UNIVERSITI PUTRA MALAYSIA

FACTORS ASSOCIATED WITH FRAILTY AMONG POSTMENOPAUSAL CHINESE WOMEN FROM SELECTED SENIOR CITIZEN ASSOCIATIONS IN KUALA LUMPUR AND SELANGOR, MALAYSIA

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By

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Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of the Requirements for the Degree of Master of Science

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Faculty : Medicine and Health Sciences

Frailty is defined as a decline in physiological condition and immunity against stressors events, which is common among the elderly population. Mounting evidence shows frailty among older person is highly associated with higher risk of cardiovascular and cardiovascular-related diseases, fall, physical disability, poor quality of life, increased mortality and morbidity. With the increase of proportion of older person in Malaysia attributed to longevity, it is expecting that frailty will continue to rise. Chinese female, with the longest life expectancy among different ethnicities in Malaysia, is expected to have a higher prevalence of frailty. Recognizing the importance of identifying factors associated frailty in promoting healthy ageing, the present study was undertaken to determine the prevalence of frailty and factors contributing to the risk of frailty among free-living postmenopausal Chinese women in Kuala Lumpur and Selangor. A total of 220 postmenopausal Chinese women were recruited from seven affiliates under Kuala Lumpur and Selangor branch of National Council of Senior Citizen Organisation (NACSCOM). Frailty status was ascertained based on five assessments, namely unintentional weight loss, self-reported exhaustion, slow gait speed, weak handgrip strength and low physical activity level. Respondents with one to two components was classified as pre-frailty, while those with at least three components were classified as frailty. Several anthropometry assessments (weight, height, waist circumference (WC), percentage of body fat (PBF)) and blood pressure (BP) were performed according to standard protocols while skeletal muscle mass was computed accordingly. Sociodemographic background (age, duration of menopause, duration of education and education level, marital status, occupation and monthly household income) of respondents were obtained through self-administered questionnaire, while sleeping quality, smoking behaviour, sedentary time were determined using Pittsburgh Sleeping Quality Index (PSQI) Questionnaire, Global Adults Tobacco Survey (GATS), and Global Physical Activity Questionnaire (GPAQ), respectively. Nutrients intake of respondents were quantified using a validated food frequency questionnaire

while diet quality was ascertained according to compliance of intakes with Malaysian Dietary Guidelines. A total of 5 ml fasting blood samples was drawn for analysis of fasting blood glucose (FBG) and lipid profile to ascertain the presence of metabolic syndrome (MS) among the respondents. Data obtained was analyzed using IBM SPSS Statistic 22.0. Independent-sample t-test was used to determine the mean differences between respondents with and without the risk of frailty, while Pearson Chi-Square ($\chi 2$) was used to determine the association between two categorical variables. Binary logistic regression was used to determine the factors that contribute to the risk of frailty.

The prevalence of pre-frailty and frailty were 64.5% and 7.3% respectively, and weak handgrip strength was most common among the respondents (51.8%) as compared to other assessment criteria. The mean age and duration of menopause for respondents were 66.47±6.62 and 16.07±7.77 years respectively, with the majority of them were married (77.7%), had formal education (87.7%), and from either low (43.6%) or middle (36.8%) economic group. With regards to anthropometry assessment, more than half of the respondents (56.8%) had normal body weight of 24.48±4.28 kg/m2, but majority (75.0%) high level of PBF of 35.14±5.13%. Overall, the majority of the respondents (87.3%) required improvement in their dietary quality, and special attention should be given to vegetables, fish, as well as milk and dairy products. The majority of the respondents (98.2%) were non-smokers, and spent approximately four hours on sedentary behaviour. Despite overall sleep quality was satisfactory, one in two respondents (53.6%) had problem with sleep latency, while about 20% complained with daytime dysfunction. The prevalence of MS was 52.3%, with increased BP as most common (75.0%), while only a minority (11.4%) presented with reduced High-Density Lipoprotein (HDL) level. Results showed that a high proportion of the respondents did not receive treatment for increased FBG (87.7% or BP (60.9%). On the other hand, respondents with risk of frailty were significantly older, had a longer duration of menopause and shorter year of education. There were significant associations between adequacy intakes of cereal and grains, adequacy of poultry, meat and eggs, and daytime dysfunction with risk of frailty in the present study. Among all the studied variables, only four factors (dietary quality, waist circumference, increased FBG and skeletal muscle mass) were found to contribute to risk of frailty among postmenopausal Chinese women, with the final model explaining 12.5% of the variance. On the other hand, age, marital status, year of education, HDL, triglyceride, BP, MS, smoking behaviour, sleeping quality, sedentary behaviour, body mass index and PBF failed to contribute to risk of frailty.

