UNIVERSITI PUTRA MALAYSIA

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BY

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

This project entitled “Sleep quality and its associated factors among hemodialysis patients in selected dialysis centres” was prepared by Ng Jing Wen and submitted to the Faculty of Medicine and Health Sciences as a partial fulfilment 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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Date:

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ABSTRACT

SLEEP QUALITY AND ITS ASSOCIATED FACTORS AMONG HEMODIALYSIS PATIENTS IN SELECTED DIALYSIS CENTRES

Ng Jing Wen

There is increasing evidence that poor sleep quality among haemodialysis (HD) patients is prevalent, at which such information is scarce at the local context. This study aimed to determine the prevalence of sleep quality and its associated factors among HD patients. This was a cross-sectional study involved 100 eligible HD patients in central region of Malaysia. Socio-demographic background of patients was obtained through self-administered questionnaire while anthropometric and biochemical parameters were obtained via dialysis record books as secondary data. Malnutrition-inflammation score (MIS), interdialytic weight gain (IDWG), International Physical Activity Questionnaire (IPAQ) and Night Eating Questionnaire (NEQ) were used to access nutritional status, fluid adherence, physical activity level (PAL) and presence of night eating syndrome (NES) of the patients, respectively. IBM SPSS version 25 was used in the statistical analysis with significance level was set at $p < 0.05$. A majority of the patients were within 55 – 64 years old with unsatisfactory financial status, had hypoalbuminemia, hyperkalemia, hyperphosphatemia and low PAL. Only 20% of the patients had fluid overload while 8% had NES. Double burden malnutrition exists in this study cohort, with approximately 30% and 20% of them were malnourished and obese, respectively. Despite HD patients who are slightly overweight tend to have higher survival rate due to reverse epidemiology, the extremely high prevalent of central obesity (69%) as represented by the excessive waist circumference and the high prevalence of low lean mass (84%) as presented by low grip strength deserves closer monitoring. Approximately 70% of patients were poor sleepers with a total of 60% of them slept less than 6 hours per day. A majority of patients had sleep disturbances, sleep latency and daytime dysfunction. Use of sleep medicine was rare. In general, poor sleep quality was significantly associated with younger age, lower financial status, low waist circumference, high MIS score, long sitting duration, low METs score and NES. Appropriate intervention to improve NES, nutritional status and structured exercise during dialysis may confer benefits to HD patients.

ABSTRAK

KUALITI TIDUR DAN FAKTOR-FAKTOR YANG BERKAITAN DENGAN PESAKIT HEMODIALISIS DI PUSAT DIALISIS TERPILIH

Ng Jing Wen

Terdapat bukti yang semakin meningkat bahawa kualiti tidur yang buruk di kalangan pesakit hemodialisis (HD) adalah lazim, di mana maklumat tersebut jarang berlaku dalam konteks setempat. Kajian ini bertujuan untuk menentukan kelaziman kualiti tidur dan faktor-faktor yang berkaitan di kalangan pesakit HD. Ini adalah kajian keratan rentas yang melibatkan 100 pesakit HD yang layak di wilayah tengah Malaysia. Latar belakang sosio-demografi pesakit diperoleh melalui soal selidik yang dikendalikan sendiri sementara parameter antropometrik dan biokimia diperoleh melalui buku rekod dialisis sebagai data sekunder. Skor kekurangan zat makanan (MIS), kenaikan berat badan interdialitik (IDWG), Soal Selidik Aktiviti Fizikal Antarabangsa (IPAQ) dan Soal Selidik Makan Malam (NEQ) digunakan untuk mengakses status pemakanan, kepatuhan cecair, tahap aktiviti fizikal (PAL) dan kehadiran makan malam sindrom (NES) pesakit, masing-masing. IBM SPSS versi 25 digunakan dalam analisis statistik dengan tahap signifikansi ditetapkan pada $p < 0,05$. Sebilangan besar pesakit berumur dalam lingkungan 55 - 64 tahun dengan status kewangan yang tidak memuaskan, mengalami hipoalbuminemia, hiperkalemia, hiperfosfatemia dan PAL rendah. Hanya 20% pesakit mengalami kelebihan cecair sementara 8% mengalami NES. Kekurangan zat makanan berganda wujud dalam kohort kajian ini, dengan kira-kira 30% dan 20% daripadanya kekurangan zat makanan dan obesiti. Walaupun pesakit HD yang berlebihan berat badan cenderung mempunyai kadar kelangsungan hidup yang lebih tinggi kerana epidemiologi terbalik, prevalensi kegemukan pusat yang sangat tinggi (69%) ditunjukkan oleh lilitan pinggang yang berlebihan dan prevalensi tinggi jisim tanpa lemak (84%) seperti yang ditunjukkan oleh kekuatan cengkaman yang rendah, memerlukan pemantauan yang lebih dekat. Kira-kira 70% pesakit adalah orang yang kurang tidur dengan jumlah 60% daripadanya tidur kurang dari 6 jam sehari. Sebilangan besar pesakit mengalami gangguan tidur, latensi tidur dan disfungsi siang hari. Penggunaan ubat tidur jarang berlaku. Secara amnya, kualiti tidur yang buruk dikaitkan dengan usia yang lebih muda, status kewangan yang lebih rendah, keliling pinggang yang rendah, skor MIS yang tinggi, jangka masa duduk yang panjang, skor MET yang rendah dan NES. Langkah-langkah yang sesuai untuk meningkatkan NES, status pemakanan dan latihan berstruktur semasa dialisis dapat memberikan manfaat kepada pesakit HD.

CHAPTER 1 INTRODUCTION

1.1 Background

There are five stages of chronic kidney disease (CKD), with End-stage renal disease (ESRD) represents the permanent loss of kidney and renal function. End-stage renal disease is diagnosed when glomerular filtration rate is lower than 15ml / min permanently (Bujang et al., 2017).

Globally, the number of patients with ESRD is increasing rapidly due to ageing and high prevalence of non-communicable diseases such as hypertension and diabetes mellitus. Starting from year 2007, there was linear increase in the number of new dialysis patients in Malaysia (National Renal Registry, 2018) and this is expected to continue in the future in correspondence to the aging population. In Malaysia, there were 6,662 new cases of haemodialysis reported in 2016, corresponding to an increase of approximately 90% in 10 year time (National Renal Registry, 2018). On the other hand, there is a steady rising trend in the prevalence rate of haemodialysis treatment from year 2007 until year 2016, with private sectors had become the largest haemodialysis provider compare to dialysis centres operated by Ministry of Health and Non-government organizations (National Renal Registry, 2018). The main factor contributed to this is the low haemodialysis capacity to patient ratio at most private dialysis centres (National Renal Registry, 2018). This ratio represents utilisation of available haemodialysis capacity and a lower ratio reflects better and more efficient utilisation. On the other hand, private sectors provide dialysis to most patients in economically advantaged West Coast states (National Renal Registry, 2018). Emerging

evidence shows tremendous increase in the needs of providing dialysis to patients had become a huge burden to the public sector. This leads to a rising trend in dialysis provided by private sector to meet with the needs of a large number of patients, which deserve studies among the haemodialysis patients receiving treatment at private sectors.

In Malaysia, obesity had become an alarming epidemic trend in which prevalence of obesity (30.6%) was higher than the world prevalence (13.0%) in 2014 (Institute for Public Health Malaysia, 2015). As obesity is a strong risk factor for the development of diabetes mellitus and hypertension (Babu et al., 2018; Pappachan et al., 2011), it is expected that the prevalence of diabetes mellitus and hypertension are on the rise with the escalating increase of obese Malaysian. For example, there were 17.5% and 30.3% of Malaysian aged 18 years old and above had diabetes and hypertension, respectively, which are expected to be increased further due to an upward surge of obesity (Institute for Public Health Malaysia, 2015). Diabetes mellitus remains as the major cause for ESRD followed by hypertension (National Renal Registry, 2018). Uncontrolled diabetes mellitus and hypertension among Malaysian will further aggravate the incidences and prevalence of ESRD.

It is worth noting that sleep disturbances are common in the general Malaysian. A local study had revealed that 12.2% of adults aged 30 – 70 years old experienced chronic insomnia (Zailinawati et al., 2008). A more recent study showed more than 60% of the secondary school teachers in Selangor, Malaysia had poor sleep quality (Musa, Moy, & Wong, 2018). Another population based survey also showed sleep problem is emerging among Malaysian, with 47.3%, 15.2%, 14.8% and 7% had problem on habitual snoring, breathing pauses, excessive daytime sleepiness and obstructive sleep

apnea, respectively (Kamil, Teng, & Hassan, 2007). Sleep disturbances among healthy population were reported to be associated with poor mental health, loss of concentration, decreased work productivity, exhaustion, poor memory, depression and poor health status (Azad et al., 2015; Zailinawati et al., 2008). As compare to non-dialysis population, poor sleep quality was more prevalent among haemodialysis patients which was from 49% to 74% (Elder et al., 2007a; Pai et al., 2007; Shen et al., 2016). Common sleep problem among haemodialysis patients includes insomnia, sleep apnea syndrome (SAS), restless leg syndrome (RLS) (Elder et al., 2007a), early morning awakening, difficulty in initiating sleep and feeling of unrefreshed during morning (Shen et al., 2016), excessive sleepiness, sleep-wake complaints and sleep-disordered breathing (Kumar & Sagar, 2019). Sleep disturbances can be associated with several negative effects such as reducing overall well-being, affect daytime alertness and activity level among haemodialysis patients (Williams et al., 2002). Sleep disturbances and disorders can also exert negative impacts on the health of haemodialysis patients by suppressing immune function and increase risk of getting coronary heart disease, infections and hypertension (Hanly, 2004; Sabbatini, 2002). Poor sleep quality should not be under-recognised as it has been associated with increases the risk of morbidity and mortality among healthy individual (Kamil et al., 2007; Zailinawati et al., 2008) as well as among hemodialysis patients (Kumar & Sagar, 2019).

1.2 Problem Statement

Etiologies of sleep disorders in dialysis patients are multifactorial and these factors including age, anxiety, depression, pain, physical activity, gender, duration and timing of dialysis and others (Kumar & Sagar, 2019; Merlino et al., 2008; Williams et al., 2002). Socio-demographic variables, comorbidities of psychiatric disorders and

other physical conditions, including tobacco use and uraemia (Masoumi et al., 2013), depression, physical activity, biochemical indicators (Elder et al., 2007), medications used, presence of metabolic abnormalities and malnutrition, medications used, presence of metabolic abnormalities, malnutrition (Bilgic et al., 2007; Masoumi et al., 2013; Perl et al., 2006), fatigue, muscle cramps, peripheral neuropathy, and emotional problems (Bilgic et al., 2007; Masoumi et al., 2013; Perl et al., 2006) had been found to be associated with sleep quality. Compare to other factors depicted above, the relationship between dietary factors such as night eating syndrome (NES) and sleep quality is under-studied.

It is worth noting that the correlations between sleep quality and some of the above factors were not consistent and the prevalence of night eating syndrome (NES) among haemodialysis patients in Malaysia is not available. For example, while body weight status was not associated with sleep quality (Unruh et al., 2006), normal body weight hemodialysis patients had poorer sleep quality compared to low body weight patients (Mehrabi et al., 2017). Similarly, while serum phosphate was not associated significantly with sleep quality among hemodialysis patients in Iran (Mehrabi et al., 2017), patients with higher serum phosphate and serum potassium were reported to have poorer sleep quality and longer sleep latency in other studies (Celik et al., 2012; Čengić et al., 2012; Elder et al., 2007a; Ho, Chan, & Daud, 2019; Turkmen et al., 2012). In addition to that, some studies found that there was significant relationship between obstructive sleep apnea and fluid volume, owing to an overload of fluid volume will result in reduced upper airway muscle tone and upper airway oedema (Fletcher, 1993; Perl, Unruh, & Chan, 2006b). The inconsistencies of findings warrant more studies

especially among hemodialysis patients at the local context whereby evidence is deemed scarce.

Despite poor sleep quality among haemodialysis patients has attract attention of health care professionals, it is not been addressed adequately. On the other hand, most of the reported studies were performed among Caucasians, with similar studies were scarce for the local communities (Ho et al., 2019, Maniam et al., 2014; Wong et al., 2011). Taken together, this study aims to determine the associations between socio-demographic factors, nutritional status, fluid adherence, physical activity and night eating syndrome with sleep quality among haemodialysis patients in selected dialysis centres in the central region of Malaysia.

Hence, the research questions to be answered in this study are:

1. What is the prevalence of poor sleep quality among haemodialysis patients?
2. Are there any associations between socio-demographic factors, nutritional status, fluid adherence, physical activity, night eating syndrome and sleep quality among haemodialysis patients?

1.3 Significance of the study

This study helps to close the research gap in the scientific literature regarding sleep quality among haemodialysis patients. It is hope that this study can provide more recent information on the prevalence of poor sleep quality, nutritional status, level of physical activity, status of fluid adherence and night eating syndrome among the hemodialysis patients in Malaysia.

Identification of factors that are associated with poor sleep quality among hemodialysis patients can act as reference or guidelines for health care providers and policy makers in implementing proper intervention programs to improve sleep quality among haemodialysis patients. An improvement in sleep quality will enhance the quality of life for haemodialysis patients thus reduce their mortality rate.

The dissemination of findings of this study is hope to raise awareness and knowledge about the importance of maintaining a good sleep quality among haemodialysis patients and the importance of health care providers to monitor sleep quality among haemodialysis patients. The findings and results of this study can be used to fill research gap and as a baseline study for future studies.

1.4 Objectives

GENERAL OBJECTIVE

To determine factors associated with sleep quality among haemodialysis patients in selected dialysis centres in the central region of Malaysia.

SPECIFIC OBJECTIVES

1. To determine the prevalence of poor sleep quality among haemodialysis patients.
2. To determine the socio-demographic factors, nutritional status, fluid adherence, level of physical activity and night eating syndrome among haemodialysis patients.
3. To determine the associations between socio-demographic factors, nutritional status, fluid adherence, level of physical activity, night eating syndrome and sleep quality among haemodialysis patients.

1.5 Research hypothesis

There are significant associations between socio-demographic factors, nutritional status, fluid adherence, physical activity, night eating syndrome and sleep quality among haemodialysis patients.

