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PREVALENCE OF GERIATRIC MALNUTRITION AND ITS ASSOCIATED FACTORS AMONG RESIDENTS AT RUMAH SERI KENANGAN CHERAS, SELANGOR

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This project entitled “Prevalence of geriatric malnutrition and its associated factors among residents at Rumah Seri Kenangan Cheras, Selangor” was prepared by Putri Nabila binti Zulfakar and submitted to Faculty of Medicine and Health Sciences as a partial fulfillment of the requirement for the degree of Bachelor of Science (Nutrition and Community Health) from the Faculty of Medicine and Health Sciences, Universiti Putra Malaysia.

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LIST OF ABBREVIATIONS

WHO	World Health Organization
BMI	Body Mass Index
WC	Waist Circumference
MUAC	Mid Upper Arm Circumference
CC	Calf Circumference
MNA	Mini Nutritional Assessment
MNA-SF	Mini Nutritional Assessment Short Form
MSQ	Mealtime Satisfaction Questionnaire
GDS	Geriatric Depression Scale
RNI	Recommended Nutrient Intake
MDG	Malaysian Dietary Guidelines
NHMS	National Health and Morbidity Survey
RSK	Rumah Seri Kenangan

ABSTRACT

PREVALENCE OF GERIATRIC MALNUTRITION AND ITS ASSOCIATED FACTORS AMONG RESIDENTS AT RUMAH SERI KENANGAN CHERAS, SELANGOR

Putri Nabila binti Zulfakar

Elderly often suffered from many diseases including geriatric malnutrition. However, there were still limited studies and inconsistent findings conducted on this issue especially among elderly resided in care home. This cross-sectional study aimed to determine the prevalence of geriatric malnutrition and its associated factors among residents at Rumah Seri Kenangan Cheras, Selangor. A researcher-administered questionnaire was used to determine the socio-demographics characteristics, medical history, mealtime experience, lifestyle factors (physical activity, smoking status, alcohol use), depression and nutritional status of the respondents. Weight, height, body mass index (BMI), waist circumference (WC), calf circumference (CC) and functional status were measured. Meanwhile, a two-day diet history was used in the interview session to assess the respondents' dietary intake. A total of 81 respondents (48 men and 33 women), aged 60 years and above, resided for at least a month length of stay were recruited. Majority of the respondents were Malay (69.1%), single (42.0%) with the mean age and mean monthly income of 73.41±7.84 years and RM 75.85±204.27, respectively. Besides, 59.3% of them had a hospital admission history and 80.2% of them consumed less than three medication per day. The mean BMI was 24.96±4.90 kg/m^2 where almost half of them had a normal weight (48.1%). In addition, 58.0% and 25.9% had abdominal obesity and muscle wasting with mean of 86.55±12.06 cm and 31.75±4.01 cm, separately. Most of them consumed daily energy (91.4%) as well as fruits and vegetables (86.4%) below the recommended requirement. More than half of them were also satisfied with their mealtime experience (70.4%), participated in physical activity (59.3%), non-smoker (70.4%), non-drinker (95.1%), and had weak handgrip strength (69.1%). The overall prevalence of geriatric malnutrition was 16.1% while 33.3% of them were found to be at risk of malnutrition. After performing the bivariate analysis, BMI ($p<0.001$), WC ($p<0.05$), CC ($p<0.001$), fruits and vegetables consumption ($p<0.05$), functional status ($o<0.05$) and depression ($p<0.05$) were all correlated significantly with MNA screening score. In conclusion, the findings of the study confirmed that geriatric malnutrition and the risk of malnutrition were prevalent among institutionalized elderly people and this situation urged for appropriate multidimensional nutritional approach in order to improve their nutritional status, health and quality of life of the elderly.

ABSTRAK

KELAZIMAN MALNUTRISI GERIATRIK DAN FAKTOR-FAKTOR YANG BERKAITAN DENGANNYA DALAM KALANGAN PENGHUNI DI RUMAH SERI KENANGAN CHERAS, SELANGOR

Putri Nabila binti Zulfakar

Golongan warga emas sering dikaitkan dengan pelbagai jenis penyakit antaranya termasuklah malnutrisi geriatrik. Walaubagaimanapun, masih terdapat kajian yang terhad dan tidak konsisten dijalankan berkenaan isu ini terutamanya dalam golongan warga emas yang tinggal di rumah penjagaan orang tua. Kajian keratan lintang ini bertujuan untuk menentukan prevalens malnutrisi geriatrik dan faktor-faktor yang berkaitan dengannya dalam kalangan penduduk di Rumah Seri Kenangan Cheras, Selangor. Soal selidik yang telah divalidasi digunakan untuk menentukan perkara peribadi, sejarah perubatan, pengalaman waktu makan, gaya hidup, kemurungan dan risiko malnutrisi para responden. Berat, tinggi, indeks jisim badan, ukur lilit pinggang, ukur lilit betis dan kekuatan genggaman tangan diukur. Manakala, sejarah pengambilan makanan diambil melalui sesi temu bual untuk menentukan pengambilan makanan responden. Seramai 81 orang responden (48 lelaki dan 33 wanita), berumur 60 tahun dan ke atas, yang tinggal di rumah penjagaan tersebut sekurang-kurangnya selama sebulan telah dipilih. Majoriti responden adalah lelaki (69.1%), bujang (42.0%) dengan purata umur 73.41±7.84 tahun dan pendapatan bulanan sebanyak RM 75.85±204.27. Selain itu, 59.3% daripada mereka mempunyai sejarah kemasukan ke hospital dan 80.2% daripada mereka mengambil ubat-ubatan kurang daripada tiga jenis sehari. Purata indeks jisim badan pula adalah 24.96±4.90 kg/m^2 di mana separuh daripada mereka mempunyai status berat badan yang normal. Tambahan pula, 58.0% dan 25.9% daripada mereka mempunyai obesiti abdomen dan pembaziran otot dengan puratanya adalah 86.55±12.06 cm dan 31.75±4.01 cm. Kebanyakan daripada mereka mengambil tenaga harian (91.4%) serta buah-buahan dan sayur-sayuran (86.4%) kurang daripada yang telah disarankan. Lebih separuh daripada mereka pula berpuas hati dengan pengalaman waktu makan (70.4%), melakukan aktiviti fizikal (59.3%), tidak merokok (70.4%), tidak mengambil minuman keras (95.1%), dan mempunyai kekuatan genggaman tangan yang lemah (69.1%). Secara keseluruhannya, prevalens malnutrisi geriatrik adalah 16.1% manakala 33.3% mencatatkan risiko malnutrisi. Setelah menjalankan analisis, indeks jisim badan ($p<0.001$), ukur lilit pinggang ($p<0.05$), ukur lilit betis ($p<0.001$), pengambilan buah-buahan dan sayur-sayuran ($p<0.05$), kekuatan genggaman tangan ($p<0.05$) and kemurungan ($p<0.05$) didapati mempunyai hubungkait yang signifikan dengan malnutrisi geriatrik. Kesimpulannya, hasil kajian ini menunjukkan bahawa malnutrisi adalah lazim dalam kalangan warga emas di rumah penjagaan. Perancangan intervensi yang sesuai diperlukan untuk meningkatkan status pemakanan, kesihatan dan kualiti hidup mereka.

CHAPTER 1

INTRODUCTION

1.1 Background

The population of elderly is progressively increasing. In the developing world, the elderly population is seen to represent the fastest growing segment of the population. The World Health Organization (2002) state that United Nation defined aging or elderly as a person who aged 60 years and above. Malaysia had agreed that the cut-off of older people age is 60 years and above. On the other hand, most developed world countries have accepted the chronological ages of 65 years.

Based on World Population Data Sheet (2019), Asia and Europe are considered as the world's oldest population of those who ages 65 years and above. This include Japan (28%), Monaco (26%) and Italy (23%). In addition, 12% of China's overall population is age 65 and above. The WHO stated that by 2050, the world's population aged 60 years and older is expected to total 2 billion, up from 900 million in 2015. In the second quarter of 2019, Malaysia's population of the elderly aged 65 years and above is 2.19 million which is 5.8% of the total population compared to second quarter 2018 (2.09 million) were recorded by Department of Statistic Malaysia. However, the percentage of elderly is expected to increase by 14.5% of the total population in 2040 (Department of Statistics Malaysia, 2016). This

remarkable phenomenon is being driven by the low birth rate, low fertility and increase life expectancy. As the older people live longer with a fewer child entering the population, this will help older people to contribute more to the total population of the world.

As the number of elderly increases, so too will their health needs. The World Health Organization (WHO) has acknowledged that aging and nutrition is a growing global challenge where there is a need to document all nutrition and health status to control morbidity rate. It is well established that elderly also prone to have common nutritional related problem such as malnutrition. According to WHO (2017) malnutrition is defined as all forms of poor nutrition in which can be categorized into undernutrition (wasting, stunting, underweight), micronutrient-related malnutrition, overnutrition (overweight, obesity) in which may cause diet-related non-communicable diseases (NCDs) such as diabetes, heart diseases and stroke. Older people are particularly vulnerable to malnutrition, as there are many practical problems with the availability of adequate nutrition (Palacios-Ceña et al., 2013). With increasing age, though both lean body mass and basal metabolic rate declines that leads to reduction in energy requirement, the necessity for other vital nutrients rises (Krishnamoorthy et al., 2018).

According to WHO (2017), undernutrition is significant with older population over 60 years old. It was reported that the prevalence of undernutrition among elderly living in the community ranges between 1.3% and 47.8%. Meanwhile, National Health and Morbidity Survey: Elderly Health (2018) reported that 3 in 10 elderly in Malaysia had malnutrition or risk of malnutrition in which 7% and 24% of elderly in Malaysia were malnutrition and at risk of malnutrition respectively. Since the malnutrition score based on the Mini Nutritional Assessment-Short Form (MNA-

SF) of at risk of malnutrition and malnutrition were combined as malnutrition, the national findings revealed that the prevalence of malnutrition among elderly in Malaysia was 30.8% meanwhile 5% of elderly was found to had muscle wasting (NHMS, 2018).

The developmental, economic, social and medical effects of the global burden of malnutrition are severe for individuals and their families, societies and countries especially vulnerable groups such as elderly. Therefore, this study is conducted to assess the prevalence of malnutrition and its associated factors among elderly at s RSK Cheras, Selangor.

1.2 Problem statement

Elderly population was likely to suffer from malnutrition than other population (Solomons & Bermudez, 2017). Based on several studies that had been conducted, the researchers mentioned that prevalence of older people who were at risk of malnutrition was relatively increased in their studies, whilst they point out that nutritional screening in these groups could prevent a possible aggravation of their nutritional status in the future (Vassilakou, Triantafillou, & Evrenoglou, 2017). This study is supported by a study on malnutrition among older adults living in Portuguese nursing homes where the risk of malnourished respondents was 38.7% which was considered high (Madeira et al., 2019). All these data showed that elderly has increasing trend of malnutrition besides of having limited evidence based that focused on prevalence of malnutrition among elderly especially at care homes in Malaysia.

In fact, malnutrition could lead to negative health outcomes especially for the elderly that is considered as vulnerable population. Based on WHO (2017),

malnutrition can cause diet-related non communicable disease such a diabetes, heart disease and stroke. Other than that, a study done by Abd, Eldardery, Mo, and Fouad (2018) showed that malnutrition can cause increase morbidity, decrease quality of life and mortality. This study was in line another recent study that reported malnutrition associated with increased risk of falls, immune dysfunction, decreased quality of life, more hospitalizations and higher mortality (Madeira et al., 2019). Hence, malnutrition will place significant burdens on healthcare and other support devices if the elderly population not taking this issue seriously (Zainudin, Hamirudin, Nor, & Sidek, 2019).

Next, there were limited studies regarding geriatric malnutrition has been done at care homes. Most of the studies in Malaysia (Aung, 2016; Tatt et al., 2019; Zainudin et al., 2019; Zainudin et al., 2016; Zakaria, Lim, & Lee, 2019) tend to focus more on community-dwelling and hospitalized elderly despite of having several studies that comparing the result of malnutrition's prevalence between free-living elderly and those who stayed at care homes. There was a study reported that elderly in geriatric homes were more vulnerable to malnutrition due to certain factors such as loneliness and familiarity of environment. (Abd et al., 2018). This study was supported by Madeira et al. (2019) where the prevalence was even higher when considering malnutrition at nursing homes. In Malaysia, the recent study by Aung (2016) reported that 25.0% of residents from several nursing homes under Pahang Social Welfare Department in Kuantan, Pahang was found to be malnourished.

In addition, there were limited studies on factors associated with geriatric malnutrition. For instance, socio-demographics characteristic, medical history, anthropometric measurement, dietary factors, lifestyle and physical activity were the common identified risk factors that had been assessed in the studies regarding

malnutrition (Aung, 2016; Lee & Muda, 2019; Zainudin et al., 2019; Zainudin, Haslinda, Nor, Rahman, & Sidek, 2016). However, there were limited studies about depression and functional status whereas there was no study has been carried out about mealtime experience in association with geriatric malnutrition in Malaysia.

Hence, this study aimed to determine the prevalence of geriatric malnutrition and its associated factors (socio-demographic characteristics, medical history, anthropometric measurement, dietary intake, mealtime experiences, lifestyle, functional status and depression) among the residents at RSK Cheras, Selangor. This study addressed the following research questions:

1. What is the prevalence of geriatric malnutrition among residents at RSK Cheras, Selangor?
2. What are the associations between socio-demographic characteristic, medical history, anthropometric measurement, dietary intake, mealtime experience, lifestyle, functional status and depression with geriatric malnutrition among residents at RSK Cheras, Selangor?

1.3 Significance of the Study

Hopefully, this study could help to provide updated information regarding the prevalence of geriatric malnutrition and reveal the associations between the factor associated such as socio-demographic characteristic, medical history, anthropometric measurement, dietary intake, mealtime experience, lifestyle, functional status and depression with geriatric malnutrition among residents at RSK Cheras, Selangor. Hence, it could indirectly fill the gaps in existing knowledge in past research. Moreover, the findings from this study could help to provide baseline data that act as a reference in conducting future research regarding geriatric malnutrition.

Lastly, the data from this study could provide insight for appropriate preventive measures to overcome rising nutritional status issue among elderly. It would help to provide beneficial information for the policymakers as well as help to inform the health professional, government and non-government organization to develop and implement effective intervention strategies for the elderly population in Malaysia. Besides, it could help the care-homes related organizations such as Department of Social Welfare in designing program and providing better services to combat this issue. Thus, it could ensure the elderly age healthily and safely.

1.4 Objectives

1.4.1 General objective

To determine factors associated with geriatric malnutrition among residents at RSK Cheras, Selangor.

1.4.2 Specific objectives

1. To determine socio-demographic characteristic (age, gender, ethnicity, marital status, educational level, past occupation, source of income, monthly income), medical history (past hospitalization, comorbidities, family history, number of medication), anthropometric measurement (weight, height, body mass index, waist circumference, calf circumference), dietary intake, mealtime experience, lifestyle (physical activity, smoking status, alcohol use), functional status (handgrip strength) and depression among residents at RSK Cheras, Selangor.
2. To assess prevalence of geriatric malnutrition among residents at RSK Cheras, Selangor.

3. To determine associations between socio-demographic characteristic, medical history, anthropometric measurement, dietary intake, mealtime experience, lifestyle, functional status and depression with geriatric malnutrition among residents at RSK Cheras, Selangor.

1.5 Hypotheses

There are significant associations between socio-demographic characteristic, medical history, anthropometric measurement, dietary intake, mealtime experience, lifestyle, functional status and depression with geriatric malnutrition among residents at RSK Cheras, Selangor.