In summary, frailty affected approximately one in thirteen of respondents, while almost two-thirds of the respondents were pre-frail. More than half of the respondents had MS, with a high prevalence of undiagnosed diabetes mellitus and hypertension cases. Although the majority had normal body weight, a high proportion of them had high PBF, and this issue should be addressed accordingly. Meanwhile adequate attention should be given on the improvement of dietary quality, emphasizing on meeting the recommendation for fish, vegetables and

dairy products. The presence of pre-frailty and frailty and identification of several modifiable factors contributed to the risk of frailty in this present study signified the need for more work including appropriate intervention to reduce and prevent the onset of frailty among the postmenopausal women.

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

FAKTOR-FAKTOR YANG BERKAITAN DENGAN MASALAH KELEMAHAN DALAM KALANGAN WANITA CINA MENOPAS DARIPADA PERSATUAN WARGA EMAS YANG TERPILIH DI KUALA LUMPUR DAN SELANGOR, , MALAYSIA

Oleh

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Febuari 2019

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Masalah kelemahan didefinisikan sebagai kemerosotan fisiologi dan imuniti terhadap peristiwa stresor yang kerap berlaku dalam kalangan warga emas. Kebanyakkan bukti menunjukkan bahawa masalah kelemahan dalam kalangan warga emas amat berkait rapat dengan peningkatan risiko penyakit kardiovaskular dan peyakit berkaitan dengan kardiovaskular, insiden terjatuh, ketidakupayaan fizikal, kualiti hidup yang buruk serta peningkatan risiko kematian dan morbiditi. Prevalen masalah kelemahan dijangka akan meningkat seiring dengan peningkatan umur serta bilangan warga emas di Malaysia. . Wanita berbangsa Cina mempunyai jangkaan hayat yang lebih panjang berbanding kumpulan etnik yang lain, dan dianggarkan mempunyai prevalen masalah kelemahan yang lebih tinggi. Bagi mempromosikan proses penuaan yang sihat, faktor-faktor yang menyumbang kepada masalah kelemahan perlu dikenalpasti, oleh itu, kajian ini bertujuan untuk mengenalpasti prevalen masalah kelemahan dan faktor-faktor yang menyumbang kepada risiko masalah kelemahan dalam kalangan wanita Cina menapos yang menetap di Kuala Lumpur dan Selangor.

Sejumlah 220 orang wanita Cina menapos daripada tujuh buah cawangan Majlis Kebangsaan PersatuanPersatuan Warga Emas Malaysia di Kuala Lumpur dan Selangor telah mengambil bahagian di dalam kajian ini. Status masalah kelemahan telah dinilai berdasarkan lima jenis penilaian, iaitu penurunan berat badan yang tidak disengajakan, tahap keletihan yang dilaporkan,tahap pergerakan yang lambat, genggaman tangan yang lemah, dan tahap aktiviti fizikal yang rendah. Responden yang mempunyai satu hingga dua komponen diklasifikasikan mempunyai masalah pra-kelemahan, manakala mereka yang mempunyai sekurang-kurangnya tiga komponen diklasifikasikan mempunyai masalah kelemahan. Beberapa penilaian antropometri (berat badan, ketinggian,

ukuran lilitan pinggang (WC) dan peratusan lemak dalam badan(PBF)) dan tekanan darah (BP) telah dijalankan menurut protokol standardi, manakala jisim otot rangka dinilai dengan sewajarnya. Latar belakang sosiodemografik (umur, tempoh menapos, tempoh dan tahap pendidikan, status perkahwinan, pekerjaan dan pendapatan bulanan isi rumah) responden telah diperolehi melalui borang soal selidik, manakala kualiti tidur, tabiat merokok, waktu sedentari dikenalpasti dengan menggunakan borang soal selidik Indeks Kualiti Tidur Pittsburgh (PSQI), Penyiasatan Tembakau Dewasa Global (GATS), dan borang soal selidik Aktiviti Fizikal Global (GPAQ). Pengambilan nutrien responden telah dinilai menggunakan borang soal selidik kekerapan makanan (FFQ) yang telah divalidasikan, manakala kualiti diet telah dikenalpasti mengikut kepatuhan kepada Garis Panduan Pemakanan Malaysia (MDG). Sebanyak 5 ml darah semasa berpuasa telah diambil untuk analisis glukosa darah puasa (FBG) dan profil lemak bagi mengenalpastisindrom metabolik (MS) dalam kalangan responden. Data yang diperolehi telah dianalisis dengan menggunakan IBM SPSS Statistic 22.0. Ujian-T Sampel Tak Bersandar digunakan untuk menentukan perbezaan min antara responden dengan dan tanpa risiko masalah kelemahan, manakala Ujian Khi Kuasa Dua ($\chi 2$) digunakan untuk mengenalpasti hubungan antara dua data kategori. Analisis regresi logistik biner digunakan untuk menentukan faktor-faktor yang menyumbang kepada risiko masalah kelemahan.