1.6 Conceptual framework

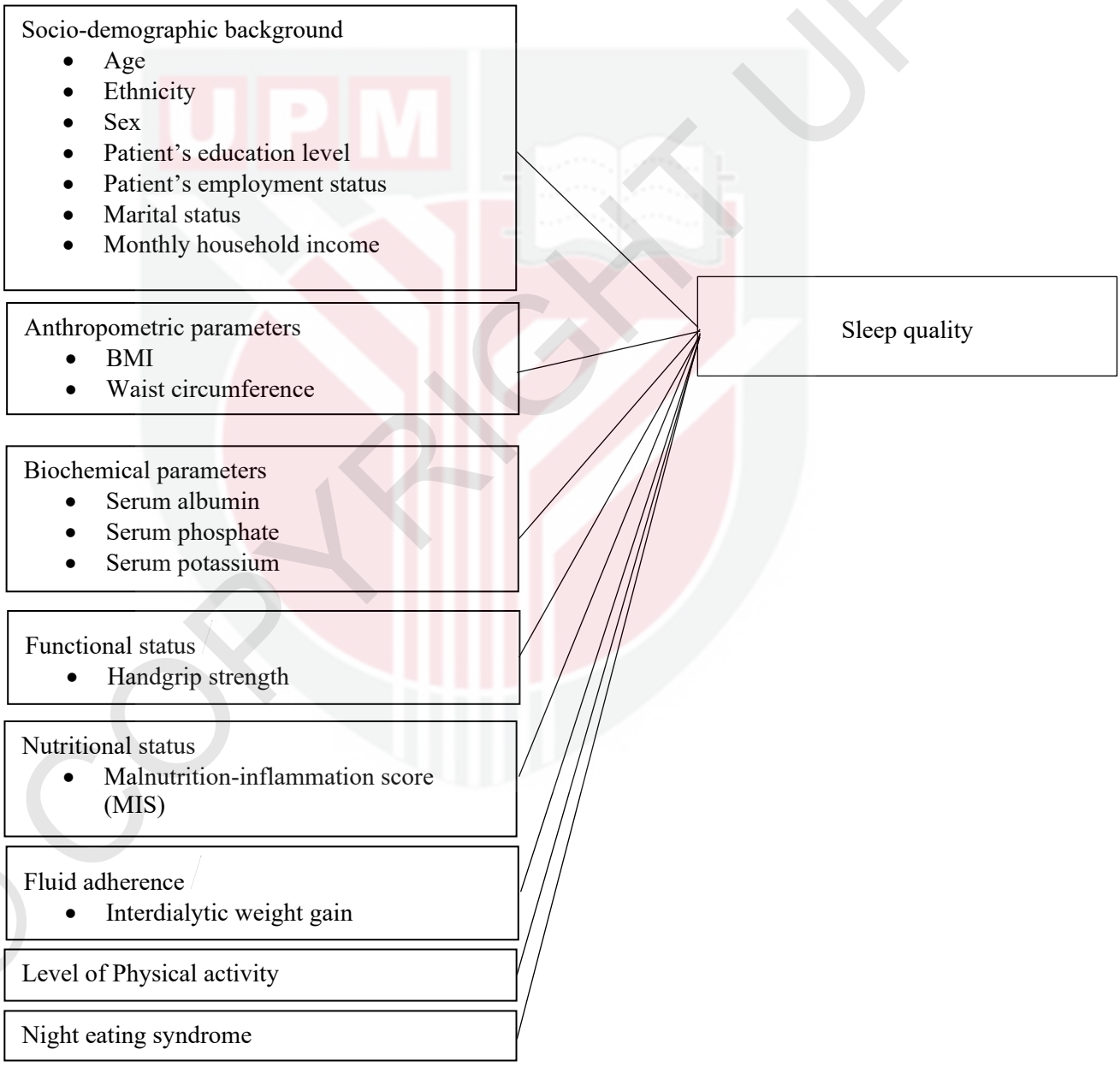

Figure 1.0: Research framework

In this study, it is hypothesized that sleep quality among haemodialysis patients is associated with several independent variables, which includes socio-demographic characteristics, nutritional status, fluid adherence, level of physical activity and night eating syndrome. Previous studies showed that socio-demographic characteristics including low income, no employment, older age and high financial reliability will negatively affect sleep quality (Joshwa, Khakha, & Mahajan, 2012; Menon et al., 2015). For anthropometry parameters, sleep quality was shown to associate negatively with BMI, visceral fat content and low handgrip strength among hemodialysis patients (Afsar & Elsurer, 2013; Ho et al., 2019). On the other hand, poor sleepers had higher level of biochemical parameters such as phosphate level (Zeydi et al., 2014), potassium (Ho et al., 2019) and blood urea nitrogen (Tada et al., 2007). Furthermore, presence of malnutrition (Bilgic et al., 2007), night eating syndrome (Allison, Spaeth, & Hopkins, 2016; Crispim et al., 2011; Kucukgoncu, Tek, Bestepe, Musket, & Guloksuz, 2014; Verster, Tromp, Donners, & Garssen, 2016; Vinai et al., 2008), fluid overload (Hao et al., 2018) and low level of physical activity (Sabbagh et al., 2008) may also associated with sleep quality among hemodialysis patients.

CHAPTER 2 LITERATURE REVIEW

2.1 Sleep quality

Sleep plays an important role in the recovery of fatigue and other body vital functions. A night of good and healthy sleep is required for a person's wellbeing. As a person ages, there is alteration in the duration of sleep and increase in the frequency of nocturnal awakening (WHO, 2004). Nocturnal awakening is also one of the sleep disturbances that are most prevalent in general population (Ohayon, Krystal, Roehrs, Roth, & Vitiello, 2010). Presence of nocturnal awakening will disrupt normal sleep of people suffered from it.

Earlier study suggested an average of 7-9 hours per night is needed for an adult (WHO, 2004). In addition to adequate sleep duration, good sleep quality and its components are important as well. Sleep quality is a self-rating indices which can reflect how satisfy an individual feel regarding his or her sleep (Ohayon et al., 2017). Components of sleep quality include awakening, sleep stages, sleep latency, sleep duration and sleep disturbances and many others. Awakening refers to episode in which an individual awake for more than 5 minutes during the night (Ohayon et al., 2017). Sleep is usually divided into one rapid eye movement stage (REM) and four non-rapid eye movement sleep stages (Stages 3 – 4 are known as slow-wave sleep) (Medic, Wille, & Hemels, 2017). Normal sleep will have these sleep stages occur in their usual time during night and in their usual amount (WHO, 2004; Shrivastava et al., 2014). On the other hand, sleep latency refers to the length of time taken to transit from wake to sleep (WHO, 2004; Shrivastava et al., 2014). Earlier study showed prolonged or delayed sleep latency was associated with an increased risk of depression (Glozier et al., 2014).

In general, sleep disturbances can be indicated by few sleep changes, symptoms of indicators. These indicators including daytime sleepiness, poor sleep, arousals and decreased amount of sleep (WHO, 2004).

Disturbances during sleep can cause several problems such as reduced in sleep quality and sleep efficiency, increase in sleep latency, sleep reduction, arousals and awakening. Sleep disturbance with different degree and frequency may lead to accidents, excessive daytime sleepiness, accidents, decreased attention and decreased quality of life (WHO, 2004). Since a good sleep quality and sleeping time are needed for the well nutritional and metabolic balance of the body, poor sleep quality can cause series of metabolic disorders such as diabetes, insulin resistance and obesity (Crispim et al., 2011).

Health consequences caused by sleep disturbance can be categorized into short-term or long-term consequences. Short-term consequences caused by sleep disturbance including somatic problems, emotional distress, reduced quality of life, mood disorders, enhanced stress responsivity, behaviour problems and other mental health problems (memory, cognition and performance deficits) (Medic et al., 2017). On the other hand, long term consequences of sleep disturbance are well documented. Earlier study showed sleep disturbances increased risk of cardiovascular disease by increasing autonomic sympathetic activation (Medic et al., 2017). Apart from cardiovascular disease, sleep disturbance may be associated with dyslipidemia, hypertension, metabolic syndrome, T2DM and weight-related issues (Medic et al., 2017). The fact that poor sleep quality was significantly associated with BMI, waist circumference, percentage of body fat, serum levels of glucose and insulin, and insulin resistance may

have attributed to the increased risk of metabolic disorder (Medic et al., 2017). In addition to that, several mechanisms had been proposed that will lead to short and long-term consequences of sleep disturbance. These include increased level of catecholamine, increase secretion of adrenocorticotropic hormones and cortisol, reduce level of insulin sensitivity and leptin, increase level of ghrelin and thus the appetite, causing circadian rhythm disruption, reduce melatonin production, and increase oxygen consumption (carbon dioxide production) (Medic et al., 2017).

2.2 Assessment of Sleep Quality

Polysomnography is the gold standard for evaluating sleep (de Zambotti, Baker, & Colrain, 2015). However, polysomnography is labour intensive, expensive and with limited availability. These limitations have led to the development of other methodologies to objectively evaluate sleep such as activity and sleep trackers. On the other hand, subjective sleep quality may be assessed through a variety of means, often via retrospective self-report inventories such as the Pittsburgh Sleep Quality Index or via ordinal or visual analog scales including on prospective sleep diaries (Buysse et al., 2006). Certain questionnaires assesses the sleep quality of patients over several days or weeks while others assesses 'usual' night sleep (WHO, 2004). However, there is a large variation of subjective measurement done among individuals and this variation is due to individual judgements about quality and normality.

2.3 Sleep Quality among haemodialysis patients

Evidence is emerging on the high prevalence of poor sleepers among haemodialysis patients (Bastos et al., 2007; Čengić et al., 2012; Edalat-Nejad & Qlich-

Khani, 2013; Elder et al., 2007; Pai et al., 2007; Shen et al., 2016; Trbojević-Stanković et al., 2014). For example, one of the studies done in Central Serbia showed that approximately two-thirds of the patients were poor sleepers with an average PSQI score as 7.8 (Trbojević-Stanković et al., 2014). Earlier studies had documented similar findings whereby a high proportion of haemodialysis patients were poor sleepers (Bastos et al.,2007; Čengić et al., 2012; Edalat-Nejad & Qlich-Khani, 2013). In the study by Čengić et al. (2012), approximately one in nine haemodialysis patients had problems with excessive sleepiness while more than 80% of them were hard to initiate (delayed or prolonged sleep latency) and maintain their sleep. Most frequent sleep problems faced by haemodialysis patients were snoring, nightmares, restless leg syndrome, day and night sleep reversal and insomnia. In the same study, most frequent causes of these sleep disorders were related to pain, pruritus, daytime napping, snoring, nightmares and breathing problems (Čengić et al., 2012).

2.4 Factors Affecting Sleep Quality

2.4.1 Socioeconomic status (SES)

Socioeconomic status is one of the risk factors that may affect sleep quality among haemodialysis patients. However, the number of studies that focused on the relationship between socioeconomic status and sleep quality was limited. Results from a few studies had summarized that poor sleep quality was significantly associated with unemployment, low income, increased financial reliability and older age (Fischer et al., 2010; Menon et al., 2015). Instead of influencing directly on sleep quality, some of these sociodemographic factors actually impact on sleep quality by increasing score of depression among haemodialysis patients. Some of these factors including

unemployment, low income and for those who without any medical expenditure reimbursement (Joshwa et al., 2012). On the other hand, discrepancies exist among findings regarding relationship between gender and sleep quality. There are inconsistency in the findings in which gender actually had higher prevalence of poor sleep quality (Menon et al., 2015; Unruh et al., 2003).

2.4.2 Anthropometric Parameters

Sleep apnea is a common disorder associated with daytime sleepiness and fatigue among obese middle-aged men (Vgontzas et al., 2000). Studies showed that sleep apneic individual had significantly greater amount of visceral fat when compared with obese control subjects with same observation goes for haemodialysis patients (Afsar & Elsurer, 2013; Vgontzas et al., 2000). On the other hand, earlier study affirmed that amount of visceral adipose tissue act as a predictor for the development of sleep apnea among haemodialysis patients (Sakkas et al., 2007).

Besides body fat, a commonly used proxy measure of obesity, body mass index (BMI) was found to correlate negatively with sleep duration (Bjorvatn et al., 2007) or positively with PSQI score (Afsar & Elsurer, 2013). Similarly to visceral fat, BMI act as a strong and independent predictor for the occurrence of sleep apnea among haemodialysis patients (Tada et al., 2007). Similar association between anthropometric parameters and sleep quality of haemodialysis patients had been documented in other studies (Afsar & Elsurer, 2013; Sakkas et al., 2007; Tada et al., 2007; Venmans, 1999). Lastly, handgrip strength as indicators of muscle health in arm and forearm was found to be negatively associated with PSQI score (Ho et al., 2019). Proposed mechanism was synthesis of anabolic hormone that responsible in maintaining and synthesis muscle

mass will be reduced in the presence of sleep disturbances (Ho et al., 2019). In the same time, muscle strength will be decreased as well (Ho et al., 2019).

2.4.3 Biochemical Parameters

Relationships between biochemical parameters and sleep disorders were documented in haemodialysis patients and continuous ambulatory peritoneal dialysis (CAPD) patients, whereby most of them were poor sleepers (Li et al., 2012). On the other hand, several studies had concluded significant negative correlation between serum albumin level and sleep disorders among haemodialysis patients (Abdelwhab, Kamel, & Noshey, 2010; Chiu et al., 2008; Zeydi et al., 2014; Tada et al., 2007; Zailinawati et al., 2008) and among CAPD patients (Li et al., 2012), suggesting dialysis population who has higher level of albumin are more likely to have better sleep quality.

On the other hand, there was significant positive correlation between poor sleep quality and higher phosphorus level (Zeydi et al., 2014; Unruh et al., 2006). On the contrary, the opposite finding had been summarized in another study that bad sleepers had significantly lower serum phosphate level than good sleepers (Chiu et al., 2008). Serum phosphate level may have a significant impact on sleep quality by having a strong causal relationship to depression among haemodialysis patients (Firoz, Shafipour, Jafari, Hosseini, & Charati, 2016). In lieu of the prevalence of hyperphosphatemia among dialysis patients, more studies are warranted to delineate the relationship between serum phosphate level and sleep quality.

Serum creatinine act as a surrogate for measuring protein-energy nutritional status. Hence, a high serum creatinine reflects a good muscle condition and a good

nutritional status. Studies had documented lower serum creatinine level among poor sleepers while good sleepers had higher creatinine level, despite inconsistent existed (Burrowes, Russell, Unruh, & Rocco, 2012; Chiu et al., 2008, Tada et al., 2007). For example, Tada et al. (2007) found a positive significant correlation between serum creatinine with both Apnea–Hypopnea Index (AHI) and OSA index respectively.

High serum potassium is common among dialysis patients. Recent local study showed serum potassium level was associated with poorer sleep quality and longer sleep latency among haemodialysis patients (Ho et al., 2019). This could be due to sleep disturbances caused by hyperkalemia including numbness, cramps and fatigue. However, earlier study reported inconsistent findings (Ongan & Yuksel, 2017). Inconsistent study finding regarding the impact of serum potassium level on sleep quality suggests further study is required.

Relationship between blood urea nitrogen (BUN) and sleep quality was only found in terms of positive correlation with both AHI and OSA index (Tada et al., 2007). The lack of study regarding this relationship address the further need to conduct more studies related with this issue.

