DETERMINANTS OF LEISURE TIME PHYSICAL ACTIVITY AMONG ELDERLY WITH TYPE 2 DIABETES MELLITUS IN PETALING DISTRICT, SELANGOR, MALAYSIA

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Chairman : Assoc. Prof. Halimatus Sakdiah binti Minhat, PhD
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Globally people are living longer due to medical advancement, better awareness and knowledge towards the importance of healthy lifestyle. Reduction of physical activity commonly linked with increasing age, due poor health and physical tolerance and is associated with comorbidity such as type 2 diabetes mellitus. Type 2 diabetes mellitus accounted as most burdening cause of morbidity among elderly and it is often regarded with reduction in physical activity.

This study aimed to determine the factors associated with leisure time physical activity among elderly with T2DM in Petaling district Selangor according to the Socio-ecological model.

A cross-sectional study was conducted in 6 health clinics within Petaling District Selangor, using stratified to proportionate size sampling and simple random sampling methods. Data collected through pre-tested and validated questionnaire using self-administered interviewer assisted method. LTPA was measured using Leisure Time Physical Activity Questionnaire designed specifically for Malaysian elderly with 2 section namely Exercise Physical Activity and Non-Exercise Physical Activity with 9 activities in total. Activity frequency measured with 5-point scale. Descriptive analysis conducted for all study variables and independent t-test, ANNOVA and multiple linear regression conducted for further analysis. Significant level was set at <0.05 p-value and 95% CI.

520 elderly patients with type 2 diabetes were included in this study with a response rate of 100%. Mean age of respondents were 67.99 ± 5.25 years (young-old 88.7%). Most respondents were male (57.7%), Indian (39.2%), married (70.4%), secondary school education level (43.3%). Mean household income was 3377.49 ± 4033.64 with 48.7% >Rm2001. Mean height 160.21 ± 9.70 cm and weight 68.70 ± 12.69 kg. Overall body mass index means 26.81 ± 4.72 with 43.3% overweight. Duration of diabetes 11.15 ± 9.11 years with 61.3 % ≤ 10 years. 78.1% has ≥3 co-morbidities and 66.2% had high knowledge on physical activity, mean score 24.69 ± 3.30. Attitude towards physical activity was positive, mean score 4.00 ± 0.44 and 68.7% respondents had good social network. Commonest resource available for physical activity was Park and 79% respondents had ≤ 2 resources.

The LTPA was dominated by the Non-exercise physical activity (1.70 ± 1.16), with cleaning house – indoor as most frequently engaged non-exercise physical activity. Meanwhile, commonest exercise based physical activity was walking, with mean score of 1.49 ± 1.70.

Final linear regression model revealed, significant determinant for Leisure Time Physical Activity among elderlies with type 2 diabetes mellitus are age (B=-0.304, 95%CI: 0.426,0.746), gender (B=0.299, 95%CI: 0.207,0.392), education level (B=0.109, 95%CI: 0.012,0.205), ethnicity (Chinese - B=0.126, 95%CI: 0.009,0.243) and (Others - B= -0.402, 95%CI: -0.760,0.045), presence of co-morbidities (B= -0.232, 95%CI: -0.338,-0.127), vigorous exercise attitude (B= 0.115, 95%CI: 0.024,0.206) and social network (B= 0.202, 95%CI: 0.106,0.299).

Majority of type 2 diabetes elderlies in Petaling district Selangor has low physical activity level with limited engagement in exercise based physical activity. Future planning and implementation of physical activity programs for T2DM elderlies should focus among those group of elderlies whom are old-old aged, male, lower education level, having >3 co-morbidities, living with poor social network and having negative attitude towards PA within vigorous exercise attitude.