Hasil kajian menujukkan bahawa prevalen masalah pra-kelemahan dan kelemahan masing-masing adalah 64.5% dan 7.3%, dan genggaman tangan yang lemah merupakan kriteria diagnostik yang paling kerap berlaku dalam kalangan responden. Purata umur dan tempoh menapos bagi responden masing-masing adalah 66.47±6.62 dan 16.07±7.77 tahun, Majoriti responden adalah yang telah berkahwin (77.7%), mempunyai pendidikan formal (87.7%), dan tergolongdaripada kumpulan ekonomi rendah (43.6%) atau pertengahan (36.8%). Manakala bagi penilaian antropometri, lebih daripada separuh responden (56.8%) mempunyai berat badan yang normal dengan purata 24.48±4.28 kg/m2, tetapi majoriti daripada mereka (75.0%) mempunyai PBF yang tinggi. Secara keseluruhan, majoriti (87.3%) daripada responden memerlukan penambahbaikan dalam kualiti diet mereka, dan perhatian harus diberikan kepada pengambilan sayur-sayuran, ikan, serta susu dan produk tenusu. Majoriti (98.2%) daripada responden tidak mempunyai tabiat merokok dan mempunyai lebih kurang empat jam bagi tingkahlaku sedentari dalam sehari. Kualiti tidur adalah memuaskan, namun satu daripada dua responden melaporkan bahawa mereka menghadapi masalah latensi tidur, dan lebih kurang 20% daripada mereka mengadu mempunyaimasalah produktivitidiwaktu siang. Prevalen MS adalah 52.3%, dengan peningkatan BP paling kerap dilaporkan dalam kalangan responden (75%), walau bagaimanpun, hanya minoriti (11.4%) responden yang didapati mempunyai tahap Lipoprotein Tinggi yang rendah. Keputusan menunjukkan bahawa sebahagian besar daripada responden tidak menerima rawatan untuk FBG (87.7%) atau BP (60.9%) yang tinggi. Sebaliknya, responden yang mempunyai risiko masalah kelemahan adalah responden yang lebih berusia, mempunyai tempoh menapos yang lebih panjang dan tempoh pendidikan yang lebih pendek. Perkaitan yang signifikan antara pengambilan bijirin dan produk bijirin, ayam, daging dan telur yang lengkap, dan masalah produktiviti diwaktu siang dengan risiko masalah

kelemahan telah ditemui dalam kajian ini. Dalam kalangan faktor-faktor yang dicadangkan, hanya terdapat empat faktor (kualiti pemakanan, ukuran lilitan pinggang, peningkatan FBG dan jisim otot rangka) didapati menyumbang kepada risiko masalah kelemahan dalam kalangan wanita Cina menapos, dengan model akhir yang menjelaskan 12.5% varians. Sebaliknya, umur, status perkahwinan, tempoh pendidikan, HDL, Trigliserida, BP, MS, tabiat merokok, kualiti tidur, tingkahlaku sedentari, IJM, PBF tidak menyumbang kepada risiko masalah kelemahan.

Secara kesimpulan, masalah kelemahan menjejaskan hampir satu daripada tiga belas responden, manakala hampir dua pertiga daripada responden mempunyai masalah pra-kelemahan. Lebih daripada separuh responden mempunyai MS, dan kebanyakkan kes diabetes mellitus dan hipertensi adalah tidak dikesan. Walaupun majoriti responden mempunyai berat badan normal, sebahagian besar daripada mereka mempunyai PBF yang tinggi, dan isu ini harus dikendalikan dengan sewajarnya. Sementara itu perhatian perlu diberikan bagi meningkatan kualiti pemakanan, terutamanya memenuhi cadangan sajian bagi pengambilan ikan, sayur-sayuran,susu dan produk tenusu. Memandangkan faktor yang boleh diubahsuai didapati menyumbang kepada risiko masalah kelemahan, perhatian terhadap faktor tersebut adalah diperlukan bagi mengurangkan dan mengelakkan permulaan masalah kelemahan.

