UNIVERSITI PUTRA MALAYSIA

DETERMINING TOTAL CHOLESTEROL LEVEL OF HOSPITALIZED ELDERLY AND ITS ASSOCIATED FACTORS IN HOSPITAL SERDANG, SELANGOR

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NOOR AZLEEN BINTI HAMBALI

A project submitted as partial fulfillment of the requirement for the degree of Bachelor of Science (Dietetics) from Faculty of Medicine and Health Sciences, Universiti Putra Malaysia.

This project entitled “Determining total cholesterol level of hospitalized elderly and its associated factors in Hospital Serdang, Selangor” was prepared by Noor Azleen Binti Hambali and submitted to the Faculty of Medicine and Health Sciences as a partial fulfillment of the requirement for the degree of Bachelor of Science (Dietetics) from the Faculty of Medicine and Health Sciences, Universiti Putra Malaysia.

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LIST OF ABBREVIATIONS

BMI	Body Mass Index
CC	Calf Circumference
CVD	Cardiovascular Disease
HDL-C	High-Density Lipoprotein Cholesterol
KH	Knee Height
LDL-C	Low-Density Lipoprotein Cholesterol
MUAC	Mid-Upper Arm Circumference
MUFA	Monounsaturated Fatty Acids
NHMS	National Health and Morbidity Survey
PUFA	Polyunsaturated Fatty Acids
TG	Triglycerides

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ABSTRACT

DETERMINING THE TOTAL CHOLESTEROL LEVEL OF HOSPITALIZED ELDERLY AND ITS ASSOCIATED FACTORS IN HOSPITAL SERDANG, SELANGOR

Noor Azleen Binti Hambali

The determination of lipid profile like total cholesterol level is important to prevent the progression of cardiovascular disease. This study aims to determine the total cholesterol level of hospitalized elderly and its associated factors in Hospital Serdang, Selangor. The factors studied were socio-demographic characteristics, medical backgrounds, anthropometric measurements, biochemical data, dietary intake, malnutrition risk, and lifestyle. This study used a descriptive study design by using a questionnaire to achieve the research objectives. Using the purposive sampling method, data were collected from 115 elderly patients aged 60 years who were admitted to surgical, medical, orthopedic, urology, cardiology, and cardiothoracic wards in Hospital Serdang, Selangor. A simple descriptive statistic and correlation analysis were used to understand the total cholesterol level and its associated factors. From the analysis undertaken, it was found that the prevalence of hypercholesterolemia among the subjects was 29.6%. The comorbidities specifically dyslipidemia (X^2=14.291, p=0.000), and other types of comorbidities (X^2=7.843, p=0.005), waist circumference (r=0.199, p=0.033), LDL-C (r=0.455, p=0.000), TG (r=0.459, p=0.000), fasting blood glucose (r=0.386, p=0.000), carbohydrate (r=-0.333, p=0.000), fat (r=0.327, p=0.000), saturated fat (r=0.304, p=0.001), PUFA (r=0.275, p=0.003), MUFA (r=0.327, p=0.000), sodium (r=0.211, p=0.024), and duration of physical activity (r=-0.287, p=0.002) were significantly associated with the total cholesterol level. The findings delivered rich insights for the health-related policymakers in formulating effective policies in improving current public health, especially among hospitalized elderly patients.

ABSTRAK

MENENTUKAN JUMLAH ARAS KOLESTEROL DAN FAKTOR-FAKTOR BERKAITAN DI KALANGAN PESAKIT WARGA TUA DI HOSPITAL SERDANG, SELANGOR.

Noor Azleen binti Hambali

Penentuan profail lipid terutamanya jumlah aras kolesterol adalah penting bagi menghalang kemajuan penyakit kardiovaskular. Kajian ini bertujuan untuk mengenal pasti faktor-faktor yang mempengaruhi jumlah aras kolesterol di kalangan pesakit warga tua di Hospital Serdang, Selangor. Faktor-faktor yang dikaji adalah ciri-ciri sosio-demografi, latar belakang perubatan, ukuran antropometri, data biokimia, pengambilan makanan, risiko kekurangan zat makanan, dan gaya hidup. Kajian ini menggunakan kajian deskriptif bagi mencapai objektif kajian. Dengan menggunakan kaedah persampelan bertujuan, data telah diambil dari 115 warga tua berumur 60 tahun dan keatas yang dimasukkan ke dalam wad pembedahan, perubatan, ortopedik, urologi, kardiologi, dan kardiothoracic di Hospital Serdang, Selangor. Analisis deskriptif dan analisis korelasi digunakan menentukan jumlah aras kolesterol dan factor-faktor berkaitan. Berdasarkan kajian ini, didapati bahawa kelaziman hiperkolesterolemia di kalangan subjek ialah sebanyak 29.6%. Komorbiditi khususnya dislipidemia (X^2=14.291, p=0.000), dan lain-lain komorbiditi (X^2=7.843, p=0.005), ukur lilit pinggang (r=0.199, p=0.033), LDL-kolesterol (r=0.455, p=0.000), trigliserida (r=0.459, p=0.000), gula darah puasa (r=0.386, p=0.000), karbohidrat (r=-0.333, p=0.000), lemak (r=0.327, p=0.000), lemak tepu (r=0.304, p=0.001), PUFA (r=0.275, p=0.003), MUFA (r=0.327, p=0.000), natrium (r=0.211, p=0.024), dan jangka masa aktiviti fizikal (r=-0.287, p=0.002) didapati berkait dengan jumlah aras kolesterol. Berdasarkan hasil kajian yang diperoleh, faktor-faktor yang berkaitan mungkin boleh dilihat sebagai salah satu aspek penting

dalam intervensi bagi memantau jumlah aras kolesterol. Hasil kajian ini juga akan memberi manfaat dalam perangkaan dasar berkaitan kesihatan bagi menambaik baik kesihatan orang awam, terutamanya pesakit warga tua di hospital.

CHAPTER 1

INTRODUCTION

1.1 Background

Both developed and developing countries experienced population aging as it is a worldwide phenomenon. This phenomenon gives a huge effect on human life as the country's population shifts towards older ages. The cut-off age for the elderly in Malaysia is 60 years and above (United Nations, 1982).

In 1950, the elderly population in the world increased from 8 percent to 12 percent in 2014, and it is predicted to be 21 percent by 2050 (Kudo, Mutisya, & Nagao, 2015). Asia is expected to have 1.3 billion of the elderly by 2050 and 1.6 billion by 2100 (Kudo et al., 2015). In Malaysia, the elderly population increase from 10.0% in 2018 to 10.3% in 2019 (Department of Statistics Malaysia Press Release Current Population Estimates, Malaysia, 2019). This showing an increment of 0.3% in a year. Based on Malaysia's Population Pyramid, it can be described that the shape of the pyramid was like a progressive shape during 1957-1970 (Jabatan Perangkaan Malaysia, 2017). The older population was lesser compared to the young population. However, in 2010 the shape of the pyramid had changed to a regressive shape and it is estimated that in 2040, Malaysia will have a nearly equal share of the young (18.6%) and older population (14.5%) (Jabatan Perangkaan Malaysia, 2017). One of the factors of these changes is increased life expectancy due to the control of infectious disease, more abundant and safer foods, and better sanitary conditions (Lindsay et al., 2014).

The cases of hypercholesterolemia especially among hospitalized elderly become a big concern towards the health care professional team. It is shown that 60 to 64 years old was the peak age group of known hypercholesterolemia with 25.2% (National Health and Morbidity Survey,

2015). Meanwhile, the percentage of self-reported hypercholesterolemia reported was 41.8% (National Health and Morbidity Survey, 2018).

The definition of hypercholesterolemia used in the study was serum total cholesterol value of greater than or equals to 5.2 mmol/L (National Cholesterol Education Program, 2002). The same definition has been used in the National Health and Morbidity Survey.

1.2 Problem statement

According to CPG Management of Hypertension (2018), high cholesterol ranked 5th in the mortality attributed to risk factors in 2008. One of the causes of hypercholesterolemia is due to nutritional issues like the dietary pattern (Supiyev et al., 2017). Besides that, overweight, obesity, hypertension, diabetes, and lifestyle factor like smoking also contribute to elevated total cholesterol in the blood (Ni et al., 2015).

In the long term, hypercholesterolemia will lead to cardiovascular diseases (CVD) (Félix-Redondo, Grau, & Fernández-Bergés, 2013). This will become a major challenge to the Malaysian healthcare system in the future in terms of the cost of treatment for chronic ailments (Ambigga et al., 2016). Also, it becomes a major concern because starting from 2005, CVD became the main cause of death in Malaysia (Department of Statistics Malaysia Press Release Current Population Estimates, Malaysia, 2019).

The gap exists as most of the studies were conducted among the elderly in community settings which might give different results in hospital settings. Also, previous studies lack in terms of assessment of the dietary intake and malnutrition risk. Therefore, this study was conducted to determine the factors associated with total cholesterol levels among hospitalized elderly in Hospital Serdang, Selangor.

1.3 Research questions

i. What is the total cholesterol level of the hospitalized elderly in Hospital Serdang, Selangor?

ii. Are socio-demographic characteristics, medical backgrounds, anthropometric measurements, biochemical data, dietary intake, malnutrition risk, and lifestyle associated with total cholesterol levels among hospitalized elderly in Hospital Serdang, Selangor?

1.4 Significance of the study

Briefly, the present study benefits the subjects, researchers, and health-related policymakers. First, subjects were able to assess their health performance. Second, the results of this study can be used by other researchers as baseline data for future studies. Lastly, this study highlights the factors of hypercholesterolemia among hospitalized elderly in Hospital Serdang, Selangor. The identification of associated factors will provide an insight into health-related policymakers to develop suitable intervention programs to improve the current public health especially hospitalized elderly patients.

1.5 Objectives

1.5.1 General objectives

To determine total cholesterol level and the association between socio-demographic characteristics, medical backgrounds, anthropometric measurements, biochemical data, dietary intake, malnutrition risk, and lifestyle with total cholesterol levels among hospitalized elderly in Hospital Serdang, Selangor.

1.5.2 Specific objectives

1. To determine the total cholesterol level among hospitalized elderly in Hospital Serdang, Selangor.
2. To assess socio-demographic characteristics, medical backgrounds, anthropometric measurements, biochemical data, dietary intake, malnutrition risk, and lifestyle among hospitalized elderly in Hospital Serdang, Selangor.
3. To determine the associations between socio-demographic characteristics, medical backgrounds, anthropometric measurements, biochemical data, dietary intake, malnutrition risk, and lifestyle with the total cholesterol level among hospitalized elderly in Hospital Serdang, Selangor.

1.6 Null hypothesis

There are no associations between socio-demographic characteristics, medical backgrounds, anthropometric measurements, biochemical data, dietary intake, malnutrition risk, and lifestyle with the total cholesterol level among hospitalized elderly in Hospital Serdang, Selangor.

1.7 Conceptual framework

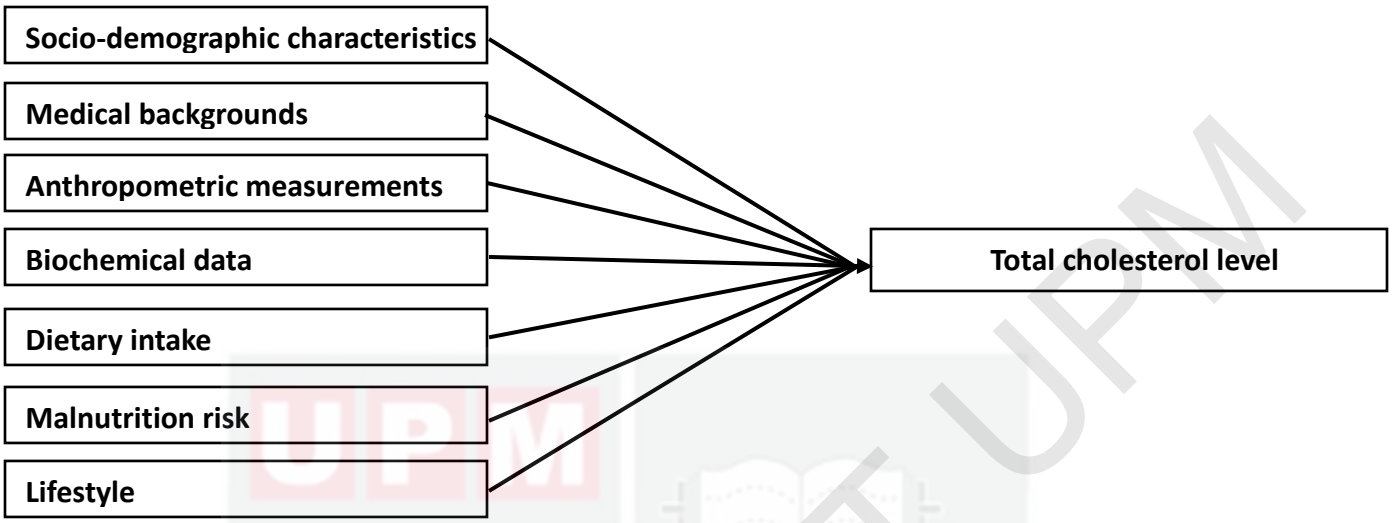

Figure 1.0: Conceptual framework

CHAPTER 2

LITERATURE REVIEW

2.1 The elderly population in Malaysia

Malaysia has adopted the United Nations definition of those 60 years and above as elderly and stated that it is a progressive state, which begins with conception and ending with death, and closely related to physical, social, and psychological changes (Mohammad & Abbas, 2012). The maintenance of this vulnerable population for both physical and mental capabilities during their older age is a crucial part of healthy aging. Therefore, there is a need to address the issues in terms of economic, social, health, environmental as well as psycho-spiritual (Tengku Aizan, 2015). The decrease in basic function which is not a part of the aging process could predict future cardiovascular events. The Malaysian healthcare system must be plan properly as the country is shifting towards the aged nation. There will be a higher rate of hospital admissions by the elderly (Yunus et al., 2017). Therefore, the Malaysian government must plan steps to ensure the wellbeing of the elderly in Malaysia.

2.2 Prevalence of high cholesterol level

The percentage of dyslipidemia among the elderly is relatively high. A study conducted by Kiplagat, Lydia, Jemimah, and Drusilla (2017) found that among all subjects, 86% had dyslipidemia. A consistent result was found in China where the prevalence of dyslipidemia was 39.9% in normal glucose subjects, 46.8% in prediabetes subjects, and 59.3% in type 2 diabetes mellitus subjects (Li, Zhao, Yu, & Ding, 2018). In Jordan, there was a noticeable increase in the percentage of hypercholesterolemia (44.3%), hypertriglyceridemia (41.9%), LDL-C (75.9%), and low HDL-C (59.5%) (Abujbara et al., 2018). Several studies had been conducted in China to find

out the prevalence of dyslipidemia and its associated factors. Previous literature revealed that among subjects aged between 60 to 90 years old, 56.8% had dyslipidemia (Lin et al., 2019). Among all subjects, the percentage of high total cholesterol was 8.4%. Another study by Liu et al. (2018) found that among all subjects 37.61% had dyslipidemia. To find out the prevalence of dyslipidemia in northeast China, Zhang et al. (2017) collected subjects above 40 years old and found that among all subjects, 62.1% had dyslipidemia and the prevalence of high TC, TG, LDL-C, and low HDL-C were 33.5%, 43.9%, 0.6%, and 8.8% respectively. In Chongqing, China the prevalence of dyslipidemia was 37.4%. Meanwhile, in Kazakhstan, the prevalence of hypercholesterolemia was 37% (Supiyev et al., 2017). Gonmei, Dwivedi, Toteja, Singh, and Vikram (2018) conducted a study in West Delhi, India among subjects aged 60 years and above. The study revealed that the prevalence of high TC, TG, LDL-C, and low HDL-C was 20.39%, 45.63%, 17.31%, and 64.08% respectively. Lastly, Alzahrani and Alamri (2017) conducted a study among hospitalized elderly and found that 24.2% of subjects had dyslipidemia.