Keywords: Leisure Time Physical Activity, Elderly, Type 2 Diabetes Mellitus

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains

FAKTOR PENENTU AKTIVITI FIZIKAL WAKTU SENGGANG DALAM KALANGAN WARGA EMAS MENGHIDAPI DIABETIS MELLITUS JENIS 2 DI DAERAH PETALING, SELANGOR, MALAYSIA

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Pengerusi : Profesor Madya Halimatus Sakdiah binti Minhat, PhD
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Masyarakat di seluruh dunia hidup lebih lama kerana kemajuan perubatan, kesedaran dan pengetahuan yang lebih baik terhadap gaya hidup sihat. Pengurangan aktiviti fizikal biasanya dikaitkan dengan peningkatan usia, kemudaratan kesihatan dan toleransi fizikal yang kurang baik dan ini dikaitkan dengan komorbiditi seperti diabetes mellitus jenis 2. Diabetes mellitus jenis 2 menyumbang penyebab kormobiditi yang paling membebankan di kalangan warga tua dan sering dikaitkan dengan pengurang aktiviti fizikal.

Kajian ini bertujuan untuk mengenalpasti faktor-faktor yang mempunyai kaitan dengan aktiviti fizikal waktu senggang di kalangan warga tua menghidapi diabetis melitus jenis 2 di daerah Petaling Selangor menggunakan model sosio-ekologi.

Sebuah kajian *cross-sectional design* telah dijalankan di 6 klinik di daerah Petaling Selangor, dengan menggunakan kaedah *stratified to proportionate size sampling* dan persampelan rawak mudah. Data dikumpulkan melalui soal selidik yang telah diuji dan disahkan serta kajian dijalankan menggunakan kaedah *self-administered interviewer assisted*. Aktiviti fizikal waktu senggang diukur menggunakan borang soal selidik Aktiviti Fizikal Masa Senggang yang direka khusus untuk warga tua di Malaysia yang terdapat 2 bahagian iaitu Aktiviti Fizikal Senaman dan Aktiviti Fizikal bukan Senaman serta 9 aktiviti didalamnya secara keseluruhan. Kekerapan aktiviti diukur dengan skala likert 5 mata. Analisis deskriptif dijalankan untuk semua pemboleh ubah dan *independent t-test, ANNOVA and multiple linear*

regression dijalankan untuk analisa selanjutnya. Tahap signifikan ditetapkan pada <0.05 *p-value* dan 95%*CI*.

520 pesakit warga tua dengan diabetes jenis 2 disertakan dalam kajian ini dengan kadar tindak balas sebanyak 100%. Purata umur responden adalah 67.99 ± 5.25 tahun (88.7% tua muda). Kebanyakan responden adalah lelaki (57.7%), India (39.2%), berkahwin (70.4%), tahap pendidikan sekolah menengah (43.3%). Purata pendapatan isi rumah ialah 3377.49 ± 4033.64 dan 48.7% >RM2001. Min ketinggian 160.21 ± 9.70 cm dan berat 68.70 ± 12.69 kg. Indeks berat badan keseluruhannya adalah 26.81 ± 4.72 dan 43.3% mempunyai berat badan berlebihan. Tempoh diabetis 11.15 ± 9.11 tahun dengan 61.3% ≤ 10 tahun. 78.1% mempunyai ≥3 *co-morbidities* dan 66.2% mempunyai pengetahuan yang tinggi mengenai aktiviti fizikal, skor min 24.69 ± 3.30. Sikap terhadap aktiviti fizikal adalah positif, min skor 4.00 ± 0.44 dan 68.7% responden mempunyai rangkaian sosial yang baik. Sumber yang biasa boleh didapati untuk aktiviti fizikal ialah Taman dan 79% responden mempunyai ≤ 2 sumber.

Aktiviti Fizikal Masa Senggang didominasi oleh aktiviti fizikal bukan senaman (1.70 ± 1.16) dan membersihkan rumah – dalaman, adalah aktiviti fizikal yang paling kerap dilakukan. Sementara itu, aktiviti fizikal senaman yang lazim dilakukan ialah berjalan, dengan skor min 1.49 ± 1.70.

