KNOWLEDGE, ATTITUDE, LIFESTYLE PRACTICES AND FACTORS AFFECTING BEHAVIOUR MODIFICATIONS IN RELATION TO METABOLIC SYNDROME AMONG TYPE 2 DIABETES PATIENTS ATTENDING DIABETES CLINIC HUSM, KELANTAN

NASIBAH BINTI TUAN YAACOB

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Abbreviations

ADL	Activities of daily living
BP	Blood pressure
BMI	Body mass index
FBS	Fasting blood sugar
HDL-c	High density lipoprotein- cholesterol
HbA1c	Glycosylated hemoglobin A1c
HUSM	Hospital Universiti Sains Malaysia
IDF	International Diabetes Federation
KPP	Klinik Pakar Perubatan (Specialist Medical Clinic)
KAPMSQ	Knowledge, Attitude and Lifestyle Practice of Metabolic Syndrome
KAPB	Knowledge, Attitude, Lifestyle Practice and Behaviour modifications
NCEP-ATP III	National Cholesterol Education Program Adult Treatment Panel III
T2DM	Type 2 diabetes mellitus
TG	Triglyceride
WHO	World Health Organization

Abstrak (Malay Version)

TAJUK: Kajian Tentang Pengetahuan, Sikap dan Amalan serta Faktor Mempengaruhi Perubahan Sikap Berkaitan Sindrom Metabolik di Kalangan Pesakit Kencing Manis diHospital Universiti Sains Malaysia Kelantan.

PENGENALAN: Sindrom metabolik telah menjadi masalah kesihatan awam utama yang membimbangkan di seluruh dunia dan di Malaysia kerana ia mendatangkan risiko kesihatan yang sangat besar. Prevalen sindrom metabolik di Malaysia adalah tinggi berbanding dengan negara-negara Asia yang lain.

OBJEKTIF: Kajian ini adalah untuk mengenalpasti tahap pengetahuan, sikap, amalan harian serta faktor-faktor yang mempengaruhi perubahan sikap berkaitan sindrom metabolik di kalangan pesakit kencing manis yang menghadiri klinik kencing manis di Hospital Universiti Sains Malaysia, Kelantan.

METODOLOGI: Kajian rentas dijalankan dari Jun sehingga November 2017 melibatkan 255 pesakit kencing manis di Hospital Universiti Sains Malaysia Kelantan. Kajian dilakukan melalui borang soal selidik, pemeriksaan fizikal, serta laporan biokimia berkaitan yang diperolehi dari fail pesakit dan sistem informasi makmal.

KEPUTUSAN: Seramai 255 pesakit kencing manis telah terlibat. Purata markah (SD) untuk pengetahuan, sikap dan perubahan sikap ialah 91.1% (6.26), 94.5 % (8.09) dan 76.7% (26.19). 97.3% daripada responden mempunyai pengetahuan yang baik, manakala 99.2% menunjukkap sikap yang positif berkaitan sindrom metabolik. Berkaitan dengan amalan harian, 91.8% responden mempunyai kadar aktiviti fizikal yang rendah dan tidak memuaskan. Amalan pemakanan di kalangan pesakit kencing manis juga menunjukkan kurangnya pengambilan sayur-sayuran (66.3%), buah-buahan (49.0%), dan ketidakseimbangan dalam penggunaan minyak. Empat faktor berkaitan perubahan sikap berkaitan sindrom metabolik adalah wanita (*p*:0.017), tahap pendidikan (sekolah menengah (*p*:0.006) dan ke atas (*p*:0.041) dan persepsi positif tentang berat badan tidak menganggu aktiviti harian (*p*:0.010).

KESIMPULAN: Walaupun majoriti pesakit kencing manis mempunyai pengetahuan yang baik dan sikap yang positif, faktor ini tidak mempengaruhi perubahan sikap berkaitan tahap kesihatan mereka. Perubahan sikap yang berterusan, lebih-lebih lagi di kalangan pesakit kronik merupakan subjek yang kompleks kerana ia sering dipengaruhi oleh faktor-faktor luar seperti tanggung jawab sosial, faktor pekerjaan dan juga masa yang terhad.

Abstract (English Version)

TITLE: Knowledge, Attitude, Lifestyle Practices and Factors Affecting Behaviour Modifications in relation to Metabolic Syndrome Among Type 2 Diabetes Patients Attending Diabetes Clinic Hospital Universiti Sains Malaysia, Kelantan

INTRODUCTION: Metabolic syndrome has become a major public health concern worldwide and in Malaysia as it imposes an enormous health risk. The prevalence of metabolic syndrome in Malaysia is high compared to other Asian countries.

