellitus is considered as a "Coronary Heart Disease Equivalent". It can affect the lipid profile. As shown in Table-6c, the three parameters of dyslipidemia were analyzed: triglyceride, HDL, and LDL. After analyzing two consecutive values of lipid profile parameters within one year of study (at 1st visit 0-month and 12-month), we found on average there were no significant differences in the target lipid parameters achieved between PCCs and DMSC with no or little improvement in the percentage. Percentage target achieved at 12-month visit among T2DM were not satisfactory for TG = 53.5%, HDL-C = 32.1%, and LDL-C 43.5%. These findings were elaborated further in Table 3.6C.

Table 3.6C: Distribution Of Lipid Profile Status As Modifiable CVD Risk Factors Among T2DM At Primary Care Clinics (PCCs) And DM-Specialist Clinic (DMSC) N=434 Within One-Year Follow-Up.

Modifiable Risk factors (Lipid profile)	PCCs n(%)	DMSC n(%)	Total	p Value
Target Achieved-TG(≤1.7mmol/l)				
at '0' month – visit				
Achieved	139(50.9)	71(47.3)	210(49.6)	0.542
Not Achieved	134(49.1)	79(52.7)	213(50.4)	
at '12' month – visit				
Achieved	115(54.2)	54(51.9)	169(53.5)	0.720
Not Achieved	97(45.8)	50(48.1)	147(46.5)	
Target Achieved-HDL-C(>1.0mmol/l for man and > 1.3 mmol/l for a woman)				
at '0' month – visit				
Achieved	90(36.9)	52(35.4)	142(36.3)	0.828
Not Achieved	154(63.1)	95(64.6)	249(63.7)	
at '12' month – visit				
Achieved	59(29.5)	38(37.3)	97(32.1)	
Not Achieved	141(70.5)	64(62.7)	205(67.9)	0.193
Target Achieved- LDL-C(≤2.6mmol/l)				
at '0' month – visit				
Achieved	69(28.5)	57(39.0)	136(32.5)	0.034
Not Achieved	173(71.5)	89(61.0)	262(67.5)	
at '12' month – visit				
Achieved	91(45.7)	40(39.2)	131(43.5)	0.326
Not Achieved	108(54.3)	62(60.8)	170(56.5)	

Regarding referral to other units, this study showed that a higher percentage of referrals came from DMSC compared to PCCs, especially to a dietician (61.4% vs 46.6%) and ophthalmology clinic (813% vs 61.2%), respectively

Table-7 Referral Distribution among T2DM at Primary Care Clinics (PCCs) and MOPD-Specialist Clinic (MOPD-SC) at 1st Visit (N=434)

Referrals Unit	PCCs (281) n (%)	DMSC (153) n (%)	Total N = 434 n (%)	p value
Dietician	131(46.6)	94(61.4)	225(51.8)	**0.005**
Diabetic educator	180(64.1)	111(71.6)	291(66.7)	0.110
Smoking Cessation Program	22(7.8)	5(3.2)	27(6.2)	0.064
Ophthalmology clinic	172(61.2)	126(81.3)	298(68.3)	**0.000**

CHAPTER 4: DISCUSSION

Prevalence of a known or established diagnosis of diabetes during the 2019 National Health Morbidity Survey (NHMS) was 9.4%, whilst in 2015 it was 8.3% showing an increasing trend. Prevalence of overall diabetes among the major ethnic groups in the NHMS 2019 showed a similar trend as previous data, which was 31.4%, 22.6%, and 15.1% among the Indians, Malays, and Chinese, respectively[18].

This study has shown that more women (61.7%) with T2DM attended both primary and hospital-based diabetic clinics than men, which is comparable to another study that showed 60% female T2DM[16]. Malays T2DM was the highest ethnic group attended diabetic clinics was comparable with Kuantan population according to the ethnic group whereby Malay ethnic is the highest percentage of the population in Kuantan (78.5%) based on Department of Statistics Malaysia 2010 census. More Chinese T2DM and higher education groups (secondary and tertiary level) of T2DM were observed at DMSC compared to PCCs, which might be due to the geographical site of both clinics. The DMSC is located in the main public hospital in the Kuantan town area, whereby the residents are more of a higher status of living and where Chinese residents are centered. In comparison, primary care clinics (PCCs) are located in Malays suburban areas which are dominated by housewives (dependents), pensioners, and self-employment residents.