1.6 Conceptual framework

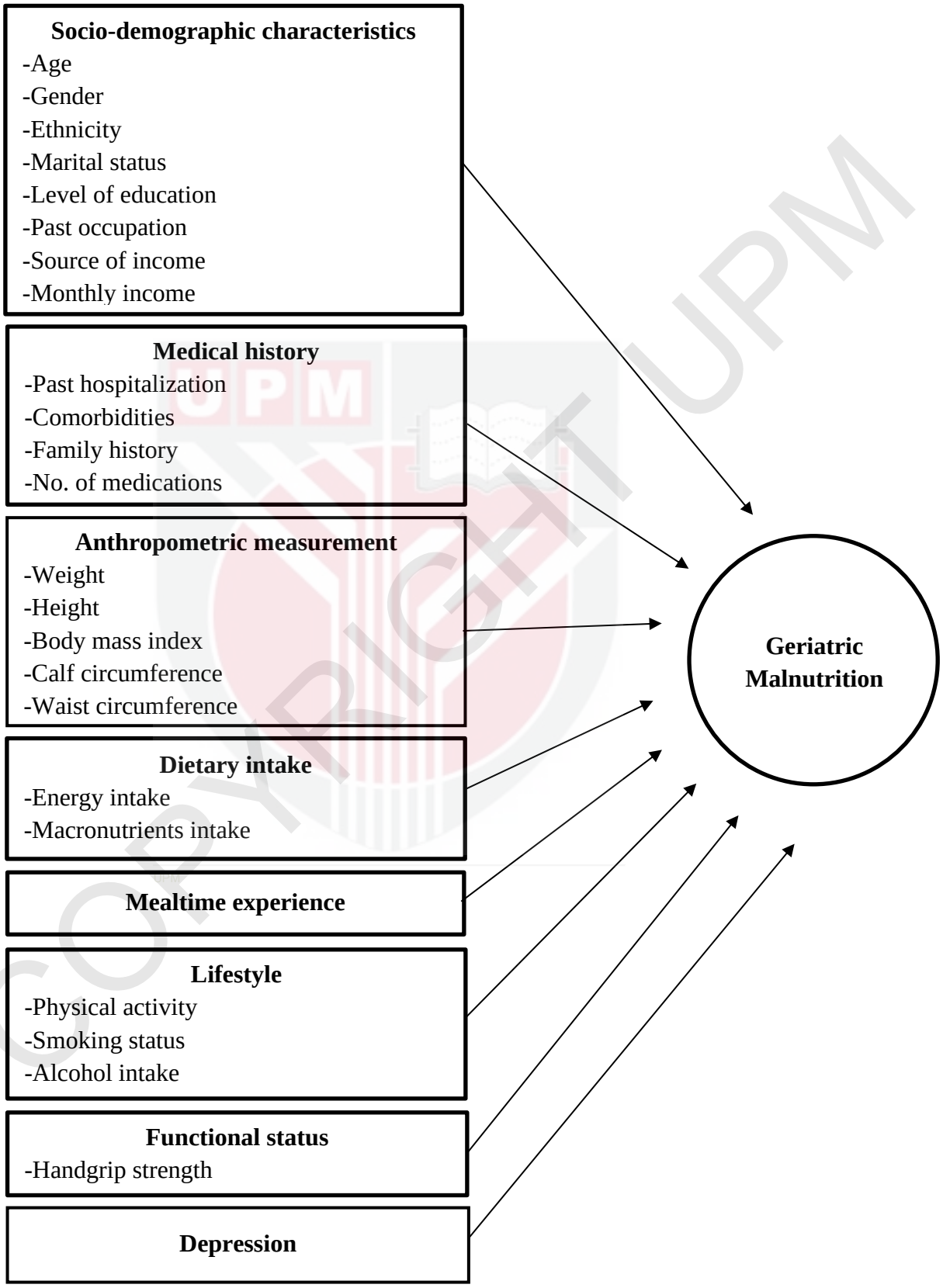

Figure 1.1 Research conceptual framework

In this study, the independent variables were socio-demographic characteristic (age, gender, ethnicity, marital status, educational level, past occupation, source of income, monthly income), medical history (past hospitalization, comorbidities, family history, number of medication), anthropometric measurement (weight, height, body mass index, waist circumference, calf circumference), dietary intake (energy and macronutrients intake), mealtime experience, lifestyle (physical activity, smoking status, alcohol use), functional status (handgrip strength) and depression while the dependent variable was geriatric malnutrition among residents at RSK Cheras.

CHAPTER 2

LITERATURE REVIEW

2.1 Prevalence of geriatric malnutrition

In the previous study, most of the researchers defined malnutrition as having poor nutrition in which included undernutrition and overnutrition (WHO, 2017; Gupta et al., 2018, 2018; Nakamura et al., 2018; Pengpid & Peltzer, 2017).

In Malaysia, the prevalence of malnutrition among elderly population reported in National Health and Morbidity Survey, NHMS (2018) was 30.8%. Apart from that, a study by Zainudin et al. (2018) among Malaysian elderly living in agricultural settlements had been done on the same year and using the same instrument which was Mini Nutritional Assessment (MNA) tool to assess malnutrition. It was found that 25.7% of elderly individuals were identified as malnourished and at-risk of being malnourished.

On the other hand, a Malaysian study regarding malnutrition which using anthropometric parameters of body weight, standing weight, BMI, mid upper arm circumference (MUAC) and waist circumference (WC) as indices to measure

malnutrition reported that overall prevalence of undernutrition was 17.4% as defined by BMI less than 18.5 kg/m^2 (Chen et al., 2012).

Other than that, a study among geriatric population living in high-altitude region in India found that 19.4% was reported of having malnutrition (Mathew et al., 2016). Another study by Shi et al. (2015) which also using MNA-SF to assess malnutrition reported that only 3.2% respondents aged 60 years and above in Chongqing, China were found to be malnourished. Meanwhile, a recent study by Madeira et al. (2019) reported that 4.8% of Portuguese population aged 65 years and over living in nursing homes were considered as malnourished. However, a study by Vassilakou et al. (2017) found that no one was malnourished while 25.8% of the total sample of free-living elderly were at risk of malnutrition.

Another study by Aung (2016) reported that 70% and 25% of institutionalized elderly were at risk of malnutrition and malnourished . This study was conducted at several nursing homes which located at Kuantan, Pahang that had been registered under Pahang Social Welfare Department. Similar finding was found in a Brazilian study among 1239 elderly from 29 nursing homes in Bahia, Brazil as more than half of the participants (66.3%) were categorized as at risk of malnutrition and malnourished according to Mini Nutritional Assessment (MNA).

Saghafi-Asl and Vaghef-Mehrabany (2017) reported that a significant difference was found in both short and long MNA scores among subjects in nursing homes and community dwelling where no community dweller was found to be malnourished whereas nearly half of the subjects from nursing home were malnourished. As regard to this condition, they also reported that the community dwellers had more satisfactory anthropometric measures, dietary intake as well as biochemical findings due to their eating dependency and better cognitive function.

Table 2.1 Prevalence of geriatric malnutrition worldwide

Author	Respondents and Location	Instruments	Prevalence of malnutrition (%)
Chen et al. (2012)	236 participants aged 60 years and above resided in government-funded shelter home in Northern Peninsular, Malaysia	Anthropometric parameters	17.4
Shi et al. (2015)	558 individuals aged 60 years and above in the region of Chongqing, China	Mini Nutritional Assessment – Short Form	3.2
Aung (2016)	80 elderly from several nursing homes under Pahang Social Welfare Department in Kuantan, Pahang	Mini Nutritional Assessment – Short Form	25.0
Mathew et al. (2016)	Respondents aged 60 years and above in high-altitude region of Nainital District, North India	Full Mini Nutritional Assessment	19.4
Vassilakou, Triantafillou & Evrenoglou (2017)	151 free-living people aged over 65 years in Athens, Greece	Full Mini Nutritional Assessment	25.8% was at risk of malnutrition
Win et al. (2017)	2252 veterans age 65 and older from home based primary care program	Mini Nutritional Assessment – Short Form	
NHMS (2018)	Elderly aged 59 years and above at non-institutional living quarters (LQ) in Malaysia	Mini Nutritional Assessment – Short Form	30.8
Zainudin et al. (2018)	413 individuals aged 60 years and above in agricultural settlements in Kuantan, Pahang	Mini Nutritional Assessment – Short Form	25.7
Madeira et al. (2019)	Elderly population aged 65 years and over living at nursing homes in Portuguese	Full Mini Nutritional Assessment	4.8

2.2 Factors associated with geriatric malnutrition among elderly

2.2.1 Socio-demographic characteristics

Previous studies stated malnutrition has been significant associated with several socio-demographic characteristics characteristic such as gender, ethnicity, marital status, educational level and monthly income. A study done by Pierre et al. (2017) on prevalence of nutritional status (undernutrition and obesity) among elderly living in the capitals of Central African Republic and Republic of Congo at revealed that gender and occupation had significant association ($p<0.0001$) with malnutrition where women (81.6%) more likely to develop malnutrition than men (18.4%). And for the occupation aspects, participants that involve in storekeeper/commercial job (42.5%) are prone to be malnourished that those who were employee (25.3%), farmer/breeder (21.9%) and no activity (2.3%).

Other than that, there was a study on prevalence and risk factors of malnutrition among geriatric population living a high-altitude region of India shown that education level had significantly associated ($p<0.000$) with malnutrition. This study was done by Gupta et. al (2018) reported that those with high school certificate and above (37.0%) highly associated with good malnutritional status compared to those who illiterate (19.6%), primary school (19.5%) and middle school (27.1%) where it might due to better social conditions and better access to food.

In Malaysia, the prevalence of malnutrition was significantly higher in females (31.6%) compared to males (30.1%) based on the MNA-SF (NHMS, 2018). In addition, NHMS (2018) also reported that malnutrition was higher among elderly in rural areas (40.2%), single (40.8%), no formal education (46.4%), unemployed (31.9%) as well as monthly income of less than RM1000 (35.2%).

2.2.2 Medical history

A few studies reported to consider medical history into measurements of malnutrition. Based on a study among free-living elderly in Athens, presence of diabetes mellitus ($p<0.05$), hypertension ($p<0.03$), osteoporosis ($p>0.0001$)and daily consumption of more than three prescribed medications ($p<0.0001$) were corelated significantly with MNA screening score (Vassilakou et al., 2017).

Another study done by Reeves et al. (2014) where it was reported that overall rates of hospital admission increase with malnourished especially among women where total admission rates were significantly higher in both overweight and obese woman compared to women with BMI of 22.5 to <25 kg/m^2.

2.2.3 Anthropometric measurements

Anthropometric measurements that usually included in assessing malnutrition were weight, height, body mass index (BMI), weight loss, waist circumference and calf circumference. A study done by Madeira et al. (2019) showed that BMI had a significant association with nutritional status which assessed using MNA tool among nursing home residents aged 65 years old and above in Portugal. This study had been supported by another study among elderly in nursing homes at Kuantan Pahang where there was a significant association between BMI and level of nutritional status (Aung, 2016).

However, Zainudin et al. (2018) revealed that malnutrition had no significant association ($p>0.05$) with BMI. Apart from that, Chen et al. (2012) assessed malnutrition using BMI where BMI less than 18.5 kg/m^2 indicated as undernutrition while BMI more than 25 kg/m^2 for overnutrition.

2.2.4 Dietary intake

From the reviewed literature, there were several studies reported that dietary intake was significantly associated with malnutrition. According to a study conducted by Gupta et al. (2018), intakes of energy, protein and carbohydrate (all $p<0.05$) were found to be significantly higher among overweight/obese male respondents than among respondents with normal BMI in which the dietary intake of nutrients was assessed using the one day 24-hour dietary recall method. On top of that, the diets of the geriatric respondents were found to be high in fat which double the RDA. On top of that, almost half of the participants who had less than 2 full meals daily were reported to be malnourished (29.7%).

Another study among Malaysian adults which aged between 20 to 65 years old shown that only the intake of energy contributed by carbohydrate and fat had significant but weak negative correlation with the nutritional status (Lee & Abdul Manan, 2019). There was also reported that only the carbohydrate intake had a significant negative association with the malnutrition and the waist circumference measurements.

This study also supported by another studies from Merchant et al. (2009) and Halkjaer et al. (2016) which also being stated in the study by Lee & Abdul Manan (2019). It was reported that both studies found weak association between carbohydrate with malnutrition and waist circumference in which Mechant et al. (2009) stated that maybe due to only the carbohydrate quantity was investigated not the source or quality of macronutrients where it could be considered as the limitation in this study. Varies in findings might be due to the method of data collection and type of questionnaire being used to assess the dietary intake.

2.2.5 Mealtime experience

Mealtime experience can be defined as the satisfaction of nutritional intake which include some of the important aspects such as the mealtime schedule, interaction of personnel and resident during mealtimes and interaction among residents during mealtimes. There is very little available evidence about mealtime experience especially among elderly in residential care settings as compared to hospitalized patients. A few studies that are available were mostly in form of qualitative studies that focused on investigating the perspectives of older adults regarding their mealtime experience. Simon (n.d.) presented the findings of their perspectives based on six aspects. One of the aspects was about nutrition quality where the interviewees felt the menu was developed with proper nutrition in mind.

Another study also included food as one of the themes in understanding meal experience among nursing home residents where it was revealed that food was perceived as privilege, sign of autonomy and normality and a measure of personal identity (Palacios-Ceña et al., 2013). Apart from that, a study regarding prevalence and determinants of poor food intake of residents living in long-term care by Keller et al. (2017) reported that mealtimes had moderate scores for person-centeredness, social and physical environment that supported mealtime experience and ambiance.

2.26 Lifestyle

2.2.6.1 Physical activity

Physical activity can be defined is defined as any bodily movement produced by the contraction of skeletal muscle or any body movement that works muscle and uses more energy than when resting (Hami, 2017). According to NHMS (2018), the overall prevalence of being physically active among elderly was 70.2% meanwhile

23.2% of elderly population in Malaysia reported to live a high level of sedentary behaviour. On the contrary, findings from a study on older people (aged 60 years and above) physical activity assessment in Kelantan by Hami (2017) revealed that respondents who were inactive comprised of 73.8% compared to active respondent which only 26.2%. Varies in findings for physical activity level might be due to the method of data collection and the types of questionnaire being used to assess physical activity level.

On top of that, there was also association being reported between physical activity and malnutrition worldwide. Based on a study on physical mobility, physical activity and obesity among Swedish elderly aged 65 years and older, a strong independent association ($p<0.001$) was found between physical activity and malnutrition. Asp et al. (2017) revealed that elderly who were inactive (22%) were more often malnourished compared to active elderly (13%). Another study also showed that physical exercise 30 min or more three times per week was associated with malnutrition (BMI $\geq$30 kg/m^2) in the elderly (Nuertey et al., 2017).

2.2.6.2 Smoking status

Based on NHMS (2018), one in ten were classified as current smokers (13.3%) which more males (25.6%) compared to females (1.6%) were current smokers among elderly population in Malaysia. This study also revealed that the most popular smoked tobacco product used among current smokers was manufactured cigarettes (10.1%).

From the reviewed literature, there were several studies that reported on the association between smoking status and malnutrition Several studies found that non-smokers are likely to develop malnutrition than smoker (Pierre et al. (2017); Nuertey

et al., 2017) A study by Jesus et al. (2017) revealed that tobacco use is slightly higher associated with malnourished individual. This might be due to anorectic effect from nicotine in tobacco that caused decrease in food intake and weight loss. Same findings were found in a study among registered pensioners in Ghana where the prevalence of underweight stratified by smoker was 14.0% compared to obesity of 8.6% (Nuertey et al., 2017).