Model regresi linier akhir menunjukkan, penentu signifikan bagi aktiviti fizikal masa senggang di kalangan warga tua menghidapi diabetes mellitus jenis 2 adalah umur (B = -0.304, 95% CI: 0.426,0.746), jantina (B=0.299, 95%CI: 0.207,0.392), tahap pendidikan (B = 0.109, 95% CI: 0.012,0.205), etnik (Cina - B = 0.126, 95% CI: 0.009,0.243) dan (Lain-lain - B = -0.402, 95% CI: -0.760, 0.045), mempunyai ≥3 *co-morbidities* (B = -0.232, 95% CI: -0.338, -0.127), *vigorous exercise attitude* (B = 0.115, 95% CI: 0.024,0.206) dan rangkaian sosial (B = 0.202, 95 % CI: 0.106,0.299).

Majoriti orang tua diabetes jenis 2 di daerah Petaling Selangor mempunyai tahap aktiviti fizikal yang rendah dan keterlibatan terhad dalam aktiviti fizikal berasaskan senaman. Perancangan masa depan dan pelaksanaan program aktiviti fizikal untuk warga tua menghidapi T2DM perlu memberi tumpuan di kalangan orang yang sangat tua, lelaki, tahap pendidikan rendah, yang mempunyai> 3 *co-morbidities*, hidup dengan rangkaian sosial yang lemah dan mempunyai sikap negatif terhadap aktiviti fizikal dalam sikap *vigorous exercise*.

Kata kunci: Aktiviti Fizikal Waktu Senggang, Warga tua, Diabetes Mellitus Jenis 2

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This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the Degree of Master of Science. The members of the Supervisory Committee were as follows:

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- supervision responsibilities as stated in the Universiti Putra Malaysia (Graduate Studies) Rules 2003 (Revision 2012-2013) are adhered to.

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LIST OF ABBREVIATIONS

ANOVA	Analysis of Variance
ATP	Adenosine Triphosphate
B	Beta
BG	Blood Glucose
BMI	Body Mass Index
CI	Confidence Interval
CMQ	Co-Morbidities Questionnaire
df	Degrees of freedom
DM	Diabetes Mellitus
DV	Dependent Variable
ECAQ	Elderly Cognitive Assessment Questionnaire
EPA	Exercise Physical Activity
F	F critical value
FPG	Fasting Plasma Glucose
HPA	Health Promotion Attitude
IPAQ	International Physical Activity Questionnaire
IPH	Institute for Public Health
IV	Independent Variable
JKEUPM	Jawatankuasa Etika Universiti untuk Penyelidikan melibatkan Manusia
KOSPEN	Komuniti Sihat Perkasa Negara
KPAQ	Knowledge on Physical Activity Questionnaire
LPQ	Leisure Participation Questionnaire
LSNS	Lubben Social Network Score
LTPA	Leisure Time Physical Activity
LTPAQ	Leisure Time Physical Activity Questionnaire
MET	Metabolic Equivalent

MLR	Multiple Linear Regression
MOH	Ministry of Health
N	Sample population
n	Sample size
NCD	Non-Communicable Disease
NCDP1M	Non-Communicable Disease Program 1 Malaysia
NEPA	Non Exercise Physical Activity
NHMS	National Health Morbidity Survey
NHANES	National Health and Nutrition Examination Survey
NMRR	National Medical Research Register
OGTT	Oral Glucose Tolerance Test
OPAPAEQ	Older Persons' Attitude Towards Physical Activity Questionnaire
P	P value
PA	Physical Activity
PAR	Physical Activity Recall
PARAQ	Physical Activity Resources Availability Questionnaire
PCr	Phosphocreatine
PDPAR	Previous Day Physical Activity Recall
HC	Health Clinic
PIS	Patient Information Sheet
Q	Question
QOL	Quality Of Life
SBA	Social Benefit Attitude
SCQ	Self-administered Comorbidity Questionnaire
SD	Standard Deviation
SE	Standard Error
SEM	Social Ecological Model