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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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LIST OF ABBREVIATIONS

CHS	Cardiovascular Health Study
CVD	Cardiovascular Diseases
SHARE	Survey of Health, Aging and Retirement in Europe
MS	Metabolic Syndrome
IR	Insulin Resistance
LDL	Low density Lipoprotein
NACSCOM	National Council of Senior Citizens Organisations Malaysia
DQI	Dietary Quality Index
BMI	Body-Mass-Index
PBF	Percentage of Body Fat
SMM	Skeletal Muscle Mass
ROS	Reactive Oxidative Species
HF	Heart Failure
UWL	Unintentional Weight Loss
NCCFN	National Coordinating Committee on Food and Nutrition
ADL	Activity of Daily Living
WHO	World Health Organization
NCEP-ATP	National Cholesterol Education Program Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults
IDF	International Diabetes Federation
T2DM	Type 2 Diabetes Mellitus
JIS	Joint Interim Statement
HDL	High Density Lipoprotein
BP	Blood Pressure
HOMA-IR	Homeostatic model assessment-Insulin Resistance
NHMS	National Health and Morbidity Survey
PSQI	Pittsburg Sleep Quality Index
CRP	C-reactive protein
GPAQ	Global Physical Activity Questionnaire
sFFQ	Semi-quantitative Food Frequency Questionnaire
HEI-M	Healthy Eating Index for Malaysia
MDG	Malaysian Dietary Guidelines
WC	Waist Circumference
IASO	International Association for the Study of Obesity
IOTF	International Obesity Task Force
TG	Triglyceride
FBG	Fasting Blood Glucose
GATS	Global Adult Tobacco Survey
BW	Body Weight
MLR	Multiple logistic regression
DM	Diabetes Mellitus

CHAPTER 1

INTRODUCTION

1.1 Background

Frailty is defined as a biologic syndrome with reduced physiological reserve and resistance toward the stressors events and leads to several adverse outcomes, such as falls, delirium and fluctuating disability (Fried *et al*., 2001). According to McDermid and Bagshaw (2014), the adaptive mechanism, complexity and threshold of human body for illness or injury will be reduced during ageing, and the threshold is referred as the "physiological reserve". Frailty involves several inter-related physiological systems, such as abnormality of the immune , skeletal muscle and cardiovascular systems (Clegg, Young, Iliffe, Rikkert, & Rockwood, 2013). Globally, the population aged 60 years and above had increased from 8.0% in 1950 to 11.0% in 2009, with the proportion of elderly people is expected to achieve 22% in the year 2050 (Department of Economic & Social Affairs, 2009). Simultaneously, the proportion of people aged 60 years and above in Asia had increased from approximately 6% in 1980 to approximately 11% in 2017, which is expected to reach approximately 24% in the year 2050 (Department of Economics & Social Affairs, 2017). Malaysia, as one of the Asia countries, is also experiencing aging (Pala, 1998). The proportion of elderly aged 65 years and above is estimated to be 6.2% or 32 million population in year 2017, and the proportion of elderly is expected to exceed 7.0 % in year 2020 (Department of Statistics Malaysia, 2017b). Besides the magnitude of aging population, the speed of ageing is alarming. While it took 45 years, 69 years and 115 years for United Kingdom, United States and France to double their aging population, a less developed country like Malaysia is expected to double our aging population from 7% in 2020 to 14% in 2043, within less than a quarter of a century.