2.2.6.3 Alcohol intake

There were several studies had been conducted to investigate the association between alcohol intake and malnutrition. Most of these studies reported that there was a significant association between alcohol intake and malnutrition (Mathew et al., 2016; Nuertey et al., 2017; Jesus et al., 2017; Kwong Hui, et al. 2017). However, the results were varied and controversial whether obesity was more prevalent among alcoholic drinker or non-alcoholic drinker.

According to Nuertey et al. (2017), elderly who does not drink alcohol (75.2%) had been shown to more likely to be well-nourished compared to those who consumed alcohol (24.8&). The finding from this study is consistent with a study done by Pierre et al. (2017) which revealed that those who take in alcohol was highly associated (54.0%) with malnutrition. Same goes to finding from Kwong Hui et al. (2017) where ever-drinker were more likely to be well-nourished.

2.2.7 Functional status

The functional status of the elderly determines their ability to perform basic self-care tasks and live independently. A study done by Agarwalla, Saikia, & Baruah (2015) revealed that there was a significant association ($p<0.05$) between functional

and nutritional status among elderly and also corroborated with other studies. Similar observation was also revealed by Mathew et al. (2016) and Madeira et al. (2019) in their studies among older adults living in urban area in Coimbatore and Portuguese nursing homes, respectively. However, there was no significant association ($p>0.05$) reported among functional status with malnutrition risk among elderly living in agricultural settlements (Zainudin et al., 2019).

2.2.8 Depression

Depression is a common mental illness and at its worst, could lead to suicide. According to NHMS (2018), 1 in 10 elderly are depressed in which 12% and 11% of women and men respectively reported to have depression. It was also reported that elderly without spouse (11%) were prone with being depressed than those with spouse (9%).

A few studies found to show an association between depression and malnutrition among elderly worldwide. Based on study regarding depression and malnutrition association in elderly women from Ahmadi et. al (2015), a significant correlation was found between BMI and GDS score. Other than that, it was reported that total body fat and BMI were significantly higher in depressed women.

On the other hand, BMI in both men and women were found to have no association with depression (Tatt et al., 2019). Despite insignificant, the study found that undernourished and at risk of malnutrition in respondents tends to increase the risk reporting depression while malnourished does not elevate or reduces the risk. Another previous study in Sri Lanka by Damayanthi, Moy, Abdullah, & Dharmaratne (2018) that focusing on community-dwelling older adults also reported that depression was not significantly associated with malnutrition.

Table 2.2 Factors associated with geriatric malnutrition

Factors	Author	Respondents and Location	Instrument	Findings
Socio-demographic characteristics	Pierre et al. (2017)	990 participants aged 65 years and above living in Central African Republic and Republic of Congo	Questionnaire	Gender and occupation were significantly associated with geriatric malnutrition.
	A. Gupta et al. (2018)	Respondents aged 60 years and above in high-altitude region of Uttarakhand, India	Questionnaire	Education level has significant association with geriatric malnutrition.
Medical history	Vassilakou et al. (2017)	151 free-living elderly over 65 years at N. Philadelphia	Questionnaire	Diabetes mellitus, hypertension, osteoporosis and daily consumption of >3 medication were correlated significantly with MNA score.
	Reeves et al. (2014)	50-64 years old from 1251619 Million Women Study participants in UK	Questionnaire	Hospital admission were significantly higher in malnourished women.
Anthropometric measurements	Madeira et al. (2019)	Elderly population aged 65 years and over living at nursing homes in Portuguese	Physical assessment	BMI had a significant association with malnutrition.
	Zainudin et al. (2018)	413 individuals aged 60 years and above in agricultural settlements in Kuantan, Pahang	Physical assessment	Malnutrition had no significant association with BMI.
	Chen et al. (2012)	236 participants aged 60 years and above resided in government-funded shelter home in Northern Peninsular, Malaysia	Physical assessment	BMI less than 18.5 kg/m^2 indicated as undernutrition

Dietary intake	A. Gupta et al. (2018)	Community-dwelling geriatric respondents aged 60 years and above in high-altitude region of Uttarakhand, India	24-hour dietary recall	Consumption of 2 full meals daily were significantly associated with malnutrition.
	Lee & Muda (2019)	490 Malaysians aged between 20 to 65 years old in Penang and Kota Bharu	24-hour dietary recall	Energy intake contributed by carbohydrate and fat had significant but weak negative correlation with the nutritional status.
Mealtime experience	Simon (n.d.)	Older adults aged 65 years and older lived in independent and assisted living centres	Semi-structured interview	Six aspects of mealtime experience might affect the nutritional status.
	Palacios-Ceña et al. (2013)	60 years and above residents of nursing home in Madrid	Semi-structured interview	Food is important to understand meal experience.
	Keller et al. (2017)	628 residents from 32 nursing homes in Canada	Semi-structured interview	Mealtime had moderate scores for person-centredness, social and physical environment.
Physical activity	Asp, Simonsson, Larm, & Molarius (2017)	558 men and women aged 65 years and older who participated in a population survey in 2012 in mid Sweden	International Physical Activity Questionnaire (IPAQ)	A significant association was found between physical activity and malnutrition.
	Nuertey et al. (2017)	4813 pensioners in Ghana	Study Questionnaire	≥30 minutes physical exercise per week was associated with malnutrition.
Smoking consumption	Nuertey et al. (2017)	4813 pensioners in Ghana	Study Questionnaire	Tobacco use was slightly higher associated with malnourished individuals.
	Pierre et al. (2017)	990 Participants aged 65 years and above living in Central	Questionnaire	Smokers were likely to become malnourished.

		African Republic and Republic of Congo		
Alcohol intake	Hui et al. (2017)	181 respondents with mean 44.7 ± 16.2 in Northern Borneo	Structured Questionnaire	Significant association was found between alcohol intake and malnutrition.
	Pierre et al. (2017)	990 Participants aged 65 years and above living in Central African Republic and Republic of Congo	Study Questionnaire	Significant association was found between alcohol intake and malnutrition.
Functional status	Mathew et al. (2016)	Respondents aged 60 years and above in high-altitude region of Nainital District, North India	Instrumental Activities of Daily Life (IADL)	Significant association was found between functional status and malnutrition.
	Madeira et al. (2019)	Elderly population aged 65 years and over living at nursing homes in Portuguese	Instrumental Activities of Daily Life (IADL)	Significant association was found between functional status and malnutrition.
	Zainudin et al. (2018)	413 individuals aged 60 years and above in agricultural settlements in Kuantan, Pahang	Instrumental Activities of Daily Life (IADL)	No significant association found.
Depression	(Ahmadi et al., 2015)	125 women elderly aged 50 years old at Shiraz, Iran	Geriatric Depression Scale – 15 (GDS-15)	Significant association found.
	(Tatt et al., 2019)	112 free-living elderly residents aged 60 years and above in Kajang	Geriatric Depression Scale – 15 (GDS-15)	No significant association found.

CHAPTER 3

METHODOLOGY

3.1 Study design

Cross-sectional study design was used in this study to assess prevalence of malnutrition and determine the association between socio-demographic characteristic, medical history, anthropometric measurement, dietary intake, mealtime experience, lifestyle, functional status and depression with geriatric malnutrition among residents at RSK Cheras, Selangor.

3.2 Study location

This study conducted in Kajang, Selangor. Selangor was located on the west coast of Peninsula Malaysia, encircling Kuala Lumpur where Shah Alam is the capital city of Selangor. It was the most developed state in Malaysia which encompassed an area approximately 7957 square kilometres as being stated in Open Government Data from Official Website of Selangor Government. Selangor was also considered as the most populous state in Malaysia with 6,528,400 residents in the second quarter of 2019 (Department of Statistics Malaysia, 2019). Based on data from the Department of Statistics Malaysia (2018), the estimated number of males and females in Selangor was 3.36 and 3.11 million people in the year 2018

respectively. Meanwhile, Kajang was one of the growing cities in Selangor with estimated population is 342,000 people. It was about half an hour's drive from Kuala Lumpur. The specific location to recruit respondents for this study was Rumah Seri Kenangan Cheras, Selangor. This selected care home comprised residents from various ethnicities where it provided services such as protection, counselling and treatment for elderly.

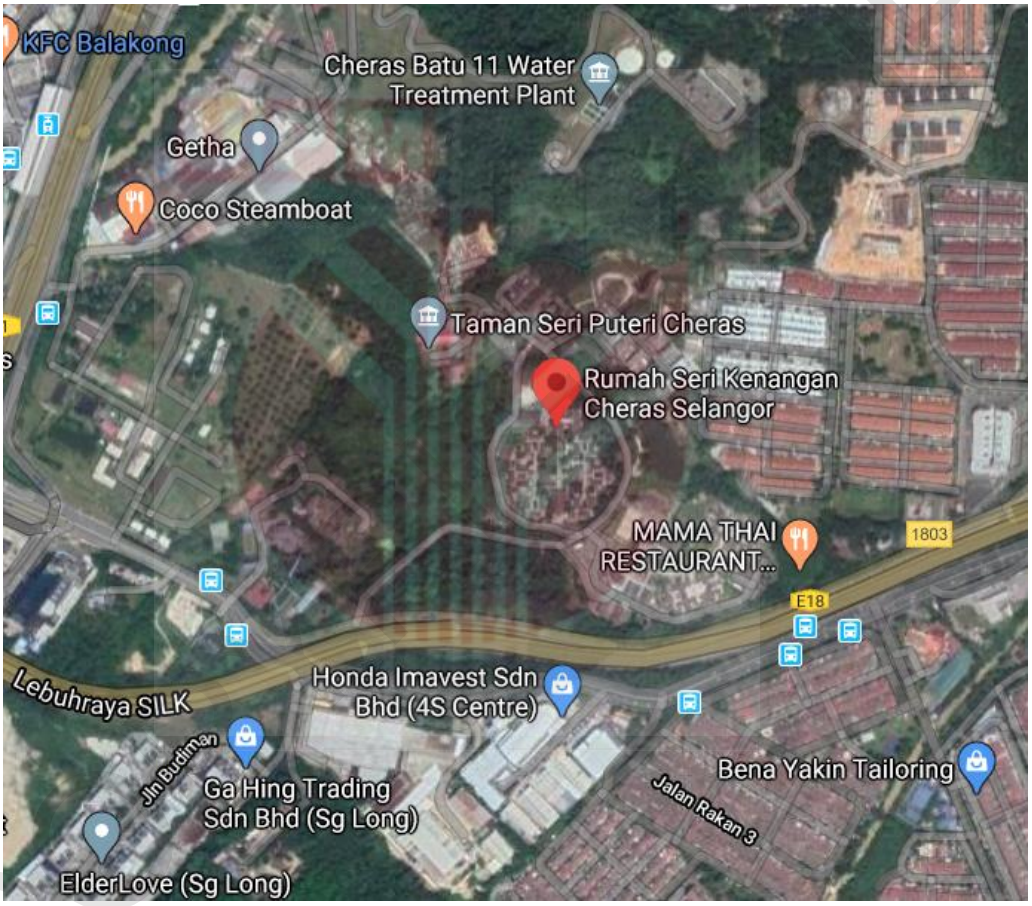

Figure 3.1 Location of Rumah Seri Kenangan Cheras

3.3 Sample size determination

The sample size for the study was calculated by using sample size calculation method by Hulley et al. (2013)

Sample size, $N = [(Z\alpha+Z\beta)/C]^2 + 3$

$C = 0.5 * \ln [(1+r)/(1-r)]$

Where;

$Z\alpha$ = 1.96

$Z\beta$ = 0.84 (80%)

r = the expected correlation coefficient

Based on Table 3.1, *r* value was estimated from a study by Abd, Eldardery, Mo, & Fouad (2018) as it was the highest sample size calculated, N = 113. Additional 20% of respondents was added for non-response, missing data, unavailability of respondents or refusal to participate. Therefore, the sample size of this study was calculated as below:

$C = 0.5 * \ln [(1+0.218)/ (1-0.218)] = 0.222$

$N = [(1.96+0.84)/0.222]^2 + 3$

= 113 respondents

= 113 + [113 x (20/100)

= 136 respondents

Table 3.1 Calculation of sample size

Studies	Prevalence (%)	Sample size, N
Prevalence of malnutrition among older people in the region of Chongqing. (Shi et al., 2015)	3.2	$N = \frac{1.96^2(0.032)(1-0.032)}{0.05^2}$ = 48
Malnutrition risks and associated factors among population of Chinese older adults in Hong Kong (Wong et al., 2019)	1.1	$N = \frac{1.96^2(0.011)(1-0.011)}{0.05^2}$ = 17
Prevalence of malnutrition among older adults living in Portuguese nursing homes (Madeira et al., 2019a)	4.8	$N = \frac{1.96^2(0.048)(1-0.048)}{0.05^2}$ = 70
Studies	**Correlation, r**	**Sample size, N**
Risk Factors of Malnutrition among Elderly at Geriatric Homes in Cairo (Abd et al., 2018)	0.218 (Age)	C = 0.5 * ln [(1+0.218)/ (1-0.218)] = 0.222 N = $[(1.96+0.84)/0.222]^2 + 3$ = 113
	0.286 (Medication)	C = 0.5 * ln [(1+0.286)/ (1-0.286)] = 0.294 N = $[(1.96+0.84)/0.294]^2 + 3$ = 94
Preliminary findings of malnutrition risk factors among older adults in a care home (Siti Al-Baidakh, Barakatun-Nisak, & Noraida, 2019)	0.48 (BMI)	C = 0.5 * ln [(1+0.48)/ (1-0.48)] = 0.52 N = $[(1.96+0.84)/0.52]^2 + 3$ = 32
	0.51 (CC)	C = 0.5 * ln [(1+0.51)/ (1-0.51)] = 0.56 N = $[(1.96+0.84)/0.56]^2 + 3$ = 28

3.4 Sampling design

The type of sampling designs that had been chosen in this study were purposive, simple random and convenience sampling. There was a total of 99 care homes in Selangor were identified according to the Department of Social Welfare's official website. Rumah Ehsan, Rumah Seri Kenangan Cheras and Pusat Sehenti Bina Diri Sungai Buloh were purposively selected as those three were government-funded care homes. And from the three care homes, RSK Cheras was randomly selected. Researcher then approached the residents who met the inclusion and exclusion criteria to participate in the study after getting information from the caregivers there.