2.3 Factors Associated with Cholesterol Level among Elderly

2.3.1 Sociodemographic characteristics

The sociodemographic status which includes age, gender, occupation, and education level is associated with dyslipidemia among the elderly. A study by Gonmei, Dwivedi, Toteja, Singh, and Vikram (2018) found that the value of total cholesterol, triglycerides, HDL-C, and LDL-C is higher is female subjects. According to Liu et al. (2018), the peak age of elderly women with dyslipidemia range between 60 to 69 years old. In contrast, elderly men are less likely to have dyslipidemia as the highest prevalence range from 40 to 49 years old. This is supported by the mean level of parameters used to detect dyslipidemia are higher among women compared to men (Gonmei et al.,

2018). Also, it is found that dyslipidemia is more prevalent in men under 50 years old but more prevalent in women more than 50 years old (Qi et al., 2015). Meanwhile, a high level of TG and low HDL-C was found in men than in women and a high level of TC and LDL-C in women than in men (Li, Zhao, Yu, & Ding, 2018). As aging occurs, the distribution of lipids becoming more uneven. A study by Zhang et al. (2017) found that as age increases, the prevalence of dyslipidemia is higher. A consistent study has been shown by Qi et al. (2015) in which the prevalence of dyslipidemia increases as aged, but the peak age is 60 years and above. Lin et al. (2019) found that at the age of 66 to 70 years old, TC, LDL-C, and TG are at the peak of the top level. Abujbara et al. (2018) found that subjects ranging from 40 to 69 years old have an increased risk to have high triglyceride value. In contrast, it is found that the prevalence of dyslipidemia was positively associated with age in women, but negatively associated with age in men (Li, Zhao, Yu, & Ding, 2018). Reduction in sex hormones with menopause that causes accumulation of fat in the trunk and abdomen (Gonmei et al., 2018). Therefore, menopause is one of the reasons that lead to changes in hormonal status and lipid profile in women (Gonmei et al., 2018). Supiyev et al. (2017) found that abnormal lipid level is associated with higher education. A study conducted by Ismail et al. (2000) found that the effect of ethnicity was not significant when waist-hip-ratio was considered. However, a study found that Asian Indians have an abnormal fat distribution which increased the risk of dyslipidemia (Nayak & Bhaktha, 2016). Another study which compares the total cholesterol level among subjects differ in ethnicity found that Malay subjects have a higher serum total cholesterol compared to Chinese subjects (Tan et al., 2009). The difference was due to polymorphism of lipoprotein called apolipoprotein E (apoE) which makes the lipoprotein among the population differ (Taskinen, 2009). In terms of education, Guzman (2010) found that education is not significantly associated with hypercholesterolemia as it cannot reflect the actual in the blood

lipid levels. Meanwhile according to Poonam et al., (2014) the same engagement in the physical activity might influence the association. Some studies found a less favorable lipid profile in both urban and rural areas (Supiyev et al., 2017; Su et al., 2015; Yamwoong, 2000). This was related to education which lowers in a certain area (Supiyev et al., 2017). Most women tend to have a less favorable lipid profile either with low or high education because of the sedentary occupation (Lara & Amigo, 2018). Meanwhile, men have a better lipid profile even with a low education because of higher physical activity (Lara et al., 2018). For marital status, a study found it as a negatively associated factor of the total cholesterol level (Song et al., 2018). Due to negative familial interactions, no improvement found in the total cholesterol level although subjects have high income and live with family (Chan, Miller, & Chen, 2016). Higher socioeconomic status is associated with dyslipidemia (Lucandra et al., 2019). This is because a person will have a big role to decide which and what food to consume if there is good financial support. Hence, leads to a better lipid profile (Agarwalla et al., 2015).

2.3.2 Medical backgrounds

The medical history of the elderly is associated with dyslipidemia. An association was found between low cholesterol levels and days of hospitalization (Lee et al., 2018). The reduction related to surgery, trauma, and acute hemorrhage during the hospitalization (Wilson, Barletta, & Tybursk, 2003). For subjects under medications, total cholesterol levels were controlled with the consumption of medications (Robert et al., 2014). Some studies revealed a non-significant change in the value of total cholesterol concerning days of hospitalization (Genest et al., 1988). This is because the days of hospitalization were too short to produce a significant change to the lipid profile (Alzahrani & Alamri, 2017). Based on past literature, most of the subjects have been

diagnosed with type 2 diabetes and hypertension (Abujbara et al., 2018; Basulaiman et al., 2014). Kiplagat, Lydia, Jemimah, and Drusilla (2017) researched type 2 diabetes patients and found that 86% of the subjects had dyslipidemia. Another study also found that 30-60% of patients with Type 2 diabetes have dyslipidemia (Low et al., 2016). This is because of poor glycemic control that increases serum lipid profile (Goldberg, 2001). Abujbara et al. (2018) found that hypertension is positively associated with the occurrence of dyslipidemia. The critical hypertension results in the long duration of dyslipidemia (Liu et al., 2010). Zhang et al. (2017) made a comparison to observe the proportion of subjects with hypertension and diabetes between dyslipidemia and the control group. A high prevalence of hypertension and diabetes was found in the dyslipidemia group. Another study found that total serum cholesterol was higher in subjects with IHD (Tom et al., 2007). Dyslipidemia is also associated with the total cholesterol as it is affected by the other lipid indicators (Lin et al., 2019). Due to that, a study suggested that the management of dyslipidemia can be made by providing target goal lipids for the patient (Abujbara et al., 2018). Other comorbidities like metabolic syndrome results in a long duration of dyslipidemia (Liu et al., 2010). Other than that, the lipid profile altered in the presence of kidney disease and nephrotic syndrome (Tsimihodimos, 2011; Tai et al., 2017). There is also a study that did not find a significant association between hypertension and hypercholesterolemia (Lin et al., 2019). This happened due to better awareness of personal history or family history which makes the subjects more likely to aware of the condition (Zhang et al., 2017). Besides that, no significant association was found between ischemic stroke and total cholesterol among non-postmenopausal hormone users (Lawrence, 2004).

2.3.3 Anthropometric measurements

Anthropometric measurements are used to assess body composition. Anthropometric measurements include height, weight, BMI, waist, and calf circumference. Past literature identified a positive association between anthropometric measurements with dyslipidemia among the elderly. Calf circumference was positively correlated with the total cholesterol level (Zhang et al., 2017). An abnormal body mass index (BMI) was significantly associated with dyslipidemia (Kiplagat, Lydia, Jemimah, & Drusilla, 2017). Lin et al. (2019) revealed that subjects with abnormal BMI and abdominal obesity increase risks to have dyslipidemia. This is consistent with Zhang et al. (2017) which found an association of abnormal waist circumference with poor control of serum lipids. It is also found that the measure of central obesity is a better predictor for detecting cardiovascular risk factors like dyslipidemia (Lee, Huxley, Wildman, & Woodward, 2008). Height is also found as a determinant for cholesterol and fat levels (Rettner, 2015). It is shown that shorter people have higher cholesterol levels which are determined by genetics (Rettner, 2015).

2.3.4 Biochemical data

Biochemical data is an important indicator to detect the development of disease if there is a deviation from the normal recommended range. A study by Gonmei, Dwivedi, Toteja, Singh, and Vikram (2018) found that the overall mean of serum total cholesterol, triglyceride, HDL cholesterol, and LDL cholesterol were 1.77 mmol/L, 1.83 mmol/L, 1.13 mmol/L, and 2.71 mmol/L, respectively. Among all subjects with type 2 diabetes, more than 50% have elevated serum LDL-C level (≥ 2.6mmol/L) (Li et al., 2018). LDL cholesterol builds up in the walls of arteries could increase the total cholesterol level (Cariou& Krempf, 2011). Besides that, a study conducted by Gonmei, Dwivedi, Toteja, Singh, and Vikram (2018) found that the overall mean of

serum total cholesterol, triglyceride, HDL-C, and LDL-C is relatively high which is 68.86 mg/dl, 162.5 mg/dl, 43.89 mg/dl, and 105.6 mg/dl, respectively. The level of TC, TG, LDL-C, and VLDL also increased (Al-Jameil, Khan, Arjumand, Khan, & Tabassum, 2014). Triglyceride increases the total cholesterol level particularly from the consumption of high carbohydrates food (Yunsheng et al., 2006). However, according to Harchaoui (2009) the cholesterol levels constant, even though triglyceride levels fluctuate 1 to 4 hours after meals. It is found that abnormal glucose level becomes a risk factor for dyslipidemia as it will increase the level of total cholesterol (Abujbara et al., 2018). Fasting blood glucose levels above the recommended 7.0 mmol/L is highly prevalent among subjects with type 2 diabetes (Kiplagat, Lydia, Jemimah, & Drusilla, 2017).

2.3.5 Dietary intake

Dietary intake is the type and amount of food intake daily. Based on a study by Liu et al. (2018), adequate consumption of fiber reduces the development of dyslipidemia. The was also a noticeable effect on the total cholesterol when subjects consumed the Dietary Approaches to Stop Hypertension (DASH) diet (Sacks et al., 2001). From past studies, it is found that the replacement of food containing saturated fat with Monounsaturated Fatty Acid (MUFA) or Polyunsaturated Fatty Acid (PUFA) able to reduce the total cholesterol level (Alhassan et al., 2012). PUFA lowered total cholesterol half as much as saturated fat raised it (Kris-Etherton, 2000). However, a study by Merkel et al., 2001 found that MUFA did not affect total cholesterol levels, but saturated fat that increases the total cholesterol levels. Increased intake of simple carbohydrates and high-fat diets alter the serum triglyceride concentration which leads to dyslipidemia. This can be seen from a high prevalence of dyslipidemia among subjects taking simple carbohydrates (Qi et al., 2015). The traditional ethnic foods such as energy-dense food and food in high saturated fat were also

associated with dyslipidemia (Supiyev et al., 2018). For sodium intake, even when subjects consumed moderate sodium reduction, no significant effect was reported on the total cholesterol (Harsha et al., 2004).

2.3.6 Malnutrition risk

A previous study found that malnutrition other than anorexia nervosa was not associated with high cholesterol (Rigaud, 2009). However, it is found that prolonged malnutrition resulting in loss of fat stores among the subjects (Dorner & Friedrich, 2018). Malnutrition risk is significantly associated with a condition called hypocholesterolemia, serum cholesterol less than 4.10 mmol/L (Zhang, Pereira, Luo, & Matheson, 2017). Besides that, a study conducted among older adults found that the score for screening and assessment tool was significantly higher if the cholesterol level increase (Zhang, Pereira, Luo, & Matheson, 2017; Contreras et al., 2010).

2.3.7 Lifestyle

The lifestyle which includes a lack of physical activities and sedentary habits is associated with dyslipidemia (Liu et al., 2010). Based on the National Health and Morbidity Survey (2019), those aged 75 years and above are the least active physically group which accounts for 59%. Habitual alcohol drinkers characterized by drinking twice per month over the past 12 months and low physical activity has a positive relationship with dyslipidemia (Qi et al., 2015). However, there is also a study that found that alcohol drinking was negatively associated factor for the total cholesterol level (Song et al., 2018). A study by Liu et al. (2018) found a positive association between smoking as well as low physical activity level and dyslipidemia among subjects. Besides

that, a positive association of dyslipidemia also was found in current smoker which smoked cigarettes daily or occasionally (Abujbara et al., 2018).

CHAPTER 3

METHODOLOGY

3.1 Study design

This was a cross-sectional study with the purpose to determine the total cholesterol level of the hospitalized elderly and its associated factors in Hospital Serdang, Selangor.

3.2 Study location

The study was conducted in Hospital Serdang, Selangor. Hospital Serdang, Selangor is a tertiary hospital in Malaysia and a government-funded hospital with multi-specialty in the various medical field. There are 34 departments and units in total providing services to patients. It has 620 beds and 17 wards operating. Hospital Serdang started its operation in 2006 and it serves people living in a nearby area.

3.3 Sample size determination

The sample size for hypothesis testing of correlation between the independent variables and dependent variables was calculated by using the formula by Cole (1997).

$$\mathbf{n} = \frac{\left(z_{1-\frac{\alpha}{2}} + z_{1-\beta}\right)^2}{r^{*2}/(1-r^{*2})} + 5$$

Where,

n = Calculated sample size

Z1-α/2 = Z score for significance level at 5% = 1.96

Z1-β = Z score for power set at 80% = 0.842

r* = correlation

Table 3.1 Calculation of sample size (Cole, 1997)

Correlation studies	Correlation, r	Sample size, n
Anthropometric measurement-Total cholesterol (Lima et al., 2011)	r=0.30	$n = \frac{(1.96 + 0.84)^2}{(0.30)^2/(1-(0.30)^2)} + 5$ n = 84
Anthropometric measurement-Total cholesterol (Lucena Rocha, de Menezes, Pimenteira de Melo, & Figueroa Pedraza, 2013)	r=-0.281	$n = \frac{(1.96 + 0.84)^2}{(-0.281)^2/(1-(-0.281)^2)} + 5$ n = **96**

The highest sample size calculated was 96 and after 20% was adjusted for the non-response rate, the study had recruited a total of 115 subjects.

3.4 Sampling design

This study used a non-probability sampling design as shown in Figure 3.4.1 below. The government hospital was chosen using purposive sampling as it is in Selangor and the nearest hospital from the faculty. Then, a few wards were selected such as medical, surgical, orthopedic, cardiology, urology, and cardiothoracic. The subjects who met the inclusion criteria and agreed to participate were included in the study.

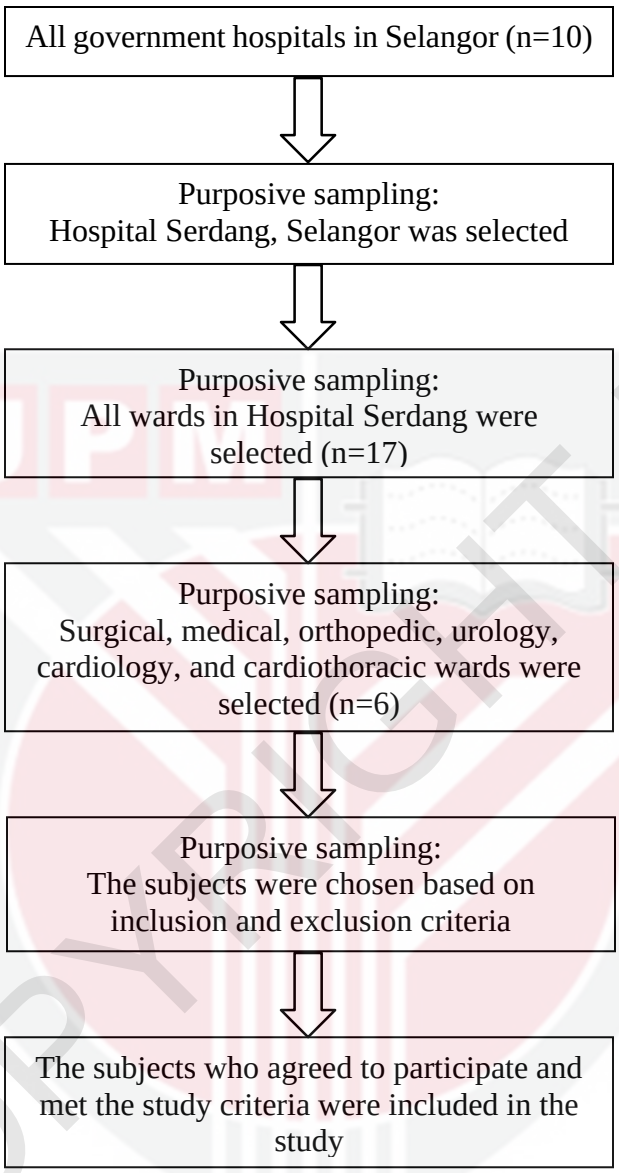

Figure 3.1: Flow of sampling method to select subjects among patients in Hospital Serdang, Selangor

3.5 Subjects

The subjects were selected based on the inclusion criteria such as subjects aged 60 years old and above as well as Malaysian citizens. The caregiver was included when the subjects need help to answer the questions. The exclusion criteria for this study were subjects that have a psychiatric illness. Critically ill subjects who need to be ventilated or sedated were also excluded from this study.