SPSS	Statistical Package for the Social Sciences
t	T value
TRA	Tension Release Attitude
T2DM	Type 2 Diabetes Mellitus
UPM	Universiti Putra Malaysia
VEA	Vigorous Exercise Attitude
WHO	World Health Organization

CHAPTER 1

INTRODUCTION

1.1 Background of the study

Globally, people are living longer due to advances in medicine. Populations around the world are rapidly ageing, and present both challenges and opportunities. The number of people over the age of 60 is expected to double by 2050 and will require radical societal change, according to a new report released by the WHO for the International Day of Older Persons (WHO, 2017).

In Malaysia, there is rapidly growing numbers of elderly population. By 2035, Malaysia will achieve a status of ageing country, which, 14% of the total population comprise of people aged 60 years and above and by 2050 the proportion will increase to 22% or 8.7 million Tyng & Hamid, 2015). This vast transition of the elderly population urges necessities in dealing with age related diseases and develop a healthy and successful aging society.

Many illnesses by nature become more common as age increases. Declining in various physiological systems (Sakuma & Yamaguchi, 2012) pathological changes (Abdul Manaf, Mustafa, Abdul Rahman, Yusof, & Abd Aziz, 2016) and decline in cognitive performance ('WHO | Tenfold increase in childhood and adolescent obesity in four decades: new study by Imperial College London and WHO', 2017) expose elderly to high risk of acquiring chronic diseases, such as heart disease, diabetes mellitus, hypertension and many more (Panagiotakos, Pitsavos, Skoumas, Lentzas, & Stefanadis, 2008).

Globally, non-communicable diseases accounted as most burdening cause of morbidity among elderly, including diabetes mellitus (DM). Among all NCD's, DM contributes highest mortality measures, accounting 1.5 million deaths in year 2012 and 89 million in total of disability-adjusted life years are attributed to DM. In global pandemic view, DM is prevalent accounting 79% among those in developing country, compared developed nations ('WHO | Global status report on noncommunicable diseases 2014', 2015). Malaysia in context of developing country, high burden in NCD reports 16% of national health expenditure in 2010 was for DM related treatments. In 2012, Malaysia expected to have 2.6 million DM patients and to be increased by 4.5 million in 2020 numbering 3 in every 10 elderly person aged above 60 > live with DM (Cheah & Goh, 2017). Such rapid changes needs a serious attention in improving strategies for disease control enormously and reduce the disease-associated burdens.

Active lifestyle denotes participation in any form of physical activity (PA) and referred as fundamental element for disease control and healthy aging. Adequate participation in PA prevent and control Non Communicable Diseases by regulating the physiological systems (World Health Organization, 2009), which include T2DM (Duclos et al., 2015). Frequent and consistent maintenance of PA level among elderly with T2DM profoundly controls the disease in effective manner by regulating the insulin absorption into the glycolysis process, thus, helps in delaying long term complications in micro vascular level (retinopathy, neuropathy), macro vascular level (stroke, coronary heart disease, peripheral arterial disease) (*Physical Activity in the Prevention and Treatment of Disease*, 2010)[i] and includes physical disorders like fall and fractures and also cognitive disorders (Knight, 2012).

Unlike younger or middle-aged people, involvement of elderly in PA is common of leisure. Leisure time refers to unengaged time or free time, when individual does not need to perform any task or to do domestic work (Edginton, Jordan, DeGraaf, & Edginton, 2001). PA defined as any bodily movement created by skeletal muscles result in various level of energy expenditure above the resting level (Caspersen, Powell, & Christenson, 2014). Leisure time physical activity (LTPA) suggested as movements of physical at any cost with energy expenditure during a free time (Caspersen et al., 2014). LTPA are also widely recognized as an element with various health benefits (Kim, Yamada, Heo, & Han, 2014). The nature of tasks or activities that can be conducted during leisure time varies and commonly related to individual preferences or hobbies, which include exercise PA such as exercising, jogging, cycling (Colberg et al., 2010) and non-exercise PA such as domestic activities (Howley, 2001).