2.4.4 Malnutrition

Malnutrition is another common problem among haemodialysis patients and can be indicated by malnutrition-inflammation score (MIS) (Bilgic et al., 2007). Malnutrition has a significant correlation with both depression and sleep quality, sleep quality can be further aggravated by the presence of depression which will affect the oral intake of haemodialysis patients (Bilgic et al., 2007). Bilgic et al. (2007) showed

poor sleepers generally higher MIS score when compared with good sleepers. Similar observation was documented among CAPD patients (Li et al., 2012). High MIS scores also act as one of the independent predictors for sleep disorders among CAPD patients (Li et al., 2012).

Appetite functions as another significant indicator of nutritional status. Sleep quality of patients decreases when their appetite becomes poorer (Burrowes et al., 2012). As poor appetite is associated with poor energy and protein intake of patients, this will then lead to protein-energy malnutrition among patients. Similar findings was reported by other study (Mazairac et al., 2011). Improvement in oral intake including energy and protein intake may overcome malnutrition among patients and hence improve their sleep quality.

2.4.5 Fluid adherence

Among haemodialysis patients, fluid compliance and fluid volume had become one of the major issues. Recent study showed closed to two-third of haemodialysis patients had fluid overload and had significantly higher excessive daytime sleepiness and poor sleep quality (Hao et al., 2018). Fluid overload is significantly associated with poor sleep quality and fewer sleeping hours among haemodialysis patients (Abreo et al., 2017; Hao et al., 2018). Patients with overhydration had an average of 0.25 sleeping hours lesser than those without overhydration (Hao et al., 2018). Apart from lesser sleeping hours, overhydration is also significantly correlated with more frequent night-time walking (Abreo et al., 2017).

Fluid volume and overload were associated closely with obstructive sleep apnea (OSA). Several studies found fluid overload among haemodialysis patients was significantly associated with total PSQI scores (Hao et al., 2018) and will increase the severity of OSA (Elias et al., 2012; Lyons et al., 2017; Ogna et al., 2015). Patients with overhydration had a significantly higher apnea-hypopnea index which is an indication of the severity of OSA than those with normal hydration status. One of the studies also suggests that overhydration does not influence the frequency of apneas but influence only duration (Elias et al., 2012). Patients with sleep apnea were found to have higher extracellular fluid volume (ECFVs) including ECFVs of leg, thorax and leg. Reduction of ECFVs of leg overnight had provided evidence that fluid accumulated in lower extremities during the daytime will shift rostrally into neck area due to recumbent position of the patient during sleep (Elias et al., 2012; Lyons et al., 2017). Such fluid displacement will lead to oedema of peripharyngeal soft tissue, an increase in neck circumference and distention of neck veins (Elias et al., 2012). All these factors will contribute to obstruction and increased collapsibility of upper airway and hence lead to obstructive sleep apnea (Lyons et al., 2017).

Due to the role of overnight rostral fluid shift in pathogenesis of OSA among haemodialysis patients, it is suggested that a reduction in fluid overload or an increase in removal of fluid from patients will aid in reducing severity of OSA (Lyons et al., 2017; Ogna et al., 2015). Removal of fluid through means such as haemodialysis and ultrafiltration decrease rate of overnight rostral fluid shift among patients in the night after haemodialysis and thus, reducing severity of apnea-hypopnea index for 36% (Lyons et al., 2015; Ogna et al., 2015). A raise in fluid removal during haemodialysis or ultrafiltration is accompanied with a reduction in total ECFVs, ECFVs of neck,

ECFVs of legs and neck circumference. This is significantly associated with an improvement in sleep structure such as sleep efficiency (Lyons et al., 2015). It is also hypothesized that further fluid reduction can reduce severity of OSA and further enhance sleep quality but further studies are required to prove this hypothesis.

2.4.6 Physical activity level

Haemodialysis patients were found to have a significantly lower level of physical activity than non-dialysis individuals (Johansen et al., 2000; Wong et al., 2011; Williams et al., 2017). Studies found most of haemodialysis patients had low physical activity level (Wong et al., 2011) and this result was proven by usage of raw accelerometer (Johansen et al., 2000). Low physical activity level among haemodialysis patients can be caused by several factors including knowledge level, serum creatinine, serum albumin, age, personal income, mental and social changes, education level, nutritional status, anaemia, fatigue, uraemia, bone disease and dialysis procedures itself (Johansen et al., 2001; Johansen et al., 2000; Wong et al., 2011). In addition to that, Majchrzak et al. (2005) showed that total and average physical activity counts of haemodialysis patients during dialysis day were lower than non-dialysis day and the decrease is caused by lack of exercise during 4-hour haemodialysis procedure.

Haemodialysis patients are less active than healthy people and their sedentary lifestyle could contribute to poor health outcomes (Williams et al., 2017). Earlier study showed that poor sleepers had lower level of physical activity than good sleepers (Sabbagh, Iqbal, Vasilevsky, & Barré, 2008), with odds of poor sleep quality decreased by 6% with every increase in score of adjusted activity score (Sabbagh et al., 2008).

Nevertheless, findings on sleep quality had been inconsistent (Song, Hu, Diao, Chen, & Jiang, 2018), and warrant the need for more studies on this aspect.

On the other hand, low to moderate-intensity physical activity, intradialytic aerobic exercise, resistance exercise (RE), aerobic exercise (AE), modified yoga-based exercise program and individualized exercise were shown to improve sleep disturbance (Cho et al., 2018a; Maniam et al., 2014; Giannaki et al., 2013; Sakkas et al., 2008; Song et al., 2018; Wu et al., 2014; Yurtkuran et al., 2007). Resistance exercise can potentially improve sleep quality of patients by increasing body temperature, improving symptoms of anxiety and depression and relieving musculoskeletal pain (Cho et al., 2018b). On the other hand, individualised exercise during maintenance haemodialysis not only can improve sleep quality of patients, but also can significantly improve exercise capacity of patients in test group within a short time (Wu et al., 2014). Hence it is recommended as a cost-effective therapeutic approach.

2.4.7 Night eating syndrome

Night eating syndrome (NES) is a type of eating syndromes which is characterised by an intake of at least 25% of daily total calorie intake during time after dinner or during nocturnal awakenings (Allison et al., 2016; Depner, Stothard, & Wright, 2014; Kucukgoncu et al., 2014). Previous studies showed that NES belongs to a delayed type of eating pattern with evening hyperphagia that can correlate with poor sleep quality (Kucukgoncu et al., 2014; Palmese et al., 2011; Nolan & Geliebter, 2012), possibly caused by frequent nocturnal awakening (Milano, De Rosa, Milano, & Capasso, 2012). Foods consumed during night period is always unhealthy and high in

calorie (Milano et al., 2012), making the individual at higher risk for malnutrition (Nolan & Geliebter, 2012). There are several diagnostic criteria for night eating syndrome including a strong urge to eat during night, insomnia (Vinai et al., 2008), morning anorexia, belief that eating is necessary to sleep, frequent night awakening accompany with eating (O'Reardon et al., 2004) and others (Allison et al., 2009; Vinai et al., 2012).

Prevalence of night eating syndrome among haemodialysis population had been under-studied regardless in Malaysia or in other countries. Limited data indicated that prevalence of NES was high among those populations with depression (21.3 – 35.2%) and with diabetes mellitus (3.8 – 12.4%) (Kucukgoncu, Midura, & Tek, 2015). It was found that 3.8 – 8.4% of individual with diabetes mellitus had NES from a systematic review (Abbott, Dindol, Tahrani, & Piya, 2018). Although there is a lack of data regarding prevalence of NES among haemodialysis populations, a high prevalence of diabetes mellitus as cause of CKD and a high prevalence of depression problem among haemodialysis patients suggest that there may be a possibility for haemodialysis patients to suffer from NES as well. Besides from the negative impacts brought by NES onto sleep quality, recent studies suggested poor sleep quality may be a potential risk factors of NES (Farhangi, 2019; Gan, Chin, & Law, 2019). More studies are needed to delineate the presence, magnitude and direction of association between NES and sleep quality.

Results from many studies had proved that there is a relationship between NES and sleep disturbances. NES can disrupt normal sleep pattern and cause sleep problems such as low sleep efficiency (Verster et al., 2016) and difficulty in initiating and

maintaining sleep well (Bos et al., 2013; Kucukgoncu et al., 2015; Vinai et al., 2008), restless leg syndrome and sleepwalking (Verster et al., 2016), shorter sleep duration (Verster et al., 2016) and longer sleep latency (Allison et al., 2016; Crispim et al., 2011; Kucukgoncu et al., 2014; Vinai et al., 2008). Sleep Disturbance Questionnaire (SDQ) and Insomnia Severity Index (ISI) are examples of instruments used to assess the presence of sleep disturbances among subjects. On average, haemodialysis patients scored higher on sleep subscale of NEQ and physical tension subscale of SDQ (Vinai et al., 2012). Other sleep-related disorders that had significant positive correlation with presence of NES are high frequency of nocturnal awakening and nocturnal arousals (O'Reardon et al., 2004; Stunkard, Allison, & O'Reardon, 2005; Verster et al., 2016), sleep apnea, and insomnia (Verster et al., 2016).

Due to the consumption of large amount of food especially high carbohydrate and high-fat food during the late evening (more than 50% of total daily calories after 7 pm), they also had a higher frequency of coughing, leg twitches, difficulty in breathing and tossing and turning (Rogers et al., 2006). Furthermore, they felt less fresh during the morning and hard to wake up in the morning (Rogers et al., 2006). This is because nocturnal eating habit will elevate a person's nocturnal body temperature thus affect one's ability to sleep well at night (Yeh & Brown, 2014). A lack of studies in Malaysia that focus on relationship between night eating syndrome and sleep quality among haemodialysis patients address the need of further study that focus on this area should be conducted.

CHAPTER 3 METHODOLOGY

3.1 Study design

This was a cross-sectional study aims to determine associations between socio-demographic factors, nutritional status, fluid adherence, physical activity, night eating syndrome and sleep quality among haemodialysis patients in selected dialysis centres of central region Malaysia.

3.2 Study location

Total population of Malaysia is estimated to be around 31.95 million in the year 2019 and ranks 44th in the world (World Population Review, 2019). There is a rising trend in population from the year 2013 due to a higher birth rate compared to lower death rate. Malaysia belongs to a federal state with a monarchy governance system. The land is divided into Malaysian Borneo and Peninsular Malaysia, with a total surface area approximately 127,722.6 square miles with Kuala Lumpur as the capital. Being the capital of the nation, Kuala Lumpur is the largest city in Malaysia with the highest density of population. The central region of Malaysia consists of Kuala Lumpur, Negeri Sembilan, Putrajaya and Selangor.

The total number of dialysis centres in Malaysia was 814 in 2016 with more than 50% of the dialysis centres was located at the central region of Malaysia namely 26.9%, 19.0% and 5.5% at Kuala Lumpur, Negeri Sembilan, Selangor and Putrajaya, respectively (National Renal Registry, 2018). Number of haemodialysis patients in Kuala Lumpur, Negeri Sembilan, Selangor and Putrajaya are 4,344 (12.7%), 1,659 (4.8%) and 5,810 (17.0%) respectively (National Renal Registry, 2018). The central

region of Malaysia consists of 34.5% of haemodialysis patients in the whole of Malaysia. The highest percentage of dialysis centres and haemodialysis patients available in the central region of Malaysia signify the selection of Kuala Lumpur, Selangor and Putrajaya as the study location.

3.3 Respondents

Most of the dialysis patients and new dialysing patients in Malaysia aged between 55 – 64 years old (National Renal Registry, 2018), with number of dialysis patients increase with age. Considering this scenario, the sampling population of this study was haemodialysis patients aged 18 years old and above that receive haemodialysis treatment in dialysis centres.

Inclusion criteria applied in this study was as below:

- Aged 18 years old and above
- Male *or* female Malaysian
- Haemodialysis patients that being dialysed for at least 3 months.

Exclusion criteria:

- Non-Malaysian
- Physically disabled
- Presence of any inflammatory illness, lung or heart failure or liver diseases
- Had been hospitalised for the past three months
- Patients with Hepatitis B and or Hepatitis C

3.4 Sample size

Calculation of sample size was performed according to formula by Cole (1997) as shown below:

$$n = \frac{(Z_{1-\alpha/2} + Z_{1-\beta})^2}{r^2/[1-r^2]} + 5$$

n = the calculated sample size
$Z_{1-\alpha/2}$ = z score for level of significance a in two-sided test
$Z_{1-\beta}$ = z score for power of the test
r = correlation

Sample size was also calculated based on prevalence formula by Daniel (1999) as shown below:

$$n = \frac{Z^2 P(1-P)}{d^2}$$

where

n = sample size,

Z = Z statistic for a level of confidence,

P = expected prevalence or proportion (in proportion of one; if 20%, P = 0.2), and

d = precision (in proportion of one; if 5%, d = 0.05).

Table 3.0 shows the summary of sample size calculated according to previous studies. Comparing the calculation in the table below, the total number of respondents calculated was 96 (Mehrabi et al., 2017a). This value was chosen as this sample size was the largest number of sample size that can be collected according to financial and time availability allocated for this study with main objective to investigate correlation between variables. Considering possibility of missing data, an addition of 5% on the sample size was included. Hence, the minimum sample size required after adjustment was 101.

Table 3.0: Summary of sample size calculation

Sample size calculation based on correlation studies		
Correlation studies	Correlation, r	Sample size, n
Nutritional status Relation between MIS and PSQI scores of dialysis patients (Li et al., 2012).	r = 0.310	$n = \frac{(1.96+0.84)^2}{(0.310)^2/[1-(0.310)^2]} + 5$ = 79
Fluid volume Relation between fluid overload and PSQI scores of dialysis patients (Hao et al., 2018)	r = 0.282	$n = \frac{(1.96+0.84)^2}{(0.310)^2/[1-(0.310)^2]} + 5$ = **96**
Night eating syndrome Relation between night eating syndrome and PSQI scores among NES patients (Palmese et al., 2011).	r = 0.430	$n = \frac{(1.96+0.84)^2}{(0.430)^2/[1-(0.430)^2]} + 5$ = 40
Physical activity Relation between physical activity and sleep quality among haemodialysis patients (Shibata, Tsutou, & Shiotani, 2013).	r = -0.308	$n = \frac{(1.96+0.84)^2}{(0.308)^2/[1-(0.308)^2]} + 5$ = 80

Calculation of sample size based on prevalence formula		
Prevalence studies	Expected prevalence, P	Sample size, n
Poor sleep quality Prevalence of poor sleep quality among haemodialysis patients (Mehrabi et al., 2017a)	0.91	$n = \frac{(1.96)^2 \, x \, 0.91(1-0.91)}{(0.05)^2}$ = 126
Poor nutritional status Prevalence of poor nutritional status among haemodialysis patients (Bilgic et al., 2007)	0.80	$n = \frac{(1.96)^2 \, x \, 0.80(1-0.80)}{(0.05)^2}$ = 246
Poor fluid adherence Prevalence of poor fluid adherence among haemodialysis patients (Hao et al., 2018)	0.65	$n = \frac{(1.96)^2 \, x \, 0.65(1-0.65)}{(0.05)^2}$ = 350
Low physical activity level Prevalence of low physical activity level among haemodialysis patients (Williams et al., 2017)	0.45	$n = \frac{(1.96)^2 \, x \, 0.45(1-0.45)}{(0.05)^2}$ = 380

3.5 Sampling design

Purposive sampling was used as the sampling design for this study as shown in Figure 3.0. The list of dialysis centres available in the central region of Malaysia was obtained from the National Renal Registry (N = 260). Each dialysis centre is estimated to have approximately 40 haemodialysis patients (National Renal Registry, 2018). With an estimation of 20% non-response rate, and consideration of transport and financial constraints, a total of five (5) centres located within 25 km radius from the Faculty of Medicine and Health Sciences, Universiti Putra Malaysia was randomly selected. From these dialysis centres, approval was obtained from only three dialysis centres. The reasons upon rejection by the remaining dialysis centres were due to unpleasant experience with previous researcher and COVID-19 pandemic condition in Malaysia. Haemodialysis patients who fulfilled with inclusion criteria in these selected centres was invited to participate in this study. Hence, at the end of study, a total of 100 haemodialysis patients were recruited from Bangi Dialysis Centre Sdn. Bhd. (n = 34), Cheras Dialysis Centre (n = 42) and MAA Medicare Charity Dialysis Centre (n = 24).