3.6 Measures

The method of measures was interview-based, where a face-to-face interview was conducted by researchers for all subjects based on the questions in the questionnaire. The questionnaire was divided into 8 parts and had bilingual for subjects' convenience. A physical examination was conducted where necessary.

3.6.1 Sociodemographic characteristics

A self-developed questionnaire was used to assess the sociodemographic characteristics of the subjects through the interview session. The sociodemographic characteristics included in the questionnaire were age, sex, ethnicity, education level, marital status, monthly household income, source of income, living arrangement, previous occupation, and living area. The subjects were needed to fill in the blank or tick the answers that best apply to them in the box and space provided.

3.6.2 Medical background

The medical background of the subject was determined through medical records and/or interview sessions. The medical data of the subject was updated continuously in the hospital system by

healthcare professionals. Length of stay in the hospital, number and type of comorbidities, family history, the number of medications, polypharmacy status, and record met with the dietitian were recorded. Bed-head tickets were referred to when the data was not available yet in the system. The length of stay in the hospital was determined from the day subject was admitted up until the researcher met the subject. The subject was asked about the types of comorbidities specifically hypertension, diabetes, dyslipidemia, ischemic heart disease, or any other types of diseases. The total number of comorbidities were also recorded. Next, the subject reported a family history of dyslipidemia. Record met with dietitian helped in determining any nutritional-related problems. Meanwhile, the number of medications determined polypharmacy which characterized by consuming 5 or more medications (Anonim, 2000).

3.6.3 Anthropometric measurements

For anthropometric measurements, the data was obtained through the medical record, interview sessions, and/or physical examinations. For each component, two readings were recorded, and the average reading was calculated. If the data cannot be obtained through the medical record or interview sessions, a physical examination was conducted. Anthropometry measurements obtained include current weight, previous weight, weight change, percentage weight change, height, body mass index (BMI), waist circumference, and calf circumference.

a) Weight

The tool used to measure weight for the ambulatory subject is the TANITA weighing scale. The scale was placed on a hard and flat surface. The subject was needed to stand barefooted on the platform with lightly dressed. The measurement was recorded to the nearest 0.1kg. For non-ambulatory subjects, the weight was assessed using an equation developed by (Chumlea, Guo, Roche, & Steinbaugh, 1988). This formula requires the measurements of mid-upper arm circumference (MUAC) and calf circumference (CC). The subject was either standing or lying with their sleeves rolled up above the shoulder and their right arm bent to 90 degrees. The MUAC was measured with the measuring tape not too compressed to the flesh. Whereas, CC was the maximum circumference of the calf muscle of either right or left leg. Calf circumference was measured using a flexible tape with the subject standing. The loop of the tape was moved up and down the calf to locate the largest diameter on the subject's leg. The tape was pulled around the calf but not too tight that the tissue was compressed. The measurement was recorded to the nearest 0.1 cm. Previous weight was recorded to calculate the percentage weight change of the subjects.

Male: 2.31(MUAC) + 1.5(CC) – 50.10 Female: 1.63(MUAC) + 1.43(CC) - 37.46

b) Height

For height measurements, the tool used for the ambulatory subject was the SECA portable stadiometer. The subject was asked to stand barefooted, lightly dressed, and look straight ahead with feet together. The back of the feet, calf, bottom, upper back, and back of the head should be in contact with the stadiometer (Gavriilidou, Pihlsgård, & Elmståhl, 2015). The measurement tool was being rested gently on the head of the subject to record the measurements. The measurement was recorded in meter (cm). For non-ambulatory subjects, knee height measurement was used to

determine the height of the subject using an equation by Shahar and Pooy (2003). Knee height was measured with a flexible measuring tape on the leg of the subject while seated or lying supine with ankle and knee bend to 90°. The tape was then rested gently under the heels of the foot. Then, the tape was placed on the anterior surface of the thigh about 3.0 cm above the patella. The pressure was applied to compress the tissue. The measurement was recorded to the nearest 0.1 cm (Chumlea et al.,1985).

Male: (1.924 x KH) + 69.38 Female: (2.225 x KH) + 50.25

c) Body Mass Index

After the height and weight of the subjects were determined, the body mass index (BMI) was calculated using the formula:

BMI (kg/m^2) = Weight (kg) ÷ (Height (m) x height (m))

The BMI was further being classified appropriately according to the standard.

Table 3.2: Body Mass Index (BMI) classification (WHO, 1998)

Underweight	<18.5 kg/m^2
Normal	18.5-24.9 kg/m^2
Overweight	25.0-29.9 kg/m^2
Obesity Class I	30.0-34.9 kg/m^2
Obesity Class II	35.0-39.9 kg/m^2
Obesity Class III	≥ 40.0 kg/m^2

d) Waist circumference

Waist circumference was measured using a flexible measuring tape and measurement was recorded to the nearest centimeter (cm). The value of the waist circumference was compared with normal cut off-waist circumference for Asians (Ministry of Health, 2003).

Table 3.3: Normal cut-off waist circumference for Asian

Women	<80 cm
Men	<90 cm

e) Calf circumference

Calf circumference is considered to provide the most sensitive measure of muscle mass among the geriatric population as it specifies the changes in fat-free mass along with the aging process. The subject was needed to lie in a supine position with the left knee bent at a 90° angle. The measuring tape was placed around the calf until the largest diameter was determined but not so tight that the tissue was compressed. The measurement was recorded to the nearest 0.1 cm. The value was compared with the indicator of muscle wasting in the elderly (Sakinah et al., 2004).

Table 3.4: Indicator of muscle wasting in the elderly

Male	<30.1 cm
Female	<27.3 cm

3.6.4 Biochemical data

Biochemical data were obtained from the medical records. Data obtained consists of fasting serum lipid profile; LDL-C, HDL-C, and TG, fasting glucose level, renal profile; urea, sodium, potassium, chloride and creatinine, and liver function test; total protein and albumin. Next, the value obtained was compared with the normal value used in Hospital Serdang.

Table 3.5: Normal value of biochemical data used in Hospital Serdang

Biochemical data	Normal reading
Fasting serum lipid profile -LDL-C -HDL-C -TG	 0-3.37 mmol/L 1.04-1.55 mmol/L 0-1.7 mmol/L
Fasting glucose level	<5.6 mmol/L
Renal profile -Urea -Sodium -Potassium -Chloride -Creatinine	 3.2-9.2 mmol/L 136-145 mEq/L 3.5-5.1 mmol/L 98-107 mEq/L 62-115 μmol/L
Liver function test -Total protein -Albumin	 64-83 g/L 35-50 g/L

3.6.5 Dietary intake

The dietary intake of the subject was assessed using two days of diet history based on the diet at home which consists of one day weekdays and one day weekends through interview sessions. This dietary recall helped to give an overall overview of the usual food intake by the subject for two days. Standard household measurements were used to improve the precisions of the subject's consumption. The components of dietary intake such as energy, carbohydrate, fiber, protein, fat, saturated fat, polyunsaturated fat (PUFA), monounsaturated fat (MUFA), trans-fatty acid, dietary cholesterol, and sodium were assessed using Nutritionist Pro software (Version 2.5, Axxa System, USA) and further compared with Medical Nutrition Therapy for Hyperlipidemia. Fluid intake was also being assessed and further compared with the Clinical Practice Guideline (CPG) for dyslipidemia. The caloric requirement for the elderly was estimated using the quick method formula.

Table 3.6: Quick method formula

Quick method formula	BMI (kg/m^2) x Energy requirement for acute elderly patients (25-30 kcal/kg)

Table 3.7: Recommendation based on MNT Hyperlipidemia and Clinical Practice Guideline (CPG) for Dyslipidemia

COMPONENTS	HYPERLIPIDEMIA
Energy	30-35 kcal/kg/day for normal body weight
Carbohydrate	• 50% of total energy for those who have elevated TG or low HDL-C
Fiber	• 20 – 30g per day • At least 6 g should soluble fiber
Protein	• 15% from total energy or 0.8-1.0g/kg per day
Dairy Products	• 1-2 servings per day
Fat	• 25 – 30% of total energy 1. Saturated fat: 7 – 10% 2. Polyunsaturated fat: 5 – 7% 3. Monounsaturated fat: 12 – 15% 4. Trans fatty acid: <1%
Dietary Cholesterol	<300 mg/day
Sodium	• 2400 mg sodium or 6 g sodium chloride
Fluid	• 6 to 9 cups per day

3.6.6 Malnutrition risk

Mini Nutritional Assessment- Short Form (MNA-SF) was adopted to assess the malnutrition risk. MNA-SF tool is widely used and easily assessable for geriatric assessment as it can be used to identify persons at risk of malnutrition. It has a sensitivity of 98%, specificity of 100%, and diagnostic accuracy of 99% to predict undernutrition. It comprises of 7 items which are questions 1 to 7. Questions 1 to 5 were assessed using an interview session meanwhile question 6 and 7 were assessed using the physical examination. The score varies from 0 to 3. Questions 1 to 7 provide different options for each score depending on the questions except item 4 which only provides a score 0 for "yes" and score 2 for "no". Guidelines for the scoring of the items are provided by the Nestle (Villalon, Laporte, & Carrier, 2011). The maximum screening score is 14 points. 12 to 14 points indicate normal nutritional status, 8 to 11 points are at the risk of malnutrition while 0 to 7 indicate malnourished.

i. Normal nutritional status (12-14 points)

ii. At the risk of malnutrition (8-11 points)

iii. Malnourished (0-7 points)

3.6.7 Lifestyle

The components of lifestyle evaluated were smoking status, alcohol consumption, and physical activity level. For smoking, the subject was asked about the amount, type, and status of smoking. The same question was asked regarding the alcohol in which the subject reported the amount, type, and status of alcohol consumption. For physical activity, components of frequency, intensity, and time were being asked (Barisic, Leatherdale, & Kreiger, 2011). The determination of moderate-intensity physical activity is based on the following: brisk walking, dancing, gardening, walking a

dog (National Health and Morbidity Survey, 2019). Meanwhile, vigorous-intensity physical activities consist of swimming, cycling, playing football, jogging, and playing basketball (National Health and Morbidity Survey, 2019). Smoking status and physical activity were compared with a standard recommendation based on the 5th Edition Clinical Practice Guideline (CPG) Management of Dyslipidemia while alcohol intake was compared with the Medical Nutrition Therapy (MNT) of Hyperlipidemia.

Table 3.8: Lifestyle recommendations based on 5th Edition (CPG) Management of Dyslipidemia 2017 and MNT Hyperlipidemia

Components	Recommendations
Physical activity	150 minutes a week of moderate aerobic or 75 minutes a week of vigorous aerobic exercise
Smoking status	Complete cessation
Alcohol intake	<2 units per day; 2 units for men & 1 unit for women

3.6.8 Total cholesterol level

The total cholesterol level was obtained through medical records. The value was then being compared with NCEP ATP III (2002).

Table 3.9 Indicator of hypercholesterolemia

Biochemical data	Value
Total cholesterol	≥ 5.2 mmol/L

3.7 Data collection

Data collection was conducted from January 2020 to the end of March 2020. First, the approval from the National Medical Research Register (NMRR) was be obtained. Next, approval of data collection was obtained from the head of the department of respective wards and Hospital Serdang director. After the approval, screening was made through medical records based on inclusion and exclusion criteria. Information sheets related to the purpose of the study was first being distributed to the subjects or their caregivers. The consent form was given before the interview session being held. Ample time was given for subjects to understand the rules. Some selected information was retrieved from the medical record and physical examination. After completion of the questionnaires, data analysis was conducted.

3.8 Data analysis

Data analysis was conducted using the IBM SPSS Version 22 with the level of significance at $p<0.05$. The normality of the data distribution was checked before the analysis started. For objective 1 and 2, the data was presented in frequency, percentage, mean, standard deviation, minimum, and maximum value. For objective 3, categorical variables were analyzed using the Chi-square test while continuous variables were analyzed using Pearson's product-moment correlation. For the Chi-square test, when the assumptions have been violated, Fisher's exact test was used to determine the significance between the variables.

3.9 Confidentiality and security of source documents and study data

Every information obtained in this study was handled confidentially, according to laws and/or regulations. The identity of the subjects was secured by using codes in which there were no

personal details stated in their questionnaire. The data entered using SPSS Statistics and the data in the computer are secured with a password. During publishing and presenting the study results, the identity of the subjects' will not be revealed without their consent, to protect the confidentiality of subjects' personal information.

3.10 Pre-testing

Pre-testing of the questionnaire was conducted before the actual data collecting process was carried out. 12 subjects from other than the selected wards who fulfill the inclusion and exclusion criteria of this study were recruited as respondents. 12 subjects were coming from 10% of the sample size. These subjects were not included in the actual data collection. Pre-testing was conducted to identify the time needed to complete the questionnaire as well as to check if the instructions are clear and easy to understand by the subject.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Introduction

This chapter discusses the result of this study based on the interpretation and analysis of the data collected from a sample of hospitalized elderly patients in Hospital Serdang, Selangor. There were 115 respondents recruited in this study (response rate of 100%).

Overall, there are two main sections in this chapter. The first section presents the findings of the first and second objectives of this study. The objective of this study is to determine the cholesterol level and to assess socio-demographic characteristics, medical backgrounds, anthropometric measurements, biochemical data, dietary intake, malnutrition risk, and lifestyle among hospitalized elderly in Hospital Serdang, Selangor.

Meanwhile, the second section mainly presents the findings of the third objective which is to determine the associations between socio-demographic characteristics, medical backgrounds, anthropometric measurements, biochemical data, dietary intake, malnutrition risk, and lifestyle with the total cholesterol level among hospitalized elderly in Hospital Serdang, Selangor.

4.2 Socio-demographic characteristics

The socio-demographic characteristics comprise ten components namely age, sex, ethnicity, residence, education level, marital status, monthly household income, source of income, living arrangement, and previous occupation. Table 4.1 below shows the socio-demographic characteristics of the subjects in Hospital Serdang, Selangor. Based on the demographic

information, out of 115 subjects, 60% were male and 40% were female. Like a previous study conducted in King Abdul Aziz University Hospital, Riyadh which had more male compared to female subjects (Al-Jameil, Khan, Arjumand, Khan, & Tabassum, 2014). The mean age for this study was 66.97 ± 5.41 years with the range around 60 to 81 years old.

Aside from that, most of the subjects' proportion was Malay (51.3%) as compared to other ethnicities. Despite the majority proportion of the Malay population, a small proportion of Chinese, Indian, and other ethnic helps to provide a good mixture of subjects from different background. For Chinese, Indian, and other ethnicities, the subjects were 24.3 %, 22.6%, and 1.7% respectively. The same finding was observed in the community setting where the biggest proportion of the subjects were Malay (Rifin et al., 2018).

Most of the subjects live in urban areas (78.3%), followed by rural (21.7%). In terms of educational level, most respondents were from secondary school leavers (45.2%), followed by primary school leavers (27.0%). Subsequently, university leavers accounted for (13.0%) whereas subjects that have no formal education and pre-university were 11.3% and 3.5% respectively. Based on the National Health and Morbidity Survey (2015), many of the subjects were also urban dwellers and secondary education holders.