OBJECTIVES: The objectives of the study are to determine knowledge, attitude, lifestyle practices and factors affecting behaviour modifications (including sociodemographic characteristics, body mass index and clinical characteristics such as having metabolic syndrome, body weight perception mismatched, body weight satisfaction, perception of body weight as health problem, perception of body weight disturbing daily activities, knowledge and attitude and ever heard of metabolic syndrome) in relation to metabolic syndrome among diabetes patients attending diabetes clinic Hospital Universiti Sains Malaysia, Kelantan.

METHODOLOGY: Cross sectional study was conducted from June until November 2017 among diabetes patients attending diabetes clinic Hospital Universiti Sains Malaysia, Kelantan. The study used a self-administered questionnaire. Patient's physical paramaters including weight, height and waist circumference was recorded, while the

biochemical parameters were retrieved from the patient's folder and laboratory information system.

RESULTS: There were 255 diabetes patients involved. Most of the participants have good knowledge (97.3%) and positive attitude (99.2%). The mean (SD) score for knowledge, attitude and behaviour changes were 91.1% (6.26) and 94.5% (8.09) respectively. For lifestyle practices, most of the respondents have inadequate physical activities as 91.8% had sedentary and low physical activities. Dietary components show inadequacy in term of vegetables, fruit intake and imbalance used of fat among respondents. Only 66.3% of the respondents took vegetables and 49.0% took fruits regularly. There is low intake of low fat milk as 22.4% drink milk regularly. 56.9% of them never used corn oil for cooking and 66.7% used palm oil regularly. There were four significant associated factors for behaviour modifications namely female sex (*p*: 0.017), having secondary (*p:* 0.006) and tertiary education (*p:* 0.041). Having a positive weight perception did not disturbed ADL also associated with positive behavioural changes among diabetes patients (*p:* 0.010).

CONCLUSION: Despite high percentage of knowledge and attitude, it does not associate with positive behaviour changes. Behaviour changes in chronic disease is a complex process as it often affected by many other factors including social responsibility, time limitation and occupation.

CHAPTER ONE: INTRODUCTION OF THE STUDY

1.1 Background

Metabolic syndrome has become a main public health concern globally and in Malaysia as it imposes an enormous health risk. It is a cluster of metabolic risk factors including central obesity, high blood pressure, dyslipidemia, and elevated glucose (1). Central obesity plays an important role as it is the predecessor for development of insulin resistance, type 2 diabetes and other cardiovascular complications (2, 3). According to Malaysian Nationwide Survey conducted in 2008, in which a total of 4341 adults were included; the prevalence metabolic syndrome across Peninsular and East Malaysia was reported to be around 34.3%, 37.1% and 42.5% based on National Cholesterol Education Adult Treatment Programs III Guidelines (NCEP-ATP III), International Diabetic Federation (IDF) and harmonized criteria respectively (4). Despite of different definition being used, it seems that the prevalence of metabolic syndrome in Malaysia are higher from other Asian countries such as Singapore and India. The prevalence of metabolic syndrome in Singapore is only 12.2% based on NCEP-ATP III criteria while in India, the prevalence of metabolic syndrome is estimated around 18.3% (NCEP-ATP III) and 25.8% (IDF) (2, 5). The risk of metabolic syndrome was high particularly among Indian, urban population and those more than 40 years old according to studies in Singapore and Malaysia (4, 5).

Other risk factors for metabolic syndrome include physical inactivity, high calory diet, central obesity, smoking and also family history of premature heart disease (6). Socioeconomic status is also one of the contributing risk factor for this condition (7). Sedentary lifestyle and high calory food intake are not only significant risk factor for metabolic syndrome, but they are also important risks in many other non-communicable diseases such as type 2 diabetes, hypertension and cardiovascular diseases (7).

Another important key aspect of disease risks are the patients' knowledge, attitude and perception towards the disease itself (8). Many studies found that adequate knowledge of the risk factors and disease will help to increase the patients' awareness and behaviour towards the condition (7). Thus, by having adequate knowledge, positive attitude and perception about the disease, they play a major role in the prevention and management of disease (2).

Lifestyle behaviour modification has been emphasized and studied in many researches but the implementation in the community is quite difficult and might differ from a community to another. For example, a study conducted among 423 selected patients in an Urban Tertiary Care Centre in Sri Lanka, 66% of the subjects have good knowledge on metabolic syndrome and its preventive measures. The patients were aware on the importance of diet changes as control measures of metabolic syndrome but they were unwilling to adjust their diet because of food taste (9). In Sweden, most participants with cardiovascular risk factors have good attitude on metabolic syndrome control measures but their diet and lifestyle practice did not correlate with their positive attitude. There were many factors affecting social behaviours in human. Often, it is described as a complex subject to be studied on. Among the barriers identified in these high-risk groups

are nature of their job and food intake in relation to stress (7). Those who works on shift tend to eat outside and preferred fast-food as their meal option (7).