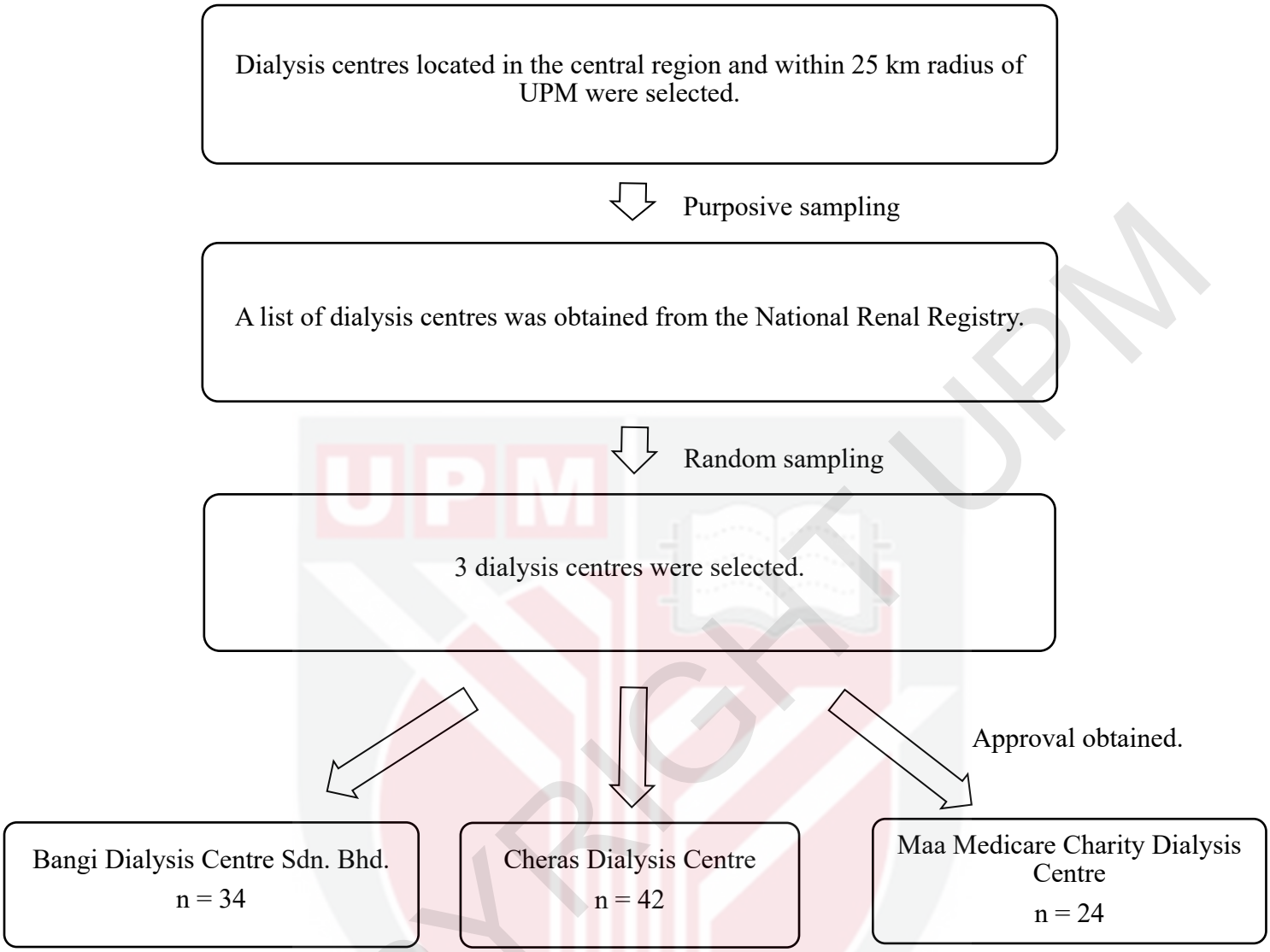

Figure 3.0: Sampling design

3.6 Study instruments

3.6.1 Socio-demographic characteristics

Information regarding the socio-demographic characteristics of the participants was obtained through a self-administered questionnaire available in English and Malay version. The questions in this section included age, ethnicity, sex, education level, occupation and monthly household income.

3.6.2 Assessment on nutritional status

Nutritional status of patients was ascertained according to different components including anthropometry, biochemical and clinical judgement. Anthropometric parameters of the participants namely dry weight, height was retrieved from dialysis record books as secondary data. Body mass index of participants was calculated from weight and height using formula which is weight in kilograms divided by height in meters squared (kg/m^2), with classification of body weight status as shown in Table 3.1. Waist circumference of patients was measured using a non-metallic, constant-tension waist measurement tape that was placed at the midpoint between the highest point of the iliac crest and lowest part of costal margin in midaxillary line around the body (Afsar & Elsurer, 2013). Among Asian population, waist circumference of ⩾80 cm in women or ⩾90 cm in men is defined as abdominal obesity (Kawaguchi et al., 2011).

Table 3.1: Classification of weight status of patients according to BMI

Classification	BMI (kg/m^2)
Protein energy malnutrition	< 23
Ideal/ goal value	⩾ 24
Obese (Weight loss will be beneficial)	> 30

Source: Hooi et al. (2017)

Functional status of participants was reflected by the measurement of Handgrip strength (JAMAR Plus+ Digital Hand Dynamometer). Warm-up exercise was needed before participants grip hand dynamometer with maximum force (Center for Health Statistics, 2013). Classification of malnutrition according to hand grip strength was shown in Table 3.2 below:

Table 3.2: Classification of malnutrition status according to handgrip strength as stratified by sex

Malnutrition status	Hand grip Strength (kg)	
	Men	**Women**
Malnourished	< 28.5	< 18
Well nourished	≥ 28.5	≥ 18

Source: (Ferreira Garcia et al., 2013)

Serum albumin, serum phosphorus, serum creatinine, urea and serum potassium were measured as biochemical parameters in this study. These laboratory parameters of participants were collected in dialysis centres as secondary data through routine laboratory methods.

Nutritional status of patients was also determined by the used of universal-recognised Malnutrition-inflammation score. Malnutrition-inflammation score (MIS) is a simple and inexpensive tool which allow determination of nutritional status among dialysis patients (Lopes, 2011). It is a quantitative nutrition screening tool, comprises of 10 variables including dietary intake, gastrointestinal symptoms, weight change, functional capacity, subcutaneous fat, comorbidity, signs of muscle wasting, serum total iron-binding capacity (TIBC), serum albumin and BMI (Singh et al., 2016). Each variable scores ranging from 0 – 3 which give a total score ranging from 0 – 30 for MIS (Singh et al., 2016). Higher risk of malnutrition is indicated by higher MIS scores. Normal nutrition status is indicated by a total MIS score of 0 and a score of 30 indicates a severe level of malnutrition and inflammation (Singh et al., 2016). Among

haemodialysis patients, a score of MIS higher than 7 points can be used to predict mortality (Borges et al., 2017).

Malnutrition-inflammation score showed a high sensitivity value of 60% among haemodialysis patients in Malaysia (Singh et al., 2016). Although internal consistency of MIS is not scientifically proved in Malaysia, one of the studies done in Mexican showed average internal consistency of MIS estimated by Cronbach's α as 0.656 (González-Ortiz et al., 2014). When compared with Subjective Global Assessment (SGA) which is another malnutrition index, MIS is a more sensitive index and able to detect higher prevalence of malnutrition among haemodialysis patients than SGA (Diaz-Martinez et al., 2019). MIS also act as a significant predictor of mortality but not SGA (Diaz-Martinez et al., 2019). Quality of life among haemodialysis patients are highly correlated with both MIS and SGA (Sohrabi, Eftekhari, Eskandari, Rezaeianzadeh, & Sagheb, 2015).

3.6.3 Fluid adherence

The fluid volume of participants in this study was assessed through the usage of interdialytic weight gain. Interdialytic weight gain (IDWG) is an important indicator used to assess water and salt intake between two dialysis sessions (López-Gómez, Villaverde, Jofre, Rodriguez-Benítez, & Pérez-García, 2005) and can be used to assess fluid adherence of patients. This marker can be obtained readily before haemodialysis sessions. An interdialytic weight gain of more than 4% indicates a state of fluid overload in patient (Hooi et al., 2017). Interdialytic weight gain was calculated by calculation as shown in below and expressed in the form of percentage (Kimmel et al., 2000):

$$\frac{Preweight\ at\ the\ beginning\ of\ HD\ session - Postweight\ of\ previous\ HD\ session}{Dry\ weight}\ x\ 100\%$$

3.6.4 Level of Physical activity

Level of physical activity of participants was assessed with the use of International Physical Activity Questionnaire (IPAQ) (International Physical Activity Questionnaire, 2005). IPAQ is available in long form (27 items) to obtain more detailed information regarding physical activity or short form (7 items) for surveillance (Chu & Moy, 2015). Both forms are available in multiple languages. IPAQ can assess physical activity in four major domains including domestic and gardening activity, work-related physical activity, leisure time physical activity and transport-related physical activity (International Physical Activity Questionnaire, 2005). In this study, short form of IPAQ was used as instrument. Short form of IPAQ included criteria of frequency and duration of each type of physical activity in last week. This short form contained question regarding three specific types of activity included in these four major domains (International Physical Activity Questionnaire, 2005). These activities were walking, moderate-intensity activities and vigorous-intensity activities. All the items in this short form were structured to provide separate scores on these three types of activities.

Total scores obtained from the short form of IPAQ can classify participants in low, moderate and high categories for the level of physical activity according to scoring protocol provided (International Physical Activity Questionnaire, 2005). Continuous score was calculated by setting MET levels as walking = 3.3 METs, moderate intensity = 4.0 METs, vigorous intensity = 8.0 METs. Total MET-minutes/week scores was calculated using formula as below (International Physical Activity Questionnaire, 2005):

Total MET-minutes/week = Walk (METs*min*days) + Moderate (METs*min*days) + Vigorous (METs*min*days)

In Malaysia, Malay version of IPAQ had gained an Intraclass Correlation Coefficients (ICC) ranged 0.54 – 0.92 and validity assessed by Spearman Correlation Coefficients ranged 0.67 – 0.98 (Chu & Moy, 2015), indicating its acceptable validity for use.

3.6.5 Night eating syndrome

Presence of Night Eating Syndrome (NES) among participants was assessed using Night eating questionnaire (NEQ) (Allison et al., 2008). The original and unpublished version of NEQ consists of nine items with 4-points Likert scale. Items assessed including evening hyperphagia (one item), morning anorexia (two items), mid-phase insomnia (one item), initial insomnia (one item), mood (three items) and nocturnal ingestions (one item) (Allison et al., 2008). In United States, revision was made on NEQ with additional five new items to assess psychological aspects of NES (Allison et al., 2008). Items in the revised version of NEQ are food cravings and control over eating behaviour both before bedtime (two items) and during night time awakenings (two items), morning hunger and timing of first food consumption (two items), percentage of food consumed after dinner (one item), awareness of nocturnal eating episodes (one item), frequency of nocturnal awakenings and ingestion of food (three items), initial insomnia (one item), and mood disturbance (two items) (Allison et al., 2008). Revised version of NEQ was used in this study to assess presence of NES among patients. It was proposed that a score of 25 can be used as a cut-off point in NEQ

to screen for possible cases of NEQ generally (Allison et al., 2008). However, a score of 30 should be used instead of 25 if the purpose is to reduce number of false positives (Allison et al., 2008). Patients without nocturnal awakening or ingestions and with only evening hyperphagia will not contribute to either of these cut scores.

Internal consistency of total scale in NEQ estimated by Cronbach's α was 0.70 (Allison et al., 2008). Nevertheless, the internal consistency of total scale in NEQ have not been tested in Malaysia, previous study showed an internal consistency of total scale in NEQ as estimated by Cronbach's α was 0.70 (Allison et al., 2008), indicating a good internal consistency of this instrument. Due to the current COVID-19 pandemic situation, a complete set of raw data in this study cannot be collected at this moment. Hence, the Cronbach's α value of NEQ used in this study cannot be established.

3.6.6 Sleep quality

Pittsburgh Sleep Quality Index (PSQI) was used to assess sleep quality of participants (Buysse, Reynolds, Monk, Berman, & Kupfer, 1989). PSQI is a self-rating questionnaire that contains 19 self-rated questions to reflect seven components of sleep quality, namely sleep latency, habitual sleep efficiency, sleep duration, subjective sleep quality, use of sleep medications, sleep disturbances and daytime dysfunction (Buysse et al., 1989). Each component weighted equally on a scale from 0 – 3. Scores from each component were summarized to yield a global PSQI score with a range of 0 – 21 (Buysse et al., 1989). The higher the PSQI score, the lower the sleep quality of participants. A global PSQI score of five or greater indicates poor sleep quality.

As an indicator for difficulty initiating sleep, the cut-off point of sleep-onset latency of more than 15 minutes was used. In terms of sleep disturbance and daytime dysfunction, patients with component score more than 0 were categorized as those with sleep disturbance and daytime dysfunction. Habitual sleep efficiency was calculated using formula as below (Buysse et al., 1989):

Habitual sleep efficiency (%) = (Number of hours slept/Number of hours spent in bed) x 100%

PSQI is user-friendly and can be used as a simple screening tool to identify individuals as good or poor sleepers, as well as to detect the presence of significant sleep disturbances (Buysse et al., 1989). The high degree of internal consistency among PSQI domains was previously ascertained at local context (Lai & Say, 2013). More recently, a high internal consistency was demonstrated with the Malay version of PSQI (Cronbach's α value for global score was 0.82, with each domain ranged from 0.64 until 0.82) (Musa et al., 2018). Due to the current COVID-19 pandemic situation, a complete set of raw data in this study cannot be collected at this moment. Hence, the Cronbach's α value of PSQI used in this study cannot be established.