Among elderly with DM, higher level PA is essential in maintaining optimum health promoting effect (Carvalho, 2014). Consistent PA is an effective approach in managing DM, but not all are compliant to it. World Health Survey in 51 countries reported 18% of population is inactive and prevalence is highest among Malaysian at 16.5% (Guthold, Ono, Strong, Chatterji, & Morabia, 2008).

Malaysia with a multiracial and multicultural society, LTPA types may differ according to different socio-demographic and sociocultural background (Cheah & Poh, 2014). Age closely related with LTPA and being unmarried is common contributing factor (Shazwani et al., 2010). In general, urban dwellers and being women, predominantly housewife, those in unemployed category, closely associated with physical inactivity (NHMS III) (IPH 2008). These factors are among general healthy elderly, whether it differs among elderly with T2DM is sparse. Income, sex, ethnicity, education level, region, house locality, job characteristics, comorbidities social support (Pai et al., 2016), employment status (Win et al., 2015), mental health status (Heo & Lee, 2010), pre elderly adults Leisure Physical Activity (Rosa et al., 2015),

Body Mass Index (BMI) (Pearce & Maddison, 2011), awareness on PA benefits (Mesters, Wahl, & Van Keulen, 2014), are the associating factors in determinacies of an elderly engaging in LTPA. Association of these factors among T2DM elderly is not widely known, globally and specifically in Malaysian context.

1.2 Problem statement

As age increase, prevelance of developing NCD increases (Cheah & Goh, 2017). Globally, 382 million individuals had DM in year 2013; this figure is estimated to grow up to 592 million by year 2035, especially among those in low and also middle-income countries (Guariguata et al., 2014). Estimations of DM in adults next 22 years confirm huge burden of DM, particularly in developing countries. In U.S., almost 1:4 adults, aged 65 years or more has diabetes (Sazlina, Browning, & Yasin, 2012). Recent study among Japanese population discovered, age-standardized prevalence of DM remained hugely unchanged for couple of decades. By means the baby-boom group attaining geriatric age range and quantity of newly diagnosed type 2 diabetes cases are expected to rise (Goto, Noda, Inoue, Goto, & Hadrien, 2016) and this changes requires a prompt management to reduce disease associated burdens.

According to National Health Morbidity survey in 2006, the age standadized prevelance for diabetes mellitus among those aged 60 years and above was at 26.2% (Letchuman et al., 2010) and in year 2015, general increasing trend in prevalence of people acquiring diabetes with age was noted, from 5.5% (95% CI: 3.9, 7.7) in the 18-19 year's age group, reaching a peak of 39.1% (95% CI: 33.6, 44.9) among the 70-74 year's age group (Institute for Public Health, 2015). Whereby, NHMS survey among elderly in year 2018 reveals that, the prevelence of diabetes among the elderly group was tremendously high with a percentage of 80.5% (95% CI: 76.79, 83.76) (Institute for Public Health, 2018). Such alarming trend of increase in diabetes prevalence needs an urge in managing and reducing potential health related cost and burden for Health Ministry and country economy.

Societal impact of diabetes is substantial. Lost of QOL, productivity, functionability and the economic cost on healthcare is enormous. Although diabetes management in Malaysia is governmental and private, majority management for chronic diseases are provided by the govenmental sector by means of heavily subsidised. In year 2011, Ministry of Health (MOH), allocated RM15.22 billion, which is equal to 7.1% of total budget for the management of T2DM and its complications. This amount does not comprise the non-prahamaceutical management for diabetes such as PA(Mustapha et al., 2017). Mustapha et. al (2017) has estimates of RM 459 every year with a total of RM 42, 362 for complication management for each patients with T2DM in Malaysia. This high cost alarms a highlights on primary and

secondary care prevention for T2DM to reduce the economic burden on healthcare.