Behaviour modifications does not rely on patient's knowledge and attitude alone (9). It is found in many studies of non-communicable diseases that lifestyle changes were affected by many factors that could be the perceived barriers affecting good practice (9). It is very important to study factors associated with behaviour modifications in our local population as it will give a new perspective to healthcare staff on how to understand patients' related behaviour regarding to this condition in order to develop an effective communication strategy. It is hope that findings in this study can be used to develop the best intervention strategies locally especially among those at risk of metabolic syndrome.

CHAPTER TWO: LITERATURE REVIEW

2.1 Definition of Metabolic Syndrome

There are several definitions used to diagnose metabolic syndrome. Among the earliest definition of metabolic syndrome are by World Health Organization criteria (WHO) in 1998 and European Group for the Study of Insulin Resistance (EGIR) (1999) criteria (6). However, both definitions are not clinically applicable as they required biochemical investigation i.e. elevated plasma insulin which is costly and not readily available in many health care centres especially in primary care.

As an alternative, NCEP-ATP III criteria was developed in 2001 which is easily used clinically, and it requires three out of five risk factors for the diagnosis of metabolic syndrome including abdominal obesity, elevated triglycerides, reduce high density lipoprotein – cholesterol (HDL-c), elevated blood pressure and elevated fasting glucose or type 2 diabetes mellitus. Although it is clinically applicable, this criteria tends to underestimate the risk of metabolic syndrome among some ethnic group especially South Asians due to higher level of waist circumference being used (6). The IDF criteria in 2005 then modifies the previous NCEP-ATP III definition in which abdominal obesity measurement is being specified according to nationality or ethnicity group. It is however made as compulsary criteria for the diagnosis of metabolic syndrome plus any other two risk factors (6). Abdominal obesity was point out in these criteria as it is the main risk factor for insulin resistance and other metabolic risks. However due to overemphasis on abdominal obesity, many other individuals that do not have abdominal obesity did not fulfill the criteria. According to Isomaa *et. al*, the presence of any of the metabolic risks

is associated with increased risk of cardiovascular morbidity (OR=3) and mortality (OR=1.8) with or without abdominal obesity (10).

The most recent definition of metabolic syndrome is the harmonized criteria which was also modified from NCEP-ATP III definition, but it uses a lower value for waist circumference measurement which is more ethnic-specific. In this recent criterion, metabolic syndrome is diagnosed when any of the three metabolic risks are present including enlarged waist circumference; triglycerides ≥ 1.7 mmol/L, HDL-C < 1.03 mmol/L in men and < 1.3 mmol/L in women, systolic blood pressure ≥ 130 mm Hg or diastolic blood pressure ≥ 85 mm Hg and fasting glucose ≥ 5.6 mmol/L. It also include those who are on medications for hypertriglyceridemia, low HDL-c, hypertension and hyperglycemia (11). The harmonized criteria was chosen based on the previous study conducted among Malaysian populations which shows high correlation within Asian populations and it does not have any prerequisite criterion to define metabolic syndrome (12). Cardiovascular morbidity and mortality increased not only in the presence of abdominal obesity but also in patient with other metabolic risks without abnormal waist circumference (13). Pokharel *et. al*, stated that Harmonized criteria had 99.9% sensitivity and 98.9% negative predictive value in diagnosis of metabolic syndrome (14). A cross sectional study on prevalence of metabolic sydrome conducted in two tertiary referral hospitals in Klang Valley, also concluded that harmonized definitions being the most specific definition in identifying metabolic syndrome in Malaysia (15).

2.2 Prevalence of Metabolic Syndrome and Risk Factors

The prevalence of metabolic syndrome is rapidly evolving in Malaysia due to economic outgrowth and the increment of obesity and type 2 diabetes mellitus. In a multi–ethnic survey in 2004, the prevalence of the metabolic syndrome was 27.5% using the IDF definitions (16), while a repeated survey done in 2008 found out that the prevalence rapidly rise to 37.1% using similar definition (4). In this nationwide survey where a total of 4341 adults were included; the prevalence of this syndrome across Peninsular and East Malaysia using other definitions was 32.1% (WHO), 34.3% (NCEP-ATP III), and 42.5% (Harmonized criteria) (4). Despite of different definition being used, it seems that the prevalence of metabolic syndrome in Malaysia are higher from other Asian countries such as Singapore and India. The prevalence of metabolic syndrome in Singapore is only 12.2% based on NCEP-ATP III criteria while in India, the prevalence of metabolic syndrome is estimated around 18.3% (ATP III) and 25.8% (IDF) (2, 5).