Corresponding with the increase in older adult population, the prevalence of frailty continues to increase. In the European Union research project, SHARE (Survey of Health, Aging and Retirement in Europe), covering 10 countries, approximately 6% to 27% over 65 years old 3European population was found to be frail (Santos-Eggimann *et al*., 2009), with almost half of the population older than 85 years old were frail (Walston *et al*., 2002). In Asian countries, the prevalence of frailty varies widely. Among the Asian countries, the highest prevalence of frailty was reported in Beijing (12.81%) and Hong Kong (12.91%), which is comparable to the prevalence reported in European countries (Chen, Wu, Chen, Lue, 2010; Jung *et al*., 2014; Kojima *et al*., 2017; Woo, Zheng, Leung, & Chan, 2015). In Malaysia, a cross-sectional study conducted among individual aged 60 years and above in urban area found that 67.7% of the individuals were pre-frail, while 5.7% of them were frail (Sathasivam, Kamaruzzaman, Hairi, Ng, & Chinna, 2015). Despite the prevalence of frailty in Malaysia was relatively low compared to other western and Asian countries, it was higher compared to Singapore (Merchant et al., 2017). A possible reason of such variations maybe due to the use of different diagnosis criteria, for example the use of Fried's Frailty

Phenotype (Fried *et al.,* 2001) in Malaysia, FRAIL scale (Morley, Malmstrom, & Miller, 2012) in Singapore and frailty index developed by researcher in Beijing and Hong Kong may result in different in prevalence. With the increasing proportion of the older population, it is expected that prevalence of frailty will continue to increase among Malaysian, which can increase the burden of the individual, society, and countries, especially on the medical cost.

Study conducted by Fried *et al*. (2001) in Cardiovascular Health Study (CHS) found that risk of worsening was relatively higher among severe frail individual compared to their pre-frail counterparts. The same study also showed that the 7-year adjusted mortality hazard ratio was 1.63 for individual with severe frailty, and the mortality rate was three-fold higher in frail individual (43%) compared to those non-frail (12%) (Fried *et al*., 2001), which was supported by other cohort studies (Rockwood *et al*., 2004; Bandeen-Roche *et al*., 2006; Ensrud *et al*., 2008). Despite aging of human is expected to accompany with the decrease in physiological reserve, however the rate or degree of decrease in the physiological reserve is accelerated in individual suffering from frailty while homeostatic mechanism will start to decrease (Ferrucci *et al*., 2002; Taffett *et al*., 2003).

In addition to the risk of worsening disability, frailty can increase the risk of cardiovascular diseases (CVD) (Avila *et al*., 2014; Sachis *et al*., 2014; Sergi *et al*., 2015; Veronese *et al*., 2017) amd CVD-related mortality risk (Veronese *et al*., 2017). The increased risk of CVD and mortality rate not only impose a burden to frail individual but also to the nation healthcare burden. In Canada, the median cost for cardiac surgery was $32,742 for frail patients, which accounted for additional 40% as compared to non-frail patients (median cost = $23,370) (Goldfarb *et al*., 2017). In Malaysia, CVD remains as the principal cause of mortality, with 13.2% of the population died due to Ischaemic heart diseases (Department of Statistics Malaysia, 2017a). In view of the high prevalence of CVD and its related complications and with the higher cost for cardiac surgery for the frail patients, increased of frailty population is expected to increase the disease burden of the nation.

Several studies had shown the relationship between socio-demographic factors, such as age, marital status and educational were associated with risk of frailty (Chen *et al*., 2010; da Alexandre *et al*., 2014; García-Peña, Ávila-Funes, Dent, Gutiérrez-Robledo, & Pérez-Zepeda, 2016; Moreira & Lourenco, 2013; Runzer-Colmenares *et al*., 2014; Woo, Zheng, Leung, & Chan, 2015). Recent cohort study also demonstrated an association between dietary quality with frailty among the elderly in Hong Kong (Chan, Leung, & Woo, 2015). In addition, studies also proposed the relationship between metabolic syndrome (MS) and insulin resistance (IR) with frailty in older adults (García-Esquinas *et al*., 2015; Hoogendijk, Huisman, & van Ballegooijen, 2017; Pérez-Tasigchana *et al*., 2017) as well as components of MS such as low density lipoprotein (LDL) cholesterol and triglycerides (Mara dos Santos Tavares *et al*., 2016). Several lifestyle behaviours, such as smoking behaviour (Etman, Kamphuis, van der Cammen, Burdorf, & van Lenthe, 2015; García-Peña *et al*., 2016; Lee, Auyeung, Leung,

Kwok, & Woo, 2014; Ottenbacher *et al*., 2009; Wang *et al*., 2013; Woods *et al*., 2005), sleeping quality (de Almeida Holanda, Oliveira Guerra, & Araújo, 2014; Nóbrega, Maciel, Moreno-Tamayo, Manrique-Espinoza, Rosas-Carrasco, Pérez-Moreno, & Salinas-Rodríguez, 2017), and sedentary lifestyle (da Alexandre *et al*., 2014; Woo *et al*., 2015) may also influence frailty. On the other hand, body weight status may have an association with frailty (Badrasawi *et al*., 2017; Blaum, Xue, Michelon, Semba, & Fried, 2005; Tavares *et al*., 2016).