3.7 Study procedures

Ethics approval was obtained from Ethics Committee for Research Involving Human Subject UPM (JKEUPM) while permission was obtained from all dialysis centres. All eligible haemodialysis patients were invited to join this study. Information sheet pertaining to the study was given to all eligible patients and researcher was prepared to answer questions or concern addressed by the potential subjects. Written informed consent was obtained from all subjects prior to study enrolment.

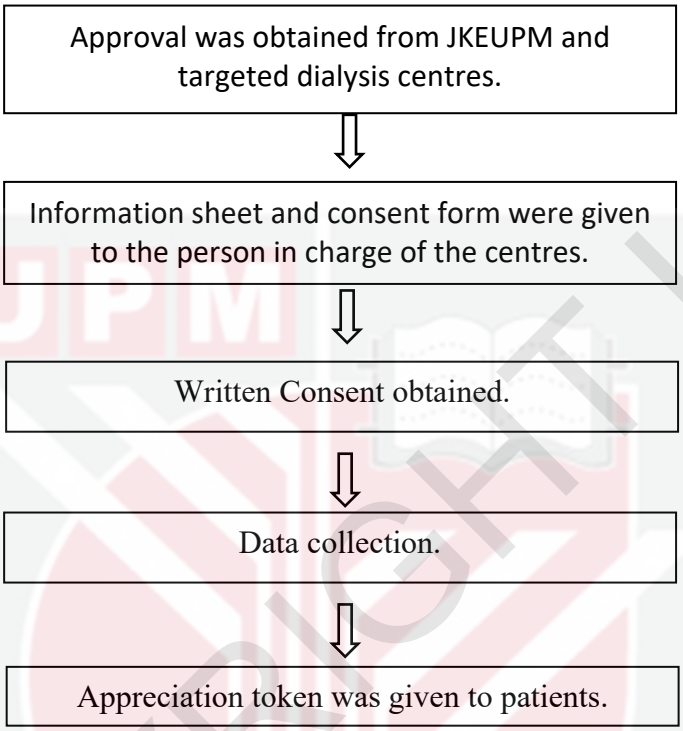

Figure 3.1: Flow chart of study

3.8 Pre-test

In this study, a total of 6 participants with characteristics similar to actual patients were enrolled in the pre-testing. The total duration required to complete questionnaire in pre-test was in between 30 – 45 minutes. Through this pre-test, several questions with unclear instruction were modified and several typing errors were found as well. Reassessment and improvement of these questions after pre-test were to ensure clear questions to be addressed and to ensure researcher can get accurate information from patients as needed in this study. Participants in the pre-test were not included into the actual analysis.

3.9 Data analysis

IBM SPSS version 25 was used to perform data analysis in this study with statistical significance level set at $p < 0.05$. Frequencies and percentage were presented if the variables are nominal or ordinal variables, whereas for interval and ratio variables, means and standard deviations were performed and presented. In this study, most of the socio-demographic characteristics of patients belonged to nominal or ordinal variables except monthly household income. All other variables were either interval or ratio variables. Independent sample T-test and One-way ANOVA test were used to compare the mean value of PSQI scores for each categorical variable. Mann-Whitney test and Kruskal–Wallis test were used as non-parametric tests when data are not normally distributed. Pearson product moment correlation was performed to determine the associations between continuous variables and the dependent variable of the study, namely sleep quality. The association between ordinal variable (eg certain socio-demographic information) and sleep quality was determined through Spearman's rank correlation whereas the associations between two categorical variables (eg certain socio-demographic information and sleep quality) were determined through Chi-Square test of independence.

CHAPTER 4 RESULTS AND DISCUSSION

4.1 Socio-demographic background of the patients

A total of 110 patients were approached while 100 eligible patients with consent were recruited, given a response rate of 90.91%. Table 4.1 showed the socio-demographic background of all patients. Mean age for patients was 56.1 ± 11.0 years old, with a majority of them was younger than 60 years old (60%), Malay (72%), unemployed (82%) and married (87%). Mean age of the patients in this study was comparable with the National Renal Registry report (2018) in which many of the haemodialysis patients aged between 55 to 64 years old. Unemployment is a universal issue among dialysis patients. According to National Renal Registry (2018), the number of haemodialysis patients that were unable to work for pay had increased for approximately seven folds from year 2007 to 2016, and this number had exceeded the number of those who were able to return for full or part-time job in the same year. This was reaffirmed in this study in which eight out of ten of the HD patients were unemployed. On the other hand, the sample was rather well represented by both sexes, made up of comparable proportion of male and female. Slightly more than 50% of the patients had attained secondary education while another one-third attained tertiary education. Financial status of the participants was not satisfactory, with mean monthly income at RM 2548 (SD = 3654.57), this is well represented by eight in ten of the patients were under the B40 category. Chi-square test was carried out to determine the difference in distribution of good and poor sleepers based on their age group, ethnicity, sex, education level, marital status and monthly household income, with no significant differences found as depicted in Table 1. On the other hand, there were significant

higher proportion of poor sleepers that were un-employed as compare to their good sleep quality counterparts ($\chi^2 = 7.518$, $p<0.05$).

Table 4.1.1 Distribution of patients according to socio-demographic background (n = 100)

Characteristics	Good sleepers (n = 29)	Poor sleepers (n = 71)	Total (n = 100)	Statistics (*p*-value)
Age (years)	54.4 ± 11.2	56.9± 10.9	56.1 ± 11.0	t = -1.004 (0.318)
<60 years old	20 (69.0)	40 (56.3)	60 (60.0)	χ^2 = 1.368 (0.242)
⩾60 years old	9 (31.0)	31 (43.7)	40 (40.0)	
Ethnicity				
Malay	22 (75.9)	50 (70.4)	72 (72.0)	
Chinese	6 (20.7)	18 (25.4)	24 (24.0)	
Indian	0 (0)	3 (4.2)	3 (3.0)	
Others	1 (3.4)	0 (0)	1 (1.0)	
Ethnicity				
Malay	22 (75.9)	50 (70.4)	72 (72.0)	χ^2 = 0.093 (0.761)
Non-Malay	7 (24.1)	21 (29.6)	28 (28.0)	
Sex				
Male	15 (51.7)	34 (47.9)	49 (49.0)	χ^2 = 0.121 (0.728)
Female	14 (48.3)	37 (52.1)	51 (51.0)	
Education level				
No formal education	1 (3.4)	0 (0)	1 (1.0)	
Primary education	4 (13.8)	11 (15.5)	15 (15.0)	
Secondary education	12 (41.4)	42 (59.2)	54 (54.0)	
Tertiary education	12 (41.4)	18 (25.4)	30 (30.0)	

Characteristics	Good sleepers (n = 29)	Poor sleepers (n = 71)	Total (n = 100)	Statistics (*p*-value)
Education level				
No formal education or primary education	5 (17.2)	11 (15.5)	16 (16.0)	χ^2 = 3.007 (0.222)
Secondary education	12 (41.4)	42 (59.2)	54 (54.0)	
Tertiary education	12 (41.4)	18 (25.4)	30 (30.0)	
Employment status				
Yes	10 (34.5)	8 (11.3)	18 (18.0)	χ^2 = 7.518 (0.006*)
No	19 (65.5)	63 (88.7)	82 (82.0)	
Marital status				
Single	5 (17.2)	7 (9.9)	12 (12.0)	
Married	24 (82.8)	63 (88.7)	87 (87.0)	
Divorce	0 (0)	1 (1.4)	1 (1.0)	
Marital status (2 categories)				
Married	24 (82.8)	63 (88.7)	87 (87.0)	χ^2 = 0.229 (0.632)
Single or divorce	5 (17.2)	8 (11.3)	13 (13.0)	
Monthly household income (RM)	3016.38 ± 3759.54	2356.72 ± 3620.41	2548.02 ± 3654.57	*t* = 0.818 (0.416)
B40	22 (75.9)	59 (83.1)	81 (81.0)	χ^2 = 0.309 (0.578)
M40 / T20	7 (24.1)	12 (16.9)	19 (19.0)	

Data were presented as n(%); As there were small number of patients under the M40 and T20 categories, the patients were collapsed into the same category.

4.2 Nutritional status of the patients

Means weight, height and BMI of patients were 67.17 kg, 161.29 cm and 25.65, kg/m^2, respectively. Approximately one-third of the patients were malnourished while another 17% of them were obese. Mean BMI of patients found in this study was slightly higher than average BMI value of haemodialysis patients in year 2016 which was 24.4 kg/m^2 (National Renal Registry, 2018). There was a high proportion of the patients (70%) with excessive waist circumference. The finding regarding the higher amount of patients being abdominal obese matched with the findings from previous studies (Afsar & Elsurer, 2013; Vgontzas et al., 2000). On the other hand, poor functional status was prevalent in this study sample, with only about 15% of them had normal hand grip strength. Poor sleepers had lower mean values in all anthropometric parameters (weight, height, BMI, WC) than their good sleeper counterparts, with an exception on handgrip strength. Nevertheless, none of these differences were significant ($p>0.05$). There was comparable proportion of malnourished patients between poor and good sleepers.

With regards to biochemical parameters, means serum albumin, phosphate, creatinine, potassium and urea were 39.12 ± 3.20 g/L, 1.81 ± 0.42 mmol/L, 851.77 ± 200.98 µmol/L, 5.06 ± 0.53 mmol/L and 19.47 ± 4.87 mmol/L, respectively. Whereas mean MIS score of patients in this study was 5.91 ± 3.20. Means serum albumin and creatinine were higher than the national registry data (National Renal Registry, 2018) but lower than data from the recent local study (Ho et al., 2019). When compared with international data, both mean albumin and mean creatinine value in this study was lower than those data reported in recent studies (Zeydi et al., 2014; Hao et al., 2018). On the other hand, serum phosphate level was comparable with those reported by National Renal Registry (2018) but the value was slightly higher than data

reported from the recent local study (Ho et al., 2019). As for international data, the mean value of serum phosphate in this study was higher than some studies (Shen et al., 2016; Trbojevic-Stankovic et al., 2014) but also lower than data reported from some other studies (Zeydi et al., 2014; Firoz et al., 2016; Hao et al., 2018). Hypoalbuminemia is prevalent in this study with more than 50% of the patients had serum albumin below 40 g/L, regardless whether they were poor or good sleepers. Serum phosphate control was sub-optimal in this study, with 77% of the patients (comprised of 75.9% of good sleepers and 77.5% of poor sleepers). Over half of the patients (57%) had hyperkalemia with 57.7% of them were poor sleepers and 55.2% of them were good sleepers.

Good sleepers had a higher means of serum albumin (39.31 ± 3.04 vs 39.05 ± 3.27), creatinine (860.49 ± 199.01 vs 848.20 ± 203.07), potassium (5.08 ± 0.54 vs 5.05 ± 0.52) and urea (19.68 ± 4.92 vs 19.38 ± 4.88) than their counterparts, despite none of these differences was significant (p>0.05). There was comparable mean serum phosphate between good and poor sleepers (1.81 ± 0.51 vs 1.81 ± 0.38). This finding was not in agreement with previous study in which poor sleepers had higher serum phosphate level (Chiu et al., 2008; Mehrabi, Sarikhani, & Roozbeh, 2017b). The data inconsistency could be due to the difference in sociodemographic background of respondents (higher percentage of male patients and older age in previous studies). On the other hand, despite mean MIS score for poor sleepers (6.03 ± 3.25) was slightly higher than good sleepers (5.62 ± 3.12), the difference was statistically not significant. The finding was in-line with Bilgic et al. (2007). Based on the results of frequency count, over half of the poor sleepers had serum albumin lesser than 40 g/L and serum potassium exceeding 5.0 mmol/L, whereas most of the poor sleepers had high serum phosphate level which was exceeding 1.60 mmol/L. However, none of the above

comparison was statistically significant. Approximately one third of the patients had an inflammatory status as indicated by MIS score greater or equal than 8. Among those with inflammatory status, most of them were poor sleepers but the difference in frequency of good and poor sleepers based on MIS score was not significant ($\chi^2 = 0.027$, $p>0.05$).

Table 4.2.1 Distribution of patients according to nutritional status (n = 100)

Parameters	Good sleepers (n = 29)	Poor sleepers (n = 71)	Total (n = 100)	*p* value
Anthropometric data				
Body weight (kg)	69.19 ± 13.51	66.34 ± 17.12	67.17 ± 16.14	$t = 0.800$ (0.425)
Height (cm)	163.18 ± 8.03	160.51 ± 9.88	161.29 ± 9.42	$t = 1.288$ (0.201)
BMI (kg/m^2)	26.05 ± 5.27	25.49 ± 4.80	25.65 ± 4.92	$t = 0.519$ (0.605)
PEM (<23)	9 (31.0)	21 (29.6)	30 (30.0)	$\chi^2 = 1.753$ (0.416)
Ideal (≥24)	13 (44.8)	40 (56.3)	53 (53.0)	
Obese (>30)	7 (24.2)	10 (14.1)	17 (17.0)	
Waist circumference (cm)	94.77 ± 11.11	90.58 ± 12.66	91.79 ± 12.32	$t = 1.556$ (0.123)
Normal	6 (20.7)	25 (35.2)	31 (31.0)	$\chi^2 = 1.408$ (0.235)
Abdominal obese	23 (79.3)	46 (64.8)	69 (69.0)	
Functional status				
Handgrip strength (kg)	16.26 ± 7.39	16.34 ± 9.14	16.32 ± 8.63	$t = -0.045$ (0.965)
Low	24 (82.8)	60 (84.5)	84 (84.0)	$\chi^2 = 0.000$ (1.000)
Normal	5 (17.2)	11 (15.5)	16 (16.0)	