Generally, this study showed a high percentage of hypertension was associated with T2DM (74.4%), comparable with another study 72.1%[16]. However, an increased prevalence was found among patients who are followed up in the National Diabetes Registry, from 70.1% in 2015 to 80.4%) in 2019[18,32]. This increasing trend is alarming as both hypertension and T2DM will double the risk for cardiovascular disease (CVD)[33]. Moreover, there is a consistent positive relationship

between elevated systolic BP (in the uncontrolled hypertension patient) and increased risk for micro- and macrovascular diseases in T2DM patients[34].

The percentage of T2DM with nephropathy in this study (diagnosis documented during the data collection period) was 12.2%, which contributed to about 50% of new patients requiring dialysis who are followed up in the National Diabetes Registry in 2012[18]. Likewise, the National Diabetes Registry 2016 showed that diabetic kidney disease (DKD) was the most common cause of end-stage kidney disease (ESKD), accounting for 65% of new patients requiring dialysis in Malaysia[32]. HTAA is the main centre for referral for T2DM complicated cases in the Kuantan district, such as T2DM with poorly controlled sugar, T2DM with organs complications, and T2DM with comorbidities. This explains why a higher percentage of T2DM patients have concomitant dyslipidemia and other diseases (thyroid diseases, lung diseases (asthma/ COPD), or osteoarthritis) observed at hospital-based DMSC.

Not every T2DM patient was calculated his/her basal mass index (BMI) (average of 0.7% assessment done), and obesity status was not recorded (5.8% recorded) at both settings. Because of the crucial associations with T2DM disease and glycemic control, it is essential for medical personnel to calculate, document, acknowledge, educate and treat patients for obesity. Incomplete documentation was also noted for the waist circumference (WC), in which the average assessment is done was only 1.6%. Therefore, because it was not documented, it gave a false low percentage of obesity status diagnosed among T2DM patients.

Despite very low BMI documentation, a higher percentage of height and weight assessments were done at PCCs. A higher percentage of exercise, smoking status, and family history of CVD assessments were done at the DMSC; however, it was not adequate (average of 50%-70% of assessments done) as shown in table-3. Assessment of risk factors mentioned above should be encouraged to all medical personnel at every patient's visit. These assessments are important for

the doctors to regularly counsel non-pharmacotherapy including exercise, diet, and smoking cessation, to the T2DM patients. Non-pharmacotherapy is one of the important management in controlling blood glucose and reducing cardiovascular events.

As illustrated further by the research assistant (RA), this study showed that an average 83.3% of T2DM participants of both settings were overweight, which 47% were in the category obese with a BMI of more than 27.5 kg/m2. This high prevalence of obesity is similar to the National Diabetic Registry report 2012, and 2019 which stated 83.4% and 84.0% of individuals with T2DM respectively are either overweight or obese[18,32]. In addition, CPG on Management of Type-2 Diabetes mellitus 2019 stated an average of 78.7% (69.6% of male & 87.8% of female) among T2DM have waist circumference (WC) more than recommended which were comparable with this study which was average of 75.0% among T2DM have waist circumference (WC) more than recommended for the individuals.

Hence more T2DM patients have central obesity resulting in a higher risk of cardiovascular complications. Therefore, the initial assessment of people with diabetes should include height, weight, BMI, and waist circumference. Weight loss of between 5-10% will improve glycaemic control, blood pressure, lipid profile, and quality of life should be counselled regularly to all obese T2DM. The therapy goals are to achieve optimal glycaemic and metabolic control through medication compliance and lifestyle modifications, including behavioural change, physical activity, and dietary interventions.

In another study, the prevalence of central obesity by waist circumference (WC) among the adult participants was high; 67% and the prevalence of normal-weight central obesity (WC) was 26.9%[36]. This study showed that one in three adults of normal weight but had central obesity, therefore body mass index measurement (BMI) should not be used alone for clinical assessment by healthcare workers. Hence, there is a need for health personnel to include the assessment of waist

circumference in all T2DM patients, even in individuals with normal BMI, for better control and intervention of central obesity.