1.2 Problem Statement

Most of the studies on frailty was conducted among the elderly in view of this age group is more susceptible to frailty. However, frail and pre-frail may present as early as middle-aged. A study conducted by Santos-Eggimann *et al*. (2009) found that 4.1% of the middle-aged adult was frail and 37.4% were pre-frail. Hence, frailty can occur as early as during the middle-aged and should not be neglected. Without any preventive measures, the tendency to progress from pre-frail to frail is likely to occur, and thus can increase the prevalence of frailty in later stage of life.

Compared to men, women are more likely to develop frailty and pre-frailty (Chen *et al*., 2010; Santos-Eggimann *et al*., 2009). In Taiwan, the prevalence of developing frail in women was two-fold higher compared to their male counterparts (Chen *et al*., 2010). Previous local study found that female was reported a higher score of physical disability compared to male (Faizal, Zuriati, Chan, & Siti Nur 'Asyura, 2017). This may be due to longer life expectancy of female compare to male. Similarly, Chinese ethnicity may have a higher prevalence of frailty, especially among Chinese female. The average life expectancy of Chinese female is 80.2 years, which is the highest among three main ethnicities in Malaysia (Department of Statistics Malaysia, 2017). Wang *et al*. (2014) explained that longer life expectancy might be related to better socioeconomic status and healthcare system, however longer life expectancy at the same time may increase the prevalence of morbidity and disability, as increased number of individual is living with diseases and disability. On the other hand, it has been long suggested that the reduce in oestrogen level during menopause was associated with decline in muscle strength and mass, which is the core of frailty (Carcaillon et al., 2012). It is evident that several studies had been conducted in other Asia or Chinese population elsewhere, however it should be noted that population and culture in different country maybe different from the population in Malaysia, as Malaysia is a multi-ethnics country and Malaysian Chinese may have adapted culture and practice from other ethnicity, such as eating and lifestyle behaviour. In the local context, limited studies had been conducted to assess the prevalence of frailty, especially among Chinese ethnicity. It is unclear on the magnitude of frailty among postmenopausal Chinese women.

With the increasing life expectancy and prevalence of frailty, it is an important perspective to consider the factors that are associated with frailty in Malaysian

population, especially among the postmenopausal Chinese women. In addition, several studies conducted in other countries on frailty are mainly focused among elderly aged 60 years and above, while limited studies are available among the middle-aged adult, especially postmenopausal women. Nonetheless, studies conducted in local context only explored the relationship on sociographic factors, cognitive and physical function, and anthropometry indicators. To the best of knowledge, risk factors being studied are mainly on the socio-demographic factors, such as age, marital status, educational level, while how dietary factors, metabolic syndrome, and lifestyle factors may be associated with frailty are highly lacking. Recognizing the magnitude and risk factors of frail is important in improving the health of the population, the present study aimed to investigate factors associated with frailty among postmenopausal Chinese women.

The following are the research questions to be answered in this study:

1. What are the relationships between socio-demographic factors (age, marital status, year of education), dietary quality index (DQI), MS and its components, lifestyle factors (smoking behaviour, sleeping quality, and sedentary behaviour) and anthropometry indicators (body mass index (BMI), percentage of body fat, PBF and Skeletal Muscle Mass, SMM) with risk of frailty among the postmenopausal Chinese women?
2. Which factors contribute significantly to frailty among the postmenopausal Chinese women?

1.3 Significance of the study

As a developing country, the proportion of elderly in Malaysia had increased consistently due to better healthcare system and longer life expectancy. However, longer expectancy may accompany with higher rate of morbidity and disability. One of the concerns may be due to reduced muscle mass or sarcopenia, which may link to development of frailty and other morbidities. It is evident that the risk of frailty may not only presented during elderly, but as early as middle-aged. Obtaining such data is imperative for the formulation of appropriate intervention strategies.

In addition, several risk factors, such as dietary quality, metabolic syndrome, lifestyle factors (smoking behaviour, sleeping quality, and sedentary lifestyle) and anthropometry indicators (BMI, PBF and SMM) may play a role on frailty, which had not been tested among the local community as a comprehensive model. The identification of modifiable factors is helpful in providing information to policy maker and health care professional for guideline and intervention development. This allows health care professional to identify and target risk factors which may lead to the development of frailty, thus delay and prevent the onset of frailty.