Parameters	Good sleepers (n = 29)	Poor sleepers (n = 71)	Total (n = 100)	*p* value
Biochemical data				
Serum albumin (g/L)*	39.31 ± 3.04	39.05 ± 3.27	39.12 ± 3.20	t = 0.371 (0.711)
<40	15 (51.7)	37 (52.1)	52 (52.0)	χ^2 = 0.000 (1.000)
⩾40	14 (48.3)	34 (47.9)	48 (48.0)	
Serum phosphate (mmol/L)**	1.81 ± 0.51	1.81 ± 0.38	1.81 ± 0.42	t = -0.005 (0.996)
<0.80	0 (0)	0 (0)	0 (0)	χ^2 = 0.000 (1.000)
0.80 – 1.60	7 (24.1)	16 (22.5)	23 (23.0)	
>1.60	22 (75.9)	55 (77.5)	77 (77.0)	
Serum creatinine (μmol/L)	860.49 ± 199.01	848.20 ± 203.07	851.77 ± 200.98	t = 0.276 (0.783)
Serum potassium (mmol/L)***	5.08 ± 0.54	5.05 ± 0.52	5.06 ± 0.53	t = 0.287 (0.775)
⩽5.0	13 (44.8)	30 (42.3)	43 (43.0)	χ^2 = 0.000 (0.989)
>5.0	16 (55.2)	41 (57.7)	57 (57.0)	
Urea (mmol/L)	19.68 ± 4.92	19.38 ± 4.88	19.47 ± 4.87	t = 0.280 (0.780)
Malnutrition-inflammation score (MIS)	5.62 ± 3.12	6.03 ± 3.25	5.91 ± 3.20	t = -0.576 (0.566)
<8	22 (75.9)	51 (71.8)	73 (73.0)	χ^2 = 0.027 (0.870)
⩾8	7 (24.1)	20 (28.2)	27 (27.0)	

Data were presented as n(%)

*National Kidney Foundation Kidney Disease Outcomes Quality Initiative (K/DOQI) Clinical Practice Guidelines for nutrition in chronic renal failure (2000)

**Clinical Practice Guidelines: Renal Replacement Therapy 4th Edition (2017)

***National Kidney Foundation K/DOQI Clinical Practice Guidelines on hypertension and antihypertensive agents in chronic kidney disease (2004)

4.3 Fluid adherence of the patients

Fluid adherence of the patients in this study was ascertained by interdialytic weight gain (IDWG). Mean IDWG was 2.94 ± 1.27%, with 20% of them had fluid overload. The IDWG was relatively lower than previous study (Chan et al., 2019). Lower IDWG could be due to higher number of female patients and lower mean age of patients participated in this study (Kuipers et al., 2016). Among patients with fluid overload status, most of them were poor sleepers (65%) with mean IDWG at 2.84 ± 1.22 %. This finding correlates with another study in which most poor sleepers had fluid overload status (Hao et al., 2018). Good sleepers had a mean interdialytic weight gain slightly higher than poor sleepers which were 3.18 ± 1.37 % but the difference was not significant (t = 1.207, p>0.05). There was no significant difference between proportion of good or poor sleepers in terms of fluid adherence status (χ^2 = 0.149, p>0.05).

Table 4.3.1 Distribution of patients according to fluid adherence (n = 100)

Characteristics	**Good sleepers (n = 29)**	**Poor sleepers (n = 71)**	**Total (n = 100)**	**Statistics (*p*-value)**
Interdialytic weight gain (%)	3.18 ± 1.37	2.84 ± 1.22	2.94 ± 1.27	t = 1.207 (0.230)
⩽ 4% (Normal)	22 (75.9)	58 (81.7)	80 (80.0)	χ^2 = 0.149 (0.700)
> 4% (Fluid overload)	7 (24.1)	13 (18.3)	20 (20.0)	

Data were presented as n(%)

4.4 Level of physical activity of the patients

Physical inactivity was prevalent among the patients, with 98% of them had either low or moderate PA. This finding was in congruent with previous studies in which most of the haemodialysis patients had low level of physical activity (Johansen et al., 2000; Wong et al., 2011; Williams et al., 2017). The low level of physical activity among most haemodialysis patients could be due to several factors such as the high prevalence of depression, lower serum creatinine level, lower education level and other comorbid conditions among haemodialysis patients (Sheshadri, Kittiskulnam, & Johansen, 2019; Wong et al., 2011). Haemodialysis patients receive dialysis treatment for at least twice weekly and the fatigue caused by the treatment itself will lead to a low level of physical activity (Wong et al., 2011). Among those with the low level of physical activity, many of them belonged to poor sleepers (n = 41) and only 15 of them were good sleepers. However, according to Chi-square test, the comparison of frequency count between two groups was not significant ($\chi^2 = 0.108$, $p>0.05$), probably due to the heterogeneity of the sample whereby majority of them were physically inactive.

Mean METs value and daily sitting duration for patients were 804.63 $\pm$ 595.43 minutes/week and 15.51 $\pm$ 3.13 hours respectively. Sitting duration of patients found in this study was longer than other study (Gomes et al., 2015). In general, poor sleepers had significantly lower METs value ($t = 5.223$, $p<0.05$) and longer sitting duration ($t = -5.472$, $p<0.05$) than good sleepers. Chi-square analysis was carried out to compare the frequency count between two groups based on their sitting duration. As approximately 98% of patients sit more than 6 hours in a day regardless of their sleep quality pattern, there was no significant difference in the proportion of patients with sitting more than

6 hours between the two groups ($\chi^2 = 1.988$, $p>0.05$). The mean sitting duration found in this study was higher than mean duration found in the previous local study (Wong et al., 2011). The longer sitting duration among haemodialysis population may be due to long haemodialysis treatment duration which is about 4 hours per session (Wong et al., 2011). There is scarce of study available on the sitting duration in haemodialysis patients, with no local data available. This addresses the need to have more research regarding sedentarism among haemodialysis patients due to several negative impacts brought by physical inactivity such as reduced muscle mass, accumulation of visceral fat, activation of inflammatory pathways, insulin resistance, neurodegeneration, development of cognitive impairment, reduced health-related quality of life, poor functioning status and frailty (Aucella, Valente, & Catizone, 2014; Filho et al., 2012; Manfredini et al., 2012). In addition to these negative impacts, sedentarism will also increase risk of colon cancer, cardiovascular disease, postmenopausal breast cancer, type 2 diabetes, depression, dementia and eventually the overall mortality rate (Aucella, Valente, & Catizone, 2014; Filho et al., 2012; Manfredini et al., 2012).

Table 4.4.1 Distribution of patients according to level of physical activity (n = 100)

Characteristics	Good sleepers (n = 29)	Poor sleepers (n = 71)	Total (n = 100)	Statistics (*p*-value)
Level of physical activity				
Low	15 (51.7)	41 (57.7)	56 (56.0)	
Moderate	12 (41.4)	30 (42.3)	42 (42.0)	
High	2 (6.9)	0 (0)	2 (2.0)	
Level of physical activity (2 categories)				
Low	15 (51.7)	41 (57.7)	56 (56.0)	χ^2 = 0.108 (0.743)
Moderate and high†	14 (48.3)	30 (42.3)	44 (44.0)	
MET-minutes/week	1237.17 ± 904.35	627.96 ± 255.15	804.63 ± 595.43	*t* = 5.223 (0.000*)
Sitting duration (hours)**	13.08 ± 3.26	16.54 ± 2.43	15.51 ± 3.13	*t* = -5.472 (0.000*)
⩽6 hours	2 (7.7)	0	2 (2.3)	χ^2 = 1.988 (0.159)
> 6 hours	24 (92.3)	61 (100.0)	85 (97.7)	

*significant at $p<0.05$; **With total n = 87; † As there were only two patients with high PAL, they were collapsed with the moderate PAL group

Data were presented as n(%)

4.5 Night eating syndrome of the patients

Presence of NES was uncommon among the patients with only 8% of them had NES. As this was the first study to identify NES among haemodialysis patients in Malaysia, comparison with local study was not possible. Similarly, there was a lack of international data regarding the exact prevalence of night eating syndrome among haemodialysis population. Hence no comparison can be done. It is interesting to know that the NEQ score was significantly lower among the good sleepers (t = -2.295, p<0.05), indicating the presence of night eating syndrome among haemodialysis patients could be one of the contributing factors that lead to their poor sleep quality. Based on result from Chi-square analysis, the difference in frequency count between two groups was not significant (χ^2 = 0.444, p>0.05). Presence of night eating syndrome posed similar negative effects on healthy population in terms of their sleep quality such as difficulty in maintaining sleep, insomnia, low sleep efficiency, sleep apnea, daytime dysfunction and shorter sleep duration (Kucukgoncu et al., 2015; O'Reardon et al., 2004; Verster et al., 2016).

Table 4.5.1 Distribution of patients according to Night eating syndrome (n = 100)

Characteristics	**Good sleepers (n = 29)**	**Poor sleepers (n = 71)**	**Total (n = 100)**	**Statistics (*p*-value)**
NEQ score	10.28 ± 5.17	13.97 ± 8.01	12.90 ± 7.46	t = -2.295 (0.024*)
< 25 (Normal)	28 (96.6)	64 (90.1)	92 (92.0)	χ^2 = 0.444 (0.505)
⩾ 25 (Night eating syndrome)	1 (3.4)	7 (9.9)	8 (8.0)	

*significant at p<0.05

Data were presented as n(%)

4.6 Sleep quality and its component among the patients

Table 4.6.1 showed the sleep quality and sleep component of the patients. Overall mean global PSQI score for all patients was 7.92 ± 4.05 which already exceeded the cut-off point of good sleep quality, and was corresponding with approximately 70% of the patients were poor sleepers. The findings reaffirmed findings of earlier studies that poor sleep quality is prevalent among dialysis population due to depression, fluid overload, physical inactivity, pain, pruritis, snoring, nightmares, restless leg syndrome and breathing problems (Bastos et al., 2007; Čengić et al., 2012; Edalat-Nejad & Qlich-Khani, 2013; Elder et al., 2007; Pai et al., 2007; Shen et al., 2016; Trbojević-Stanković et al., 2014). As expected, poor sleepers had a significantly higher mean PSQI score than their good sleep counterparts (t = -14.454, p<0.05).

With regards to sleep components, poor sleepers had significantly higher means than good sleepers in all components except on the use of sleep medicine. This could be attributed to a majority of patients were not using sleep medicine, regardless of their sleep quality pattern. Even in comparison with other previous studies, prevalence of sleep medication usage among haemodialysis patients was relatively low, ranging from 8 – 19% (Elder et al., 2007a; Merlino et al., 2008). The possible reasons that contribute to low usage of sleep medication among Malaysian including they could cope with symptoms without the need of medications, difficulty in getting sleep medications, fear of being addicted, many of them may take their sleep problems for granted (Zailinawati, Ariff, Nurjahan, & Teng, 2008) or the sleep problem was not too serious for physician to prescribe sleep medicine. Several studies had concluded that usage of sleep medication may worsen sleep quality of haemodialysis patients but the mechanism is unclear and more studies are needed (Elder et al., 2007a; Mehrabi et al., 2017b). Mean

duration of sleep for patients was 5.41 ± 1.61 hours per day. Poor sleepers had significantly shorter sleep duration than good sleepers (t = 8.811, p<0.05). The short in sleep duration among these patients was due to some factors which including they were hard to maintain their sleep, high BMI, overhydration and presence of night eating syndrome (Bjorvatn et al., 2007; Čengić et al., 2012; Elias et al., 2012; Verster et al., 2016).

Chi-square test was used to analyse the frequency count between two sleeper groups based on their status of sleep latency, sleep duration, sleep disturbances, use of sleep medicine and daytime dysfunction. There was a total of 60% patients in this study with sleep duration less than 6 hours per day, in which almost all of them belonged to poor sleepers. This percentage was significantly higher than those with sleep duration more or equal to 6 hours per day (χ^2 = 44.930, p<0.05). Majority of the patients had sleep disturbances and sleep latency with number of poor sleepers was significantly higher than number of good sleepers (χ^2 = 13.988, p<0.05 for sleep disturbances) (χ^2 = 17.006, p<0.05 for sleep latency). Almost all of the patients did not use any sleep medicine and the difference of frequency count between groups was not significant (χ^2 = 0.016, p>0.05). Lastly, over half of them (56%) presented with daytime dysfunction in which proportion of poor sleepers was significantly higher than good sleepers (χ^2 = 22.736, p<0.05).

Table 4.6.1 Comparison of sleep quality and sleep component scores of the patients (n = 100)

Sleep components	Good sleepers (n = 29)	Poor sleepers (n = 71)	Total (n = 100)	Statistics (*p*-value)
Global PSQI score	3.28 ± 1.39	9.82± 3.14	7.92 ± 4.05	*t* = -14.454 (0.000*)
⩽ 5 (Good sleepers)	29 (100.0)	0 (0)	29 (29.0)	
>5 (Poor sleepers)	0 (0)	71 (100.0)	71 (71.0)	
Subjective sleep quality	0.66 ± 0.48	1.62 ± 0.76	1.34 ± 0.82	*t* = -7.563 (0.000*)
Sleep latency	0.90 ± 0.90	2.17 ± 0.88	1.80 ± 1.05	*t* = -6.528 (0.000*)
Without sleep latency	12 (41.4)	4 (5.6)	16 (16.0)	χ^2 = 17.006 (0.000*)
With sleep latency	17 (58.6)	67 (94.4)	84 (84.0)	
Sleep duration (score)	0.79 ± 0.77	2.30 ± 0.87	1.86 ± 1.08	*t* = -8.094 (0.000*)
Sleep duration (hours)	7.07 ± 0.81	4.73 ± 1.33	5.41 ± 1.61	*t* = 8.811 (0.000*)
< 6 hours	2 (6.9)	58 (81.7)	60 (60.0)	χ^2 = 44.930 (0.000*)
⩾ 6 hours	27 (93.1)	13 (18.3)	40 (40.0)	
Sleep efficiency	0.07 ± 0.26	1.35 ± 1.24	0.98 ± 1.21	*t* = -8.272 (0.000*)

Sleep components	Good sleepers (n = 29)	Poor sleepers (n = 71)	Total (n = 100)	Statistics (*p*-value)
Sleep disturbances	0.69 ± 0.47	1.17 ± 0.45	1.03 ± 0.50	t = -4.794 (0.000*)
Without sleep disturbances	9 (31.0)	2 (2.8)	11 (11.0)	χ^2 = 13.988 (0.000*)
With sleep disturbances	20 (69.0)	69 (97.2)	89 (89.0)	
Use of sleep medicine	0.00 ± 0.00	0.06 ± 0.37	0.04 ± 0.32	t = -0.809 (0.420)
Without usage	29 (100.0)	69 (97.2)	98 (98.0)	χ^2 = 0.016 (0.900)
With usage	0 (0)	2 (2.8)	2 (2.0)	
Daytime dysfunction	0.17 ± 0.38	1.15 ± 0.97	0.87 ± 0.95	t = -7.276 (0.000*)
Without dysfunction	24 (82.8)	20 (28.2)	44 (44.0)	χ^2 = 22.736 (0.000*)
With dysfunction	5 (17.2)	51 (71.8)	56 (56.0)	

*significant at $p<0.05$

Data were presented as n(%)

4.7 Correlation of selected variables with Sleep Quality

4.7.1 Socio-demographic factors and sleep quality

$H_0$1: There is no significant associations and correlation between socio-demographic background with sleep quality among haemodialysis patients.