In Kelantan, the estimated prevalence of metabolic syndrome in one of the cross-sectional study in Bachok in year 2011 was 32.2% (IDF) and 28.5% (NCEP ATP III), which is slightly low compared to our nationwide study (17). In Malaysian, the prevalence of metabolic syndrome was found to be high among female, in contrast to a study done in Singapore (4, 5). However, in both surveys, the risk of metabolic syndrome was high particularly among urban residents, Indian ethnicity and those who aged 40 years old and above (4, 5).

Other predisposing risk factors include physical inactivity, obesity, high calories diet, smoking and also family history of premature heart disease (6). Physical aspects including sedentary lifestyle and high energy food intake are also important risk factors for metabolic syndrome development (7). Low socioenomic status also plays some role for metabolic syndrome occurence (7).

2.3 Metabolic Syndrome and Type 2 Diabetes Mellitus

The increasing prevalence of metabolic syndrome is contributed by increased prevalence of obesity and type 2 diabetes mellitus across the world as they are closely related. It is known that abnormal glucose level is one of the important risk factor of metabolic syndrome. The growing epidemic of type 2 diabetes occur not only in Malaysia but also worldwide. In 1985, the estimated population of diabetes patients in the world was 30 millions but this figure increased tremendously to 135 millions in 1995 (18). The situation is much the same in Malaysia as the prevalence of diabetes increased from 6.3% in 1986 to 8.2% in 1996 (19). A study carried out among Malaysian adults of age 18 years old and above, the prevalence of diabetes based on finger-pricked fasting glucose was estimated around 11.6% (20). This condition is worrying as they are many comorbidities associated with diabetes and these risks are even higher with the presence of metabolic syndrome.

Type 2 diabetes mellitus and metabolic syndrome are often co-exist as 86% patient with type 2 diabetes have metabolic syndrome among US populations (21). In Klang Valley, Malaysia, the proportion was even higher as 96.1% of diabetes patients fulfilled metabolic syndrome definition (22). The presence of both metabolic syndrome and type 2 diabetes

mellitus increased the risk of developing cardiovascular disease. A National Health and Nutrition Examination Survey III among American aged 50 years old and above found that the prevalence of cardiovascular diseases was 19.2% in patients with both type 2 diabetes and metabolic syndrome, while the prevalence of cardiovascular diseases on those having metabolic syndrome without diabetes was only 13.9%. However, similar study also described that the prevalence of coronary heart disease was not increased among those with type 2 diabetes without metabolic syndrome. This finding was in contrast with other studies which described diabetes as a major independent risk factor for cardiovascular diseases. The authors, however mentioned that the correlation of impaired fasting blood sugar (a criterion for metabolic syndrome) and diabetes (abnormal sugar level) might lead to these insignificant results (21).

Literatures including MRFIT cohort have described diabetes as an independent risk factor for coronary heart disease with three times relative risk compared to non-diabetic ($p < 0.0001$) (23). A famous endocrinologist, Christopher D. Byrne also wrote similar findings in his book. He states that the risk of cardiovascular diseases increases with presence of any metabolic syndrome features including hyperglycemia or diabetes mellitus (24). Presence of any one of the features increases the risk of cardiovascular disease by three fold and presence of four features of metabolic syndrome increases the risk by fourteen folds (24). Thus, it is very important to identify metabolic syndrome among those with type 2 diabetes because the risk of cardiovascular complications will significantly increase causing higher risk of morbidity and mortality among diabetes patients. It is important to manage all the risk factors accordingly to prevent such disastrous sequelae.

2.4 Knowledge, Attitude and Lifestyle Practices in relation to Metabolic Syndrome

Knowledge, attitude and perception towards disease is an important key aspect in management of metabolic syndrome (8). By having adequate knowledge on the risk factors and management of disease will help to increase the awareness and built healthy practices towards disease control measures and prevention (7, 9).

Level of knowledge is different from one population to another and it is very important to know the level in order to educate effectively regarding these conditions. A study among urban population in Sri Lanka found that many subjects were unaware of high vegetable consumption and good sugar control are associated with lower risk of obesity and cardiovascular diseases (9). In United States, half of the respondents believed that overweight or obesity was more of hormonal problem rather than due to their diet or lifestyle practices (25). The findings were almost similar in India as only 10% of the participants attributed the risk of metabolic syndrome with poor lifesytle practices (2). In view of that, they believe that drugs are the most superior in the management of metabolic syndrome rather than the importance of practicing healthy lifestyle (2). It is very important to study knowledge among our local population so that the physicians are aware of their misconception and level of knowledge. This can also build a good communication strategy while dealing with patient's treatment and management. It is also important to structure an intervention that best suit our local population.