A study has suggested that abdominal fat causes fat cells to release 'pro-inflammatory' chemicals causing a complex interaction within the cells which can make the body less sensitive to insulin. Their ability to respond to insulin becomes less effective, known as insulin resistance which is the hallmark of type 2 diabetes[37]. This complex interaction will increase the risk of developing type 2 diabetes for unknown diabetes obese people and cause difficulty maintaining the blood sugar under control for those who have diabetes. Treating obesity will treat Type-2 Diabetes by improving insulin sensitivity and glycemic control. Moderate and sustained weight loss of about five percent to 10 percent of body weight is recommended, improving insulin action, decreasing blood glucose concentrations, and eventually reducing the need for some diabetes medications. A program that includes diet, exercise, and behaviour modification can successfully treat obesity, occasionally pharmacotherapy and surgery may be warranted.

How does family history affect the risk of heart disease? Familial factors likely play some role in high blood pressure, heart disease, and other related conditions. Siblings are 1st-degree relatives of patients with CVD who will have about a 40% risk increase of cardiovascular event, while offspring of parents with premature CVD will have from 60% to 75% risk increase[38]. One of the most common hereditary diseases is familial hypercholesterolemia (FH). This is a genetic disorder associated with elevated low-density lipoprotein cholesterol (LDL-C) levels from birth and premature atherosclerotic cardiovascular disease (ASCVD)[39]. Patients with familial hypercholesterolemia are considered at high cardiovascular risk, and the treatment target is LDL-C <2.6 mmol/l or at least a 50 % reduction in LDL-C[40].

Apart from genetic or family history of cardiovascular diseases, these T2DM patients often share common environments and other factors like unhealthy diet, lack of physical activity, smoking, or

alcohol consumption that may further increase their risk. Thus, early identification of hereditary diseases or family history of CVD can alert medical personnel to start the appropriate treatment early and adequately improve prognosis, and reduce adverse clinical cardiovascular outcomes. Furthermore, counselling of appropriate exercise according to the age and fitness status and smoking cessation can also be done concurrently if exercise and smoking status assessment were utterly assessed. From the study, about 55% to 70% of T2DM patients were assessed for other CVD assessments such as the family history of CVD in 1st-degree relatives, exercise status, and smoking status. A higher percentage of assessment was noted at the DMSC.

Additional data collections for non-modifiable CVD risk factors (age according to gender and 1st-degree relatives with CVD) and other modifiable CVD risk factors such as exercise and smoking status assessments among T2DM were completed by research assistance (RA). This study showed that a high percentage of T2DM have 'increasing age' (male > 55, female >55) as a significant risk factor for CVD events (74%), and a family history of CVD events in 1st-degree relatives (60%). In addition, a higher percentage (77%) of T2DM patients at PCCs have regular exercise compared to DMSC (defined as 150 minutes of moderate-intensity exercise within one week based on Malaysian CPG on Obesity). Most of the T2DM patients at PCCs were self-employed or Felda settlers who carried out work activities on the farm or at the plantation, which can be considered as adequate exercise. In contrast, more T2DM patients at DMSC were government workers.

Generally, cigarette smoking increases the risk of type 2 diabetes in the general population for both men and women[41], which may be mediated through direct metabolic effects alone or in combination with an unhealthy lifestyle. In this study, the percentage of non-smokers for both settings was an average of 72%. The high percentage of non-smokers observed in this study can be due to a higher percentage of females among T2DM patients (62%) attending the clinics. A small percentage (14%) of current smokers reflects the small percentage of quit smoking clinic referrals

of 6%. Nevertheless, the intention to stop smoking should arise from all T2DM smokers. They should be aware that smoking is one significant risk factor for CVD diseases and other diseases related, such as stroke, aortic aneurysm, and peripheral arterial disease. The cardiovascular risks increase with the number of cigarettes smoked and with the duration of smoking[42]. The risk is greatly increased even by exposure to low levels of cigarette smoke, such as secondhand passive smoking or smoking a few cigarettes per day[42]. Hence, all T2DM smokers should be advised to quit smoking and referred to a quit smoking clinic.

The most fundamental CVD risk assessments among T2DM for every checkup at any clinic are blood pressure (BP) reading, and blood glucose monitoring, either fasting blood sugar (FBS) or random blood sugar (RBS). In addition, add-on periodically fasting lipid profile (FLP) include total cholesterol (TC), triglyceride (TG), low-density lipoprotein (LDL-C), and high-density lipoprotein (HDL-C – as good cholesterol), and haemoglobin A1c (HbA1c) are also mandatory.