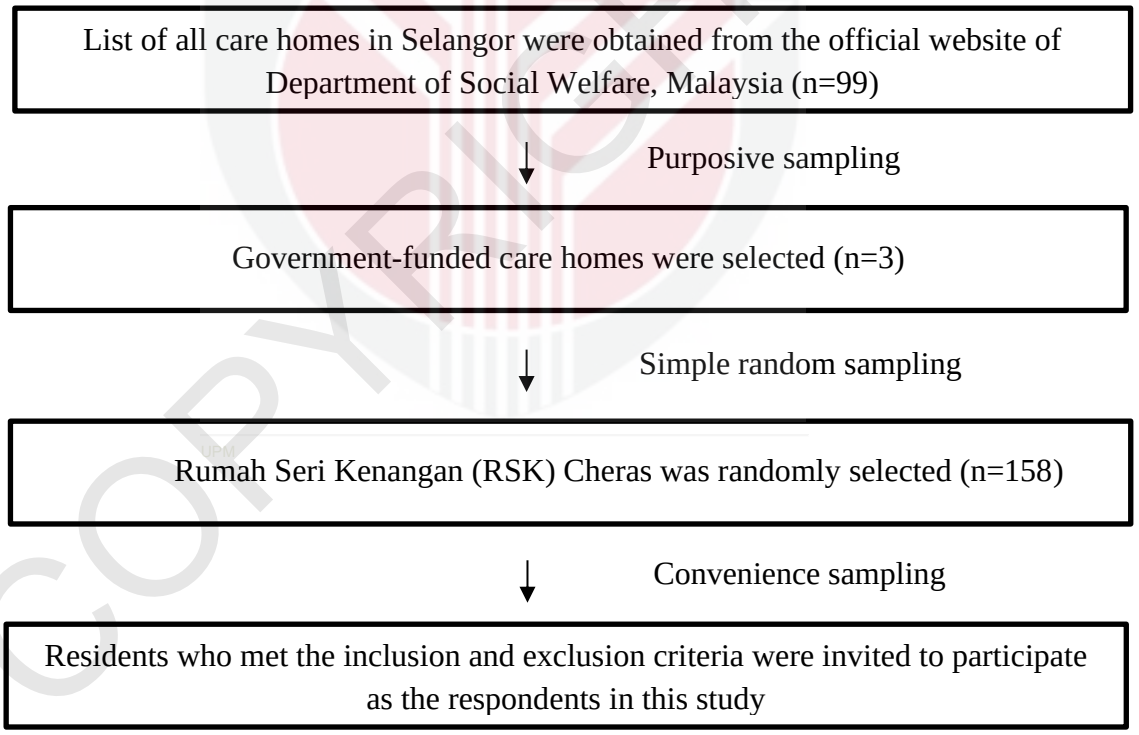

Figure 3.2 Flow chart of sampling procedure

3.5 Respondents

The respondents for this study were Malaysian elderly aged 60 years old and above with no special relationship with the researcher and currently stay at RSK Cheras for at least a month length of stay. Meanwhile, residents who were unable to communicate, diagnosed with mental illness and critically ill were excluded from this study. As a result, 81 out of 158 residents of RSK Cheras that met the study criteria were participated in the study.

3.6 Measurements

The instruments used in this study included researcher-administered questionnaire in form of interview which combined items of socio-demographic characteristics, medical history, mealtime experience, lifestyle, depression, geriatric malnutrition and dietary intake. Anthropometric measurements which includes weight, height, waist circumference, calf circumference along with the assessment for functional status were also conducted by the researcher. Detailed descriptions of each measure in this study were listed below.

3.6.1 Questionnaire

Respondents were assessed using a set of Malay questionnaire consists of open-ended and multiple choices answer through a face-to-face interview with the researcher.

3.6.1.1 Socio-demographic characteristics

The information needed regarding socio-demographic characteristics which included age, sex, ethnicity, marital status, educational level, source of income and

personal monthly income were collected during the interview. Age and monthly income were asked through open-ended questions whereas sex, ethnicity, marital status, educational level and source of monthly income were asked through close ended questions.

3.6.1.2 Medical history

The information needed regarding medical history were assessed based on several components such as past hospitalization, comorbidities, family history, treatment and number of medications taken. Only past hospitalization and number of medications taken were asked through open-ended questions.

3.6.1.3 Mealtime experience

Mealtime experience were assessed by using Mealtime Satisfaction Questionnaire (MSQ) which was develop by Keller (2013) to measure the overall satisfaction of meals and mealtime experience of older adults living in retirement or long-term care. This questionnaire consisted of 14-question where each of the item were rated using four-point Likert scales ranging from 0 to 3 in which most of the time=3, sometimes=2, rarely=1 and never=0. The total score was generated by summing all 14-item that yielding a range from 0 to 42 scores. The scoring was distributed into unsatisfied (0-14), neutral (15-29) and satisfied (30-42). The higher the scores indicated higher level of satisfaction of mealtime experience. Even though MSQ was never been used in Malaysia, it was reliable to use in this study with Cronbach Alpha of 0.882 that considered as good internal consistency.

3.6.1.4 Lifestyle

Lifestyle was divided into three parts which were physical activity, smoking status, and alcohol use. All these parts were assessed using a self-developed questionnaire in which there were a total of four questions for each part that focusing on the frequency, amount and type.

Physical activity was measured based on F.I.T.T components which stood for frequency, intensity, time and type of exercise. The respondents were first asked whether they participate or not in any physical activity in order to get the prevalence of active and inactive respondents. They might skip the next three questions on type, duration and frequency of performing the physical activity when they answer 'no' for the first question.

As for the smoking status, the respondents were assessed using following questions; 'Do you smoke?', 'How often do you smoke?', 'How many cigarettes do you smoke in a day?' and 'What type of tobacco product(s) do you smoke?'. From the first question, the data on the prevalence of smokers and non-smokers were obtained.

Finally, the alcohol use was assessed by interviewing the respondents whether they were consuming alcoholic beverages or not to get the prevalence of current drinkers and non-drinkers. When they answer 'yes' for the first question, the type of alcoholic beverages consumed, amount and frequency of consuming the alcoholic beverages were further asked.

3.6.1.5 Depression

Short Geriatric Depression Scale (GDS) that consisted of 15-items of 'yes' or 'no' question was used in this study to assess depressive symptoms in this study. Each respondent was asked to respond 'yes' or 'no' for each question. GDS score less than 6 was categorised as normal, in between 6 to 8 as mild, 9 to 12 as moderate while 13 to 15 as severe depressive symptoms. Question 1, 5, 7, 11 and 13 were going to be reverse scored. In addition, higher GDS score indicated more symptoms and higher severity (Tatt et al., 2019). This shorter version of GDS 15-item scale was validated against the 30-item scale and it was recommended to be used in primary care. Based on Greenberg (2018), it was extensively used in the community, acute and long term care settings as it was easy to administer and took about five to seven minutes to completes. Besides, the GDS was found to have a 92% sensitivity and 89% specificity when evaluated against diagnostic criteria. In validation study which comparing the long and short form of GDS, both were successful in differentiating depressed from non-depressed adult with high correlation ($r = 0.84$, $p < 0.001$).

3.6.1.6 Geriatric malnutrition

The geriatric malnutrition was measured by using a Mini Nutritional Assessment Short Form (MNA-SF) that belonged to Nestle Nutrition Institute (NNI). MNA-SF questionnaire detected elderly with malnourished or at risk of malnutrition. This questionnaire included six questions which question A for decreasing in food intake, question B for weight loss, question C for mobility status, question D for psychological stress, question E for neuropsychological problem, question F1 for Body Mass Index (BMI) and question F2 for calf circumference (CC). There was no need to answer question F2 if question F1 was already completed. For scoring

purpose, total score of the points from part A until part F were summed up and classified into three classifications which were well-nourished with score 12 to 14 points, at risk of malnutrition with score 8 to 11 points and malnourished with MNA score less than 7 points. A study conducted by Vassilakou et al. (2017) had found that the sensitivity of this tool is estimated at 96%, its expertise at 98% and positive predictive value for detecting malnutrition at 97%.

3.6.2 Anthropometric measurement

3.6.2.1 Body weight and height

Body weight and height were measured using TANITA Digital Weight Scale HD319 and SECA stadiometer to the nearest 0.1 kg and 0.1 cm with minimal clothing and no shoes. Standard procedures of measuring weight and height were applied in which for weight, the weighing scale should be placed on flat, hard surface and calibrated at regular intervals. Meanwhile, for height, the head must be positioned in the Frankfort horizontal plan, feet together where heels, buttocks and shoulder were in contact with the wall.

3.6.2.2 Body mass index

BMI of the respondents were calculated by researcher based on a standard formula which was weight in kilograms divided by the square of height in metres to measure the weight status by height. The BMI then was categorized using standard classification from WHO (2002,2006) in which were defined as follows:

Table 3.2 WHO BMI classification

BMI (kg/m^2)	Classification
<18.5	Underweight
18.5 – 24.9	Normal weight
25.0 – 29.9	Overweight
30.0 – 34.9	Obese class I
35.0 – 39.9	Obese class II
≥40.0	Obese class III

3.6.2.3 Waist circumference

WC were measured using a Lufkin measuring tape at the smallest area below the rib cage and above the belly button. Respondents with WC more than 90 cm and 80 cm in men and women respectively were classified as having abdominal obesity (WHO/IASO/OTF, 2000). All measurements were taken twice, and the average value was used for data entry.

3.6.2.4 Calf circumference

Lufkin measuring tape was used to measure CC at its widest point while both of leg were folded to 90 degrees. The measurements of below than 30 cm and 27.3 cm was indicated as having muscle wasting for men and women, respectively (Sakinah et al., 2016). All measurements were taken twice, and the average value was used for data entry.

3.6.3 Functional status

Functional status of the respondents was measured using hand grip strength test as it had become a popular indicator of physical functioning in surveys especially among elderly (Musalek & Kirchengast, 2017). Measurement was performed with using a Jamar digital hand-hold dynamometer that calibrated first at the start of the

study. Handgrip strength was measured in a face-to-face assessment along with anthropometric measurements and performed using arm chosen by the respondents as the dominant one. Respondents were given the opportunity to grip the dynamometer in order to become familiar with the device. The procedure was performed twice. Normal references values in kilogram (kg) were taken according to age and sex as follows (Gaikwad, Gupta, Samarth, & Sankalecha, 2016):

Table 3.3 Cut-off references for handgrip strength

Age	Male			Female		
	Weak	Normal	Strong	Weak	Normal	Strong
60-64	<30.2	30.2-48.0	>48.0	<17.2	17.2-31.0	>31.0
65-69	<28.2	28.2-44.0	>44.0	<15.4	15.4-27.2	>27.2
70-99	<21.3	21.3-35.1	>35.1	<14.7	14.7-24.5	>24.5

3.6.4 Dietary intake

A two-day diet history was conducted to assess usual dietary intake of the respondents. During the interview, respondents were required to state their usual food and beverages intake for two days in which one day represented weekday while another one day represented weekend. The researcher recorded the information given including types of foods and beverages, time of consumption, portion size and cooking method. Aids such as picture of household equipment and the household measurements tools were used during the interview to improve the accuracy in estimating the portion sizes of the dietary intake consumption. All the information obtained were computed and analyzed using Nutritionist Pro software to get the estimated total energy, macronutrients (carbohydrate, protein, fat) and micronutrients intake.

Mean value intake of total energy and macronutrients was compared with

Recommended Nutrient Intake (RNI) for Malaysian to determine adequacy of the nutrient intake. The proportion of energy was 50-65%, 10-20% and 25-30% for carbohydrate (CHO), protein and fat, respectively (RNI, 2017). The value obtained in grams was converted into kilocalories (kcal) first by considering 1 gram of CHO = 4 kcal, 1 gram of protein = 4 kcal and I gram of fat = 9 kcal. The percentage of each macronutrient intake was calculated by diving the nutrient intake with total energy intake (both in kcal) and then multiplied with 100. Table 3.4 showed the recommendation of energy and macronutrients intake for elderly based on RNI 2017.

Table 3.4 Recommendation of energy, protein and fat intake for elderly

	Men	Women
Energy (kcal/day)	2030	1770
Protein (g/day)	58	50
Fat (g/day)	56-68	49-59

Total servings of fruit and vegetable per day were also obtained and compared with Malaysian Dietary Guidelines (MDG) 2010 in which the recommendation intake was five servings per day that consisted of two servings of fruits and three servings of vegetable.

3.7 Pre-testing

Pre-testing was carried out on approximately 10% of the actual sample sizes (136 respondents) which was among 14 residents from Pusat Jagaan dan Pendidikan Warga Emas Darul Insyirah, Bangi. The actual sample of the questionnaire was distributed and completed among the chosen respondents that had similar inclusion and exclusion criteria with the target population. Time taken for respondents to complete the questionnaire and interview session was recorded. The clarity of instructions and understanding of questions from the questionnaire was assessed. Moreover, problems encountered by respondents of pre-testing in answering the questionnaire was identified and corrected based on their feedback. The feasibility of questionnaire was re-assessed after pre-testing. The respondents for pre-testing were excluded during data collection of this study.

3.8 Data collection procedures

Data collection was conducted on February 2020. Before the commencement of the study, ethical clearance was obtained from UPM's Ethics Committee for Research Involving Human Respondents (Reference No: JKEUPM-2019-430). Besides, permission to conduct the data collection was granted from Department of Social Welfare (JKM) and head of RSK Cheras through official letter and phone call.

Information sheets was distributed among respondents to inform them regarding the purpose of this study and informed consent was obtained prior to the administration of the questionnaire. The respondents first completed the questionnaire specifically designed for the purpose of the study which took approximately 20 minutes and then followed by anthropometric measurements. The

respondents' information was kept confidentially by ensuring no personal details being written on the questionnaire booklet.

3.9 Data analysis

The statistical analysis was performed using IBM SPSS Statistic 22 with statistical significance level was set at $p<0.05$. Normality test was conducted first before further analyzed the data.

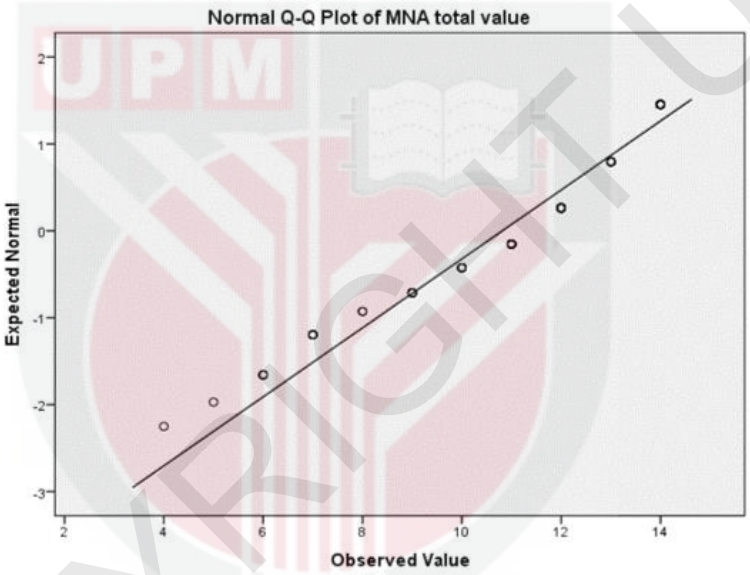

Figure 3.3 Normal Q-Q Plot of MNA total value

Since the data were found to be normally distributed, socio-demographic characteristic, medical history, anthropometric measurement, dietary intake, mealtime experience, lifestyle, functional status and depression data were presented as frequencies and percentages and as well as means and standard deviation. Similarly, prevalence of geriatric malnutrition data was also presented as frequencies and percentages and as well as means and standard deviation. Meanwhile, the associations between independent and dependent variables were tested using the Chi-square test and Pearson's product-moment correlation, respectively.

CHAPTER 4
RESULTS AND DISCUSSION

4.1 Socio-demographic characteristics

Socio-demographic characteristics of the respondents were presented in Table 4.1. A total of 81 residents from RSK Cheras were recruited as the respondents, 59.3% were men and 40.7% were women. Smaller sample size with 59.6% of participation was due to the COVID-19 pandemic as well as the implementation of Movement Control Order (MCO) by the Malaysian government during the period of data collection.

Based on Table 4.1, the age of respondents ranged from 61 to 92 years with the mean age of 73.41±7.84 years. In addition, majority of them were Malay which consisted of 69.1%, followed by Chinese (17.3%) and Indian (13.6%). The highest proportion of the respondents were single (42.0%) and had a secondary education level (38.3%). Other than that, most of them were self-employed (45.7%) before entering the care home and only 4.9% of them did not have any employment history.