Besides knowledge, lifestyle practices are also an important modifiable risk factor in management of metabolic syndrome. Having regular breakfast has been studied worldwide as a very important factor in reducing the risk of obesity and metabolic syndrome. A meta-analysis in 2011 analyzed 19 studies conducted in Asia and Pacific regions showed a positive association between skipping breakfast and overweight (26). In this study, it was stated that skipping breakfast associated with reduced satiety and leads to an increased total calories intake. The possible mechanism is due to high level of circulating insulin in respond to skipping breakfast. This will later lead to increased in fat storage and also inappropriate weight gain among breakfast skippers (26).

Diet composition such as high sugar beverages intake and decreased consumption of dairy products is also associated with greater risk of metabolic syndrome (27). High sugar beverages not only result in higher energy retention but also lead to lower satiety and hunger, which contribute to higher prevalence of obesity and type 2 diabetes mellitus (27). According to Pereira *et al*., high consumption of dairy products inversely associated with incidence of all components of metabolic syndrome (28). High fat diet such as fast food or "westernized diet" was found to increase the risk of metabolic syndrome (29). Meanwhile, an adaptation of Mediterranean diet which is rich in fruits, vegetables, nut, and olive oil reduced the cardiovascular risk factors and its metabolic components (29, 30).

Having good knowledge alone did not results in positive lifestyle modifications. A randomized controlled trial among Sri Langkan adults found that 25% of the patients did not want to change their current diet and lifestyle despite their high level of knowledge on cardiovascular risk factors (9). In this study, almost all patients (91.7%) agreed on the

necessity of diet modifications to control their cardiovascular complications but reluctant to do so because of food taste (9). There were inconsistence associations between level of knowledge and attitude with practice and behaviour modifications as mentioned in the literature (9). Behaviour modification is a complex cycle often affected by many other factors including nature of the job and also stress condition (7).

Different population study will find interesting and unique findings pertaining to their target population. Although many study of metabolic syndrome shows that awareness among their target populations were not satisfactory but the difference in their understanding and components of metabolic syndrome are much varied. Hopefully from this research, we will gain much benefit on how to tackle our targeted population and the best way to approach them specifically on metabolic syndrome.

2.5 Behaviour Modification in Management of Metabolic Syndrome

Clinical management of metabolic syndrome require a long-term management and follow up to reduce the risk of its artherosclerosis and cardiovascular complications. In a current guideline of metabolic syndrome, individuals with metabolic syndrome should be encouraged for lifestyle intervention, before any medical or surgical treatment (31). The mainstay of management of metabolic syndrome includes weight management, increased physical activity and also diet management (6). According to a recent meta-analysis; risk of type 2 diabetes mellitus are reduced by more than 50% with intensive lifestyle intervention among pre-diabetes patients (32). Similar findings by Carlos *et al*. (2008), weight loss plays a major role in reducing all the risk factors for metabolic syndrome (33). The statement from American Heart Association mentioned that choosing a low

atherogenic diet reduced risk of prothrombotic state in a patient with metabolic syndrome (6).

Physical activities also play a major role in prevention and controlling the risks of metabolic syndrome. Our local diabetes guideline recommended patients with diabetes to at least exercise 150 minutes per week of moderate intensity physical activity and/ or at least 90 minutes per week of vigorous aerobic activity. Physical activity does not only help in lowering their sugar level and maintain their weight, but it also helps to reduce risk of coronary heart disease (34). A study by Dunstan, Salmon (35) shows that physical activities of 2.5 hours per week or more reduced the risk of future insulin resistance, obesity and dyslipidemia while sedentary activities increased the risks of metabolic syndrome.

2.6 Factors Associated with Behaviour Modifications in relation to Metabolic Syndrome

Older adults, professional workers, appropriate knowledge and healthy attitude on metabolic syndrome prevention are among the factors associated with behaviour modifications in relation to metabolic syndrome (36). However, according to Lo *et al*., many of these factors including age, sex, educational level, family income, and knowledge pertaining to metabolic syndrome play only small role in health promoting behaviours related to it (31). Being overweight and having metabolic syndrome also did not influence much in behaviour modification and practicing healthy lifestyle (25). The presence of co-morbid condition such as cardiac disease or stroke also found to have

negative association with behaviour modification among patients with metabolic syndrome risk factors (37).

The main aim in management of metabolic syndrome is to achieve weight reduction and to control the risk factors by the means of increasing physical activity and healthy eating habits. For patient to implement weight reduction plan, it is necessary for them to have positive perception and satisfaction of their body weight. In a study conducted among 526 patients with cardiovascular diseases, most of the obese patients underestimated their weight as "normal" or even "underweight" (38). Body weight perception mismatched is one of the barrier for effective behaviour modifications especially in weight management interventions (39). An appropriate body weight perception is required for them to practice healthy lifestyle and to apply weight reduction plan.