There were 79.1% of the respondents are married while 13.9% are widowed. The remaining 4.3% and 2.6% are divorced and single, respectively.

The average monthly household income differs according to each household. Most subjects have an income ranging RM500-RM1000 per month (31.3%) meanwhile the least is RM1001-RM1500 (7.8%). The mean monthly household of the subjects was about RM 1510.14 with a minimum income of RM100 and a maximum income of RM9000 per month.

For the source of income, most of the subjects (45.2%) received money from their family followed by charity aid like Jabatan Kebajikan Masyarakat and ZAKAT (32.2%). Also, some subjects are funded by pension funds (18.3%), salary (2.6%), and EPF (1.7%).

From the demographic characteristics, it is shown that most of the subjects live with their spouse and family (52.2%), followed by living with spouse only (26.1%) and others (21.7%). Others defined as the subjects who live in facilities and services for older people provided by the government, private or NGO's (COUNTRY REPORT MALAYSIA, n.d.).

On top of that, this study unveils the previous occupation of the subjects. Majority of the subjects used to work in the private sector (48.7%). Some used to work in the government sector (19.1%) and self-employed (18.3%). Some of the subjects are unemployed (13.9%).

Table 4.1: Socio-demographic characteristics of the subjects (N=115)	
Characteristics	**Mean ± SD**
Age (Years)	66.97 ± 5.41
Monthly household income (RM)	1510.14 ± 1498.07
	N (%)
Sex	
Male	69 (60.0)
Female	46 (40.0)
Ethnicity	
Malay	59 (51.3)
Chinese	28 (24.3)
Indian	26 (22.6)
Others	2 (1.7)
Living area	
Rural	25 (21.7)
Urban	90 (78.3)
Education level	
No formal education	13 (11.3)
Primary level	31 (27.0)
Secondary level	52 (45.2)
Pre-university	4 (3.5)
University	15 (13.0)
Marital status	
Single	3 (2.6)
Married	91 (79.1)
Divorced	5 (4.3)
Widowed	16 (13.9)
Monthly household income	
Less than RM 500	31 (27.0)
RM 500 – RM 1000	36 (31.3)
RM 1001 – RM 1500	9 (7.8)
RM 1501 – RM 2000	14 (12.2)
More than RM 2000	25 (21.7)
Source of income	
Salary	3 (2.6)
Pension fund	21 (18.3)
EPF	2 (1.7)
Charity aid	37 (32.2)
Family	52 (45.2)
Living arrangement	
With spouse only	30 (26.1)
With spouse and family	60 (52.2)
Others	25 (21.7)
Previous occupation	

Self-employed	21 (18.3)
Government	22 (19.1)
Private	56 (48.7)
Unemployed	16 (13.9)

4.3 Medical backgrounds

From Table 4.2 below, the mean length of stay of subjects in the ward was 4.03 ± 4.19 days with the minimum and maximum days of 1 and 21 days, respectively. The highest number of comorbidities was 9 and some subjects do not have any comorbidities. As for the number of medications, the lowest number of medications consumed is 1 and can be high up until 27 types of medications.

Table 4.2: Length of stay, no. of comorbidities and no. of medications of the subjects (N=115)

Medical characteristics	Mean ± SD	Min-Max Value
Length of stay (days)	4.03 ± 4.19	1-21
Number of comorbidities	2.90 ± 1.52	0-9
Number of medications	7.97 ± 5.96	1-27

As shown in Table 4.3, only 6.1% of the subjects have records met with dietitians. For comorbidities, four main diseases were asked alongside with other comorbidities that the subjects have. There were 71.3% have hypertension which is the biggest portion of the subjects. The second highest was diabetes in which 64.3% of subjects have the disease. Some subjects have dyslipidemia (38.3%) while some of them have ischemic heart disease (32.2%). While another 49.6% have diseases other than hypertension, diabetes, dyslipidemia, and IHD. A study conducted in tertiary hospitals among hospitalized elderly also found that the common diseases were hypertension and diabetes mellitus (Latiffah et al., 2006). Besides that, hypertension, dyslipidemia, and type 2 diabetes mellitus were the most popular diseases among the elderly (Pinto de Souza

Fernandes, Duarte, Pessoa, Franceschini, & Ribeiro, 2017). When looking at medical characteristics, family history was also being considered. From the result, most of the subjects have a family history of various diseases (85.2%). Meanwhile, about 14.8% have a family history of dyslipidemia. The chances of getting certain types of diseases are coming from family history. A study by Asresahegn, Tadesse, and Beyene (2017) assessed the family history of diseases among the subjects to get further information about the occurrence of current diseases. Also, more than half of the subjects are polypharmacy (67.0%). Like a previous study conducted in the Family Medicine Clinic University Science Malaysia Hospital which found that the prevalence of polypharmacy among 238 hospitalized elderly was high (Senik & Kadir, 2006).

Table 4.3: Medical characteristics of the subjects (N =115)

Medical characteristics	N (%)
Record met with the dietitian	7 (6.1)
Comorbidities (Hypertension)	82 (71.3)
Comorbidities (Diabetes)	74 (64.3)
Comorbidities (Dyslipidemia)	44 (38.3)
Comorbidities (IHD)	37 (32.2)
Comorbidities (Others)	57 (49.6)
Family history (Dyslipidemia)	17 (14.8)
Family history (Others)	98 (85.2)
Polypharmacy	77 (67.0)

4.4 Anthropometric measurements

The subjects have a mean weight of 66.18 ± 13.85 kg and a mean height of 162.32 ± 9.06 cm. The mean weight change of the subjects was 2.73 ± 4.47 kg. Meanwhile, the percentage of weight change around 4.17 ± 6.94 %. From Table 4.4, the mean BMI for the subjects was 25.13 ± 5.36 kg/m^2 which falls under overweight for BMI classification. Besides that, the mean circumference for the waist was 82.17 ± 16.27 cm which is abnormal for women. Meanwhile for calf circumference which is 33.69 ± 4.13 cm was abnormal for both males and females.

Table 4.4: Anthropometric characteristics of the subjects (N=115)	
Anthropometric characteristics	**Mean ± SD**
Weight (kg)	66.18 ± 13.85
Previous weight (kg)	67.55 ± 13.54
Weight change (kg)	2.73 ± 4.47
Percentage weight change (%)	4.17 ± 6.94
Height (cm)	162.32 ± 9.06
BMI (kg/m^2)	25.13 ± 5.36
Waist circumference (cm)	82.17 ± 16.27
Calf circumference (cm)	33.69 ± 4.13

Based on Table 4.5, Most of the subjects (53.0%) have no change in weight for the past 3 months. About 29.6% of the subjects experienced weight loss while 17.4% experienced weight gain. A big portion of subjects falls under normal (38.3%) and overweight (29.6%) BMI classification. Following that, underweight and obese class I shared the same proportion (13.0%) and the least was obese class II (5.2%) and III (0.9%). In contrast with the previous study conducted by Li et al. (2018) which most of the subjects fall under the overweight category. For the waist, the percentage distribution was almost the same between normal and abnormal classification. Among all subjects, 53% of them have normal waist circumference. As compared to the previous study, there was some contrary where the study found out that many of the subjects had an abnormal waist circumference (Zhang et al., 2017). Whereas for the calf, many subjects have a normal calf circumference classification with 87.8%.

Table 4.5: Anthropometric characteristics of the subjects (N =115)	
Anthropometric characteristics	**N (%)**
The trend of weight change	
Positive (weight gain)	20 (17.4)
Negative (weight loss)	34 (29.6)
No change (weight maintain)	61 (53.0)
BMI classification	
Underweight (<18.5 kg/m^2)	15 (13.0)
Normal (18.5-24.9 kg/m^2)	44 (38.3)
Overweight (25.0-29.9 kg/m^2)	34 (29.6)

Obese I (30.0-34.9 kg/m^2)	15 (13.0)
Obese II (35.0-39.9 kg/m^2)	6 (5.2)
Obese III (≥40 kg/m^2)	1 (0.9)
Waist classification	
Normal	61 (53.0)
Abnormal	54 (47.0)
Calf classification	
Normal	101 (87.8)
Abnormal	14 (12.2)

4.5 Biochemical data

Based on Table 4.6, the mean value of biochemical data for the subjects falls under the normal range. However, for both fasting blood glucose and creatinine, the mean value deviates from the normal range.

Table 4.6: Biochemical data of the subjects (N=115)

Biochemical data	Mean ± SD
LDL-C (mmol/L)	2.52 ± 0.88
HDL-C (mmol/L)	1.16 ± 0.31
Triglyceride (mmol/L)	1.39 ± 0.59
Fasting blood glucose (mmol/L)	6.94 ± 4.05
Urea (mmol/L)	7.66 ± 4.78
Sodium (mEq/L)	136.30 ± 13.39
Potassium (mmol/L)	4.23 ± 0.69
Chloride (mEq/L)	105.25 ± 7.03
Creatinine (µmol/L)	164.17 ± 179.32
Protein (g/L)	71.35 ± 7.87
Albumin (g/L)	36.93 ± 8.67

Most of the subjects have a normal range of biochemical data. Table 4.7 classifies the classification of biochemical data based on normal and abnormal values. More than half of the

subjects have an abnormal range of fasting blood glucose (57.4%) and creatinine (52.2%). A similar finding was found where fasting blood glucose higher compared to other biochemical indicators (Joshi et al., 2014). For lipid value which consists of LDL-C, HDL-C, and TG, a major portion of the subjects had a normal reading. More than half of the subjects had value within the normal range. A study conducted by Toteja, Singh, and Vikram (2018) found an opposite outcome in which the reading was relatively high.

Table 4.7: Biochemical data of the subjects (N =115)

Biochemical data	N (%)
LDL-C classification	
Normal (0-3.37 mmol/L)	100 (87.0)
Abnormal	15 (13.0)
HDL-C classification	
Normal (1.04-1.55 mmol/L)	80 (69.6)
Abnormal	35 (30.4)
Triglyceride classification	
Normal (0-1.7 mmol/L)	98 (85.2)
Abnormal	17 (14.8)
Fasting blood glucose classification	
Normal (<5.6 mmol/L)	49 (42.6)
Abnormal	66 (57.4)
Urea classification	
Normal (3.2-9.2 mmol/L)	76 (66.1)
Abnormal	39 (33.9)
Sodium classification	
Normal (136-145 mEq/L)	79 (68.7)
Abnormal	36 (31.3)
Potassium classification	
Normal (3.5-5.1 mmol/L)	96 (83.5)
Abnormal	19 (16.5)
Chloride classification	
Normal (98-107 mEq/L)	66 (57.4)
Abnormal	49 (42.6)
Creatinine classification	
Normal (62-115 μmol/L)	55 (47.8)
Abnormal	60 (52.2)
Protein classification	
Normal (64-83 g/L)	93 (80.9)
Abnormal	22 (19.1)
Albumin classification	

Normal (35-50 g/L)	74 (64.3)
Abnormal	41 (35.7)

4.6 Dietary intake

Table 4.8 shows the nutrients based on the dietary intake of the subjects. The mean energy intake for the subjects is 1581.37 ± 560.67 kcal. However, the energy requirement differs from each individual. For certain nutrients like carbohydrate, protein, fat, saturated fat, polyunsaturated fatty acid (PUFA), monounsaturated fatty acid (MUFA), and trans fatty acid, the adequacy was calculated to compare with the recommendation.

Table 4.8: Dietary intake of the subjects (N=115)

Nutrients	Mean ± SD	Min-Max Value
Energy (kcal)	1581.37 ± 560.67	516-3531
Carbohydrate (%)	62.42 ± 8.81	42-86
Protein (%)	13.74 ± 3.64	6-28
Fat (%)	24.09 ± 7.72	6-45
Saturated fat (%)	4.47 ± 3.34	0-14
PUFA (%)	3.70 ± 3.47	0-14
MUFA (%)	4.18 ± 3.77	0-13
Trans fat (%)	0.00 ± 0.00	0-0
Fiber (g)	6.25 ± 3.98	0-17
Dairy products (serving)	0.36 ± 0.64	0-3
Dietary cholesterol (mg)	99.93 ± 130.05	0-794
Sodium (mg)	2019.10 ± 1102.90	244-4952
Fluid (cups)	4.30 ± 2.06	1-12

More than half of the subjects did not meet the energy requirement (67.0%). In contrast, some subjects had exceeded the energy requirement (12.2%). For carbohydrates, a big proportion

of the subjects which is about 82.9% had exceeded the recommendation while only 5.7% had insufficient carbohydrates in their dietary intake. Similarly, a study among residents in China that found a high intake of carbohydrate (Qi et al., 2015). For protein, fat, saturated fat, PUFA, dairy products, and fluid, almost a quarter of the subjects meet the recommendation while more than half had insufficient of those nutrients. However, according to Supiyev et al., (2018) most of the subjects had increase intake of saturated fat. For fluid, it is found that 3 in 4 Malaysian drink enough plain water in daily life (National Health and Morbidity Survey, 2019). For trans fatty acid, 100% of the subjects had met the recommendation. On the other hand, 100% of the subjects did not meet the recommendation for fiber. Another study found that out of all subjects, about half did not meet the requirement of fiber (Liu et al., 2018). All subjects have sufficient intake of dietary cholesterol and sodium and there were even that had exceeded the requirement. The subjects either meet or had insufficient intake of MUFA.

Table 4.9: Dietary intake of the subjects (N =115)

Nutrients	**N (%)**		
	Meet	**Exceed**	**Insufficient**
Energy (kcal)	24 (20.9)	14 (12.2)	77 (67.0)
Carbohydrate (%)	4 (11.4)	29 (82.9)	2 (5.7)
Protein (%)	32 (27.8)	17 (14.8)	66 (57.4)
Fat (%)	29 (25.2)	26 (22.6)	60 (52.2)
Saturated fat (%)	27 (23.5)	10 (8.7)	78 (67.8)
PUFA (%)	16 (13.9)	24 (20.9)	75 (65.2)
MUFA (%)	7 (6.1)	-	108 (93.9)
Trans fat (%)	115 (100.0)	-	-
Fiber (g)	-	-	115 (100.0)
Dairy products (serving)	26 (22.6)	3 (2.6)	86 (74.8)
Dietary cholesterol (mg)	55 (47.8)	60 (52.2)	-

Sodium (mg)	85 (73.9)	30 (26.1)	-
Fluid (cup)	34 (29.6)	3 (2.6)	78 (67.8)

4.7 Malnutrition risk

Table 4.10 shows the MNA-SF score of the subjects. The mean score obtained was 12.04 ± 2.38 with a minimum value of 5 and a maximum value of 14.

Table 4.10: Malnutrition risk of the subjects (N=115)

	Mean ± SD	Min-Max Value
Total MNA-SF score	12.04 ± 2.38	5-14

The total score was further classified into three categories which are shown in Table 4.11. More than half (66.1%) of the subjects have normal nutritional status. Almost a quarter (28.7%) of the subjects are at the risk of malnutrition while another small proportion (5.2%) are malnourished. Malnutrition could be due to longer stays at the hospital. This is supported by a study by Alzahrani and Alamri (2017) which found that the longer the length of hospitalization, the higher risk of developing malnutrition.

Table 4.11: Malnutrition risk classification of the subjects (N =115)

Classification	N (%)
Normal nutritional status (12-14 points)	76 (66.1)
At the risk of malnutrition (8-11 points)	33 (28.7)
Malnourished (0-7 points)	6 (5.2)

4.8 Lifestyle

The results for components of the lifestyle that were being asked to the subjects are illustrated in Table 4.12. The mean pieces of cigarettes taken by subjects were 3.92 ± 8.74 with a maximum of 50 pieces of cigarettes in a day. The maximum unit of alcohol consumed by subjects was 2 units per day. As for physical activity, the maximum time spent was about 2100 minutes in a week.