Results obtained from the study may also serve as a baseline data for future study. Future study can explore more on the effect of socio-demographic factors,

dietary quality, metabolic syndrome and its components, lifestyle factors and anthropometry indicators with frailty among postmenopausal Chinese women.

1.4 Objective

1.4.1 General Objective

To determine factors that contribute to the risk of frailty among postmenopausal Chinese women from selected affiliates of NACSCOM in Kuala Lumpur and Selangor.

1.4.2 Specific Objectives

1. To assess the following variables among postmenopausal Chinese women
    i. prevalence of pre-frailty and frailty,
    ii. socio-demographic background (age, marital status, and year of education),
    iii. Dietary Quality Index (DQI),
    iv. Metabolic Syndrome (MS) and its components,
    v. lifestyle factors (smoking behaviour, sleeping quality, and sedentary behaviour),
    vi. anthropometry indicators (BMI, PBF, and SMM)
2. To determine the mean difference on socio-demographic factors, DQI, MS and its components, lifestyle factors and anthropometry indicators among postmenopausal Chinese women with and without risk of frailty.
3. To determine the associations between socio-demographic factors, DQI, MS and its components, lifestyle factors and anthropometry indicators with risk of frailty among postmenopausal Chinese women.
4. To determine factors that contribute to the risk of frailty among postmenopausal Chinese women.

1.5 Hypothesis

H_A1: There are significantly mean difference on socio-demographic factors, DQI, MS and its components, lifestyle factors and anthropometry indicators among postmenopausal Chinese women with and without risk of frailty.

H_A2: There are significant associations between socio-demographic factors (age, marital status, year of education), DQI, MS and its components, lifestyle factors (smoking behaviour, sleeping quality, and sedentary behaviour) and anthropometry indicators (BMI, PBF

and SMM) with risk of frailty among postmenopausal Chinese women.

H_A3: There are factors contribute significantly to the risk of frailty among postmenopausal Chinese women.

1.6 Conceptual Framework

Figure 1.1 showed the conceptual framework of the potential factors that contributed to risk of frailty. Factors which may contributed to risk of frailty are sociodemographic factors, such as age (Chen *et al*., 2010; da Alexandre *et al*., 2014; García-Peña *et al*., 2016; Moreira & Lourenco, 2013; Runzer-Colmenares *et al*., 2014; Woo *et al*., 2015), marital status (Chen *et al*., 2010; Runzer-Colmenares *et al*., 2014), and year of education (Chen *et al*., 2010; da Alexandre *et al*., 2014; García-Peña *et al*., 2016; Moreira & Lourenco, 2013; Woo *et al*., 2015), DQI (Chan *et al*., 2015; Shikany, Barrett-Connor, Ensrud, Cawthon, & Lewis ., 2014), MS and its components (García-Esquinas *et al*., 2015; Hoogendijk, Huisman, & van Ballegooijen, 2017; Pérez-Tasigchana *et al*. 2017; Tavares *et al*., 2016), lifestyle factors, such as smoking behaviour (Etma *et al*., 2015; García-Peña *et al*., 2016; Ottenbacher *et al*., 2009; Woods *et al*., 2005), sleeping quality (Kim *et al*., 2015; Moreno-Tamayo *et al*., 2017; Nóbrega *et al*., 2014), and sedentary behaviour (Song *et al*., 2015; Theou, Blodgett, Godin, & Rockwood, 2017; Virtuoso Júnior *et al*., 2017), and anthropometry indicators, such as BMI (Badrasawi *et al*., 2017; Boutin *et al*., 2017; García-Esquinas *et al*., 2015; Hubbard, Lang, Llewellyn, & Rockwood, 2010; Mezuk, Lohman, Rock, & Payne, 2016; Sheehan, O'Connell, Cunningham, Crosby, & Kenny, 2013) PBF (Cesari *et al*., 2006; Porter, McDonald & Bales, 2014; Sipilä *et al*., 2004) and SMM (Williams *et al*., 2018). Sociodemographic factors and anthropometry indicators were studied in previous local studies, thus these were included in the conceptual framework. Several modifiable factors such as dietary quality and lifestyle factors had been studied in several Western and Asian countries; however, the data on the associations between dietary quality and lifestyle factors and frailty were lacking in local context. As several components of MS (increased blood pressure, triglyceride and blood glucose level) may co-exist with frailty among the middle-aged population, thus it is worthwhile to explore the potential relationships between MS and risk of frailty. In short, potential factors such as socio-demographic factors (age, marital status, year of education), DQI, MS and its components, lifestyle factors (smoking behaviour, sleeping quality, and sedentary behaviour) and anthropometry indicators (BMI, PBF and SMM) which may contribute to the risk of frailty are examined in the present study.