Regarding the source of income, all the respondents received monthly pocket money of RM30 from RSK Cheras. In addition, approximately 4.9% and 3.7% of

them received pension and charity which resulted in the mean of monthly income was about RM75.85±204.27.

Table 4.1: Socio-demographic characteristics of the respondents (N=81).

Characteristics	Mean±SD	n (%)
Age (years)	73.41±7.84	
60-69		31 (38.3)
70-79		27 (33.3)
≥80		23 (28.4)
Gender		
Men		48 (59.3)
Women		33 (40.7)
Ethnicity		
Malay		56 (69.1)
Chinese		14 (17.3)
Indian		11 (13.6)
Marital status		
Single		34 (42.0)
Married		23 (28.4)
Divorced or widowed		24 (29.6)
Education level		
No formal education		18 (22.2)
Primary school		29 (35.8)
Secondary school		31 (38.3)
College or university		3 (3.7)
Previous occupation		
None		4 (4.9)
Self-employed		37 (45.7)
Government		19 (23.5)
Private		21 (25.9)
Source of income		
Pension		4 (4.9)
EPF		1 (1.2)
Charity		3 (3.7)
Family		1 (1.2)
Monthly income (RM)	75.85±204.27	

4.2 Medical history

In this study, medical history of the respondents which included past hospitalization, comorbidities, family history and total number of medication use were also being analyzed. Based on Table 4.2, more than half of them (59.7%) had been admitted into the hospital due to variety of health problems such as accident, surgery and asthma attack. Regarding morbidity profile, 40.7% of them had hypertension, 37.0% had diabetes and only 17.3% had heart attack. In addition, 23.5% of the respondents were reported to have a family history of diabetes followed by hypertension (21.0%) while minority of the respondents which was 8.6% had family history of dyslipidaemia.

Table 4.2: Medical history of the respondents (N=81).

Characteristics	Mean±SD	n (%)
Past hospitalization		
Yes		48 (59.3)
No		33 (40.7)
Comorbidities		
Diabetes		30 (37.0)
Hypertension		33 (40.7)
Heart disease		14 (17.3)
Family history		
Diabetes		19 (23.5)
Dyslipidemia		7 (8.6)
Hypertension		17 (21.0)
Use of medications	2.44±3.142	
Less than three per day		51 (63.0)
Three or more per day		30 (37.0)

Regarding the use of medication, it was highlighted that more than half (80.2%) of the evaluated residents used less than three medications in their everyday life to manage their health and general well-being. Respondents who admitted consuming several medications were mostly those who reported having at least one comorbidity.

4.3 Anthropometric measurement

The anthropometric measurement of the respondents was tabulated in Table 4.3. The mean weight and height were 59.25±13.64 kg and 153.7±10.37 cm, respectively. Meanwhile, the mean body mass index (BMI) for total respondents was 24.96±4.90 kg/m^2 which was categorised as normal. This can be further observed in the Table 4.3 where almost half of them (48.1%) reported to have normal weight followed by overweight (28.4%) and obese (16.0%) whereas only 7.4% (n=6) were underweight.

Table 4.3: Anthropometric variables of the respondents (N=81).

Variables	Mean±SD	n (%)
Weight (kg)	59.25±13.64	
Height (cm)	153.7±10.37	
Body mass index (BMI)	24.96±4.90	
Underweight (<18.5 kg/m^2)		6 (7.4)
Normal weight (18.5-24.9 kg/m^2)		39 (48.1)
Overweight (25.0-29.9 kg/m^2)		23 (28.4)
Obese (≥30.0 kg/m^2)		13 (16.0)
Waist circumference (cm)	86.55±12.06	
Normal		34 (42.0)
Abdominal obesity		47 (58.0)
Calf circumference (cm)	31.75±4.01	
Normal		60 (74.1)
At risk of muscle wasting		21 (25.9)

In addition, the table also showed that the prevalence of abdominal obesity among the respondents was 58.0% with the mean waist circumference of 86.55±12.06 cm. With regard to the muscle wasting, 25.9% of them was reported to have muscle wasting while majority of them (74.1%) had normal calf circumference measurement with the mean of 31.75±4.01 cm.

4.4 Dietary intake

Table 4.4 summarized the data on dietary intake of the respondents obtained from their two days diet history profiles. An additional column showed the summarized recommended range of intakes for both men and women. It was shown that the overall mean energy intake was 1352.89±371.08 kcal/day which considered lower than the recommended energy intake in the Recommended Nutrient Intake for Malaysia (RNI).

The mean intakes of carbohydrate, protein and fat were 173.95±54.62 g/day, 64.19±34.24 g/day and 47.80±15.30 g/day, respectively. The mean protein intake of the respondents exceeded the amount recommended whereas the mean fat intake was considered low as compared to the RNI. Meanwhile, the mean number of servings of fruits and vegetables consumed by the respondents was 2.75±1.45 servings per day. The Malaysian Dietary Guidelines (MDG) recommended at least five servings of fruit and vegetables every day which indicated that the respondents' intake did not reach the recommendations. It was shown that majority of the respondents (86.4%) did not consume adequate amount of fruit and vegetables.

Table 4.4: Energy, macronutrients, fruit and vegetables intake of the respondents (N=81).

Dietary intake	Mean±SD	n (%)	Recommendation
Energy (kcal/day)	1352.89±371.08		1770-2030 kcal
Carbohydrate (g/day)	173.95±54.62		50-58g
Protein (g/day)	64.19±34.24		49-68g
Fat (g/day)	47.80±15.30		
Fruit and vegetables	2.75±1.45		5 servings
None		11 (13.6)	
<5 servings		70 (86.4)	
≥5 servings		-	

Next, Table 4.5 showed the distribution of respondents by percentage of energy from carbohydrate, protein and fat. The mean percentage of total energy contributed by macronutrients was 51.21±6.31% for carbohydrate, 17.79±2.84% for protein and 31.91±6.74% for fat. The percentage of energy contribution recommended by the existing guidelines was 50-65%, 10-20% and 25-30% for carbohydrates, protein and fat, respectively.

It can be seen that only the mean percentage of fat intake slightly exceeded the suggested percentage range as compared to the mean percentage of carbohydrate and protein intake in which more than half of respondents (56.8%) consumed fat intake higher than the requirement. On the other hand, 55.6% (n=45) and 79.0% (n=64) of respondents fulfilled the carbohydrate and protein requirement in accordance to RNI for Malaysia.

Table 4.5: Percentage of energy intake from carbohydrate, protein and fat of the respondents (N=81).

Dietary intake	Mean±SD	n (%)
Percentage of energy from carbohydrate	51.21±6.31	
>50%		34 (42.0)
50-65%		45 (55.6)
>65%		2 (2.5)
Percentage of energy from protein	17.79±2.84	
<10%		1 (1.2)
10-20%		64 (79.0)
>20%		16 (19.8)
Percentage of energy from fat	31.91±6.74	
<25%		7 (8.6)
25-30%		28 (34.6)
>30%		46 (56.8)

4.5 Mealtime experience

In this study, mealtime experience was also being assessed using Mealtime Satisfaction Questionnaire (MSQ) to know the respondents' satisfaction toward important aspects such as the site where the food is served, the mealtime schedule, interactions among residents at mealtime as well as the personnel attitudes.

Table 4.6: Mealtime experience of the respondents (N=81).

Mealtime experience	Mean±SD	n (%)
Total MSQ score	31.62±7.48	
MSQ categories		
Unsatisfied (0-14)		3 (3.7)
Neutral (15-29)		21 (25.9)
Satisfied (30-42)		57 (70.4)

The mean score of MSQ among the respondents was 31.62±7.48 which considered high and indicating that the respondents satisfied with their mealtime experience. It was shown that only 3.7% (n=3) of respondents were unsatisfied while more than half of them (70.4%) feeling satisfied with their mealtime experience.

Table 4.7 showed all 14-item used in assessing the mealtime experience. Overall, it can be said that more than half of the respondents answered 'most of the times' for all 14 items. Question number four of 'Is there enough variety of foods to choose from?' reported to have the least 'most of the time' answer with 51.9% (n=42) but had the most 'never' answer with 13.6% (n=11) as compared to other questions. Meanwhile, almost all the respondents (90.1%) selected 'most of the time' for question number one whereas there were no respondents picked 'never' as an answer.

Table 4.7: Distribution of respondents (N=81) by Mealtime Satisfaction Questionnaire items.

MSQ items	Never n (%)	Rarely n (%)	Sometimes n (%)	Most of the time, n (%)
1. Are meals served at the right time of the day?	-	2 (2.5)	6 (7.4)	73 (90.1)
2. Do you recognize the foods on the menu?	1 (1.2)	2 (2.5)	10 (12.3)	68 (84.0)
3. Are you offered foods that you like?	6 (7.4)	6 (7.4)	24 (29.6)	45 (55.6)
4. Is there enough variety of foods to choose from?	11 (13.6)	8 (9.9)	20 (24.7)	42 (51.9)
5. Is the food appealing?	5 (6.2)	6 (7.4)	23 (28.4)	47 (58.0)
6. Do you like how the food tastes?	4 (4.9)	8 (9.9)	25 (30.9)	44 (54.3)
7. Are foods served at the right temperature?	1 (1.2)	6 (7.4)	17 (21.0)	57 (70.4)
8. Is the portion size right for you?	2 (2.5)	2 (2.5)	14 (17.3)	63 (77.8)
9. Do you look forward to dining with your tablemates?	6 (7.4)	8 (9.9)	19 (23.5)	48 (59.3)
10. Are you comfortable in the dining room?	10 (12.3)	9 (11.1)	17 (21.0)	45 (55.6)
11. Do you like the dining atmosphere?	8 (9.9)	9 (11.1)	21 (25.9)	43 (53.1)
12. Do the employees treat you with respect?	2 (2.5)	4 (4.9)	15 (18.5)	60 (74.1)
13. Are you happy with how the meals are served?	5 (6.2)	2 (2.5)	20 (24.7)	54 (66.7)
14. Overall, how satisfied are you with your mealtimes?	2 (2.5)	5 (6.2)	17 (21.0)	57 (70.4)

4.6 Lifestyle

Lifestyle factors of the respondents which consisted of physical activity, smoking and drinking status were also being analysed in this study. As shown in the Table 4.8, 59.3% of the respondents considered as physically active where 33.3% and 25.9% of them were categorized into participated in low and moderate physical activity intensity, respectively.

In addition, 21.0% of them were reported to engage in physical activity for at least 20 minutes, 37.0% for 20 to 60 minutes and only one respondent admitted

performing physical activity more than an hour. Most of them were basically participated in Tai Chi session organized by RSK Cheras on every Monday for 30 to 45 minutes. Besides, the mean frequency of physical activity among the respondents was 3.48±2.35 per week.

Table 4.8: Lifestyle variables of the respondents (N=81).

Variables	Mean±SD	n (%)
Physical activity		
Participation		
Yes		48 (59.3)
No		33 (40.7)
Intensity		
Low		27 (33.3)
Moderate		21 (25.9)
Duration (per day)		
<20 minutes		17 (21.0)
20 – 60 minutes		30 (37.0)
>60 minutes		1 (1.2)
Frequency (per week)	3.48±2.35	
Smoking status		
Tobacco use		
Yes		24 (29.6)
No		57 (70.4)
Type of tobacco products		
Cigarettes		24 (29.6)
Electronic cigarettes		-
Usage (per day)	2.69±5.80	
Frequency (per week)	2.42±6.15	
Alcohol intake		
Alcohol consumption		
Yes		4 (4.9)
No		77 (95.1)
Type of alcoholic beverages		
Wine		3 (3.7)
Beer		1 (1.2)
Intake (per day)	0.05±0.22	
Frequency (per week)	0.21±1.11	

Next, for smoking status, majority of the respondents (70.4%) reported that they were non-smokers while 29.6% of them were past smokers. It can be said that none of them categorized as current smoker as there will be a lightly punishment for

those who smoke, there. On top of that, cigarette was the main tobacco product used by the respondent (29.6%) which resulted in the mean of usage and frequency of smoking were 2.69±5.80 per day and 2.42±6.15 per week.

The same situation applied to the alcohol intake as none of the respondent was considered as current drinker due to the condition stated throughout their placement in RSK Cheras. Based on Table 4.8, majority of the respondents (95.1%) did not consume alcohol. It can be said that most of them were Malays as the teaching of Islam forbid the consumption of alcohol.

There was only 4.9% admitted consuming alcoholic beverages in which 3.7% preferred wine followed by beer (1.2%) as the kinds of drinks they usually consumed. The mean intake and frequency of drinking status were 0.05±0.22 per day and 0.21±1.11 per week, respectively.

4.7 Functional status

The hand grip strength was assessed to measure muscular strength of the respondents. According to Table 4.9, the mean reading for handgrip strength was 15.65±7.18 kg corresponding to the weak muscle strength category.

Table 4.9: Handgrip strength of the respondents (N=81).

Functional status	Mean±SD	n (%)
Handgrip strength (kg)	15.65±7.18	
Handgrip strength categories		
Weak		56 (69.1)
Normal		25 (30.9)
Strong		-

In addition, most of the respondents (69.1%) had weak muscle strength followed by normal category (30.9%). On the other hand, none of them was reported to have strong muscle strength.

4.8 Depression

Depression was assessed using Geriatric Depression Scale (GDS) and tabulated in Table 4.10. The total mean score of GDS among the respondents was 6.86±3.31. Among them who reporting depressive symptoms, 28.4% had mild symptoms, 32.1% had moderate symptoms and only 2.5% had severe symptoms. Meanwhile, others were considered as normal (37.0%).

Table 4.10: Depression status of the respondents (N=81).

Depression	Mean±SD	n (%)
Total GDS score	6.86±3.31	
GDS categories		
Normal (<6)		30 (37.0)
Mild (6-8)		23 (28.4)
Moderate (9-12)		26 (32.1)
Severe (13-15)		2 (2.5)

Table 4.11 showed all 15-item used to assess the depression status. The data showed that 86.4% of the respondents thought that it was wonderful to be alive followed by the feeling of full energy (71.6%) and life satisfaction (70.4%). Contrariwise, more than half of the respondents (66.7%) chose to stay at home rather than going out and try new things. On top of that, 54.3% and 48.1% of them admitted to often felt bored and had a thought of their lives was empty, respectively.

Table 4.11: Distribution of respondents (N=81) by Geriatric Depression Scale-15 items.

GDS items	Yes (%)	No (%)
1. Are you basically satisfied with your life?*	70.4	29.6
2. Have you dropped many of your activities and interest?	44.4	55.6
3. Do you feel that your life is empty?	48.1	51.9
4. Do you often get bored?	54.3	45.7
5. Are you in a good spirit most of the time?*	67.9	32.1
6. Are you afraid something bad is going to happen to you?	43.2	56.8
7. Do you feel happy most of the time?*	69.1	30.9
8. Do you often feel helpless?	46.9	53.1
9. Do you prefer to stay at home rather than going out and try new things?	66.7	33.3
10. Do you feel you have more problems with memory than most?	43.2	56.8
11. Do you think it is wonderful to be alive?*	86.4	13.6
12. Do you feel pretty worthless the way you are now?	30.9	69.1
13. Do you feel full of energy?*	71.6	28.4
14. Do you feel your situation is hopeless?	29.6	70.4
15. Do you think that most people are better off than you are?	46.9	53.1

*Reverse scoring

4.9 Prevalence of geriatric malnutrition

Regarding the nutritional status according to Mini Nutritional Assessment-Short Form (MNA-SF), 16.0% and 33.3% of the respondents were identified as malnourished and at risk of malnutrition, respectively, whereas the remaining were well-nourished (50.6%). The total mean of MNA score was 10.81±2.52 which indicated at risk of malnutrition.