Generally, blood pressure assessment was done to all T2DM patients on every visit reaching almost 100% done. However, blood sugar monitoring among T2DM patients was not optimum at DMSC for all three visits (0, 6, and 12 months). A lower percentage of Fasting Blood Sugar (FBS) or Random Blood Sugar (RBS) assessments were seen at the DMSC clinic might be due to different dates/days of blood investigations taken. T2DM patients will come two weeks earlier for the blood glucose test. Due to technical or documentation issues, the result might not be available during the visit. As good blood sugar control is the key success of CVD risk reduction, this finding suggested the need for a further systematic and thorough arrangement for optimum monitoring of blood sugar profile among T2DM patients. The hospital may want to adopt a better system to overcome the problem.

According to CPG Management of T2DM 2015, HbA1c should be monitored every quarterly visit. However, most diabetic clinics will do the test according to the individual patient's requirement and

availability of the resources, which usually is once a year. The HbA1c periodic monitoring was noted to be good at 1st visit (0-month) visit with an average of 96%. Lower HbA1c assessment noted at PCCs compared to DMSC at '12' month visit (86% vs 96%). A lower percentage of HbA1c results available at PCCs might also be due to the same issue as DMSC or may be due to the patient defaulted blood investigation. Technical issues such as the blood records were not available during data collection can be another reason. HbA1c provides a reliable scheme to monitor chronic glycemia, and elevation of HbA1c has been regarded as a risk factor for coronary heart disease and stroke in subjects with or without diabetes[43]. Essentially if there are enough resources, it is suggested that more frequent HbA1c monitoring should be done within one year for all T2DM. HbA1c correlates well with the risk of long-term diabetes complications; hence it is currently considered the test of choice for monitoring and chronic management of diabetes[43].

As pointed out, the modifiable risk factors for CVD are dyslipidemia, high blood pressure, obesity, smoking, and a sedentary lifestyle. Studies have demonstrated that lipid abnormalities are associated with an increased risk of cardiovascular events in patients with or without diabetes. Study has shown that cardiovascular disease (CVD) was significantly associated with increased concentrations of low-density lipoprotein cholesterol (LDL-C), decreased concentrations of high-density lipoprotein cholesterol (HDL-C), and increased triglyceride concentration (TG)[18]. In the Standards of Medical Care in Diabetes (2019), the American Diabetes Association still recommends that all adults with diabetes who are over age 40 to take moderate potency statins in addition to lifestyle therapy. The reason is, controlling the risk factors will help lower the overall risk for developing heart disease. Hence, lipid profile assessment among T2DM is essential for cardiovascular disease (CVD) prevention and early detection. Generally, total cholesterol and triglyceride assessments for both hospital and clinic settings were good, with an average of 90% to 97%, though HDL-C and LDL-C assessments were not consistent.

Control of BP can reduce CVD outcomes. The relationship between BP and the risk of CVD events is consistent and independent of other risk factors. The CVD risk is increased in diabetic patients with uncontrolled blood pressure. Target BP controlled among T2DM varies depending on the consensus recommendation, studied report, and publications[20,21,44,45]. During this research project, the recommended target blood pressure considered was ≤ 135/75 according to According Malaysian Clinical Practice Guideline (CPG) Management of Diabetics 2009 and 2015[18]. Moreover, the BP-lowering arm of one of the randomized control trials (RCT); the ADVANCE trial (with a final BP of 135/75 mm Hg) showed a significant 9%, 14%, and 18% reduction in the relative risk of major macro-and microvascular complications, total coronary events, and cardiovascular deaths, respectively, additionally contributing to 14% reduction in total mortality[20,45]. According to CPG on Management of Diabetic 2015, pharmacological treatment should be initiated in patients with diabetes when the blood pressure (BP) is persistent >140 mm Hg systolic and/or >90 mm Hg diastolic[46] (Level I) and treat to goal systolic (SBP) of lower than 135 mm Hg and diastolic (DBP) lower than 75 mm Hg.[20](Level I).

The Prevalence of HPT among T2DM in this study on average for both settings was 74.4%. Generally, the BP target achieved at the 1st and 12-month visits among T2DM was low (21.3% vs 29.2%), respectively. The study also found that only about 10% sustained within the target BP throughout the one year (achieved-to- achieved). What was worrying is that nearly 60% of T2DM patients have never achieved the target BP within one year of data collection (not achieved-to- not achieved). The question is how low we should go with blood pressure reduction to achieve the best target for therapeutic benefits. According to the latest Malaysian CPG on Management of Hypertension 2018, the target BP should be aimed at <140/80 mmHg with a target of <130/80 mmHg in younger patients and those at higher risk of cardiovascular disease[47]. Clockwise CPG on Management of Type-2 Diabetes mellitus 2015 recommended pharmacological treatment to

achieve a target systolic (SBP) of lower than 135 mm Hg and diastolic (DBP) lower than 75 mm Hg.[18]. As most literature explained, it is recommended to direct the treatment according to the individual needs based on their age, comorbidities, complications such as heart failure, kidney disease, and retinopathy, and their risk of adverse events.