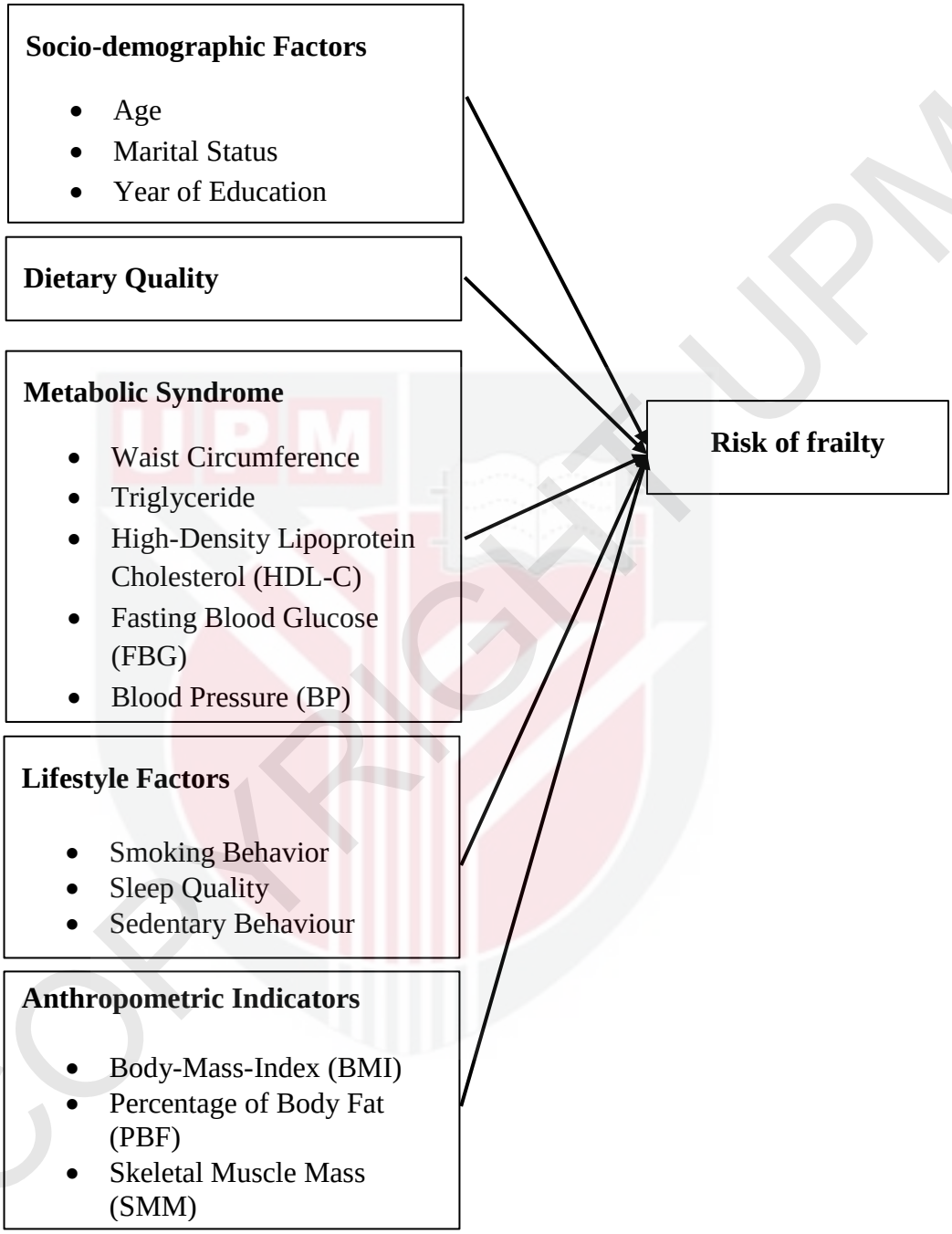

Figure 1.1: Conceptual Framework of Study

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