Table 4.12: Geriatric malnutrition among respondents (N=81).

Malnutrition	Mean±SD	n (%)
Total MNA-SF score	10.81±2.52	
MNA-SF categories		
Malnourished (≤7)		13 (16.1)
At risk of malnutrition (8-11)		27 (33.3)
Normal (12-14)		41 (50.6)

A similar trend of malnutrition status was found among elderly population at Southwest China and elderly living in agricultural settlements where 77.5% and 74.3% of the respondents, respectively, were classified as good nutritional status (Shi et al., 2015; Zainudin et al., 2019). In contrast, Pereira et al. (2015) reported that more than half of institutionalized elderly Brazilians (66.3%) was malnourished and at risk of malnutrition. This finding was supported by Aung (2016) as according to the study, majority of the elderly were at risk of malnutrition and malnourished with the result of 95.0%.

In addition, the study from Win, Ceresa, Arnold, & Allison (2017) showed that the prevalence of malnutrition and at risk for malnutrition were 15.0% and 40.3%, respectively. The study on Portuguese population aged 65 years and above living in nursing homes found that 4.8% were categorized as malnourished and 38.7% were at risk of malnutrition. These inconsistent findings can be explained due

to differences in settings, population studied as well as the instruments to assess the nutritional status. It was notable that the prevalence of malnutrition varied depending on the settings, population targeted and nutritional status assessment tools. Overall, this indicated that the institutionalized elderly was prone to have an increased risk for malnutrition.

Table 4.13: Distribution of the respondents (N=81) by Mini Nutritional Assessment-Short Form items.

Items	n (%)
Loss appetite in the last 3 months	
Severe loss	4 (4.9)
Moderate loss	37 (45.7)
No appetite loss	40 (49.4)
Weight loss during the last 3 months	
More than 3 kilograms	3 (3.7)
Unknown	34 (42.0)
From 1 to 3 kilograms	11 (13.6)
No weight loss	33 (40.7)
Mobility	
Bed or chair bound	2 (2.5)
Able to get out of bed or chair but does not go out	6 (7.4)
Goes out	73 (90.1)
Psychological stress or acute stress in the past 3 months	
Yes	24 (29.6)
No	57 (70.4)
Neuropsychological problems	
Severe dementia or depression	8 (9.9)
Moderate dementia	28 (34.6)
No disease	45 (55.6)
Body mass index (BMI)	
Less than 19	7 (8.6)
From 19 to less than 21	9 (11.1)
From 21 to less than 23	14 (17.3)
23 or greater	51 (63.0)
Calf circumference (CC)	
Less than 31 cm	35 (43.2)
31 cm or more	46 (56.8)

Table 4.13 summarized the distribution of the respondents based on MNA-item. Out of 81 respondents, only 4.9% were found to severely loss their appetite,

3.7% admitted to loss more than three kilograms of their weight and 29.6% of them reported to have psychological stress in the past three months.

Besides, almost all the respondents (90.1%) reported to be able to goes out for a walk whereas only 2.5% were immobile. With regard to neuropsychological problems, only 9.9% of them had severe dementia or depression, 34.6% had moderate dementia and more than half of the respondents (55.6%) considered having no neuropsychological problems.

As for the anthropometric assessment section in MNA-SF, 63.0% and 56.8% of them were categorised into having 23 kg/m^2 or greater BMI and 31 cm or more calf circumference.

4.10 Factors Associated with geriatric Malnutrition

For this hypothesis testing specifically when using Chi Square test, nutrition status was divided into two categories which were well-nourished and malnourished. Malnourished group included both respondents with malnutrition and those at risk of malnutrition.

4.10.1 Socio demographic characteristic and geriatric malnutrition

A Pearson correlation was calculated examining the relationship between age and monthly income with geriatric malnutrition. A weak correlation that was non-significant was found for age (r=0.168, p=0.135) and monthly income (r=0.119, p=0.290) which indicated that both were not related to geriatric malnutrition. This was consistent with several previous study's finding that reported age and monthly income were not significantly associated with malnutrition status (Wong et al., 2019; Pereira et al., 2015; Li et al., 2020). However, other studies found a significant association between age and malnutrition status (Madeira et al., 2019; Win et al., 2017). The results were in accordance with Zainudin et al. (2019) where they also observed a significant association between income and malnutrition risk.

Meanwhile, a chi-square test of independence was used to assess association between gender, ethnicity, marital status, education level and previous occupation with geriatric malnutrition among resident at RSK Cheras. This study found that there was no significant association between gender and geriatric malnutrition (p=0.319) which was consistent with a study finding by (Chavarro-Carvajal et al. (2015) and (Li et al., 2020). However, it was contradicted with several earlier studies by Vassilakou et al. (2017), Pereira et al. (2015) and Madeira et al. (2019). Besides,

it had been observed a significant association was found between female and nutritional status (Pereira et al., 2015; Agarwalla et al., 2015).

Table 4.14 Association between sociodemographic factors and geriatric malnutrition among residents at RSK Cheras, Selangor.

Variables	**Geriatric malnutrition**			
	r		***p*-value**	
Age[a]	-0.168		0.135	
Monthly income[a]	0.119		0.290	
Variables	**Geriatric malnutrition, n (%)**		**χ^2**	***p***
	Normal	**Malnourished**		
Gender[b]			0.993	0.319
Men	27 (65.9)	21 (52.5)		
Women	14 (34.1)	19 (47.5)		
Ethnicity[b]			0.788	0.375
Malay	26 (63.4)	30 (75.0)		
Non-Malay	15 (36.6)	10 (25.0)		
Marital status[b]			0.317	0.574
Single/Divorced	31 (75.6)	27 (67.5)		
Married	10 (24.4)	13 (32.5)		
Education level[b]			0.017	0.896
Up to primary school	23 (56.2)	24 (60.0)		
≥Secondary school	18 (43.9)	16 (40.0)		
Previous occupation[c]			-	0.616
Unemployed	3 (7.3)	1 (2.5)		
Employed	38 (92.7)	39 (97.5)		

[a]Data analysed using Pearson correlation
[b]Data analysed using Chi-square test
[c]Data analysed using Fisher's Exact Test

Next, there was also no association between ethnicity (p=0.375) and marital status (p=0.574) with geriatric malnutrition. Regarding ethnicity, this study finding went in the same line with an earlier study in Malaysia by (Chen et al., 2012). The proportions of non-Malays (Chinese, Indian and others) in this study were much lower as compared to Malay which might cause the result to be non-significant.

Contrariwise, a study conducted in Nepal identified an association between ethnicity and malnutrition at the community-level (Tamang et al., 2019). Meanwhile, previous study in China by Wong et al. (2019) had supported the finding on non-significant association between marital status and geriatric malnutrition. However, analysis made by Shi et al. (2015) and Madeira et al. (2019) found that there were a significant association between marital status and geriatric malnutrition. Mathew et al. (2016) observed that respondents who were single/widowed/divorced were significantly associated with malnutrition as compared to married respondents.

Moreover, the result in Table 4.14 also revealed that no significant association found between educational level (p=0.896) and geriatric malnutrition. This finding was contradicting with a study on malnutrition risk factors among residents at geriatric homes in Cairo, Egypt by Abd et al. (2018) as well as a study among older adults living in Portuguese nursing homes by Madeira et al. (2019). On the contrary, no significant association was observed between educational level and malnutrition in several previous studies in Hong Kong and India which seems to be in accordance with this study finding (Mathew et al., 2016; Wong et al., 2019). However, Win et al. (2017) stated that low level of education had been recognized as predictor of poor dietary intake which later lead to malnourished.

As regard to the previous occupational status, no relationship with geriatric malnutrition was found in this study (p=0.616). Besides, there were still limited studies conducted to analyse the association between previous occupational status with malnutrition. When taking all the socio-demographic variables into account, the non-significant association found possibly due to younger elderly, predominance of men in the sample and accessibility of food.

4.10.2 Medical history and geriatric malnutrition

Table 4.25 revealed that there was a no significant association was observed between past hospitalization (p=0.147). However, according to The Nursing Home Centre Abuse (2019), hospitalization was one of the physical health issues that can lead to malnutrition.

No significant association also found between morbidity profile of diabetes (p=0.287) hypertension (p=0.417), and heart disease (p=0.808) with geriatric malnutrition. Similarly, it had been found that diabetes, hypertension and heart disease were not associated with nutritional status (Pereira et al., 2015; Damayanthi, Moy, Abdullah, & Dharmaratne, 2018). However, Shi et al. (2015) and (Chavarro-Carvajal et al., 2015) reported that number of comorbidities was independently associated with an increased risk of poor nutrition. Recent study found that diabetes mellitus led to higher rates of malnutrition in elderly patient with COVID-19 while comorbid hypertension did not significantly associated with malnutrition (Li et al., 2020).

On top of that, this study found that family history of diabetes (p=0.558), dyslipidaemia (p=0.432) and hypertension (p=1.000) had no significant association with geriatric malnutrition. Similarly, no significant association was found between use of medication and geriatric malnutrition in this study which possibly due the medication was being served and monitored by the caregivers. These findings were consistent with a previous study by Pereira et al. (2015) and Mathew et al. (2016) where no relationship was observed between medication use with malnutrition. On top of that, Tamang et al. (2019) reported that elderly with polypharmacy were at risk of malnutrition as compared to others who did not consume medication for more than one disease.

Table 4.15 Association between medical history and geriatric malnutrition among residents at RSK Cheras, Selangor.

Variables	Geriatric malnutrition, n (%)		χ^2	*p*
	Normal	Malnourished		
Past hospitalization[b]			2.100	0.147
Yes	28 (68.3)	20 (50.0)		
No	13 (31.7)	20 (50.0)		
Comorbidities[b]				
Diabetes			1.135	0.287
Yes	18 (43.9)	12 (30.0)		
No	23 (56.1)	28 (70.0)		
Hypertension			0.660	0.417
Yes	19 (46.3)	14 (35.0)		
No	22 (53.7)	26 (65.0)		
Heart disease			0.059	0.808
Yes	8 (19.5)	6 (15.0)		
No	33 (80.5)	34 (85.0)		
Family history[b]				
Diabetes			0.343	0.558
Yes	8 (19.5)	11 (27.5)		
No	33 (80.5)	29 (72.5)		
Dyslipidemia[c]			-	0.432
Yes	2 (5.0)	5 (12.2)		
No	38 (95.0)	36 (87.8)		
Hypertension			0.000	1.000
Yes	9 (22.0)	8 (20.0)		
No	32 (78.0)	32 (80.0)		
Total medication use[b]			0.099	0.753
<3	27 (65.9)	24 (60.0)		
≥3	14 (34.1)	16 (40.0)		

[b]Data analysed using Chi-square test
[c]Data analysed using Fisher's Exact Test

In short, medical history was found to be not significantly associated with geriatric malnutrition in this study. However, Schueren et al. (2013) reported that poor medical conditions which included multimorbidity and polypharmacy might explain higher prevalence of malnutrition

4.10.3 Anthropometric measurement and geriatric malnutrition

Among the anthropometric assessment studied, body mass index (p=0.001) were significantly associated with geriatric malnutrition in this study which was in consonance with a study done by (Chavarro-Carvajal et al., 2015). Similarly, BMI categories also showed statistically significant association with the nutritional status where 44.7% of the malnourished persons were categorized as being underweight (Damayanthi et al., 2018). This finding was supported by the other earlier malnutrition studies by Madeira et al. (2019), Shi et al. (2015) and Aung, (2016). Contrariwise, BMI was found to have a non-significant association with malnutrition based on a previous study in Malaysia by Zainudin et al. (2019).

Table 4.16 Association between anthropometric measurement and geriatric malnutrition among residents at RSK Cheras, Selangor.

Variables	**Geriatric malnutrition**			
	r		***p*-value**	
Weight[a]	0.519		<0.001**	
Height[a]	0.176		0.117	
BMI[a]	0.456		<0.001**	
Waist circumference[a]	0.247		0.026*	
Calf circumference[a]	0.573		<0.001**	
Variables	**Geriatric malnutrition, n (%)**		**χ^2**	***p***
	Normal	**Malnourished**		
Waist circumference[b]			6.611	0.010**
Normal	11 (26.8)	23 (57.5)		
Abdominal obesity	30 (73.2)	17 (42.5)		
Calf circumference[b]			4.386	0.036*
Normal	35 (85.4)	25 (62.5)		
Muscle wasting	6 (28.6)	15 (37.5)		

[a]Data analysed using Pearson correlation
[b]Data analysed using Chi-square test
*Correlation is significant at the 0.05 level
**Correlation is significant at the 0.01 level

Besides, it was found that waist circumference (p=0.026) and calf circumference (p=0.001) were significantly associated with geriatric malnutrition. Consistent with this finding as regard to calf circumference, Li et al. (2020) observed that low calf circumference had a significant relationship with increased risk of malnutrition in Wuhan, China. In addition, Chavarro-Carvajal et al. (2015) also confirmed that low calf circumference was significantly increase the risk of malnutrition.

In this study, a positive strong correlation was observed between calf circumference (r=0.573) and weight (r=0.519) with geriatric malnutrition while BMI had a positive moderate correlation (r=0.456) followed by a positive weak correlation of waist circumference (r=0.247) with geriatric malnutrition. Hence, this study found that respondents who had lower BMI, waist circumference and calf circumference were prone to be malnourished given their positive and significant correlation with MNA scores.

4.10.4 Dietary intake and geriatric malnutrition

Bivariate analysis showed that there was a weak, negative but non-significant association between total energy intake (r=0.104, p=0.357), daily carbohydrate intake (r=0.102, p=0.365), protein intake (r=0.138, p=0.218) as well as fat intake (r=0.007, p=0.949) with geriatric malnutrition. According to a study done by Agarwalla et al. (2015), there was a significant association between calorie intake and nutritional status in which they reported that those with inadequate intake were significantly higher to be malnourished. Tsuji et al. (2019) also revealed that insufficient energy intake may lead to malnutrition among older home-care

recipients. Meanwhile, protein intake index was found to significantly correlate with MNA score (Vassilakou et al., 2017).

Table 4.17 Association between dietary intake and geriatric malnutrition among residents at RSK Cheras, Selangor.

Variables	Geriatric malnutrition	
	r	***p*-value**
Energy (kcal/day)[a]	-0.104	0.357
Carbohydrate (g/day)[a]	-0.102	0.365
% of energy from carbohydrate[a]	-0.073	0.514
Protein (g/day)[a]	-0.138	0.218
% of energy from protein[a]	-0.007	0.949
Fat (g/day)[a]	-0.007	0.949
% of energy from fat[a]	0.178	0.112
Fruit and vegetables[a]	-0.260	0.019[*]

[a]Data analysed using Pearson correlation
[b]Data analysed using Chi-square test
[c]Data analysed using Fisher's Exact test
[*]Correlation is significant at the 0.05 level

In addition, the association between percentage of energy from each macronutrients and geriatric malnutrition were also being analysed. However, there were no significant associations found in this study between percentage of energy from carbohydrate (r=-0.073, p=0.514), percentage of energy from protein (r=-0.007, p=0.949) and percentage of energy from fat (r=0.178, p=0.112) with geriatric malnutrition among residents at RSK Cheras.