A study among African American found that most of the respondents were satisfied with their body weight although they were overweight. They were also found to have less motivation for weight loss compared to those who have body weight dissatisfaction (40). Paradoxically, in other studies, subjects who have body weight satisfaction has better motivation and more probability in losing weight (41-43). It is interesting to know in our local populations whether body image and perception affects their behaviour and lifestyle.

Self physical activities perception also affects the physical performance of individuals. Those who associated themselves with reduced physical capabilities will have low physical activities (44). However, perceived risk of disease in overweight subjects plays only limited role in influencing weight loss among them (40). Lifestyle changes require

an individual to have an adequate health perception and also the ability to overcome the perceived barriers (31).

2.7 Justification of the study

The overall prevalence of non-communicable diseases in Malaysia is high and it contributes as main cause of morbidity and mortality in our country. According to the latest National Health and Morbidity Survey (2015), the prevalence of diabetes mellitus increased from 15.2% (2011) to 17.5% (2015) and the trend is expected to rise if there is no appropriate intervention or preventive measures were taken (45). This worrying condition not only pertaining to diabetes, but also involved obesity, hypertension and metabolic syndrome. Metabolic syndrome is a condition commonly encounter among diabetes patient. It is estimated that around 90% of diabetes patients have metabolic syndrome. The presence of other metabolic risk factors in metabolic syndrome further compounded the risk of future cardiovascular complications. Although, it is expected that most of type 2 diabetes patients already fulfilled metabolic syndrome definition, it is important to emphasize that these components are modifiable. Although they may have metabolic syndrome at the initial presentation, with appropriate control measures, they can reverse the diagnosis and the complications.

The main management in both type 2 diabetes and metabolic syndrome and many other non-communicable diseases is mainly emphasizing on therapeutic behaviour modications. There are many studies that have shown that long term effect of behaviour modification including appropriate diet and increasing physical activities can reverse the

metabolic and cardiovascular risks (46, 47). However, behaviour changes are often affected by many other confounding factors, including the social aspects. Thus, to achieve behaviour modification among these high-risk groups, it is very important to know what are the factors that contribute for behaviour changes to construct an effective intervention programme or strategies for metabolic syndrome. In addition, it is also important to know whether these high-risk groups are aware of metabolic syndrome and its related complications and whether they have the right attitude towards metabolic syndrome control measures as these factors will contribute to their behaviour changes later.