This study showed a low point glycemic control achieved in this study shown by FBS/RBS and HbA1c values, respectively, with almost no increment in the percentage of glycemic control after one year. This study showed an average of 87% had HbA1c > 6.5%. A significantly higher percentage of target HbA1cwas not achieved at the 12-month visit at DMSC (95.5% vs 83.5%). What factors contribute to poor glycemic control? The result of this study was comparable with another large study at the primary care level in Kedah in 2019 whereby 84.4% had HbA1c > 6.5%. Those with a longer duration of T2DM, younger age, female, and Indian ethnicity were found to be the factors generally associated with poorer glycemic control[30]. Another study also found more than half (68%) of the patients with diabetes had HbA1c >6.5%. Moreover, age (<60 years), sex (male), duration of diabetes (>5 years), body mass index (obese), type of treatment (diet therapy vs combination therapy), and abnormal lipid profile were factors significantly associated with HbA1c > 6.5%[48]. Another article mentioned that poor dietary adherence, high consumption of carbohydrates, and sedentary lifestyle are prevalent in patients with T2DM[49].

A higher percentage of target HbA1c not achieved at MOPD-SC might be due to MOPD-SC hospital-based referral center for un-controlled T2DM. Hence, the type of T2DM patients seen in MOPD-SC are problematic cases, suffer from diabetic complications, and are associated with even more comorbidity. Therefore, this study emphasizes that additional intervention and preventive activities should be carried out throughout the T2DM management for better glycemic control achievement in the time to come.

Lowering LDL is the main aim of the treatment. According to the latest CPG on T2DM 2019, all individuals with T2DM over the age of 40 should be treated with a statin regardless of baseline LDL-cholesterol (LDL-C) level (LDL-C targets revised according to the category of CV risk). In this study, we found targets achieved for TG, HDL-C, and LDL-C at the first visit and 12-months followed up were averagely parallel; no significant improvement was noted. Generally, the percentage of targets achieved for TG, HDL-C, and LDL-C were 51.5%, 34.2%, and 38.0%, respectively. This study has highlighted the suboptimal target achieved of diabetic dyslipidemia in both primary care and hospital-based settings. As total cholesterol (TC), LDL-C and TG were positively correlated with glycated haemoglobin (HbA1c)[50]. The low percentage of HbA1c target-controlled achieved in this study explained the suboptimal control of lipid parameters. Healthcare providers need to put more effort to recognize these shortfalls and take remedial measures to improve glycemic control and diabetic dyslipidemia targets achievement. Other than medication compliance, the most important intervention is lifestyle modification. Lifestyle modification focuses on reducing saturated fat, trans fat, and cholesterol intake; weight loss (if indicated), and increased physical activity have been shown to improve the lipid profile in patients with diabetes[32].

Dietician and ophthalmology clinic referrals were found higher in the DMSC. This might be because dietician and ophthalmology units are under the same roof as hospital-based DMSC. Accessible and convenient for the referral to take place. At PCCs, visiting dieticians will attend to all dietary cases such as diabetes, obesity, hypertension, dyslipidemia, or gestational diabetes on a rotation basis according to the scheduled appointment. It is suggested that one permanent dietician post at every primary care clinic should be considered to improve dietary advice and diet intervention to all T2DM patients as well other medical problems related to diet.

Diabetes Educators are health care providers who educate the provision of diabetes self-management and care to diabetic patients. Besides counseling and educating diabetic patients,

diabetes educators play a major role in assessing diabetic complications by conducting annual diabetic foot examinations and fundocamera tests to assess diabetic retinopathy. However, diabetes educator services were not optimized as in this study, an average of 67% of T2DM patients only were attended by diabetes educators at both hospital-based and primary care clinics. Diabetes educators' service should be augmented with sustainable knowledge and skills in providing education and motivating self-empowerment to all T2DM patients, thus improving glycemic control and reducing CVD risk factors.