Involvement in PA have countless positive impact on health of an elderly. In recent years, many evidence supports the fact of regular PA among elderly has preventive effect for cardiovascular diseases, hypertension, diabetes (Liu et al., 2017), metabolic syndrome (He et al., 2014), cognitive decline, osteoporosis and many more (Laurin D, Verreault R, Lindsay J, MacPherson K, 2001). In T2DM, regular PA has significant health outcomes regardless of age and being physically active prevents and controls disease (He et al., 2014), thus increases the active independent and quality of life of an elderly at any age of life (Nimrod & Shrira, 2016). Significantly, PA helps in glycaemic control in T2DM and minimise complication enabling a healthy ageing (Colberg et al., 2010). In non-pharmacological treatment approach for T2DM, regular PA such as aerobic or resistance exercise, improves insulin sensitivity and changes physiological mechanism within body composition to improve metabolic outcome which may conserve at least for 5 years. Additionally, uncomplicated T2DM with satisfactory glucose rates likely to be benefited more from long-term regular PA (Bernard Zinman, MD (co-chair); Neil Ruderman & DPhil (co-chair); Barbara N. Campaigne, PhD; John T. Devlin, MD; and Stephen H. Schneider, 2004). Individual efforts in integrating the recommended level of PA for being active is biomarkers for gaining maximal health benefit in T2DM, especially among elderlies (Nelson, Karin M., Reiber, Gayle, Boyko, Edward, Nelson, Reiber, & Boyko, 2002). However, physical inactivity percentage is still high among elderly with T2DM (Sarahwild, Gojka Roglic, Anders Green, Richard Sicree, 2004).

Despite having sufficient guidelines and adequate PA programs in community level, the rate of success for these programs remain low among elderlies, more lesser among those elderlies with chronic diseases. Researches have identified that, PA based public health programs are remaining sluggish due to failure in taking into consider the factors related to health behaviours towards PA (Benjamin et al, 2016). Adequately addressing context in which the programs may rise to succes are when those individual, social and physical enviroments are taken into count (Heany & Israel, 2008; Stokols et al, 1996). Present study was carried out at multi-level using Socio-Ecological Model (SEM) in identifiying the determinant factors of LTPA among elderly with T2DM in Petaling district Selangor.

A recent systematic review revealed that, in subjects related to PA participation among elderly with T2DM, studies are focused on PA in general compared to LTPA (Chastin et al., 2015). LTPA is known to be more synonym for elderly who are dominated by retirees. LTPA refers to the activities done during out of daily routine often more of enjoyable (Chan et al., 2014) and it is foremost factor for a healthy life and determinacies of various health related outcomes (Wang et al, 2012). Past researches

reported that, PA is health behaviour determined by various number of factors (Fleury & Lee, 2006). Current researches have mainly focused on individual determinants to PA, such as socio-demographic background and health. Many has failed to consider factors such as physical environment, social and health in hollistic, which may influnece PA determinancies. Such approach is under the criticism since the outcome has emphasis on the individual factors alone, rather, not considered to examine the external contributing factors as whole within the PA behaviour that takes place (Giles-Corti & Donovan, 2002b). However, a systematic review revealed, very limited articles are available on determinants of LTPA in diversed population, and even lesser are conducted adpating a model into the study (Edginton et al, 2019).