2.8 Conceptual Framework

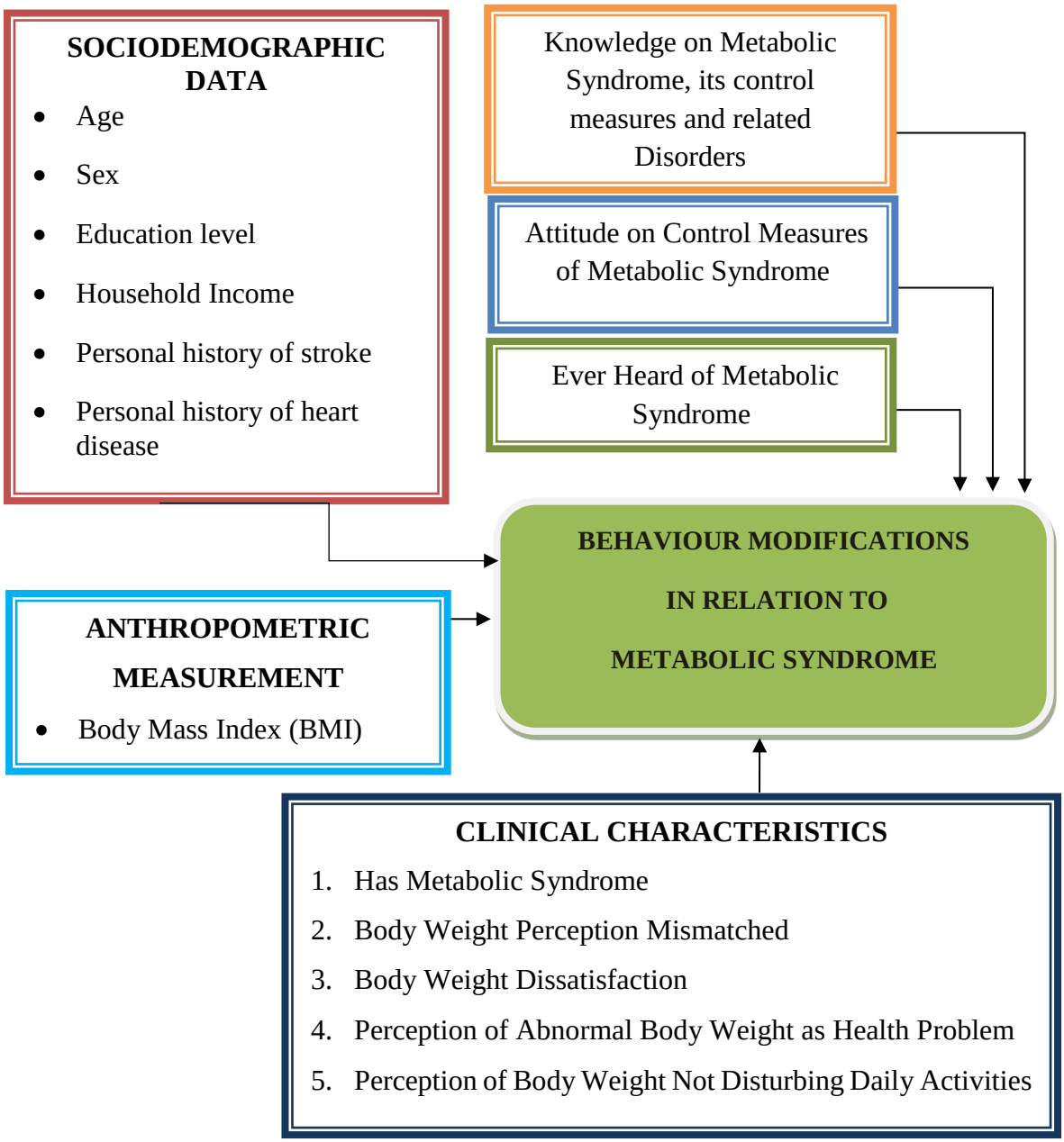

Figure 2.1: Conceptual Framework

CHAPTER THREE: OBJECTIVES AND HYPOTHESES

3.1 Research Questions

1. Are those patients with type 2 diabetes mellitus attending diabetes clinic in KPP Hospital Universiti Sains Malaysia Kelantan aware of metabolic syndrome, its control measures and related disorders?
2. What is their attitude on control measures of metabolic syndrome?
3. What is their lifestyle practices on control measures of metabolic syndrome?
4. What are the factors associated with behaviour modifications in relation to metabolic syndrome among type 2 diabetes patients?

3.2 General Objective

To describe knowledge, attitude, lifestyle practices and factors associated with behaviour modifications in relation to metabolic syndrome among Type 2 diabetes patients.

3.3 Specific Objective

1. To describe the knowledge on metabolic syndrome, its control measures and related disorders among Type 2 diabetes patients attending diabetes clinic KPP in Hospital Universiti Sains Malaysia Kelantan.

2. To describe the attitude on control measures of metabolic syndrome among Type 2 diabetes patients attending diabetes clinic KPP in Hospital Universiti Sains Malaysia Kelantan.
3. To describe the lifestyle practices on control measures of metabolic syndrome among Type 2 diabetes patients attending diabetes clinic KPP in Hospital Universiti Sains Malaysia Kelantan.
4. To determine the factors associated with behaviour modifications in relation to metabolic syndrome among Type 2 diabetes patients attending diabetes clinic KPP Hospital Universiti Sains Malaysia Kelantan based on positive behaviour modification score.

3.4 Research Hypotheses

There are associations between behaviour modifications in relation to metabolic syndrome with sociodemographic characteristics (age, sex, education level, household income, personal history of stroke and personal history of heart disease) and body mass index and clinical characteristics (having metabolic syndrome, body weight perception mismatched, body weight satisfaction, perception of body weight as health problem, perception of body weight disturbing daily activities, knowledge and attitude and ever heard of metabolic syndrome) among Type 2 diabetes patients attending diabetes clinic KPP in Hospital Universiti Sains Malaysia Kelantan.

3.5 Operational Definition

1. Type 2 Diabetes Mellitus (T2DM) patients: Those who were diagnosed with T2DM as stated in the folder retrieved from Klinik Pakar Perubatan in Hospital Universiti Sains Malaysia according to Malaysian Clinical Practice Guideline of Type 2 Diabetes Mellitus (5th edition) (34).
2. Physical disability: Those who were dependent on others for activies of daily living (ADL-dependent).
3. Physical active level (PAL): The level of physical activity was categorised based on items Part IIIa.
    a. For those who work, physically inactive, low, moderate and vigorous physical activity was considered grade 1, 2, 3 and 4 respectively either during work or leisure activities (refer to Questionnaire – part IIIa Question 12 and Question 13).
    b. For those who did not work/student/pensioner, physically inactive, low, moderate and vigorous physical activity was considered grade 1, 2, 3 and 4 respectively during leisure activities (refer to Questionnaire – part IIIa Question 14).