On the contrary, fruit and vegetables intake were found to be significantly associated with geriatric malnutrition (p=0.019) which was inversely matching with the result of a previous study by Wong et al. (2019). A weak negative correlation (r=-0.260) was observed indicating that respondents who consumed five or more

servings of fruit and vegetables tend to havee high risk of malnutrition. This might possibly due to no respondents were reported to fulfilled five or more servings of fruit and vegetables in this study. Other than that, aging factors and medication use might as well interfere with the digestion and absorption of the nutrient.

In short, other than fruits and vegetables intake, other dietary intake factors were found to be not significantly associated with geriatric malnutrition. The non-significant findings could be due to scheduled and monitored menu planning by a nutritionist, there.

4.10.5 Mealtime experience and geriatric malnutrition

A Pearson correlation coefficient was used to test the association between mealtime experience and geriatric malnutrition among residents at RSK Cheras. It was revealed that there was no significant association between mealtime experience and geriatric malnutrition (r=0.084, p=0.457). This can be explained as no barriers and facilitators that prevent them to enjoy mealtimes were identified.

Table 4.18 Association between mealtime experience and geriatric malnutrition among residents at RSK Cheras, Selangor.

Variables	Geriatric malnutrition	
	r	***p*-value**
Total MSQ score[a]	0.084	0.457

[a]Data analysed using Pearson correlation

Previous understanding on the association between mealtime experience and geriatric malnutrition were less studied. Despite a very little available evidence about this association, most of the qualitative study found that mealtime experience had a

positive effect on malnutrition (Barnes et al., 2012; Pizzola et al., 2013). To the best knowledge, this was the first local study to address the related association.

4.10.6 Lifestyle factors and geriatric malnutrition

Findings of lifestyle factors which included physical activity, smoking status and drinking status were presented in Table 4.19, Table 4.20 and Table 4.21. Among the physical activity variables studied, no significant association was observed between participation (p=0.544) and frequency of exercise per week (p=0.625) with geriatric malnutrition. This non-significant association might be due to the scheduled activity such as tai chi and chair exercise as well as performing spontaneous physical activity and even housework.

Table 4.19 Association between physical activity and geriatric malnutrition among residents at RSK Cheras, Selangor.

Physical activity	**Geriatric malnutrition**			
	r		***p*-value**	
Frequency (per week)[a]	-0.076		0.625	
Variables	**Geriatric malnutrition, n (%)**		**χ^2**	***p***
	Normal	**Malnourished**		
Participation[b]			0.296	0.586
Yes	26 (63.4)	22 (55.0)		
No	15 (36.6)	18 (45.0)		
Intensity[b]			1.488	0.475
Low	13 (31.7)	14 (35.0)		
Moderate	13 (31.7)	8 (20.0)		

[a]Data analysed using Pearson correlation
[b]Data analysed using Chi-square test

The same result was observed in previous study conducted by Damayanthi et al. (2018). Despite insignificant, Tamang et al. (2019) reported that the elderly who

lack of physical activity tend to be malnourished as has been reported also in other studies by Wong et al. (2019) and Vassilakou et al. (2017). Physical inactivity was identified to affect the development of malnutrition as this can be explained due to loss of muscle and increase nutrient needs as well as reduce food intake (Abd et al., 2018).

Similarly, no significant association was found between tobacco use and geriatric malnutrition (p=0.072). In addition, there was a weak negative and positive correlation but non-significant association of usage of tobacco per day (r=0.047, p=0.679) and frequency of smoking per week (r=0.012, p=0.919), respectively, with geriatric malnutrition. On top that, according to Table 4.21, intake of alcohol beverages per day (r=0.051, p=0.649) and frequency of alcohol use per week (r=0.035, p=0.757) had a negative correlation but not significantly associated with geriatric malnutrition. This non-significant findings between smoking and drinking status with geriatric malnutrition might be due to the small percentage of smokers and drinkers as well as the restrictions set by RSK Cheras.

Table 4.20 Association between smoking status and geriatric malnutrition among residents at RSK Cheras, Selangor.

Smoking status	**Geriatric malnutrition**			
	r		***p*-value**	
Usage (per day)[a]	-0.047		0.679	
Frequency (per week)[a]	0.012		0.919	
Variables	**Geriatric malnutrition, n (%)**		**χ^2**	***p***
	Normal	**Malnourished**		
Tobacco use[b]			0.000	1.000
Yes	12 (29.3)	12 (30.0)		
No	29 (70.7)	28 (70.0)		

[a]Data analysed using Pearson correlation
[b]Data analysed using Chi-square test

Several studies reported a strong association between lifestyle factors particularly smoking and drinking status. However, in this study, no significant association was observed neither smoking nor alcohol consumption with geriatric malnutrition. This study aligned with findings from study conducted in India (Mathew et al., 2016) and Southwest China (Shi et al., 2015). On the contrary, Wong et al. (2019) found an significant association between smoking and malnutrition while Vassilakou et al. (2017) observed that alcohol consumption was significantly correlated with MNA screening score. Schueren et al. (2013) reported that malnutrition might be linked with taste and appetite that were affected in smokers and drinkers.

Table 4.21 Association between drinking status and geriatric malnutrition among residents at RSK Cheras, Selangor.

Drinking status	**Geriatric malnutrition**			
	r		***p*-value**	
Intake (per day)[a]	-0.051		0.649	
Frequency (per week)[a]	-0.035		0.757	
Variables	**Geriatric malnutrition, n (%)**		χ^2	***p***
	Normal	**Malnourished**		
Alcohol use[b]			-	0.359
Yes	1 (2.4)	3 (7.5)		
No	40 (97.6)	37 (92.5)		

[a]Data analysed using Pearson correlation
[b]Data analysed using Chi-square test

4.10.7 Functional status and geriatric malnutrition

Table 4.22 revealed that handgrip strength was associated with geriatric malnutrition (p=0.002). A moderate positive correlation (r=0.333) was found indicating that residents with weak muscle strength tend to be malnourished. It can be observed from Table 4.22 in which the respondents who identified to be in weak category of handgrip strength were significantly at risk of malnutrition and malnourished as compared to those who had a normal handgrip strength.

Table 4.22 Association between functional status and geriatric malnutrition among residents at RSK Cheras, Selangor.

Functional status	Geriatric malnutrition	
	r	***p*-value**
Handgrip strength[a]	0.333	0.002[**]

[a]Data analysed using Pearson correlation
[**]Correlation is significant at the 0.01 level

Despite its methodological differences, several previous studies were in accordance with the finding in this study as they reported that poor physical function are strongly related with poor nutrition status (Chavarro-Carvajal et al., 2015; Ning et al., 2020). On top of that, Pereira et al. (2015), Mathew et al. (2016) and Madeira et al. (2019) reported that functional status based on instrumental activities of daily life (IADL) had a significant association with malnutrition. However, no significant association between functional status and malnutrition was found among elderly living in agricultural settlements which might be due to differences in socio-demographic characteristic (Zainudin et al., 2019).

4.10.8 Depression and geriatric malnutrition

Findings from Table 4.23 provided insight on depression that was significantly associated with geriatric malnutrition (r=-0.345, p=0.002). Residents with depression which got high score in GDS tend to be malnourished according to MNA score given the moderate negative correlation between total GDS score and geriatric malnutrition.

Similarly, most of the earlier studies also found that respondents who reported to have symptoms of depression (GDS-15 score more than five) were at risk of malnutrition and malnourished (Madeira et al., 2019; Pereira et al., 2015). Meanwhile, Win et al. (2017) reported that depression was an independent risk factors for malnutrition among elderly. Stockholm (2007) and (Chavarro-Carvajal et al., 2015) also observed a significant association between depression and geriatric malnutrition. It could be explained that the depression had been considered as the most cause of poor food intake among other disorders that affecting mental health (Madeira et al., 2019).

Table 4.23 Association between depressive symptoms and geriatric malnutrition among residents at RSK Cheras, Selangor.

Depressive symptoms	**Geriatric malnutrition**			
	r		***p*-value**	
Total GDS score[a]	-0.345		0.002**	
Variables	**Geriatric malnutrition, n (%)**		**χ^2**	***p***
	Normal	**Malnourished**		
Depression categories[b]			3.943	0.047*
Normal (≤5)	20 (48.4)	10 (25.0)		
Depression (>5)	21 (51.2)	30 (75.0)		

[a]Data analysed using Pearson correlation
[b]Data analysed using Chi-square test
**Correlation is significant at the 0.01 level
*Correlation is significant at the 0.05 level

CHAPTER 5

CONCLUSIONS AND RECOMMENDATION

5.1 Conclusion

The present study clearly identified the prevalence of geriatric malnutrition and its associated factors among residents at RSK Cheras, Selangor. Overall, the geriatric malnutrition prevalence observed using MNA questionnaire was found to be 16.1%, but the troubling fact was the proportion of residents who were at risk (33.3%) which warranted consideration as well as intervention. Moreover, variables such as body mass index (BMI), waist circumference, calf circumference, fruits and vegetables intake, functional status and depression must be closely monitored, given their significant relationship with the geriatric malnutrition. Contrariwise, Socio-demographic characteristic, medical history, energy and macronutrients intake, mealtime experience, and lifestyle factors had no significant association with geriatric malnutrition

Lastly, as regard to the association between the different dimensions of variables and geriatric malnutrition, these institutionalized people needed an appropriate multidimensional nutritional approach to deal with these issues in order to improve their nutritional status, health and quality of life of the elderly which in turn could lessen the adverse consequences of malnutrition such as hospitalization,

complications and even mortality. Further studies were required to establish the effective coping strategies.

5.2 Limitations

Inevitably, this study had several limitations that should be kept in mind when interpreting the findings. First, as this was a cross-sectional study, it limited the ability of cause-effect relationship establishment between geriatric malnutrition and its associated factors. Second, this study only focused on institutionalized elderly thus, the results could not be generalized to all older adults especially those who lived in different setting such as non-institutionalized community dwellers. In addition, the proportion of respondents according to gender and ethnicity was unbalance due to small sample size achieved with participation rate of 59.6%. Besides, other medium such as online data collection was impossible to be conducted among elderly as they might struggle with it due to aging factors as well.

Another notable limitation in this study was no assessment of biochemical parameters as regard to geriatric malnutrition were done. This was due to constraints of resources and lack of skilled researchers. Hence, this study was not able to look into biochemical parameters such as hemoglobin and albumin as well as other factors such as oral health which might affect the nutritional status

Since the questionnaire was researcher-administered, recall bias might be another limitation as some probing were asked. In addition, there was a high chance of under and over reporting regarding the dietary intake which solely depending on respondents' memories and also interviewer skill that differ between each individual. Next, some anthropometric measurements were not performed in standardized

conditions such as not wearing light clothes and took of the shoe due to mobility limitations as well as to ensure respondents' comfort during the assessment.

However, it could be assumed that this study had low refusal rate regarding participation from the residents. Despite all these limitations, the prevalence of geriatric malnutrition among residents at RSK Cheras could still be used as a baseline reference for future studies or even the other related fields.

5.3 Recommendations

There were some recommendations to improve study for future research and intervention. Instead of cross-sectional study, longitudinal study was strongly recommended so that the causality of the relationship can be determined. Besides, further study could be conducted by using larger sample size and wider elderly population and location to generate better and more generalized findings. For instance, study location should include all RSK or government-funded care homes so that the results obtained will be more representative.

On top of that, other variables such as respondents' belief, knowledge and attitude on nutrition can also be studied to understand more regarding their behavior towards consumption of food. Data on biochemical parameters, oral health, cognitive capacity and loneliness feelings need to be obtained and examined to add up more knowledge on geriatric malnutrition among institutionalized elderly.

Meanwhile, based on the study findings, it was suggested that nutrition screening can be routinely conducted to assess the geriatric malnutrition status as the tool used for assessment which was MNA can be easily get and quick to use. Besides, it was also recommended to implement education programs as well as a proper nutritional approach to aid the elderly in adopting healthy life practices.

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Appendix A: Approval letter from Ethics Committee Research Involving Human Subjects (JKEUPM)

Appendix B: Approval letter from Department of Social Welfare

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JKMM 100/12/5/2 : 2019 / 568
07 Januari 2020

PUTRI NABILA BINTI ZULFAKAR
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Tuan/Puan,

KELULUSAN MENJALANKAN KAJIAN/PENYELIDIKAN DI JABATAN KEBAJIKAN MASYARAKAT

Dengan hormatnya saya merujuk kepada perkara di atas.

2. Sukacita dimaklumkan permohonan tuan/puan untuk menjalankan kajian/penyelidikan bertajuk **Prevalence of geriatric malnutrition and hypertension with its associated factors among residents at selected care homes in Selangor** dan tempat kajian/penyelidikan **seperti di Lampiran** telah **DILULUSKAN**. Tempoh kelulusan bagi melaksanakan kajian /penyelidikan di tempat yang dipilih adalah selama **TIGA (3) bulan** mulai **07 Januari 2020** hingga **07 April 2020**.

3. Sehubungan itu, tuan/puan diminta untuk menyerahkan **DUA (2) salinan tesis/laporan/penerbitan dan berjilid kepada Jabatan setelah kajian tuan/puan selesai**. Tuan/puan tidak boleh menggunakan/menerbitkan secara bersendirian atau berkumpulan apa-apa maklumat, artikel, gambar atau ilustrasi lain yang berhubungan selain daripada tujuan kajian/penyelidikan ini melainkan dengan persetujuan bertulis daripada pihak JKM terlebih dahulu.

4. Tuan/puan juga dikehendaki melaporkan diri ke **Jabatan Kebajikan Masyarakat Negeri** bagi tujuan pemakluman kajian di setiap lokasi yang diluluskan. Sebarang maklumat lanjut, tuan/puan boleh menghubungi Bahagian Perancangan dan Pembangunan, Jabatan Kebajikan Masyarakat di talian 03-8323 1930 atau emel noraidaibrahim@jkm.gov.my.

Sekian, terima kasih.

"BERKHIDMAT UNTUK NEGARA"
"BERKAT BERJASA"

Saya yang menjalankan amanah,

WAN NORAIDAH BINTI WAN MOHD ZAIN
Bahagian Perancangan dan Pembangunan
b.p. Ketua Pengarah Kebajikan Masyarakat
Malaysia

Appendix C: Information sheet and consent form

(Malay version)

JAWATANKUASA ETIKA UNIVERSITI UNTUK PENYELIDIKAN MELIBATKAN MANUSIA (JKEUPM) UNIVERSITI PUTRA MALAYSIA, 43400 UPM SERDANG, SELANGOR, MALAYSIA

BORANG 2.4: PENERANGAN DAN PERSETUJUAN RESPONDEN

Sila baca maklumat berikut dengan teliti. Sekiranya anda mempunyai sebarang pertanyaan, sila kemukakan kepada penyelidik.

1. TAJUK KAJIAN

Kelaziman dan faktor-faktor yang berkaitan dengan malnutrisi geriatrik dalam kalangan penduduk di rumah jagaan yang terpilih di Selangor.

2. PENGENALAN

Malnutrisi ditakrifkan sebagai segala bentuk pemakanan yang tidak baik. Dengan peningkatan usia, walaupun kedua-dua jisim badan tanpa lemak dan penurunan kadar metabolisme basal membawa kepada pengurangan dalam keperluan tenaga, keperluan untuk nutrien penting yang lain meningkat. Oleh itu, kajian ini bertujuan untuk mengkaji kelaziman malnutrisi geriatrik dan faktor-faktor yang berkaitan dengannya di kalangan 136 penduduk di rumah-rumah penjagaan yang dipilih di Selangor.