CHAPTER 5: LIMITATION Of STUDY

This study was constructed to the best of our abilities to get valid data and reliable results. However, this study, like other studies, is not exempted from limitations as summarized below:

The data represented T2DM patients on outpatient follow-up in one public hospital and two selected klinik kesihatan in Kuantan, instead of involving other health clinics or hospitals in other districts or other states. Therefore, the study results may not be representative of the entire population.

The study was a cross-sectional study, and the selection of participants was based on inconvenience sampling, which might lead to bias for recruiting T2DM patients who were compliant with follow-ups and easier access to the clinic. It might also miss the T2DM who were defaulted appointments and/or did not come for blood investigations.

Technical limitations also occurred during data collection from the patients' and lab results records. The results may not be available during the data collection period, though subsequent visits were done to update the data. In addition, the cardiovascular risk assessments were done by medical personnel but not documented. Thus, it might also be underreported.

CHAPTER 6: CONCLUSION & RECOMMENDATIONS

As cited, the risk factors for poor glycaemic control can be contributed by the long duration of diabetes, age < 60 years old, obesity, type of treatment, and abnormal lipid profile. The study showed comorbidities such as hypertension and obesity were highly associated with T2DM. Thus, it emphasizes the important intensification of pharmacotherapy in sync with therapeutic lifestyle changes to ensure control of comorbidities as well as glycaemic control.

Diabetic educators play an important role in improving glycemic control by providing education, counselling, motivating self-empowerment to all T2DM. A diabetic educator should see every T2DM, therefore, diabetic educators require continuous medical education (CME) and diabetic care training to enhance their skill in providing services.

Generally, assessments for CVD risks were sufficient except for BMI calculation and waist circumference measurement, which need to be enhanced further. Both primary and hospital-based specialist clinics have a small percentage of diabetes controlled status, indicating the need for more enforcement to strengthen both pharmaco- and non-pharmacotherapy. In addition, this enforcement will also improve the BP and lipid profile controlled status. Assessment and counselling on exercise, weight reduction, and smoking status, referral to a dietician, smoking cessation program for smokers, and an ophthalmologist, should be performed on every T2DM patient for better prevention and early intervention of its complications.

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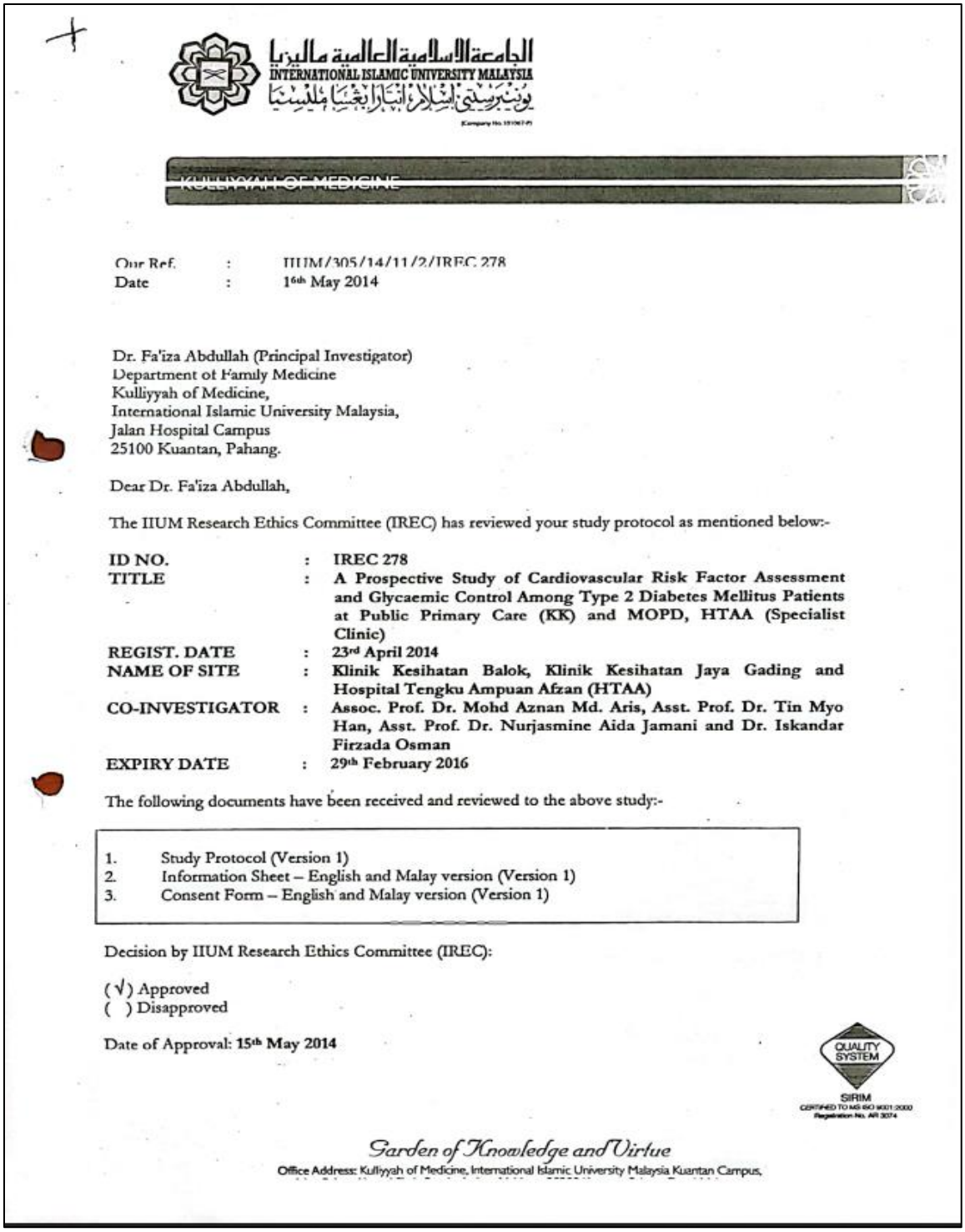
APPENDICES