    This self-reported physical activity level questionnaire was adapted from Saltin–Grimby Physical Activity Level Scale (SGPALS) questionnaire. It was originally decribed by Saltin and Grimby in 1968 and modification on some of the activities were done in 1992 in SGPALS to suit the current physical activity examples. It has been used widely as it is a simple tool which has high predictive validity with respect to various risk factors for some health conditions. Some authors mentioned that SGPALS has some limitation in determining the causal relationship. Since it was a

self-reported questionnaire, there might be overreporting among the subjects from their actual physical activity level (48, 49).

4. Metabolic Syndrome: In this study, metabolic syndrome patients referred to those patients who fulfilled the Harmonized definition. Harmonized definition of metabolic syndrome requires presence of three out of five risk factors:
    a. waist circumference according to nationality or ethnicity-specific criteria; which is ≥80 cm for female and ≥90 cm for male.
    b. triglycerides ≥ 1.7 mmol/L,
    c. HDL-C < 1.03 mmol/L in men and < 1.3 mmol/L in women,
    d. systolic blood pressure ≥ 130 mm Hg or diastolic blood pressure ≥ 85 mm Hg and,
    e. fasting glucose ≥ 5.6 mmol/L.

    It also includes those who are on medications for hypertriglyceridemia, low HDL-c, hypertension and hyperglycemia (11).
5. Positive Behaviour modification:

    The score was summation from question 14 (6 statements; a to f) in section three of metabolic syndrome questionnaire (KAPMSQ) in percentage. Those who score 75% and above is considered to have positive behaviour modification.
6. Good knowledge:

    Those who score 75% and above is considered to have good knowledge.
7. Positive attitude:

    Those who score 75% and above is considered to have positive attitude.
8. Body Weight Perception Mismatched

    This refer to those who perceived their body weight differently from their actual weight (refer Part A: Patient's Backgroud section II).

9. Perception of Body Weight as Health Problem

   This refers to those who refers their body weight as health problem (refer Part A: Patient's Backgroud section II).

10. Poor household income:

    In this study, those with household income of less than RM2000 were considered as poor. This rate was taken according to poverty line income (PLI). PLI was calculated from Malaysian median income RM2,830 (US$944), which two-third from the value; RM1,886(US$629). These method of calculation were also adopted by Britain and Australia (50).

CHAPTER FOUR: METHODOLOGY

4.1 Study Design

This is a cross sectional study.

4.2 Study Duration

The study duration is about 18 months.

4.3 Study Location

Hospital Universiti Sains Malaysia (HUSM) is a tertiary teaching hospital which offer out-patient and in-patient medical services. It is located in Kubang Kerian, which is about five kilometres from Kota Bharu city center. It was initially built for teaching services before expanding its scope which include health care services since October 1983. The health care service consists of two types:

i. Outpatient services:
    a. Klinik Rawatan Keluarga (KRK), which opens daily during weekdays.
    b. Specialist clinics
    c. Accident and emergency unit
ii. In patient service.

Diabetes clinic is under outpatient medical services, i.e. Klinik Pakar Perubatan (specialist clinic). It runs every Sunday and Wednesday. There are around 60 appointments reserved during the day. Up to date, there are 4042 diabetes patients registered under Hospital Universiti Sains Malaysia. The subjects in the present study were recruited from diabetes clinic throughout study duration.

4.4 Study Population and Sample

4.4.1 Reference Population

Type 2 diabetes patients in Kelantan.

4.4.2 Source Population

Type 2 diabetes patients attending diabetes clinic in Hospital Universiti Sains Malaysia Kelantan.

4.5 Sample Frame

List of Type 2 diabetes patients attending diabetes clinic in KPP during duration of the study.

4.6 Subject Criteria

4.6.1 Inclusion Criteria

Adult patient with type 2 diabetes mellitus diagnosed according to latest Malaysian Clinical Practice Guideline of Management of Type 2 Diabetes Mellitus, 5th Edition (2015).

4.6.2 Exclusion Criteria

1. Physical disability;

   Those who were dependent on others for their daily activites must be excluded from this study as this could be an important factor that limits their level of lifestyle practices.

2. Mental impairment;

   Those who have an underlying psychiatric illness under clinic or psychiatry follow up.

3. Those who were blind and deaf. This is a self-administered questionnaire; thus, this specific group should be excluded.

4. Illiterate. This is a self-administered questionnaire; thus, this specific group must be excluded.

5. Those who cannot understand Malay language.

   This questionnaire is self administered written in Malay language.

4.7 Sample Size Calculation

The sample size was calculated for all objectives. However only the one that yielded the biggest sample size was taken as the study sample size.