Table 4.12: Lifestyle of the subjects (N=115)

Components	Mean ± SD	Min-Max Value
Smoking (pieces/day)	3.92 ± 8.74	0-50
Alcohol (unit/day)	0.06 ± 0.33	0-2
Physical activity (min/week)	171.48 ± 325.34	0-2100

For smoking status, more than half of the subjects are smoking (75.7%). According to the National Health and Morbidity Survey (2018), one in ten elderly were smokers. The most popular type was the normal cigarette like Marlboro, Gudang Garam, Pall Mall, and Dunhill which accounts for about 92.9% of the subjects. A similar result was found where most of the smokers frequently used manufactured cigarettes (National Health and Morbidity Survey, 2018). About 21% of smokers smoked cigarette while 5% smoked e-cigarette (National Health and Morbidity Survey, 2019). The least popular type in the study was an electronic cigarette and other types like "rokok daun" with 3.6%. In contrast with smoking status, the proportion of subjects who did not drink alcohol is much higher (94.8%). A greater number of subjects consumed beer (83.3%) compared to wine (16.7%). In terms of physical activity, 60.9% of subjects had some activities recorded. In contrast with a study conducted by Qi et al., (2015) where the percentage of subjects performed physical activity was less than 50%. Among subjects that carried out physical activity, some subjects carry out a moderate-intensity activity (54.3%), followed by light-intensity (35.7%)

and vigorous-intensity (10.0%). Most of them (54.3%) spent between 20 minutes to 60 minutes per day to carry out physical activity. Despite the time spent and physical activity recorded, only 31.3% had met the recommendation while the rest did not meet the recommendation.

Table 4.13: Lifestyle of the subjects (N =115)

Components	N (%)
Smoking	
Smoking status	
Yes	28 (24.3)
No	87 (75.7)
Smoking (type) n=28	
Cigarette	26 (92.9)
Electronic	1 (3.6)
Others	1 (3.6)
Alcohol	
Alcohol status	
Yes	6 (5.2)
No	109 (94.8)
Alcohol (type) n=6	
Wine	1 (16.7)
Beer	5 (83.3)
Physical Activity	
Physical activity status	
Yes	70 (60.9)
No	45 (39.1)
Physical activity (intensity) n=70	
Light	25 (35.7)
Moderate	38 (54.3)
Vigorous	7 (10.0)
Physical activity (min/day) n=70	
Less than 20 min/day	16 (22.9)
20-60 min/day	38 (54.3)
More than 60 min/day	16 (22.9)
Physical activity (meet recommendation) n=70	
Yes	36 (31.3)
No	79 (68.7)

4.9 Total cholesterol level

The mean cholesterol level for subjects was 4.08 ± 1.51 mmol/L with a minimum value of 0.18 mmol/L and a maximum value of 7.87 mmol/L.

Table 4.14: Cholesterol level of the subjects (N=115)

	Mean ± SD	Min-Max Value
Total cholesterol level (mmol/L)	4.08 ± 1.51	0.18-7.87

The total cholesterol level is further classified into normal and abnormal class in Table 4.15. The prevalence of hypercholesterolemia among subjects was 29.6% while the majority had a normal total cholesterol level. The result showed the opposite side as compared to past studies. A study conducted in Jordan found that the prevalence of hypercholesterolemia was high as 44.3% (Abujbara et al., 2018). Meanwhile, among community-dwelling elderly in Malaysia, the prevalence of hypercholesterolemia was also reportedly high (National Health and Morbidity Survey, 2018).

Table 4.15: Cholesterol classification of the subjects (N=115)

Classification	N (%)
Normal (<5.2 mmol/L)	81 (70.4)
Abnormal (≥5.2 mmol/L)	34 (29.6)

4.10 Hypotheses testing

a) There is no significant association between socio-demographic characteristics with the total cholesterol level among hospitalized elderly patients in Hospital Serdang, Selangor.

Based on Table 4.16, the Pearson correlation was conducted to study the association between age and total cholesterol levels. The result showed that there was no significant relationship between age and total cholesterol level ($p>0.05$). Further analysis was conducted to test the association between other socio-demographic characteristics with total cholesterol levels. The components tested were sex, ethnicity, living area, education level, marital status, monthly household income, source of income, living arrangement, and previous occupation. The analysis was conducted using the Chi-square test. Based on Table 4.17, there was no significant relationship between those components with the total cholesterol levels ($p>0.05$). Therefore, the result indicated that the total cholesterol level was not influenced by socio-demographic characteristics among hospitalized elderly. Hence, the null hypothesis was failed to be rejected.

Table 4.16: Correlation test between age with total cholesterol level

Socio-demographic characteristics	*r*-value	*p*-value[b]
Age (year)	-0.088	0.348

[b]Pearson's correlation

Increasing in age is associated with an abnormal value of biochemical indicators. It is shown that when a person reaches the age of 60 years old and above, the lipid indicators including total cholesterol will become abnormal (Abujbara et al., 2018). A study related to the management of dyslipidemia among the elderly also suggested the same finding (Streja, 2014). Another study found that at the age of 66 to 70 years old, total cholesterol is at the peak of the top-level (Lin et al., 2019). However, those findings were inconsistent with the current study. The current result showed that age was not associated with the total cholesterol level. Similarly, some studies showed

that there was no association between age and lipid profile (Kiplagat, Lydia, Jemimah, & Drusilla, 2017; Supiyev et al., 2017; Tan et al., 2008).

Table 4.17: Correlation test between socio-demographic characteristics with total cholesterol level (N=115)

Variables	Total Cholesterol		X^2	*p*-value[c]
	N (%)			
	Normal total cholesterol level	Abnormal total cholesterol level		
Sex			1.002	0.317
Male	51 (73.9)	18 (26.1)		
Female	30 (65.2)	16 (34.8)		
Ethnicity			0.998	0.318
Malay	44 (74.6)	15 (25.4)		
Non-Malay	37 (66.1)	19 (33.9)		
Living area			2.823	0.093
Urban	60 (66.7)	30 (33.3)		
Rural	21 (84.0)	4 (16.0)		
Education level				0.752[a]
No formal education	10 (76.9)	3 (23.1)		
Received formal education	71 (69.6)	31 (30.4)		
Marital status				1.000[a]
Not married	2 (66.7)	1 (33.3)		
Married	79 (70.5)	33 (29.5)		
Monthly household income			0.091	0.763
≤ RM 2000.00	64 (71.1)	26 (28.9)		
> RM 2000.00	17 (68.0)	8 (32.0)		
Source of income			0.024	0.878
Family	37 (71.2)	15 (28.8)		
Other sources	44 (69.8)	19 (30.2)		
Living arrangement			1.670	0.196
With spouse and family	66 (73.3)	24 (26.7)		
Others	15 (60.0)	10 (40.0)		
Previous occupation				0.556[a]
Unemployed	10 (62.5)	6 (37.5)		
Employed	71 (71.7)	28 (28.3)		

[a]Fisher's Exact test
[c]Chi-square test

It is found that sex, ethnicity, residence, education level, marital status, monthly household income, source of income, living arrangement, and previous occupation were not significantly

associated with total cholesterol level. Similarly, the previous study showed no association although one group had more subjects having hypercholesterolemia (Kiplagat et al., 2017). Meanwhile, a study found that the prevalence of dyslipidemia was significantly higher in men (Liu et al., 2018). The value of total cholesterol is also significantly higher in female subjects (Gonmei, Dwivedi, Toteja, Singh, & Vikram, 2018). This can be explained as menopause leads to changes in hormonal status and lipid profile in women (Gonmei et al., 2018). Besides that, the reduction in sex hormones with menopause causes the accumulation of fat in the trunk and abdomen in women (Gonmei et al., 2018). A previous study found a similar finding with the current study in which the effect of ethnicity was not significant when waist-hip-ratio was considered (Ismail et al., 2000). However, a study found that Asian Indians have an abnormal fat distribution which increases the risk of dyslipidemia (Nayak & Bhaktha, 2016). Another study found a higher serum total cholesterol in Malays, compared with Chinese subjects (Tan et al., 2009). The difference was due to polymorphism of lipoprotein called apolipoprotein E (apoE) which makes the lipoprotein among the population differ (Scott et al., 2009). A previous study discussed the association of education level with total cholesterol level. It showed that education is not directly influencing the current blood lipid levels (Guzman, 2010). This is because of the effect of education on blood lipid levels not high enough to display a large magnitude of the effect, especially for total cholesterol (Guzman, 2010). Inconsistent with current findings, some studies revealed a less favorable lipid profile in women either in with high or low education, because of sedentary occupation (Lara & Amigo, 2018). However, in men, due to high engagement in physical activity, a favorable lipid profile can be observed even with low education (Lara et al., 2018). Moreover, subjects who lived in the urban area have a less favorable lipid profile (Supiyev et al., 2017) while subjects who lived in a rural area have a higher cholesterol level. Consistent with the current study, marital status was

found as a negatively associated factor of the total cholesterol level (Song et al., 2019). This is because some subjects have a negative familial interaction despite a high income and live with family (Sacks et al., 2001). This leads to no change in the lipid profile of the subjects. Past literature has found an association between higher socioeconomic status and dyslipidemia (Santo et al., 2019). This is because a person will have a big role to decide which and what food to consume if there is a good financial support-better lipid profile (Agarwalla et al., 2015).

b) There is no significant association between medical backgrounds with total cholesterol levels among hospitalized elderly patients in Hospital Serdang, Selangor.

A correlation test was conducted to determine the association between medical characteristics with total cholesterol levels. Pearson correlation test was used with the components tested were the length of stay, number of comorbidities, and number of medications. From Table 4.18, it is found that there was no significant relationship between the components with total cholesterol levels ($p>0.05$). Chi-square test was conducted as shown in Table 4.19 and showed that only comorbidities, specifically dyslipidemia and others that were significantly associated with the total cholesterol level. ($p<0.05$). Thus, the null hypothesis was failed to be rejected except for dyslipidemia and other types of comorbidities.

Table 4.18: Correlation test between the length of stay, no. of comorbidities, and no. of medications with total cholesterol (N=115)

Medical characteristics	r-value	p-value[b]
Length of stay (days)	-0.070	0.458
Number of comorbidities	-0.032	0.732
Number of medications	0.107	0.253

[b]Pearson's correlation

A past study related to days of hospitalization revealed that no change was found in the value of total cholesterol (Genest et al., 1988). In agreement with the current study, the mean for length of stay was 4 days. This is due to the short days of hospitalization to produce significant changes to

the lipid profile (Alzahrani & Alamri, 2017). Inconsistent with current findings, a previous study found that plasma cholesterol levels decrease related to surgery, trauma, and acute hemorrhage (Wilson, Barletta, & Tybursk, 2003). Besides that, total cholesterol levels significantly lower in subjects adherent to medications (Robert et al. 2014).

Table 4.19: Correlation test between medical characteristics with total cholesterol level (N=115)

Variables	**Total Cholesterol**		X^2	***p*-value[c]**
	N (%)			
	Normal total cholesterol level	**Abnormal total cholesterol level**		
Record met with the dietitian				0.672[a]
Yes	6 (85.7)	1 (14.3)		
No	75 (69.4)	33 (30.6)		
Comorbidities (Hypertension)			0.630	0.427
Yes	56 (68.3)	26 (31.7)		
No	25 (75.8)	8 (24.2)		
Comorbidities (Diabetes)			0.819	0.365
Yes	50 (67.6)	24 (32.4)		
No	31 (75.6)	10 (24.4)		
Comorbidities (Dyslipidemia)			14.291	**0.000**
Yes	22 (50.0)	22 (50.0)		
No	59 (83.1)	12 (16.9)		
Comorbidities (IHD)			3.156	0.076
Yes	22 (59.5)	15 (40.5)		
No	59 (75.6)	19 (24.4)		
Comorbidities (Others)			7.843	**0.005**
Yes	47 (82.5)	10 (17.5)		
No	34 (58.6)	24 (41.4)		
Family history (Dyslipidemia)				0.233[a]
Yes	4 (50.0)	4 (50.0)		
No	77 (72.0)	30 (28.0)		
Polypharmacy			0.111	0.740
Yes	55 (71.4)	22 (28.6)		
No	26 (68.4)	12 (31.6)		

[a]Fisher's Exact test
[c]Chi-square test

In terms of comorbidities, it was revealed that all but dyslipidemia and other comorbidities were not significantly associated with the total cholesterol level. Similarly, a study found no

significant association found between hypertension and diabetes (Lin et al., 2019). This is because of a better awareness of personal history or family history which makes the subjects more likely to aware of the condition (Zhang et al., 2017). Contrary to past studies, the finding of this study found that diabetes and hypertension do not significantly influence the total cholesterol level. In the past, studies found that diabetes and hypertension were the risk factors for total cholesterol levels (Abujbara et al., 2018). About 30-60% of patients with Type 2 diabetes have dyslipidemia (Low et al., 2016). As a result of poor glycemic control, the serum lipid profile will increase (Goldberg, 2004). As for hypertension, it is suggested that critical hypertension results in a long duration of dyslipidemia (Liu et al., 2014). Dyslipidemia is found to be significantly associated with total cholesterol in the current study. Past studies also revealed that the changes in the value of total cholesterol were affected by the other lipid indicators (Lin et al., 2019). Furthermore, The American Association of Clinical Endocrinologists and American College of Endocrinology 2017 guidelines (AACE 2017) stated that the management of dyslipidemia can be made by providing target goal lipids for the patient (Abujbara et al., 2018). Findings from this research found that other types of comorbidities were significantly associated with total cholesterol. Based on the questionnaires, common comorbidities besides diabetes, hypertension, and ischemic heart disease was kidney disease. Consistent with the previous study, it is shown that people that have kidney disease experienced some changes in the metabolism of lipoprotein (Tsimihodimos, 2011). Therefore, the lipid profile is altered in the presence of kidney disease. Besides that, according to the Clinical Practice Guidelines for Lipids stated that the presence of nephrotic syndrome will increase the level of total cholesterol, aside from hypothyroidism, cholestasis, and drugs (Tai et al., 2017). The amount of fluid also determined the efficacy of kidney work. Based on the current

study, about half of the subjects did not meet the recommendation for fluid which became one of the contributors to the kidney not functioning properly.

c) There is no significant association between anthropometric measurements with total cholesterol levels among hospitalized elderly patients in Hospital Serdang, Selangor.

Pearson correlation was conducted to determine the association between anthropometric characteristics with total cholesterol levels. The anthropometric indicators that were tested were weight, previous weight, weight change, percentage weight change, height, body mass index (BMI), waist, and calf circumference. From the analysis, it is found that only waist circumference was significantly associated with the total cholesterol level ($p<0.05$). Therefore, the null hypothesis was failed to be rejected except for waist circumference.

Table 4.20: Correlation test between anthropometric characteristics of the subjects with total cholesterol level (N=115)

Anthropometric characteristics	*r*-value	*p*-value[b]
Weight (kg)	-0.014	0.885
Previous weight (kg)	-0.043	0.650
Weight change (kg)	-0.161	0.085
Percentage weight change (%)	-0.150	0.110
Height (cm)	-0.052	0.581
BMI (kg/m^2)	0.009	0.927
Waist circumference (cm)	0.199	**0.033**
Calf circumference (cm)	0.043	0.650

[b]Pearson's correlation

The current study revealed that there was no significant association between BMI with total cholesterol levels. Inconsistent with the previous study which found that subjects with abnormal BMI have increased risks to have dyslipidemia (Kiplagat, Lydia, Jemimah, & Drusilla, 2017). No association was found between height and total cholesterol levels in the current study. However, previous studies found height as a determinant for cholesterol and fat levels (Rettner, 2015). This is because shorter people tend to have higher cholesterol and fat levels (Rettner, 2015). Inconsistent with current findings, a past study found that calf circumference was positively correlated with the total cholesterol level (Zhang et al., 2017). Findings from this study reported that the waist circumference has a significant influence on the total cholesterol level. Consistently, another study found that abdominal obesity is strongly associated with abnormal lipid profiles (Lin et al., 2016). Prior studies ascertained the association of abnormal waist circumference with poor control of serum lipids (Zhang et al., 2017). Besides that, a meta-analysis study among the Asian population found that the measure of central obesity is a better predictor for detecting cardiovascular risk factors like dyslipidemia (Lee, Huxley, Wildman, & Woodward, 2008).

d) There is no significant association between biochemical data with the total cholesterol levels among hospitalized elderly patients in Hospital Serdang, Selangor.