Appendix 1



الجامعة الإسلامية العالمية ماليزيا
INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA

KULLIYYAH OF MEDICINE

Our Ref. : IIUM/305/14/11/2/IREC 278
Date : 16th May 2014

Dr. Fa'iza Abdullah (Principal Investigator)
Department of Family Medicine
Kulliyyah of Medicine,
International Islamic University Malaysia,
Jalan Hospital Campus
25100 Kuantan, Pahang.

Dear Dr. Fa'iza Abdullah,

The IIUM Research Ethics Committee (IREC) has reviewed your study protocol as mentioned below:-

ID NO.	:	**IREC 278**
TITLE	:	**A Prospective Study of Cardiovascular Risk Factor Assessment and Glycaemic Control Among Type 2 Diabetes Mellitus Patients at Public Primary Care (KK) and MOPD, HTAA (Specialist Clinic)**
REGIST. DATE	:	**23rd April 2014**
NAME OF SITE	:	**Klinik Kesihatan Balok, Klinik Kesihatan Jaya Gading and Hospital Tengku Ampuan Afzan (HTAA)**
CO-INVESTIGATOR	:	**Assoc. Prof. Dr. Mohd Aznan Md. Aris, Asst. Prof. Dr. Tin Myo Han, Asst. Prof. Dr. Nurjasmine Aida Jamani and Dr. Iskandar Firzada Osman**
EXPIRY DATE	:	**29th February 2016**

The following documents have been received and reviewed to the above study:-

1. Study Protocol (Version 1)
2. Information Sheet – English and Malay version (Version 1)
3. Consent Form – English and Malay version (Version 1)

Decision by IIUM Research Ethics Committee (IREC):

(√) Approved
( ) Disapproved

Date of Approval: **15th May 2014**

QUALITY SYSTEM
SIRIM
CERTIFIED TO MS ISO 9001:2000
Registration No. AR 3074

Garden of Knowledge and Virtue
Office Address: Kulliyyah of Medicine, International Islamic University Malaysia Kuantan Campus,

Appendix 2.

JABATAN KESIHATAN NEGERI PAHANG
Jalan IM4, Bandar Indera Mahkota
25582 Kuantan
Pahang Darul Makmur
http://jknpahang.moh.gov.my

No. Faks
Pengarah : 09 570 7799
Pengurusan : 09 570 7798
Perubatan : 09 570 7797
Pergigian : 09 570 7796
Farmasi : 09 570 7795/92
BKKM : 09 570 7794
Kesihatan Awam : 09 570 7793
Tel : 09 570 7999

Ruj. Kami : (30) dlm JKN.PHG.(KA-PKK) 2/40 Jld .2
Tarikh : 17 Mac 2014

Dr Fa'iza bt Abdullah
Pensyarah
Jabatan Perubatan Keluarga
Fakulti Perubatan,
Universiti Islam Antarabangsa
25200 KUANTAN

Puan,

KEBENARAN MENJALANKAN KAJIAN DI FASILITI KESIHATAN (NMRR NO. 19832) BAGI TUJUAN KELULUSAN ETIKA PENYELIDIKAN.