In conclusion, this study assists in understanding in depth, the factors associated with LTPA among elderly with T2DM. Obtaining accountable information's on PA determinants among elderly with T2DM allows improving sluggish community programs and enhance individualized care, thus, reduces a large amount of medication related expenses, through lifestyle changes as a treatment care. In essence, the findings from this study could also constantly direct in the formulation of future health policy/module making as well as provision of adequate resources for promoting disease control strategies among elderly T2DM populations from various sociodemographic backgrounds in Malaysia. A concept of seamless care can be attained and holistic client centred care could be successfully implemented. Literally, a good client centred care enhances the health of an elderly and promote a healthy ageing. Convincingly, an overall approach for NCD Care enforcement, especially on T2DM management within Health Ministry Malaysia or among non-government service providers, accomplishable with fore coming information's from this study which associates PA determinants among elderly with T2DM.

1.3 Research questions

1.3.1 What is the LTPA among elderly with T2DM in Petaling district, Selangor?

1.3.2 What are the determinants of LTPA among elderly with T2DM in Petaling district, Selangor?

1.4 Significance of the study

The finding from this study will assist in enriching the body of knowledge related to determinants of LTPA among elderly with T2DM in Petaling district, Selangor. This information's could benefit the researcher of same interest

group for comparable studies and provide insight informations that can be utilized for related future researches.

Irrespective of benefits to scientific world, results from this research can create awareness among elderly with T2DM on prevelance and typology of LTPA among them. Despite, obtained findings could also serve as a mediator for encouragement in elderly with T2DM in LTPA involvement. Such engagement may assist in glycaemic control and complication prevention in long term. Overall, this study result could provide baseline information to guide the elderly with T2DM in improving their health status.

Despite T2DM elderly, outcome from this study would also provide an accountable informations for healthcare service providers, in understanding potential support and barriers for an elderly with T2DM engaging in LTPA. This available information will assist the relevant authorities in the development of programme and guideline towards improving the health status and diabetic control of elderly with T2DM Despites, the results will also assist in filling the gaps or flaws within available programs for successions of current practice. Such success rate of disease control helps in reduction of burden on management of T2DM healthcare cost. Additionally, the findings can reduce the service providers burden by increasing the T2DM elderly independence and quality of life.

To the foremost benefit among policy makers, informations from this research helps in designing national programs, formulating health policy/module, as well as provision of adequate resources for promoting disease control strategies among elderly T2DM populations from various sociodemographic backgrounds. In addition, for those regional development authorities, this study results could help in providing significant guide in improving the physical activity related facilities, that accommodate the needs of communities dwelling elderly with T2DM for LTPA engagement.

1.5 Study objectives

1.5.1 General objective

To determine the factors associated with Leisure Time Physical Activity among elderly with T2DM in Petaling district, Selangor

1.5.2 Specific objectives

1. To determine LTPA participation among elderly with T2DM in Petaling district, Selangor

2. To determine the distribution of the respondents according to:
   i. Individual factor (age, sex, ethnicity, income, marital status, level of education, Body Mass Index, Duration of DM, Presence of other Co-morbidity, Knowledge on physical Activity benefits and Attitude towards Physical activity)
   ii. Social environment (Perceived social network received from Family/ Friendships)
   iii. Physical environment (Resource availability for physical activity)

3. To determine the association between LTPA participation and:
   i. Individual factor (age, sex, ethnicity, income, marital status, level of education, Body Mass Index, Duration of DM, Presence of other Co-morbidity, Knowledge on physical activity benefits and Attitude towards Physical activity)
   ii. Social environment (Perceived social network from Family / Friendships)
   iii. Physical environment (Resource availability for physical activity)

4. To determine the predictive model for LTPA participation among elderly with T2DM in Petaling district, Selangor using Socio-ecological model

1.6 Study hypothesis

1.6.1 There is a significant association between LTPA participation and:

i. Individual factor (age, sex, ethnicity, income, marital status, level of education,
Body Mass Index, Duration of DM, Presence of other Co-morbidity, Knowledge
on physical activity benefits and Attitude towards Physical activity)
ii. Social environment (Perceived social network received from Family / Friendships)
iii. Physical environment (Resource availability for physical activity)

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