The association between biochemical data with the total cholesterol level was determined using the Pearson correlation test. From the analysis in Table 4.21, LDL-C, HDL-C, and fasting blood glucose were significantly associated with the total cholesterol level ($p<0.05$). Thus, the null hypothesis was failed to be rejected except for LDL-C, TG, and fasting blood glucose.

Table 4.21: Correlation test between biochemical data of the subjects with total cholesterol level (N=115)		
Biochemical data	***r*-value**	***p*-value[b]**
LDL-C (mmol/L)	0.455	**0.000**
HDL-C (mmol/L)	0.049	0.602
Triglyceride (mmol/L)	0.459	**0.000**
Fasting Blood Glucose (mmol/L)	0.386	**0.000**
Urea (mmol/L)	-0.034	0.719
Sodium (mEq/L)	-0.027	0.774
Potassium (mmol/L)	0.089	0.344
Chloride (mEq/L)	-0.080	0.398
Creatinine (µmol/L)	0.012	0.902
Protein (g/L)	-0.080	0.397
Albumin (g/L)	0.053	0.574

[b]Pearson's correlation

Based on the results depicted from the analysis, it is reported that LDL-C, TG, and fasting blood glucose had a significant association with the total cholesterol level. A study that supports the current findings showed that abnormal glucose level was a risk factor for dyslipidemia as it will increase the level of total cholesterol (Abujbara et al., 2018). Comparing with the current study, fasting blood glucose had a significant effect might be due to a high percentage of subjects with comorbidities of diabetes. Most of the subjects with diabetes had an abnormal value of fasting blood glucose. For triglyceride, it is found that triglyceride increases the total cholesterol level particularly from the consumption of high carbohydrates food (Yunsheng et al., 2006). However,

in contrast with current findings, a study showed that cholesterol levels remain constant, even though triglyceride levels fluctuate 1 to 4 hours after meals (Harchaoui, 2009). Besides that, a study on diabetes found that there was a significant change in the level of LDL-C (Joshi et al., 2014). This is because LDL cholesterol builds up in the walls of arteries which leads to an increase in the total cholesterol level (Cariou& Krempf, 2011).

e) There is no significant association between dietary intake with the total cholesterol level among hospitalized elderly patients in Hospital Serdang, Selangor.

Pearson correlation analysis was used to determine the association between dietary intake with total cholesterol. From Table 4.22, it is found that carbohydrate, fat, saturated fat, PUFA, MUFA, and sodium were significantly associated with the total cholesterol level ($p<0.05$). Thus, the null hypothesis was failed to be rejected except for carbohydrate, fat, saturated fat, PUFA, MUFA, and sodium.

Table 4.22: Correlation test between dietary intake of the subjects with total cholesterol level (N=115)

Nutrients	***r*-value**	***p*-value[b]**
Energy (kcal)	0.111	0.239
Carbohydrate (%)	-0.333	**0.000**
Protein (%)	0.128	0.172
Fat (%)	0.327	**0.000**
Saturated fat (%)	0.304	**0.001**
PUFA (%)	0.275	**0.003**
MUFA (%)	0.327	**0.000**

Trans fat (%)	-	-
Fiber (g)	0.142	0.131
Dairy products (serving)	0.014	0.880
Dietary cholesterol (mg)	0.129	0.168
Sodium (mg)	0.211	**0.024**
Fluid (cups)	0.076	0.420

[b]Pearson's correlation

It is shown that the replacement of food containing saturated fat with PUFA or MUFA able to reduce the total cholesterol level (Alhassan et al., 2012). PUFA lowered total cholesterol half as much as saturated fat raised it (Kris-Etherton, 2000). From the pattern of dietary intake of the subjects, most of the subjects have a lack of intake of both nutrients. Therefore, it might affect the total cholesterol level of the subjects. Incorporation of olive oil, canola oil, walnuts, soybean, and leafy vegetables could increase the intake of PUFA and MUFA in the diet. Another study was conducted regarding the DASH Diet approach and the effects of blood lipids. It is found that when the subjects consumed the DASH diet, there was a noticeable effect on the total cholesterol (Sacks et al., 2001). The diet mainly has approximately 7% of saturated fat. Based on the study, it shows that sodium also has a contribution to the level of cholesterol, as the subjects were indirectly consumed a controlled amount of sodium. From the result of the current study, the subjects were either meet or exceed the requirement of sodium. In contrast with the current finding, it is found that moderate sodium reduction of 50 to 80 mmol/d versus 130 to 200 mmol/d reported no significant increase in total cholesterol (Harsha et al., 2004). The choices of carbohydrates also play a big role in the lipid profile. Consistent with the previous study which showed a higher prevalence of dyslipidemia among subjects taking simple carbohydrates (Qi et al., 2015). Traditional ethnic foods like energy-dense food and high saturated food are also associated with

dyslipidemia (Supiyev et al., 2017). From food history, most of the subjects stick to common food in Malaysia like nasi lemak, roti canai, tosai, chapati, white bread, and biscuits.

f) There is no significant association between malnutrition risk with the total cholesterol level among hospitalized elderly patients in Hospital Serdang, Selangor.

Pearson correlation test analysis was conducted between the MNA-SF score with the total cholesterol level, meanwhile, a Chi-square test was conducted between the malnutrition classification with the total cholesterol level. Based on Table 4.23 and Table 4.24, there was no significant association found between malnutrition risk with total cholesterol level. Therefore, the null hypothesis was failed to be rejected.

Table 4.23: Correlation test between malnutrition risk with total cholesterol level (N=115)

MNA-SF score	***r*-value**	***p*-value[b]**
Total score	0.017	0.855

[b]Pearson's correlation

Table 4.24: Correlation test between malnutrition classification with total cholesterol level (N=115)

Variables	**Total Cholesterol**		X^2	***p*-value[c]**
	N (%)			
	Normal total cholesterol level	**Abnormal total cholesterol level**		
Classification			1.193	0.275
Normal nutritional status	51 (67.1)	25 (32.9)		
At the risk of malnutrition/malnourished	30 (76.9)	9 (23.1)		

[c]Chi-square test

The MNA-SF is a reliable tool to classify the elderly according to the malnutrition classification. Other than that, other tools can also be used like DETERMINE and MNA. Based on the result, it is shown that no association between malnutrition risk and total cholesterol level. The current finding was inconsistent with the previous studies. Past studies found that cholesterol levels increase significantly with the score of the screening and assessment tools (Contreras et al., 2010; Zhang et al., 2017). This is because prolonged malnutrition resulting in loss of fat stores among the subjects (Dorner & Friedrich, 2018). Malnutrition risk is significantly associated with a condition called hypocholesterolemia which is serum cholesterol less than 160 mg/dL (Zhang, Pereira, Luo, & Matheson, 2017). However, a previous study found that malnutrition other than anorexia nervosa was not associated with high cholesterol (Rigaud, 2009).

g) There is no significant association between lifestyle with the total cholesterol level among hospitalized elderly patients in Hospital Serdang, Selangor.

Table 4.25 shows the Pearson correlation test between lifestyle and total cholesterol levels. From the analysis, it is revealed that physical activity, specifically the duration in a week was significantly associated with total cholesterol level ($p<0.05$). Thus, the null hypothesis was failed to be rejected except for the duration of physical activity.

Table 4.25: Correlation test between lifestyle with total cholesterol level (N=115)		
Components	***r*-value**	***p*-value[b]**
Smoking		
Smoking (pieces/day)	0.159	0.090
Alcohol		
Alcohol (unit/day)	0.010	0.913
Physical activity		
Physical activity (min/week)	-0.287	**0.002**

[b]Pearson's correlation

Current findings related to smoking and alcohol intake were inconsistent with some of the previous studies. Some studies related to smoking behavior and alcohol intake found a significant association with the lipid profile (Abujbara et al., 2018; Tan et al., 2008). This is because smoking could alter the serum lipoprotein profile (Okamura, 2010). Besides that, a previous study showed a positive association of dyslipidemia in current smoker which smoked cigarettes daily or occasionally (Abujbara et al., 2018). The current finding of the physical activity possessed a consistent result with a previous study in lack of physical activities and sedentary habits are the characteristic of dyslipidemia (Liu et al., 2010). The main reason for not meeting the recommendation for physical activity is due to the illness and mobility of the subjects. The subjects' mobility is limited in which assistance is needed when performing physical activity. The finding was consistent with the National Health Morbidity Survey (2019) which found that persons aged 75 years and above have the least engagement with the physical activity (59%). Consistent with current findings, a previous study found that alcohol drinking was negatively associated factor for total cholesterol levels (Song et al., 2018).

CHAPTER 5

CONCLUSION, LIMITATIONS, AND RECOMMENDATIONS

5.1 Conclusion

The current study reported the prevalence of hypercholesterolemia of 29.6%. Comorbidities specifically dyslipidemia and other comorbidities, waist circumference, LDL-C, TG, fasting blood glucose, carbohydrate, fat, saturated fat, PUFA, MUFA, sodium, and duration of physical activity were significantly associated with the total cholesterol level. Therefore, the findings of this study have shown the importance of screening and assessment especially dietary intake assessment which affects the total cholesterol level among elderly patients. Meanwhile, age, sex, ethnicity, living area, education level, marital status, monthly household income, source of income, living arrangement, previous occupation, length of stay in the hospital, number of comorbidities, number of medications, record met with a dietitian, hypertension, diabetes, IHD, family history of dyslipidemia, polypharmacy status, weight, previous weight, weight change, percentage of weight change, height, BMI, calf circumference, HDL-C, urea, sodium, potassium, chloride, creatinine, protein, albumin, energy intake, protein intake, fiber intake, dietary cholesterol, fluid intake, malnutrition risk, smoking, and alcohol intake were not significantly associated with the total cholesterol level in hospitalized elderly.

5.2 Limitation of the study

Some limitations need to be addressed in this study. Firstly, the unavailability of the caregiver to help to answer the question. This is because some subjects have difficulty to recall certain information. Second, for the selection of the sample size, patients that consumed

medications to control the total cholesterol level are not being excluded in which would bias the results of the analysis towards the null hypothesis. In this study, medications to control the total cholesterol level can be addressed as a potential confounding variable. Lastly, the study has the potential to bias especially recall bias. During the interview session, the questions can either be answered by the subject or the caregiver. If the subject or caregiver did not know well or have a problem recalling the answer, misreported might happen.

5.3 Recommendations

In general, there are two aspects of recommendation identified for future research. Firstly, to add more data into the field, future intervention studies can be conducted. Next, health promotion program can be conducted which include the dietary intervention and physical activity among the elderly to maintain the total cholesterol level and to prevent other complication. Lastly, current findings can help to revise current guidelines based on the identified risk factors.

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APPENDIX I

Approval letter from MREC

(English Version)

JAWATANKUASA ETIKA & PENYELIDIKAN PERUBATAN
(Medical Research & Ethics Committee)
KEMENTERIAN KESIHATAN MALAYSIA
d/a Kompleks Institut Kesihatan Negara
Blok A, No 1, Jalan Setia Murni U13/52,
Seksyen U13, Bandar Setia Alam,
40170 Shah Alam, Selangor.
Tel: 03-3362 8888/8205

Ref : KKM/NIHSEC/ P19-229 (7)
Date: 13 -March -2019

Dr Noraida Omar
UNIVERSITY PUTRA MALAYSIA (UPM)

Nur'Aiman Bin Taslim Galli
UNIVERSITY PUTRA MALAYSIA (UPM)

Dear Sir / Mdm,

ETHICS INITIAL APPROVAL NMRR-18-3027-44602 (IIR)
Determining the Nutritional Status of The Hospitalized Elderly by using Mini Nutritional Assessment-Short Form (MNA-SF) and Its Associated Factors in Hospital Serdang

This letter is made in reference to the above matter.

2. The Medical Research and Ethics Committee (MREC), Ministry of Health Malaysia (MOH) has provided ethical approval for this study. Please take note that all records and data are to be kept strictly **CONFIDENTIAL** and can only be used for the purpose of this study. All precautions are to be taken to maintain data confidentiality. Permission from the District Health Officer / Hospital Administrator / Hospital Director and all relevant heads of departments / units where the study will be carried out must be obtained prior to the study. You are required to follow and comply with their decision and all other relevant regulations, including the Access to Biological and Benefit Sharing Act 2017.

3. The investigators involved in this study are:

   HOSPITAL SERDANG
   Dr Noraida Omar (Penyelidik Utama)
   Nur'Aiman Bin Taslim Galli (Penyelidik Utama)

4. The following study documents have been received and reviewed with reference to the above study:

Documents received and reviewed with reference to the above study:

1. Study Protocol_Version 4, dated 26-Feb-2019
2. Patient Information Sheet and Informed Consent Form_English_Version 4, dated 05-Mar-2019
3. Patient Information Sheet and Informed Consent Form_BM_Version 4, dated 05-Mar-2019
4. Questionnaire_Version 2, dated 18-Jan-2019
5. Investigator's documents : Declaration of Conflict of Interest (COI), IA-HOD-IA, and CV:
   a) Dr Noraida Omar (Penyelidik Utama)
   b) Nur'Aiman Bin Taslim Galli (Penyelidik Utama)

5. Please note that the approval is valid until **12-March-2020**. The following are to be reported upon receiving ethical approval. Required forms can be obtained from the Medical Research Ethics Committee (MREC) website (**http://www.nih.gov.my/mrec**).

   i. **Continuing Review Form** has to be submitted to MREC within 2 month (60 days) prior to the expiry of ethical approval.
   ii. **Study Final Report** upon study completion to the MREC.

APPENDIX II

Approval letter from MREC

(Malay Version)

JAWATANKUASA ETIKA & PENYELIDIKAN PERUBATAN
(Medical Research & Ethics Committee)
KEMENTERIAN KESIHATAN MALAYSIA
d/a Kompleks Institut Kesihatan Negara
Blok A, No 1, Jalan Setia Murni U13/52,
Seksyen U13, Bandar Setia Alam,
40170 Shah Alam, Selangor.
Tel: 03-3362 8888/8205

Ruj.Kami: KKM/NIHSEC/ P19-229 (6)
Tarikh : 13 -Mac-2019

Dr Noraida Omar
UNIVERSITY PUTRA MALAYSIA (UPM)

Nur'Aiman Bin Taslim Galli
UNIVERSITY PUTRA MALAYSIA (UPM)

Dato'/ Tuan/ Puan,

SURAT KELULUSAN ETIKA: NMRR-18-3027-44602 (IIR)
Determining the Nutritional Status of The Hospitalized Elderly by using Mini Nutritional Assessment-Short Form (MNA-SF) and Its Associated Factors in Hospital Serdang

Dengan hormatnya perkara di atas adalah dirujuk.

2. Bersama dengan surat ini dilampirkan surat kelulusan saintifik dan etika bagi projek ini. Segala rekod dan data subjek adalah SULIT dan hanya digunakan untuk tujuan kajian dan semua isu serta prosedur mengenai *data confidentiality* mesti dipatuhi. Kebenaran daripada Pengarah Hospital / Institusi di mana kajian akan dijalankan mesti diperolehi terlebih dahulu sebelum kajian dijalankan. Dato' / Tuan / Puan perlu akur dan mematuhi keputusan tersebut dan undang-undang lain yang berkaitan, termasuklah Akta Akses Kepada Sumber Biologi dan Perkongsian Faedah 2017.