As shown in Table 4.7.1.1, in terms of sociodemographic factors, only employment status was associated with sleep quality, as reflected as PSQI global score. Employed patients had significant lower PSQI score as compared to their non-employed counterparts (t = -2.130, p<0.05), indicating the former had better sleep quality. Finding from this study was in agreement with previous studies in which there was a significant association between employment status and sleep quality ($\chi 2$= 7.518, p<0.05) (Fischer et al., 2010; Menon et al., 2015). This association was due to increased financial reliability that may result in other cofactors such as depression which resulting in poorer sleep quality (Joshwa et al., 2012).

On the other hand, there were no significant associations between sleep quality with other socio-demographic factors. There was no significant association in between sex and sleep quality based on Chi-square test ($\chi 2$= 0.121, p>0.05). Previous studies had not yet determine a definite relationship in between gender and sleep quality of haemodialysis patients due to inconsistency in the findings (Menon et al., 2015; Unruh et al., 2003). Some of the studies found male patients had better sleep quality than female patients (Menon et al., 2015; Norozi Firoz et al., 2016). Results from both local and international studies indicated that women had poorer sleep quality (higher global PSQI scores), higher prevalence of insomnia and shorter sleep duration than men

among general healthy population (Farah et al., 2019; Madrid-Valero et al., 2017; Tang et al., 2017). The exact reason behind this difference was not yet understood but one of the studies suggested that menopause may be the reason contributes to poorer sleep quality among women (Madrid-Valero et al., 2017). Comparison of mean global PSQI score based on age group, ethnicity, education level, marital status and monthly household income had been carried out using Independent sample T-test (for age group) and Kruskal-Wallis analysis (for other variables) as a test for non-parametric data. There was no significant difference between mean score or rank of global PSQI scores among patients based on age group ($t = 0.291$, $p>0.05$), ethnicity ($H = 5.567$, $p>0.05$), education level ($H = 6.543$, $p>0.05$), marital status ($H = 1.734$, $p>0.05$) and monthly household income ($H = 3.675$, $p>0.05$). No definite conclusion can be made to determine which specify age group, ethnic group, education level, marital status and income status had the highest or lowest global PSQI score. However, previous study found a positive correlation between low income status and poor sleep quality among haemodialysis patients (Menon et al., 2015). The finding discrepancy between this study with previous study could be due to difference in instrument used to assess financial status of patients (Menon et al., 2015). In previous study, Kuppuswamy's socioeconomic status scale was used to grade socioeconomic status into upper, middle and lower classes (Menon et al., 2015), which was different as per current study protocol.

Although age and monthly household income had no association with sleep quality based on Pearson's product moment correlation (for age) and Spearman's rank correlation analysis (for monthly household income), these two variables had significant correlations with one of the sleep components. As for the global PSQI score

and the rest of the six sleep components, age had either positive (subjective sleep quality only) or negative correlation with these components but the correlation was negligible and insignificant. Similarly, monthly household income was negatively correlated with subjective sleep quality (r = -0.212, p<0.05). However, there was a lack of previous findings regarding the specific correlation between monthly household income with subjective sleep quality, which addressed the need for more research.

Table 4.7.1.1 Comparison of mean Global PSQI score based on socio-demographic background

Variables	**Mean ± SD**	***t*-value**	***p*-value**
Age			
<60 years old	8.02 ± 4.39	0.291	0.074
⩾60 years old	7.78 ± 3.53		
Sex		-0.545	0.587
Male	7.69 ± 4.05		
Female	8.14 ± 4.08		
Employment status		-2.130	0.036*
Yes	6.11 ± 4.34		
No	8.32 ± 3.90		
	Mean rank	***H*-value**	***p*-value**
Ethnicity		5.567	0.135
Malay	48.56		
Chinese	59.35		
Indian	42.33		
Others	2.50		

Variables	Mean ± SD	*t*-value	*p*-value
Education level		6.543	0.088
No formal education	2.50		
Primary education	49.13		
Secondary education	55.83		
Tertiary education	43.18		
Marital status		1.734	0.420
Single	41.25		
Married	51.95		
Divorce	35.00		
Monthly household income (RM)		3.675	0.159
B40	51.07		
M40	58.68		
T20	33.50		

*significant at $p<0.05$

Table 4.7.1.2 Associations and correlation between socio-demographic background and sleep quality among haemodialysis patients

Variables	Global PSQI	SSQ	SL	SD	SE	SDB	SM	DD
Socio-demographic background								
Age (years)	-.0.096 (0.344)	0.031 (0.763)	-0.090 (0.373)	-0.020 (0.840)	-0.089 (0.379)	-0.107 (0.289)	-0.229 (0.022*)	-0.065 (0.520)
Monthly household income (RM)	-0.016 (0.873)	-0.212 (0.034*)	-0.110 (0.274)	-0.004 (0.971)	0.093 (0.357)	0.016 (0.871)	0.052 (0.609)	-0.091 (0.370)

*significant at $p<0.05$

4.7.2 Nutritional status and sleep quality

$H_0$2: There is no significant associations and correlation between nutritional status with sleep quality among haemodialysis patients.

Nutritional status of haemodialysis patients in this study was accessed through anthropometric data, biochemical data and Malnutrition-inflammation score (MIS). In terms of anthropometric data, comparison of mean global PSQI scores were computed for BMI, waist circumference and handgrip strength through ANOVA test and Independent sample t-test whenever applicable. Pearson's product moment correlations were performed to ascertain the correlations between independent variables and sleep quality.

There was no significant correlation between sleep quality of haemodialysis patients with body weight, height, BMI and handgrip strength. With regards to classification of nutritional status according to BMI, there was comparable mean global PSQI score across the three groups (F= 0.619, p>0.05). This finding was in contrast with previous studies in which obese patients had a higher global PSQI score than those with normal BMI (Mehrabi et al., 2017a; Turkmen et al., 2012). The findings discrepancy could be attributed to the difference in socio-demographic background of patients (higher number of male patients and older age in previous studies) as well as methodology used for example different classifications of BMI and different instruments were used to assess sleep quality. Similarly, there was no significant difference on sleep quality between patients with low or normal handgrip strength. This finding was not in agreement with previous local study (Ho et al., 2019) and this may

be due to the difference in model of hand dynamometer used as an instrument. Relationship between handgrip strength and sleep quality of haemodialysis patients was understudied. Only one study had shown that handgrip strength as part of physical function measurement had no correlation with sleep disturbances among haemodialysis patients (Wyngaert et al., 2020).

On the other hand, there was no significant associations between global PSQI scores and biochemical parameters, namely serum albumin, potassium and phosphate. Patients with high serum phosphate level >1.60 mmol/L had higher mean global PSQI score (8.00 $\pm$ 3.93) than those with normal serum phosphate level (7.65 $\pm$ 4.51) but the difference failed to be significant ($F = 0.329$, $p>0.05$). This was in good agreement with previous local and international studies although the difference in previous studies was significant (Ho et al., 2019; Menon et al., 2015).

Table 4.7.2.1 Comparison of mean Global PSQI score based on nutritional status

Variables	Mean ±SD	*t* or *F* values	*p*-value
Anthropometric data			
BMI (kg/m^2)		0.619*	0.540
Protein energy malnutrition (<23)	8.37 ± 4.99		
Ideal (⩾24)	7.96 ± 3.50		
Obese (>30)	7.00 ± 3.89		
Waist circumference (cm)		1.864	0.065
Normal	9.03 ± 4.51		
Abdominal obese	7.42 ± 3.76		
Functional status			
Handgrip strength (kg)		-1.235	0.220
Low	7.70 ± 3.73		
Normal	9.06 ± 5.43		
Biochemical data			
Serum phosphate (mmol/L)		-0.360	0.720
0.80 – 1.60	7.65 ± 4.51		
>1.60	8.00 ± 3.93		
Serum albumin (g/L)		-0.583	0.561
<40	7.69 ±3.59		
⩾40	8.17 ± 4.52		
Serum potassium (mmol/L)		-0.127	0.899
⩽5.0	7.86 ± 4.17		
>5.0	7.96 ± 4.00		

* *F* value based on Anova test

Possible correlations between nutrition parameters with sleep quality of haemodialysis patients were investigated using Pearson's product moment correlation

test, with the results display in Table 4.7.2.2. Among the anthropometric parameters, only waist circumference was correlated weakly with both global PSQI score (r = -0.211, p<0.05) and daytime dysfunction (r = -0.319, p<0.05), whereby higher WC was associated with better sleep quality and lesser daytime dysfunction. These findings were not in agreement with earlier findings (Afsar & Elsurer, 2013; Vgontzas et al., 2000). Similar to results of BMI, the findings discrepancy could be attributed to the difference in socio-demographic background of patients (higher number of male patients and younger age in previous studies) investigated as well as the methodology used to assess sleep disturbances. On the other hand, there was no significant correlation between biochemical parameters with sleep quality regardless either global PSQI score or its sleep components. Future studies with a larger scale should be conducted to delineate the potential relationships between biochemical parameters with sleep quality among haemodialysis patients.

Malnutrition-inflammation score (MIS), is a universal measure for nutritional and inflammation status of haemodialysis patients. As shows in Table 4.7.2.2, MIS was correlated positively with global PSQI score (r = 0.201, p<0.05), subjective sleep quality (r = 0.197, p<0.05) and daytime dysfunction (r = 0.245, p<0.05), indicating patients with poorer nutritional status had poorer sleep quality. Although the correlations were weak, these findings parallel well with previous study (Bilgic et al., 2007) and had provided evidence for a possible relationship between nutritional status of patients with their sleep quality. Exact mechanism on how nutritional status may affect the sleep quality of haemodialysis patients was unclear but could be due to other possible cofactors accompanied with poor nutritional status such as depression (Bilgic et al., 2007) which will further deteriorate patients' sleep quality. In addition, poor

appetite belongs to one of the factors which may decrease their nutritional intake from food (Ongan & Yuksel, 2017). Decreased intake of nutritious foods will not only lead to protein-energy malnutrition (Mazairac et al., 2011) as indicated by BMI or MIS score but will also give an impact on several biochemical parameters such as serum albumin and serum creatinine (Mazairac et al., 2011), in which all of these parameters could become factors of poor sleep quality among haemodialysis patients. High MIS score among patients indicated a state of inflammation which could be one of the underlying factors that lead to decrease in sleep quality caused by elevation of sleep regulatory cytokines such as IL-1β and TNF-α that related to excessive daytime sleepiness during inflammation or the other sleep disorders such as sleep apnea (Chiu et al., 2008; Krueger, Majde, & Rector, 2011). Systemic inflammation measured by increased in several inflammatory biomarkers such as C-reactive protein was also found to correlate with poorer sleep quality in previous study (Zeydi et al., 2014). Unfortunately, sleep regulatory cytokines and inflammatory biomarkers were not accessed in this study making confirmation not possible. More studies are warranted on this aspect.

Table 4.7.2.2 Associations and correlation between nutritional status and sleep quality among haemodialysis patients

Variables	Global PSQI	SSQ	SL	SD	SE	SDB	SM	DD
Anthropometric data								
Body weight (kg)	-0.104 (0.303)	-0.162 (0.108)	-0.102 (0.311)	0.005 (0.964)	-0.075 (0.459)	-0.044 (0.663)	-0.036 (0.722)	-0.143 (0.156)
Height (cm)	-0.138 (0.170)	-0.191 (0.057)	0.016 (0.876)	-0.121 (0.229)	-0.102 (0.312)	0.009 (0.932)	0.028 (0.782)	-0.047 (0.641)
BMI (kg/m^2)	-0.098 (0.333)	-0.122 (0.228)	-0.073 (0.473)	0.070 (0.492)	-0.053 (0.603)	-0.085 (0.402)	-0.056 (0.582)	-0.181 (0.072)
Waist circumference (cm)	-0.211 (0.035*)	-0.169 (0.092)	-0.162 (0.107)	-0.036 (0.725)	-0.089 (0.381)	-0.129 (0.201)	-0.099 (0.327)	-0.319 (0.001**)
Functional status								
Handgrip strength (kg)	0.053 (0.602)	-0.126 (0.211)	0.087 (0.389)	0.068 (0.504)	0.035 (0.730)	0.166 (0.098)	0.140 (0.163)	-0.019 (0.853)

Variables	Global PSQI	SSQ	SL	SD	SE	SDB	SM	DD
Biochemical data								
Serum albumin (g/L)	0.045 (0.655)	-0.075 (0.457)	-0.007 (0.948)	0.095 (0.349)	0.102 (0.315)	0.078 (0.443)	0.115 (0.253)	-0.051 (0.613)
Serum phosphate (mmol/L)	0.004 (0.965)	-0.116 (0.251)	0.009 (0.927)	0.090 (0.372)	0.024 (0.811)	0.052 (0.611)	-0.030 (0.765)	-0.042 (0.679)
Serum creatinine (µmol/L)	0.051 (0.614)	-0.082 (0.416)	0.158 (0.117)	0.086 (0.397)	-0.035 (0.728)	0.005 (0.959)	0.064 (0.525)	0.021 (0.839)
Serum potassium (mmol/L)	-0.005 (0.964)	0.005 (0.964)	0.055 (0.587)	0.079 (0.434)	0.013 (0.899)	-0.006 (0.952)	-0.050 (0.623)	-0.189 (0.060)
Urea (mmol/L)	0.060 (0.553)	-0.005 (0.963)	0.007 (0.944)	0.096 (0.344)	0.150 (0.136)	0.001 (0.992)	0.057 (0.575)	-0.067 (0.511)
Malnutrition-inflammation score (MIS)	0.201 (0.045*)	0.197 (0.050*)	0.090 (0.371)	0.046 (0.650)	0.167 (0.097)	0.184 (0.067)	-0.066 (0.511)	0.245 (0.014*)

*significant at $p<0.05$

** significant at $p<0.0$

4.7.3 Fluid adherence, level of physical activity, night eating syndrome and sleep quality

$H_0$3: There is no significant associations and correlation between fluid adherence with sleep quality among haemodialysis patients.

$H_0$4: There is no significant associations and correlation between level of physical activity with sleep quality among haemodialysis patients.

$H_0$5: There is no significant associations and correlation between night eating syndrome with sleep quality among haemodialysis patients.

Comparisons of mean global PSQI score among patients based on fluid adherence, level of physical activity and night eating syndrome were computed using Independent sample t-test or ANOVA test, whichever appropriate. Pearson's product moment correlation was used to test the correlations between sleep quality (global PSQI score and sleep components) with fluid adherence and night eating syndrome, whereas Spearman rank correlation was used to determine the association and correlation between physical activity level with sleep quality. The factors found to be associated significantly with sleep quality of patients were night eating syndrome, METs score and sitting duration.

As shown in Table 4.7.3.1, patients with night eating syndrome (NES) had significantly higher mean global PSQI score than their counterparts (t = -2.291, p<0.05).