Dengan segala hormatnya merujuk perkara di atas dan surat puan bertarikh 15 Mac 2014 adalah berkaitan.

2. Sukacita dimaklumkan bahawa pihak jabatan telah meneliti permohonan puan dan tidak mempunyai sebarang halangan untuk menjalankan kajian bertajuk ***"A Prospective Study of Cardiovascular Risk Factor Assessment and Glycaemic Control Among Type 2 Diabetes Mellitus Patient at Public Primary Care (KK) and MOPD , HTAA (Specialist Clinic)"*** dilakukan di Klinik Kesihatan Balok, Klinik Kesihatan Jaya Gading dan Klinik Pakar Perubatan, Hospital Tengku Ampuan Afzan, Kuantan. Kajian hanya dimulakan setelah pihak puan mendapat surat kelulusan *NIH's Approval For Conducting Research in the Ministry Of Health Malaysia (Versi 2.0 Tarikh: 15 Feb 2008)* dan juga dari Jawatankuasa Etika dan Penyelidikan Perubatan (JEPP), KKM.

3. Walaubagaimanapun, pihak puan dikehendaki untuk melapor diri kepada pegawai yang menjaga dan mematuhi semua peraturan semasa berada di fasiliti. Hasil penyelidikan juga hendaklah dikongsi bersama dengan Kementerian Kesihatan Malaysia untuk dimanfaatkan dalam menambahbaik mutu perkhidmatan kesihatan negara ini.

4. Bersama-sama ini disertakan **Borang Persetujuan Penyelidik, Pengesahan Ketua Jabatan dan Institusi** yang telah dilengkapkan untuk tindakan puan selanjutnya.

Sekian, terima kasih.

"PENYAYANG, BEKERJA BERPASUKAN DAN PROFESIONALISMA ADALAH BUDAYA KERJA KITA"

Saya yang menurut perintah,

(DATO' DR NORHIZAN BIN ISMAIL)
Pengarah Kesihatan Negeri
Jabatan Kesihatan Negeri Pahang
☎ *09-5707601*

s.k - Pengarah
Hospital Tengku Ampuan Afzan
KUANTAN

- Clinical Research Center
Hospital Tengku Ampuan Afzan
KUANTAN

- Pegawai Kesihatan Daerah
KUANTAN

INDEX

BACK PAGE

Cardiovascular risks assessment and good glycemic control are important for better risk reduction management in preventing and improving CVD outcomes. The Ministry of Health (Malaysia) has carried out tremendous efforts in improving diabetic care in primary and hospital settings. This research book revisits the current situation on cardiovascular disease risk assessment and glycemic control at both hospital-based and primary care clinics. Assessments for CVD risks were found sufficient except for BMI calculation and waist circumference measurement. Hypertension and obesity were highly associated with T2DM. Both clinics have a small percentage of diabetes targets achieved, indicating the need for more enforcement to strengthen both pharmaco- and non-pharmacotherapy, hence will also improve the BP and lipid profile targets. Assessment and counselling on exercise, weight reduction, smoking status; dietician, and ophthalmologist referral should be performed on every T2DM patient for better risk reduction management.

FA'IZA ABDULLAH is a lecturer with the Department of Family Medicine, Kulliyyah of Medicine, International Islamic University Malaysia. She obtained her FRACGP qualification as Family Medicine Specialist in the year 2016 from the Royal Australian College of General Practitioners (RACGP) and Malaysia Academy Family medicine (MAFP). Her research interests include non-communicable diseases and mental health at the workplace. Presently she is a fellow of the Royal Australian College of General Practitioners (RACGP), a fellow of the Academy of Family Physicians Malaysia (FAFP), and a member of the Malaysian Primary Care Research Group (MPCRG). She was head of IIUM Family Health Clinic from 2017 until 2021 and is currently an office-bearer of the Malaysia Medical Association (MMA) Pahang Branch. As a clinical lecturer, she actively does research and writes health cases. She is also active in the Malaysia medical association organizing scientific meetings for doctors and conveying health information to the public as a guest on Radio PahangFM and moderator for public forums.

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