3. Penyelidik- penyelidik yang terlibat ialah:

   HOSPITAL SERDANG
   Dr Noraida Omar (Penyelidik Utama)
   Nur'Aiman Bin Taslim Galli (Penyelidik Utama)

4. Adalah dimaklumkan bahawa kelulusan ini adalah sah sehingga **12-Mac-2020.** Tuan/Puan perlu menghantar dokumen-dokumen seperti berikut selepas mendapat kelulusan etika. Borang-borang berkaitan boleh dimuat turun daripada laman web Jawatakuasa Etika & Penyelidikan Perubatan (JEPP) (http://www.nih.gov.my/mrec).

   i. ***Continuing Review Form*** selewat-lewatnya dalam tempoh 2 bulan (60 hari) sebelum tamat tempoh kelulusan ini bagi memperbaharui kelulusan etika.
   ii. ***Study Final Report*** pada penghujung kajian.
   iii. Mendapat kelulusan etika sekiranya terdapat pindaan ke atas sebarang dokumen kajian / lokasi kajian / penyelidik. Pihak JEPP mempunyai hak untuk menarik balik kelulusan etika sekiranya terdapat perubahan dokumen kajian yang tidak diisytiharkan.

5. Kajian tersebut hanya melibatkan pengumpulan data melalui:

   i. Borang soal selidik
   ii. Antropometri

6. Sila ambil maklum bahawa sebarang urusan surat-menyurat berkaitan dengan penyelidikan ini haruslah dinyatakan **nombor rujukan surat** ini untuk melicinkan urusan yang berkaitan.

APPENDIX III

Subject Information Sheet & Informed Consent

(English Version)

PARTICIPANT INFORMATION SHEET AND INFORMED CONSENT FORM
(for adult subjects and interventional studies)

1. **Title of study:** Determining the Total Cholesterol Level of the Hospitalized Elderly and Its Associated Factors In Hospital Serdang, Selangor

2. **Name of the investigator:** Noor Azleen binti Hambali

   Name of institution: Hospital Serdang

3. **Name of sponsor:** Universiti Putra Malaysia

4. **Introduction:**

You are invited to participate in this study. The details of the research are described in this document. Please take your time to read through this information sheet and informed consent form before making any decision. Please ask the researcher if anything is unclear or if you like more information. If you wish to participate, you need to sign this informed consent form.

Your participation in this study is voluntary. You may also refuse to answer any questions you do not want to answer. If you volunteer to be in this study, you may withdraw from it at any time. If you withdraw, any data collected from you up to your withdrawal will still be used for the study.

This study has been approved by the Medical Research and Ethics Committee, Ministry of Health Malaysia.

5. **What is the purpose of the study?**

The purpose of this study to determine the associations between socio-demographic characteristics, medical backgrounds, anthropometric measurements, biochemical data, dietary intake, malnutrition risk, and lifestyle with the total cholesterol level among hospitalized elderly in Hospital Serdang, Selangor. This research is necessary because hypercholesterolemia is highly occurred and related to the increased risk of cardiovascular disease and death. A total of 115 elderly patients from Hospital Serdang will be participating in this study. The whole study will last about 3 months and your participation will be about 40 minutes throughout the face to face interview session.

6. What kind of study procedures will I receive?

If you agree to participate in the study, you will be face to face interviewed to complete a set of questionnaires and will be measured on several anthropometric measurements. Anthropometric measurements need us to measure your weight, height, body mass index (BMI), waist, and calf circumference. You will be asked to remove your shoes then stand up straightly on the weighing scale to measure weight and again stand up straightly to measure your height. If you are bedridden, your mid-upper arm circumference (MUAC) and calf circumference (CC) will be taken to estimate your weight, and also your knee height will be measured at a position of ninety degrees to estimate your height.

7. What will happen if I decide to take part?

You will be face to face interviewed, the researcher will fill a set of questionnaires which includes information regarding your socio-demographic characteristics, medical backgrounds, anthropometric measurements, biochemical data, dietary intake, malnutrition risk, and lifestyle. Your total cholesterol level will also be determined.

8. When will I be interviewed?

You will be interviewed as soon as possible after you give informed consent.

9. What are my responsibilities when taking part in this study?

You must answer all of the questions asked by the study staff honestly during the interview session.

10. What kind of treatment will I receive after I participate in the trial?

This study does not involve any treatment or further medical references after you participate in this study.

11. What are the potential risks and side effects of being in this study?

There are no risks and side effects of being in this study.

12. What are the benefits of being in this study?

You will be informed on your current nutritional status but the study data and results will not be returned to you.

13. What if I am injured during this study?

There is no risk to be injured in this study. This is an interview and a questionnaire-based study. You are only required to answer the questionnaire.

14. What are my alternatives if I do not participate in this study?

You do not have to participate in this study to get treatment for your disease or condition.

15. Who is funding the research?

There is no sponsor funding for the research and you will not be paid to participate in this study. You will also not be charged to participate in this study.

16. Can the research or my participation be terminated early?

You may withdraw from the study at any time.

17. Will my medical information be kept secret?

All your information obtained in this study will be kept and handled confidentially, following applicable laws and/or regulations. When publishing or presenting the study results, your identity will not be revealed without your expressed consent. Individuals involved in this study and your medical care, qualified monitors, and auditors, the sponsor or its affiliates and governmental or regulatory authorities may inspect and copy your medical records, where appropriate and necessary. Data from the study will be archived but your identity will not be revealed at any time.

18. Who should I call if I have questions?

If you have any questions about the study or if you think you have a study-related injury and you want information about treatment, please contact the researcher, Noor Azleen binti Hambali at telephone number 011-19244911 or email at leenhambali@gmail.com.You may also contact to her supervisor, Dr. Noraida Omar, 03-89472463. If you have any questions about your rights as a participant in this study, please contact The Secretary, Medical Research & Ethics Committee, and Ministry of Health Malaysia, at telephone number 03-2287 4032.

INFORMED CONSENT FORM

Title of Study: Determining the Total Cholesterol Level of the Hospitalized Elderly and Its Associated Factors In Hospital Serdang, Selangor

By signing below I confirm the following:

- I have been given oral and written information for the above study and have read and understood the information given.
- I have had sufficient time to consider participation in the study and have had the opportunity to ask questions and all my questions have been answered satisfactorily.
- I understand that my participation is voluntary and I can at any time free withdraw from the study without giving a reason and this will in no way affect my future treatment. I am not taking part in any other research study at this time. I understand the risks and benefits, and I freely give my informed consent to participate in the conditions stated. I understand that I must follow the study doctor's (investigator's) instructions related to my participation in the study.
- I understand that study staff, qualified monitors and auditors, the sponsor or its affiliates, and governmental or regulatory authorities have direct access to my medical record to make sure that the study is conducted correctly and the data are recorded correctly. All personal details will be treated as STRICTLY CONFIDENTIAL
- I will receive a copy of this subject information/informed consent form signed and dated to bring home.
- I agree/disagree* for my family doctor to be informed of my participation in this study. *(*delete which is not applicable)*

Subject:

Signature: I/C number:

Name: Date:

An investigator conducting informed consent:

Signature: I/C number:

Name: Date:

Impartial witness: *(Required if the subject is illiterate and contents of the participant information sheet are orally communicated to the subject)*

Signature: I/C number:

Name: Date:

APPENDIX IV

Subject Information Sheet & Informed Consent

(Malay Version)

RISALAH MAKLUMAT PESERTA DAN BORANG PERSETUJUAN atau KEIZINAN PESERTA

(untuk subjek dewasa dan penyelidikan intervensi)

1. Tajuk penyelidikan: Menentukan Jumlah Paras Kolesterol dan Faktor-Faktor Berkaitan Di Kalangan Pesakit Warga Tua Di Hospital Serdang, Selangor

2. Nama Penyelidik: Noor Azleen binti Hambali

3. Nama Institusi: Hospital Serdang, Selangor

Nama Penaja: Universiti Putra Malaysia

4. Pengenalan:

Anda dijemput untuk mengambil bahagian dalam kajian ini. Butiran penyelidikan akan diterangkan dalam dokumen ini. Sila baca dan pertimbangkan maklumat ini dengan teliti sebelum anda membuat keputusan. Sila minta penyelidik jika ada sesuatu yang tidak jelas atau jika anda mahukan maklumat lanjut. Sekiranya anda ingin mengambil bahagian, anda perlu menandatangani borang persetujuan ini.

Penyertaan anda dalam kajian ini adalah secara sukarela. Anda berhak untuk tidak menjawab sebarang pertanyaan atau persoalan yang anda enggan jawab. Jika anda secara sukarela mengambil bahagian dalam kajian ini, anda boleh menarik diri pada bila-bila masa. Sekiranya anda melakukan sedemikian, sebarang data yang dikumpulkan daripada anda masih akan digunakan untuk kajian ini.

Penyelidikan ini telah mendapat kelulusan Jawatankuasa Etika dan Penyelidikan Perubatan, Kementerian Kesihatan Malaysia.

5. Apakah tujuan penyelidikan ini dilakukan?

Tujuan penyelidikan ini dilakukan adalah untuk menentukan hubungkait antara faktor sosio-demografi, latar belakang perubatan, ukuran antropometri, data biokimia, pengambilan diet, risiko malnutrisi dan cara hidup dengan jumlah tahap kolesterol dalam kalangan pesakit warga tua di Hospital Serdang, Selangor.

Penyelidikan ini diperlukan kerana hiperkolesterolemia sering berlaku berkait rapat dengan peningkatan risiko penyakit kardiovaskular, morbidity dan kematian. Sejumlah 115 pesakit warga tua seperti anda daripada Hospital Serdang, Selangor akan menyertai penyelidikan ini. Penyelidikan ini akan berlangsung selama 3 bulan dan tempoh pembabitan anda dianggarkan selama 40 minit.

6. Apakah prosedur penyelidikan yang akan saya terima?

Jika anda bersetuju untuk mengambil bahagian dalam kajian ini, anda akan ditemuduga untuk menyelesaikan satu set soal selidik dan beberapa ukuran antropometri akan diambil daripada anda.

7. Apakah yang terjadi sekiranya saya bersetuju untuk menyertai penyelidikan ini?

Anda akan ditemubual untuk melengkapkan set soalan penyelidikan termasuk maklumat mengenai faktor sosio-demografi, latar belakang perubatan, ukuran antropometri, data biokimia, pengambilan diet, risiko malnutrisi dan cara hidup. Jumlah tahap kolesterol jugak akan dinilai.

8. Bilakah saya akan ditemubual?

Anda akan ditemubual secepat mungkin selepas anda memberikan keputusan berkaitan persetujuan ini.

9. Apakah tanggungjawab saya sewaktu menyertai penyelidikan ini?

Adalah penting untuk menjawab semua soalan yang ditanya oleh penyelidik dengan jujur dan sepenuhnya.

10. Apakah jenis rawatan yang akan saya terima selepas menyertai penyelidikan ini?

Kajian ini tidak melibatkan apa-apa rawatan.

11. Apakah risiko dan kesan-kesan sampingan menyertai penyelidikan ini?

Tiada risiko atau kesan sampingan sekiranya anda menyertai penyelidikan ini.

12. Apakah manfaatnya saya menyertai kajian ini?

Anda akan dimaklumkan berkaitan status pemakanan semasa anda. Maklumat yang diperolehi dari kajian ini akan membantu memperbaiki proses rawatan pada masa hadapan.

13. Apakah yang akan terjadi sekiranya saya tercedera semasa menyertai kajian ini?

Tidak ada risiko kecederaan dalam kajian ini. Ini adalah kajian berasaskan borang soal selidik. Anda hanya perlu menjawab boring soal selidik dalam kajian ini.

14. Apakah rawatan alternatif lain sekiranya saya tidak menyertai penyelidikan ini?

Anda tidak perlu menyertai kajian ini untuk mendapatkan rawatan bagi penyakit atau masalah kesihatan anda.

15. Siapakah yang membiayai penyelidikan ini?

Tiada pihak yang membiayai penyelidikan ini.

16. Bolehkah penyelidikan ataupun penyertaan saya ditamatkan lebih awal daripada yang dirancang?

Anda dibenarkan untuk menarik diri daripada penyelidikan ini pada bila-bila masa.

17. Adakah maklumat perubatan saya akan dirahsiakan?

Segala maklumat anda yang diperolehi dalam penyelidikan ini akan disimpan dan dikendalikan secara sulit, bersesuaian dengan peraturan-peraturan dan/ atau undang-undang yang berkenaan. Sekiranya hasil penyelidikan ini diterbitkan atau dibentangkan kepada orang ramai, identiti anda tidak akan didedahkan tanpa kebenaran anda terlebih dahulu. Pihak- pihak tertentu seperti individu yang terlibat dalam penyelidikan dan rawatan perubatan anda, juruaudit

dan jurupantau yang terlatih, pihak penaja atau pihak gabungannya, pihak berkuasa kerajaan atau undang-undang, boleh memeriksa dan membuat salinan laporan perubatan anda jika berkenaan dan diperlukan. Segala data yang berkaitan dengan penyelidikan ini akan diarkib, tetapi identiti anda tidak akan didedahkan sama sekali pada bila-bila masa.

18. Siapakah yang perlu saya hubungi sekiranya saya mempunyai sebarang pertanyaan?

Anda boleh menghubungi penyelidik ini, Noor Azleen binti Hambali pada sambungan telefon 011-19244911 ataupun emel kepada leenhambali@gmail.com sekiranya anda mempunyai sebarang pertanyaan mengenai penyelidikan ini atau jika anda mengesyaki anda mengalami kecederaan yang terhasil daripada penyelidikan ini. Anda boleh juga menghubungi pemantau penyelidikan ini iaitu Dr. Noraida Omar, 03-89472463. Jika anda mempunyai sebarang pertanyaan berkaitan dengan hak-hak anda sebagai peserta dalam penyelidikan ini, sila hubungi: Setiausaha, Jawatankuasa Etika & Penyelidikan Perubatan, Kementerian Kesihatan Malaysia, melalui talian telefon 03-2287 4032.