3. APAKAH YANG PERLU ANDA LAKUKAN?

Responden dikehendaki membaca dan faham berkenaan kajian ini sepertimana yang telah diberitahu di dalam borang ini. Sekiranya responden bersetuju untuk melibatkan diri dalam kajian ini, anda diminta untuk menandatangan borang persetujuan responden. Perkara yang perlu dilakukan adalah seperti berikut;

a) Penyelidik akan mengambil ukuran tinggi, berat, ukur lilit pinggang, ukur lilit betis dan kekuatan genggaman tangan.
b) Responden akan ditemu ramah berkenaan tentang maklumat peribadi, maklumat perubatan, pengambilan makanan, pengalaman waktu makan, gaya hidup, gejala kemurungan dan risiko malnutrisi.

Anda berhak menolak untuk menyertai kajian ini atau menamatkan penyertaan anda pada bila-bila masa, tanpa sebarang denda yang akan dikenakan.

4. SIAPA YANG TIDAK BOLEH MENYERTAI KAJIAN INI?

Individu yang tidak sihat dan tidak boleh berkomunikasi dalam Bahasa Melayu dan Bahasa Inggeris akan dikecualikan daripada kajian ini.

5. APAKAH FAEDAH MENYERTAI KAJIAN INI?

a) KEPADA ANDA SEBAGAI PESERTA?

Anda akan mengetahui tentang status pemakanan dari segi kekurangan zat makanan tetapi tidak boleh menentukan status kesihatan secara keseluruhan kerana ia hanya satu kajian berdasarkan soal selidik. Maklumat mengenai maklumat peribadi, maklumat perubatan, pengukuran antropometri, pengambilan pemakanan. pengalaman waktu makan, gaya hidup, taraf kerja dan gejala

kemurungan daripada anda akan membantu menentukan hubungan dengan kekurangan zat makanan dalam kalangan penduduk di rumah-rumah penjagaan terpilih. Ringkasan penemuan akan diberikan atas permintaan. Anda tidak akan menerima sebarang pampasan kerana menyertai kajian ini.

b) KEPADA PENYELIDIK?
Kajian ini akan menyediakan maklumat yang terkini pada kejadian malnutrisi geriatrik dan faktor- faktor yang berkaitan dengannya dalam kalangan penduduk di rumah-rumah penjagaan terpilih di Selangor. Selain itu, maklumat yang diperolehi mungkin berguna untuk penyelidikan masa depan.

6. ADAKAH IA BERISIKO?

Responden tidak akan menghadapi sebarang risiko dengan mengambil bahagian dalam kajian ini. Sila maklumkan kepada pengkaji sekiranya anda menghadapi sebarang masalah atau mempunyai sebarang maklumat penting yang mungkin mengubah persetujuan anda untuk terus menyertai kajian ini.

7. ADAKAH MAKLUMAT DAN IDENTITI SAYA KEKAL RAHSIA?

Semua maklumat yang diperolehi daripada responden akan kekal sulit. Hasil penerbitan atau keputusan yang diperolehi akan dilaporkan secara umum manakala identiti responden tidak akan dikenal pasti.

8. SIAPA YANG SAYA PERLU HUBUNGI SEKIRANYA SAYA MEMPUNYAI SOALAN TAMBAHAN SEMASA MENGIKUTI PENYELIDIKAN INI?

Jika terdapat sebarang pertanyaan mengenai kajian ini, anda boleh menghubungi

Penyelidik	Penyelia
Putri Nabila binti Zulfakar H/P: 016-9622171 Email: put.nabila1408@gmail.com	Dr. Noraida binti Omar H/P: 019-2252902 Email: noraidaomar@upm.edu.my
Jabatan Pemakanan dan Dietetik, dan Dietetik Fakulti Perubatan dan Sains Kesihatan, dan Sains Kesihatan Universiti Putra Malaysia, 43400, UPM Serdang, Selangor Darul Ehsan.	Jabatan Pemakanan Fakulti Perubatan Universiti Putra Malaysia 43400, UPM Serdang, Selangor Darul Ehsan.

Sila tandatangan di sini sekiranya anda telah membaca dan memahami kandungan halaman ini

9. PERSETUJUAN

Saya…… No Kad Pengenalan. ……

beralamat……

……..dengan ini bersetuju untuk mengambil bahagian secara sukarela dalam penyelidikan yang tersebut di atas *(kajian klinikal/percubaan ubat-ubatan/rakaman video/kumpulan sasaran/temuduga/ soal selidik).

Saya telah diberi penjelasan secara menyeluruh mengenai penyelidikan ini dari segi metodologi, risiko dan komplikasi (seperti tertulis pada Helaian Penerangan Responden). Saya memahami bahawa saya berhak menarik diri dari penyelidikan ini pada bila-bila masa tanpa memberi sebarang alasan.Saya juga memahami bahawa sebarang maklumat yang berkaitan identiti saya akan dirahsiakan.

Saya* berminat / tidak berminat untuk mengetahui keputusan kajian yang melibatkan saya.

I setuju/tidak bersetuju untuk imei/gambar/rakaman video/ rakaman suara digunakan dalam apa jua bentuk penerbitan atau pembentangan. (sekiranya berkaitan).

*potong yang tidak berkenaan

Tandatangan ……..…… Tandatangan ……..……
(Responden) (Saksi)

Tarikh :…….….. Nama :…….…..

No. K/P: ……..…..

Saya mengesahkan bahawa saya telah menerangkan kepada responden ini sifat dan tujuan penyelidikan yang tersebut di atas.

Tarikh ……..…… Tandatangan ……..……
(Penyelidik)

Appendix D: Questionnaire

(Malay version)

No. rujukan:

FAKULTI PERUBATAN DAN SAINS KESIHATAN JABATAN PEMAKANAN DAN DIETETIK

BORANG SOAL SELIDIK

Tajuk:

KELAZIMAN MALNUTRISI GERIATRIK DAN FAKTOR-FAKTOR YANG BERKAITAN DENGANNYA DALAM KALANGAN PENDUDUK DI PUSAT JAGAAN TERPILIH DI SELANGOR

Nama penyelidik	**:**	**PUTRI NABILA ZULFAKAR**
No. matrik	**:**	**188823**
Nama penyelia	**:**	**DR. NORAIDA OMAR**
Tarikh pengumpulan data	**:**	

Soal selidik ini hanya bertujuan untuk penyelidikan. Segala maklumat yang dikumpulkan dalam borang soal selidik ini akan dirahsiakan dan tidak akan didedahkan kepada sesiapa.

Penyertaan dan kerjasama anda amatlah dihargai.

BAHAGIAN A: PERKARA PERIBADI

Sila isikan perkara di bawah dan tandakan "√" pada kotak yang berkaitan.

Umur	_____ tahun
Jantina	❑ Lelaki ❑ Perempuan
Kaum	❑ Melayu ❑ Cina ❑ India ❑ Lain-lain, sila nyatakan: …….....
Status perkahwinan	❑ Bujang ❑ Berkahwin ❑ Bercerai ❑ Balu atau duda
Tahap pendidikan	❑ Tidak bersekolah ❑ Sekolah rendah ❑ Sekolah menengah ❑ Pra universiti ❑ Universiti
Pekerjaan terdahulu	❑ Bekerja sendiri ❑ Pekerja kerajaan ❑ Pekerja swasta
Sumber pendapatan	❑ Gaji

	❑ Wang pencen ❑ KWSP ❑ Bantuan amal ❑ Lain-lain, sila nyatakan: ……..
Pendapatan bulanan	Sila nyatakan: RM……..

BAHAGIAN B: SEJARAH PERUBATAN

Bahagian ini akan **DIISI OLEH PENYELIDIK** dengan merujuk sesi temu duga.

Maklumat Perubatan	Catatan
Sejarah kemasukan ke hospital	❑ Ya ❑ Tidak
Sebab kemasukan ke hospital	Sila nyatakan: ……..
Komorbiditi	❑ Kencing manis ❑ Darah tinggi ❑ Sakit jantung ❑ Lain-lain, sila nyatakan: ……
Sejarah keluarga	❑ Kencing manis ❑ Dislipidemia ❑ Darah tinggi ❑ Lain-lain, sila nyatakan: ……
Jumlah ubat-ubatan	Sila nyatakan: ……..

BAHAGIAN C: PENGUKURAN ANTROPOMETRI

Bahagian ini akan **DIISI OLEH PENYELIDIK** dengan merujuk sesi temu duga.

	Bacaan pertama	**Bacaan kedua**	**Purata**
Berat (kg)			
Tinggi (cm)			
Indeks jisim tubuh (BMI) _____kg/m^2	❑ Kurang berat badan (<18.5 kg/m^2) ❑ Normal (18.5 – 24.9 kg/m^2) ❑ Lebih berat badan (25.0 – 29.9 kg/m^2) ❑ Obes kelas I (30.0 – 34.9 kg/m^2) ❑ Obes kelas II (35.0 – 39.9 kg/m^2) ❑ Obes kelas III (≥40.0 kg/m^2)		
Ukur lilit pinggan (cm)			
Ukur lilit betis (cm)			

BAHAGIAN D: PENGUKURAN KEKUATAN GENGGAMAN TANGAN

Bahagian ini akan **DIISI OLEH PENYELIDIK** dengan merujuk sesi temu duga.

	Bacaan pertama	**Bacaan kedua**	**Purata**
Kekuatan genggaman tangan (kg)			

BAHAGIAN E: PENGAMBILAN MAKANAN

Dalam bahagian ini, responden diminta untuk menyatakan kebiasaan makanan dan menerangkan saiz hidangan makanan yang diambil selama dua hari, iaitu **satu hari mewakili hari bekerja** dan **satu hari mewakili hujung minggu.**

1) Hari bekerja

Waktu/Tempat	Makanan/Minuman	Kuantiti	Catatan

2) Hujung minggu

Waktu/Tempat	Makanan/Minuman	Kuantiti	Catatan

BAHAGIAN F: PENGALAMAN WAKTU MAKAN

Bahagian ini akan **DIISI OLEH PENYELIDIK** dengan merujuk kepada sesi temu bual. Skala pemarkahan adalah seperti berikut:
kerap = 3, kadang-kadang = 2, jarang-jarang = 1, tidak pernah =0

Adakah makanan disediakan tepat pada waktunya?	0	1	2	3
Adakah anda mengenali makanan yang disediakan?	0	1	2	3
Adakah anda dihidangkan dengan makanan yang anda tidak gemar?	0	1	2	3
Adakah terdapat pelbagai makanan jenis makanan untuk dipilih?	0	1	2	3
Adakah makanan yang disediakan menyelerakan?	0	1	2	3
Adakah anda gemar akan rasa makanan yang disediakan?	0	1	2	3
Adakah makanan disediakan pada suhu yang betul?	0	1	2	3
Adakah saiz hidangan yang disediakan sesuai untuk anda?	0	1	2	3
Adakah anda sentiasa berharap untuk makan bersama rakan anda?	0	1	2	3
Adakah anda selesa berada di ruang makan?	0	1	2	3
Adakah anda menyukai suasana ruang makan anda?	0	1	2	3
Adakah staf melayan anda dengan baik?	0	1	2	3
Adakah anda gembira dengan makanan yang disediakan?	0	1	2	3
Secara keseluruhan, adakah anda berpuas hati dengan waktu makan anda?	0	1	2	3

BAHAGIAN G: GAYA HIDUP

Bahagian ini akan **DIISI OLEH PENYELIDIK** dengan merujuk kepada sesi temu bual.

A. Aktiviti fizikal

Perkara	Catatan
Adakah anda melakukan aktiviti fizikal?	❑ Ya ❑ Tidak Jika tidak, sila langkau soalan 2, 3 dan 4
Apakah jenis aktiviti fizikal yang anda lakukan?	❑ Ringan ❑ Sederhana ❑ Berat Sila nyatakan :……..
Berapa lamakah anda melakukan aktiviti fizikal pada setiap hari?	❑ Kurang daripada 20 minit ❑ 20 – 60 minit ❑ Lebih daripada 60 minit
Berapakah kekerapan anda melakukan aktiviti fizikal itu?	…… seminggu …… sebulan

B. Status merokok

Perkara	Catatan
Adakah anda merokok?	❑ Yes ❑ No
Apakah jenis rokok yang anda gunakan?	❑ Rokok tembakau ❑ Rokok elektrik ❑ Lain-lain, sila nyatakan: ……..
Berapa jumlah rokok yang anda gunakan untuk satu hari?	Sila nyatakan: ……..
Berapakah kekerapan anda merokok?	…… seminggu …… sebulan

C. Pengambilan alkohol

Perkara	Catatan
Adakah anda mengambil minuman eralkohol?	❑ Ya ❑ Tidak
Apakah jenis minuman beralkohol yang anda ambil?	❑ Wine ❑ Beer ❑ Lain-lain, sila nyatakan: ……..
Berapakah jumlah pengambilan minuman beralkohol dalam sehari?	Sila nyatakan : ……..
Berapakah kekerapan pengambilan minuman beralkohol anda?	…… seminggu …… sebulan

BAHAGIAN H: KEMURUNGAN

Bahagian ini akan **DIISI OLEH PENYELIDIK** dengan merujuk kepada sesi temu bual.

Perkara	Ya	Tidak
Adakah anda berpuas hati dengan hidup anda?		
Pernahkah anda hilang minat melakukan aktiviti kesukaan anda?		
Adakah anda rasa kehidupan anda kosong?		
Adakah anda selalu rasa bosan?		
Adakah anda sentiasa dalam keadaan yang baik?		
Adakah anda takut sesuatu yang buruk akan terjadi kepada anda?		
Adakah anda gembira dalam kebanyakkan masa?		
Adakah anda selalu rasa tidak berdaya?		
Adakah anda lebih gemar untuk tinggal di rumah daripada keluar dan mencuba benda baru?		
Adakah anda mempunyai masalah dengan memori anda dalam kebanyakan masa anda?		
Adakah anda rasa gembira masih dapat meneruskan kehidupan?		
Adakah anda rasa tidak memberi manfaat dengan kehidupan yang anda ada sekarang?		
Adakah anda rasa bersemangat?		
Adakah anda rasa situasi anda tidak dapat dibantu?		
Adakah anda rasa orang lain lebih baik dari anda?		

BAHAGIAN I: RISIKO MALNUTRISI

Bahagian ini akan **DIISI OLEH PENYELIDIK** dengan merujuk kepada sesi temu bual.

Perkara	Catatan
Adakah pengambilan makanan anda berkurang sejak tiga bulan yang lepas disebabkan kehilangan selera makan, masalah penghadaman, masalah untuk mengunyah atau masalah menelan?	0. Sanagat berkurang 1. Sederhana 2. Tidak berkurang
Adakah anda mengalami kehilangan berat badan dengan tidak disengajakan sepanjang tiga bulan yang lepas?	0. Turun melebihi 3kg 1. Tidak tahu 2. Turun diantara 1kg – 3kg 3. Tiada penurunan
Adakah pergerakkan anda terbatas?	0. Atas katil atau berkerusi 1. Mampu berdiri tapi tidak keluar 2. Mampu keluar
Adakah anda mengalami masalah psikologi stress atau pesakit akut sepanjang tiga bulan yang lepas?	0. Ya 1. Tidak
Adakah anda mempunyai masalah neuropsikologi?	0. Nyanyuk atau kemurungn teruk 1. Nyanyuk ringan 2. Tiada masalah
Berapakah BMI anda?	0. Kurang daripada 19 1. 19 dan kurang daripada 21 2. 21 dan kurang daripada 23 3. 23 dan ke atas
Berapakah ukur lilit betis anda?	1. Kurang daripada 31 3. 31 dan ke atas
Jumlah markah =	**Kategori MNA:** ( ) Normal (12-14) ( ) Risiko malnutrisi (8-11) ( ) Malnutrisi (0-7)