BORANG PERSETUJUAN/KEIZINAN PESERTA

Tajuk Penyelidikan: Menentukan Jumlah Paras Kolesterol dan Faktor-Faktor Berkaitan Di Kalangan Pesakit Warga Tua Di Hospital Serdang, Selangor

Dengan menandatangani di bawah, saya mengesahkan bahawa:

-Saya telah diberi maklumat tentang penyelidikan di atas secara lisan dan bertulis and saya telah membaca dan memahami segala maklumat yang diberikan dalam risalah ini.
-Saya telah diberikan masa yang secukupnya untuk mempertimbangkan penyertaan saya dalam penyelidikan ini dan telah diberi peluang untuk bertanyakan soalan dan semua persoalan saya telah dijawab dengan sempurna dan memuaskan.
-Saya juga faham bahawa penyertaan saya adalah secara sukarela dan pada bila-bila masa saya bebas menarik diri daripada penyelidikan ini tanpa harus memberi sebarang alasan dan ianya sama sekali tidak akan menjejaskan rawatan perubatan saya pada masa akan datang. Saya tidak mengambil bahagian dalam mana-mana penyelidikan lain pada masa ini. Saya juga memahami tentang risiko dan manfaat penyelidikan ini dan saya secara sukarela memberi persetujuan untuk menyertai penyelidikan ini di bawah syarat-syarat yang telah dinyatakan di atas. Saya faham saya harus mematuhi nasihat dan arahan yang berkaitan dengan penyertaan saya dalam penyelidikan ini daripada doktor penyelidikan (penyelidik).
-Saya faham bahawa kakitangan penyelidikan, pemantau dan juruaudit terlatih , pihak penaja atau gabungannya, dan pihak berkuasa kerajaan atau undang-undang, mempunyai akses langsung dan boleh menyemak laporan perubatan saya bagi memastikan penyelidikan ini dijalankan dengan betul dan data direkodkan dengan betul. Segala maklumat dan data peribadi akan dianggap sebagai SULIT.
-Saya akan menerima satu salinan 'Risalah Maklumat Peserta dan Borang Persetujuan atau Keizinan Peserta' yang telah lengkap dengan tarikh dan tandatangan untuk dibawa pulang ke rumah.
-Saya bersetuju/ tidak bersetuju* untuk doktor yang merawat keluarga saya diberitahu tentang penyertaan saya dalam penyelidikan ini. *(*Potong mana yang tidak berkenaan)*

Subjek:

Tandatangan: No. kad pengenalan:

Nama: Tarikh:

Penyelidik yang mengendalikan proses menandatangani borang keizinan:

Tandatangan: No. kad pengenalan:

Nama: Tarikh:

Saksi tidak-berpihak/adil: *(Diperlukan; jika subjek adalah buta huruf dan kandungan risalah maklumat peserta disampaikan secara lisan kepada subjek)*

Tandatangan: No. kad pengenalan:

Nama: Tarikh:

APPENDIX V

Questionnaire Form

APPENDIX *(QUESTIONNAIRE)*

Nombor Rujukan/ *Reference Number*:

FAKULTI PERUBATAN DAN SAINS KESIHATAN

JABATAN PEMAKANAN DAN DIETETIK

BORANG SOAL SELIDIK

QUESTIONNAIRE

Tajuk Kajian/*Research Question*:

MENENTUKAN JUMLAH PARAS KOLESTEROL DAN FAKTOR-FAKTOR BERKAITAN DI KALANGAN PESAKIT WARGA TUA DI HOSPITAL SERDANG, SELANGOR

DETERMINING THE TOTAL CHOLESTEROL LEVEL OF THE HOSPITALIZED ELDERLY AND ITS ASSOCIATED FACTORS IN HOSPITAL SERDANG, SELANGOR

Penyelidik/ *Researcher* : Noor Azleen bt Hambali

No. Matrik/ *Matric no.* : 192473

Program/ *Program* : B. Sc. (Dietetics)

Penyelia/ *Supervisor* : Dr. Noraida bt Omar

BAHAGIAN A / *SECTION A: SOCIODEMOGRAPHIC CHARACTERISTICS*

Sila isi maklumat pada tempat kosong atau tanda (✓) pada pilihan yang paling sesuai dengan anda.

Please fill in the blank or tick (✓) the answers that best applies to you.

No	Maklumat/*Information*	Catatan/ *Remarks*
1.	Umur *Age*	…….. Tahun/ *Years old*
2.	Jantina *Sex*	❑ Lelaki/ *Male* ❑ Perempuan/ *Female*
3.	Kaum *Ethnicity*	❑ Melayu/ *Malay* ❑ Cina/ *Chinese* ❑ India/ *Indian* ❑ Lain-lain/ *Others* Sila nyatakan/ *Please specify*: …….
4.	Tahap Pendidikan *Education level*	❑ Tidak bersekolah/ *No formal education* ❑ Sekolah rendah/ *Primay level* ❑ Sekolah menengah/ *Secondary level* ❑ Pra-universiti/ *Pre-university* ❑ Universiti/*University*

5.	Status perkahwinan *Marital Status*	❑ Bujang/ *Single* ❑ Berkahwin/ *Married* ❑ Bercerai/ *Divorced* ❑ Balu/*Widow* atau/*or* Duda/*Widower*
6.	Pendapatan bulanan isi rumah *Monthly household income*	❑ < RM 500 ❑ RM 500 – RM 1000 ❑ RM 1001 – RM 1500 ❑ RM 1501 – RM 2000 ❑ > RM 2000 Sila nyatakan/ *Please specify*: ……
7.	Sumber pendapatan *Source of income*	❑ Gaji/ *Salary* ❑ Wang pencen/ *Pension fund* ❑ KWSP/ *Provident fund* ❑ Bantuan amal/ *Charity aid* ❑ Keluarga/ *Family*
8.	Susunan hidup *Living arrangement*	❑ With spouse and family/*With spouse and family* ❑ Dengan pasangan sahaja/ *With spouse only* ❑ Lain-lain/ *Others* Sila nyatakan/ *Please specify:* ……
9.	Pekerjaan terdahulu *Previous occupation*	❑ Bekerja sendiri/ *Self-employed* ❑ Pekerja kerajaan / *Government employee* ❑ Pekerja swasta / *Private employee* ❑ Tidak bekerja / *Unemployed*
10.	Tempat tinggal *Residence*	❑ Bandar/ *Urban* ❑ Luar bandar/ *Rural* ❑ Lain-lain/ *Others* Sila nyatakan/ *Please specify*: ……

BAHAGIAN B / *SECTION B: MEDICAL BACKGROUND*

Bahagian ini akan **DIISI OLEH PENYELIDIK** dengan merujuk kepada rekod perubatan anda dan sesi temu bual.

*This section is **TO BE FILLED BY RESEARCHER** by referring to your medical record and interview session.*

No.	Maklumat Perubatan / *Medical Information*	Catatan/ *Remarks*
1.	Tarikh kemasukan ke hospital *Date of admission to hospital*	☐☐☐☐☐☐☐☐☐☐
2.	Tempoh berada di hospital *Length of stay (days)*	☐☐ Hari
3.	Komorbiditi *Comorbidities*	❑ Diabetes/ *Diabetes* ❑ Darah tinggi / *Hypertension* ❑ Sakit jantung / *Cardiovascular disease* ❑ Dislipidemia / *Dyslipidemia* ❑ Lain-lain / *Others* Sila nyatakan/ *Please specify*: ……..
4.	Jumlah komorboditi *Number of comorbidities*	……..
5.	Sejarah keluarga *Family history*	Penyakit / *Disease*

		❑ Dislipidemia / *Dyslipidemia* ❑ Darah tinggi / *Hypertension* ❑ Lain-lain / *Others* Sila nyatakan/ *Please specify*: …….. ……..
6.	Number of medications *Jumlah ubat-ubatan*	Sila nyatakan/ *Please specify*: ……..

BAHAGIAN C / *SECTION C: ANTHROPOMETRIC MEASUREMENTS*

Bahagian ini akan **DIISI OLEH PENYELIDIK** dengan merujuk kepada rekod perubatan anda dan sesi temu duga.

*This section is **TO BE FILLED BY RESEARCHER** by referring to your medical record and interview session.*

No.	**Maklumat/ *Information***	**Bacaan pertama / *First reading***	**Bacaan kedua / *Second reading***	**Purata / *Average***
1.	Bacaan antropometri *Anthropometry measurements*			
	-Berat semasa / *Current weight*	…….kg	…….kg	…….kg
	-Berat sebelum / *Previous weight*	…….kg	…….kg	…….kg
	-Perubahan berat / *Weight change*	…….kg	…….kg	…….kg
	-Peratus perubahan berat / *Percentage of weight change*	…….%	…….%	…….%
	-Tinggi / *Height*	…….m	…….m	…….m
	-BMI	…….kg/m^2	…….kg/m^2	…….kg/m^2
	-Ukur lilit pinggang / *Waist circumference*	…….cm	…….cm	…….cm
	-Ukur lilit betis / *Calf circumference*	……...cm	……..cm	……..cm

BAHAGIAN D / *SECTION D: BIOCHEMICAL DATA*

Bahagian ini akan **DIISI OLEH PENYELIDIK** dengan merujuk kepada rekod perubatan anda.

*This section is **TO BE FILLED BY RESEARCHER** by referring to your medical record.*

1.	**Data biokimia / *Biochemical data***	**Bacaan / *Reading***	**Bacaan normal / *Normal value***
	-Fasting serum lipid profile		
	-LDL-C	…….mmol/L	0-3.37 mmol/L
	-HDL-C	…….mmol/L	1.04-1.55 mmol/L
	-TG	…….mmol/L	0-1.7 mmol/L
	-TC	…….mmol/L	0-5.17 mmol/L
	-Fasting glucose level	…….mmol/L	<5.6 mmol/L
	-Renal profile		
	-Urea	…….mmol/L	3.2-9.2 mmol/L
	-Sodium	…….mmol/L	136-145 mEq/L
	-Potassium	…….mmol/L	3.5-5.1 mmol/L
	-Chloride	…….mmol/L	98—107 mEq/L
	-Creatinine	…….mmol/L	62-115 µmol/L
	-Liver function test		
	-Total protein	…….g/dL	64-83 g/L
	-Albumin	…….g/dL	35-50 g/L

BAHAGIAN E / *SECTION E: MALNUTRITION RISK*

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

*This section is **TO BE FILLED BY RESEARCHER** by referring to the medical record and interview sessions.*

No.	**Maklumat / *Information***	**Catatan / *Remarks***
1.	Adakah pengambilan makanan anda berkurang sejak tiga bulan yang lepas disebabkan kehilangan selera makan, masalah penghadaman, masalah untuk mengunyah atau masalah menelan? *Has food intake declined over the past three months due to loss of appetite, digestive problems, chewing or swallowing difficulties?*	0 = Pengurangan pengambilan makanan yang teruk / *severe decrease in food intake* 1 = Pengurangan pengambilan makanan yang sederhana / *moderate decrease in food intake* 2 = Tiada pengurangan pengambilan makanan / *no decrease in food intake* Score:…….
2.	Adakah anda mengalami kehilangan berat badan dengan tidak disengajakan sepanjang tiga bulan yang lepas? *Involuntary weight loss during the last 3 months?*	0 = Pengurangan berat badan lebih dari 3 kg / *weight loss greater than 3 kg (6.6 lbs)* 1 = Tidak tahu / *does not know* 2 = Pengurangan berat badan antara 1 hingga 3 kg

		/ *weight loss between 1 and 3 kg (2.2 and 6.6 lbs)* 3 = Tiada pengurangan berat badan / *no weight loss* Score:…….
3.	Adakah pergerakkan anda terbatas? *Mobility?*	0 = Terbatas di katil atau kerusi / *bed or chair bound* 1 = Boleh bangun dari katil atau kerusi tetapi tidak keluar / *able to get out of bed / chair but does not go out* 2 = Boleh keluar / *goes out* Score:……
4.	Adakah anda mengalami masalah psikologi stress atau pesakit akut sepanjang tiga bulan yang lepas? *Has the patient suffered psychological stress or acute disease in the past three months?*	0 = Ya / *yes* 2 = Tidak / *no* Score:……

5.	Adakah anda mempunyai masalah neuropsikologi? *Neuropsychological problems?*	0 = Demensia atau kemurungan yang teruk / *severe dementia or depression* 1 = Demensia ringan / *mild dementia* 2 = Tiada masalah psikologikal / *no psychological problems* Score:……

6.	Berapakah BMI anda? *Body mass index (BMI)? (weight in kg / height in m²)*	0 = BMI kurang dari 19 / BMI less than 19 1 = BMI 19 hingga kurang dari 21 / BMI 19 to less than 21 2 = BMI 21 hingga kurang dari 23 / *BMI 21 to less than 23* 3 = BMI 23 atau lebih / *BMI 23 or greater* Score:……
7.	Berapakah ukur lilit betis anda? *Calf circumference (CC) in cm*	0 = Ukur lilit kurang dari 31 / *CC less than 31* 3 = Ukur lilit 31 atau lebih / *CC 31 or greater* Score:……
	Jumlah skor / *Total score*	

Skor saringan / *Screening score* (max. 14 points)

- ❑ 12-14 points: Status pemakanan normal / *Normal nutritional status*
- ❑ 8-11 points: Berisiko kekurangan zat makanan / *At risk of malnutrition*
- ❑ 0-7 points: Malnutrisi / *Malnourished*

BAHAGIAN F / *SECTION F: DIETARY INTAKE*

A) Sejarah pemakanan / *Diet history*

Arahan:

1. Dalam bahagian ini, responden diminta untuk menyatakan kebiasaan makanan yang diambil selama 2 hari, iaitu **satu hari mewakili hari bekerja** dan **satu hari mewakili hujung minggu.**
2. Responden diminta untuk menyenaraikan kebiasaan makanan yang diambil pada setiap hari.
3. Responden diminta untuk menerangkan saiz hidangan, tempat dan cara masakan makanan yang diambil.

Instruction:

1. *In this section, the respondents need to state the usual food intake for 2 days which is **one day represents weekday** and **one day represents weekend.***
2. *Respondents will be asked to list all foods usually consumed in each meal in a day.*
3. *The respondents need to describe the serving size, place and cooking method of each food consumed.*

Hari / *Day*:

Waktu makan / *Mealtime*	**Saiz hidangan / *Serving size***	**Tempat / *Place***	**Cara masakan / *Cooking method***
Sarapan pagi / *Breakfast*			
Makan tengah hari / *Lunch*			
Snek petang / *Evening snack*			
Makan malam / *Dinner*			

Hari / *Day*:

Waktu makan / *Mealtime*	**Saiz hidangan / *Serving size***	**Tempat/ *Place***	**Cara masakan / *Cooking method***
Sarapan pagi / *Breakfast*			
Makan tengah hari / *Lunch*			
Snek petang / *Evening snack*			
Makan malam / *Dinner*			

BAHAGIAN G / *SECTION G: LIFESTYLE*

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

*This section is **TO BE FILLED BY RESEARCHER** by referring to the interview sessions.*

A) Status merokok / *Smoking status*

No.	**Maklumat / Information**	**Catatan / Remarks**
1.	Adakah anda merokok? *Do you smoke?*	❑ Ya / Yes ❑ Tidak / *No*
2.	Apakah jenis rokok yang anda gunakan? *What type of cigarette do you use?*	❑ Rokok / *Cigarette* ❑ Rokok elektronik / *Electronic Cigarette* ❑ Lain-lain / *Others* Sila nyatakan / *Please specify*: ……..
3.	Berapa jumlah rokok yang anda gunakan untuk satu hari? *How many pieces of cigarettes do you smoke per day?*	Sila nyatakan / *Please specify*:…….

B) Pengambilan minuman keras / *Alcohol consumption*

1.	Adakah anda mengambil minuman keras? *Are you taking alcohol?*	❑ Ya / *Yes* ❑ Tidak / *No*
2.	Apakah jenis minuman keras yang anda ambil? *What type of alcohol do you drink?*	❑ Wine ❑ Beer ❑ Lain-lain / *Others* Sila nyatakan/ *Please specify*: ……..
3.	Berapakah jumlah pengambilan minuman keras dalam sehari? *How much do you drink your alcohol per day?*	Sila nyatakan / *Please specify*:…….

C) Tahap aktiviti fizikal / *Physical activity level*

1.	Adakah anda melakukan aktiviti fizikal? *Do you do any physical activity?*	❑ Ya / *Yes* ❑ Tidak / *No* Jika tidak, sila langkau soalan 2, 3, dan 4 / *If no, please skip question 2,3, and 4*
2.	Apakah jenis aktiviti fizikal yang anda lakukan? *What type of physical activity did you do*?	❑ Ringan / *Light* ❑ Sederhana / *Moderate* ❑ Berat / *Vigorous* Sila nyatakan/ *Please specify:*…… …….. ……..
3.	Berapa lamakah anda melakukan aktiviti fizikal pada setiap hari? *What is the duration of your physical activity for each day?*	❑ Kurang daripada 20 minit / *Less than 20 minutes* ❑ 20 – 60 minit / *20 – 60 minutes* ❑ Lebih daripada 60 minit / *More than 60 minutes*
4.	Berapakah lamakah anda melakukan aktiviti fizikal dalam masa seminggu? *How long do you perform your physical activity in a week?*	……min per minggu/ *min per week*