Night eating syndrome was found to correlate positively and significantly with global PSQI score and sleep components except for the use of sleep medicine (r = 0.118, p>0.01). Strength of correlation varies across the sleep components. On the other hand, while there were moderate correlations between NES with global PSQI score (r = 0.431, p<0.01) and sleep disturbances (r = 0.424, p<0.01), the correlations between NES and other sleep components were weak. Previous studies showed presence of NES can impact sleep quality by disrupting normal sleep pattern (Verster et al., 2016), causing a higher frequency of nocturnal arousals and nocturnal awakening (O'Reardon et al., 2004; Stunkard et al., 2005; Verster et al., 2016). Besides overall sleep quality, NES may also affecting other sleep components as well, including shorter sleep duration (Verster et al., 2016), low sleep efficiency (Verster et al., 2016), longer sleep latency (Allison et al., 2016; Crispim et al., 2011; Kucukgoncu et al., 2014; Vinai et al., 2008) and sleep disorders such as sleep apnea and insomnia (Verster et al., 2016). The exact mechanism on how NES may impact sleep quality and its components however is unclear, in view of the limiting available resources. Nevertheless, proposed mechanism postulated a raise of body temperature caused by nocturnal food consumption (Yeh & Brown, 2014) will affect individual's ability to sleep well and result in a variety of problems such as tossing and turning, leg twitches, difficulty in breathing and higher frequency of coughing (Rogers et al., 2006). Despite the study sample of the present study is relatively small, it is imperative that the findings of the present study provided important data regarding the poorer sleep quality among haemodialysis patients with night eating syndrome. Furthermore, this was the first study done to investigate the relationship between night eating syndrome with sleep quality among haemodialysis patients in Malaysia and hence can be used as an

important reference for future study to further improve sleep quality of patients with night eating syndrome.

Regarding the level of physical activity, only METs score and sitting duration were found to be associated significantly with sleep quality. METs score had significant negative moderate relationship with overall PSQI score (r = -0.477, p<0.01), whereas sitting duration was correlated positively and strongly with global PSQI score (r = 0.704, p<0.01). In addition, METs score and sitting duration were correlated significantly with all sleep components with the exception on usage of sleep medicine. However, difference between mean global PSQI score with sitting duration categories (⩽6 hours and > 6 hours) was not significant (t = -1.894, p>0.05). A higher METs score and shorter sitting duration were associated with lower global PSQI score and better sleep quality due to the active lifestyle. No comparison can be made with previous study due to scarcity of data regarding relationship between METs score and sitting duration with sleep quality of haemodialysis patient.

As shown in Table 4.7.3.2, there were no relationships between sleep quality with IDWG or physical activity. Earlier studies showed significant correlation between fluid adherence and sleep quality due to lesser sleeping hour and more frequent night time walking caused by overhydration status (Abreo et al., 2017; Hao et al., 2018) but this was not shown in this study. Despite IDWG is a frequently used measure for fluid adherence, the use of a more objective measure of fluid status of patients such as fluid volume as assessed using multi-frequency bioimpedance analysis should be included in future study to delineate the relationship between fluid status and sleep quality among dialysis population.

Lastly, mean global PSQI score of patients decreased as their level of physical activity assessed by IPAQ score increase but the difference was insignificant (F = 2.879, p>0.05). The mean global PSQI score decreased slightly as the level of physical activity progress from low (8.52 ± 4.26) to a moderate level (7.38 ± 3.61) but reduced tremendously when a physical activity raises from moderate (7.38 ± 3.61) to the high level (2.50 ± 0.71). Based on the analysis, the negative correlation between IPAQ score and sleep quality (global PSQI score and all sleep components) was not significant. A recent study showed haemodialysis patients with an active lifestyle had less problem in falling asleep (Sheshadri et al., 2019). However, the mechanism on how regular exercise or how different types of physical activity can improve sleep quality is still under-investigated. Few studies suggested that physical activity can improve sleep quality of haemodialysis patients by alleviating symptoms such as insomnia (Sheshadri et al., 2019), anxiety, depression, and increasing body temperature (Cho et al., 2018b). In view of the prevalent of poor sleep quality among dialysis population and the commonly reported consequences associated with physically inactive, more studies on this aspect is warranted.

Table 4.7.3.1 Comparison of mean Global PSQI score based on fluid adherence, level of physical activity and night eating syndrome

Variables	Mean ±SD	*t* or *F* values	*p*-value
Interdialytic weight gain		-0.406	0.686
⩽4% (Normal)	7.84 ± 3.87		
> 4% (Fluid overload)	8.25 ± 4.79		
IPAQ score		2.879**	0.061
Low	8.52 ± 4.26		
Moderate	7.38 ± 3.61		
High	2.50 ± 0.71		
Sitting duration (hours)		-1.894	0.062
⩽6 hours	2.50 ± 0.71		
> 6 hours	8.05 ± 4.12		
NEQ score		-2.291	0.024*
< 25 (Normal)	7.65 ± 3.97		
⩾ 25% (Night eating syndrome)	11.00 ± 3.93		

*significant at $p<0.05$; ** *F* value based on Anova test

Table 4.7.3.2 Associations and correlation between fluid adherence, level of physical activity, night eating syndrome and sleep quality among haemodialysis patients

Variables	Global PSQI	SSQ	SL	SD	SE	SDB	SM	DD
Fluid adherence								
Interdialytic weight gain	-0.049 (0.631)	0.051 (0.612)	-0.092 (0.363)	-0.119 (0.240)	-0.081 (0.425)	0.043 (0.673)	0.089 (0.378)	-0.001 (0.995)
Night eating syndrome								
NEQ score	0.431 (0.000**)	0.316 (0.001**)	0.264 (0.008**)	0.261 (0.009**)	0.378 (0.000**)	0.424 (0.000**)	0.118 (0.244)	0.327 (0.001**)
Physical activity								
IPAQ score	-0.081 (0.423)	-0.103 (0.310)	-0.074 (0.467)	-0.127 (0.208)	-0.080 (0.428)	-0.189 (0.059)	-0.126 (0.213)	-0.127 (0.209)
MET-minutes/week	-0.477 (0.000**)	-0.381 (0.000**)	-0.353 (0.000**)	-0.350 (0.000**)	-0.290 (0.003**)	-0.317 (0.001**)	-0.103 (0.307)	-0.343 (0.000**)
Sitting duration (hours)**	0.704 (0.000**)	0.423 (0.000**)	0.401 (0.000*)	0.641 (0.000**)	0.577 (0.000**)	0.464 (0.000**)	0.231 (0.031*)	0.450 (0.000**)

*significant at $p<0.05$

** significant at $p<0.01$

CHAPTER 5 CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

This finding was consistent with previous study which showed poor sleep quality is common among dialysis population. Besides poor sleep quality, the financial status of the subjects is unsatisfactory, with many were unemployed despite 60% were below official retirement age. This is a universal phenomenon as the need to fit the schedule of dialysis often require HD patients to opt for an early retirement or to sacrifice their employment or job opportunities. This is particular concerning the researcher as employed subjects had significantly better sleep quality then their non-employed counterparts. Most socio-demographic background of haemodialysis patients in this study correlated well with national data.

Double burden malnutrition exists in this study cohort. In light of malnourished HD patients are often exposed to higher risk of mortality, appropriate nutritional interventions are warrant. On the other hand, despite higher WC patients were found to have better sleep quality, the co-exist of high BMI and body fat percentage among the patients should be avoided. It is worth mentioning that low grip strength is prevalent among the patients. As low grip strength is increasingly being use as surrogate measure for nutritional status and is well correlated with survival rate of HD patients, appropriate intervention is needed for HD patients. Besides ensuring adequate protein intake for HD patients to intervene both malnutrition and low grip strength, HD patient should be advised to perform exercises to build up their grip strength gradually.

Physical inactive and sedentarism are both prevalent among the patients. Acknowledging physical active HD patients have better sleep quality, it is imperative to encourage HD patients to be physically more active. On the other notes, as HD patients may have limited time to perform physical activity, structured exercise during dialysis may confer benefits to HD patients since it is easy for patients to follow and often results in high participation rates.

Hypoalbuminemia, hyperkalemia and hyperphosphatemia were prevalent, which reflect limitations of the dialysis procedure as well as possibly poor compliance among the patients. Regular dietary counselling should be given to all HD patients to overcome the above biochemical abnormalities. Fluid overload was less severe among the patients. This should not be taken as comfortable findings as fluid overload was measured based on IDWG, more objective measures such as fluid volume should be performed in future studies.

It is worth noting that despite there were only a small proportion of the patients suffered from night eating syndrome, the findings that presence of night eating syndrome was associated with poorer sleep quality deserved appropriate intervention to improve NES. However, problem of night eating syndrome among dialysis population had not yet been recognized by relevant health care workers in dialysis centre. This may lead to night eating syndrome become undiagnosed and may become one of the factors contribute to their worsened sleep quality. Hence, it is important for screening of night eating syndrome to be carried out among haemodialysis population as part of intervention to improve their health.

5.2 Strengths and Limitations

Total numbers of patients recruited in this study had achieved minimum sample size required by this study leading to sufficient power of the study. Socio-demographic background of patients recruited in this study was comparable with national data, hence this study was able to reflect situation of HD patients in Malaysia.

In terms of methodology of study, the instruments used for several variables exhibit a high internal consistency and had been proved to be suitable used in accessing certain variables. These instruments including Malnutrition-inflammation score and Pittsburgh Sleep Quality Index (both Malay and English version). Thus result of these several variables had a high reliability and accuracy.

There were several limitations found in the present study. First and foremost, the patients were limited to HD patients sampled from central region of Malaysia. Hence the result cannot be generalized to the whole haemodialysis population in Malaysia. Second, the study design of this study was a cross-sectional study which cannot establish causal relationship between variables.

Next, for assessment of fluid adherence, only interdialytic weight gain was used as the only objective measure. Usage of only one objective measure may not be able to fully assess fluid adherence of haemodialysis patients. Thus, the accuracy of fluid adherence assessed in this study may be lower. In addition to that, reliability and validity of using Night Eating Questionnaire to assess presence of Night Eating Syndrome among haemodialysis populations had yet to be established. This could affect the reliability of the result found in the present study.

5.3 Recommendations

The present study was the first cross-sectional study in Malaysia which provided information regarding prevalence of night eating syndrome among haemodialysis population and its possible correlation with sleep quality. Due to lack of previous study regarding this area, it is recommended that further study regarding night eating syndrome among this population should be conducted to delineate the possible association.

This study also reaffirmed finding from previous study in which poor sleep quality among this population is prevalent and interventive measures should be taken to overcome this issue. In order to further investigate the relationship between sleep quality and several variables, longitudinal study should be conducted instead of cross-sectional study. Study with larger scale that involved more patients from different dialysis centres at different states should be conducted to raise the generalization of the population in Malaysia. For better data quality and accuracy, more objective measures are needed to capture data on sleep quality using polysomnography, on physical activity using accelerometers or pedometer and on night eating syndrome among haemodialysis patients.

Last but not least, health care professionals including nurse and dietitian should be sensitive on the possible factors that may influence sleep quality of haemodialysis population due to many negative effects exerted by poor sleep quality. Furthermore, current health related policy should be revised by government sectors to improve sleep quality of haemodialysis patients. Appropriate guidelines should be formulated with the

intention to provide structured recommendation on the improvement and treatment of sleep quality among HD patients.

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ETHICS COMMITTEE FOR RESEARCH INVOLVING HUMAN SUBJECTS
(JKEUPM)
UNIVERSITI PUTRA MALAYSIA

Research title	:	**Sleep Quality and its Associated Factors among Hemodialysis Patients in Selected Dialysis Centres.**
Study Site	:	**Dialysis centres in Kuala Lumpur, Selangor and Putrajaya.**
JKEUPM Ref No.	:	**JKEUPM-2019-453**
Researcher	:	**Ng Jing Wen**
Supervisor	:	**Assoc. Prof. Dr. Chan Yoke Mun**

Documents received and reviewed with reference to the above study:

1. Ethics Application Form, Version 1 dated 7/11/2019
2. Respondent Information Sheet & Consent (English), Version 2 dated 18/12/2019
3. Respondent Information Sheet & Consent (Malay), Version 2 dated 18/12/2019
4. Proposal (English), Version 2 dated 18/12/2019
5. Questionnaires/ Interviews (English), Version 1 dated 7/11/2019
6. Questionnaires/ Interviews (Malay), Version 1 dated 7/11/2019
7. Curriculum Vitae of:
    a. Assoc. Prof. Dr. Chan Yoke Mun

The University Research Ethics Committee, Universiti Putra Malaysia (JKEUPM) operates in accordance to the ICH-GCP Guidelines.

Decision by JKEUPM:

[X] Approved

[X] **Permission MUST BE OBTAINED from the respective hospitals/ institutions before conducting the research**

[ ] Disapproved

Please note that the approval is **VALID UNTIL 6 JANUARY 2021**

Researchers should comply with the following:

I. Complete a Study Final Report upon study completion (Form 3.2).

II. Ethical approval is required in the case of amendments/ changes to the study documents/ study sites/ study team.

Appendix C – Information sheet

Reference: JKEUPM-2019-453

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

FORM 2.4: RESPONDENT'S INFORMATION SHEET AND INFORMED CONSENT FORM

Please read the following information carefully and do not hesitate to discuss any questions you may have with the researcher.

1. STUDY TITLE : Sleep Quality and its associated factors Among Hemodialysis Patients in Selected Dialysis Centres.

2. INTRODUCTION: Evidence is mounting that many haemodialysis patients have poor sleep quality. As compare to non-dialysis population, poor sleep quality is more prevalent among haemodialysis patients. Sleep disturbances can be associated with several negative effects such as reducing overall well-being, affect daytime alertness and activity level among haemodialysis patients. Etiologies of sleep disorders in dialysis patients are multifactorial and these factors including age, anxiety, depression, pain, physical activity, gender, duration and timing of dialysis and others. Despite poor sleep quality among haemodialysis patients has attract attention of health care professionals, it is not been addressed adequately. On the other hand, most of the published studies were performed among Caucasians, with scarce information available for the local communities. Hence, this study aims to investigate possible relationships among several factors and sleep quality among haemodialysis patients.

3. WHAT WILL YOU HAVE TO DO?

After reading this information sheet and informed consent, you will need to sign at the end of this page as an indication that your participation in this study is solely voluntary.

There are no invasive measurements involved and no unpleasant feelings are expected.

The questionnaire consists of four (4) sections. Sections A (sociodemographic), B (nutritional status) and C (sleep quality, physical activity, night eating syndrome, social support, depression, frailty and dietary intake) will be administered through face-to-face interview. Section D comprises of measurement of anthropometric parameters (body weight, height, body fat percentage, waist circumference) and functional status (handgrip strength). Body fat percentage, waist circumference and functional status will be measured using standardised techniques, with non-invasive devices. On the other hand, information on body weight, height and laboratory data (serum albumin, serum phosphorus, serum creatinine, serum potassium and urea) will be retrieved from your medical record as secondary data.

The whole duration needed for this data collection will be 30 – 45 minutes.

4. WHO SHOULD NOT PARTICIPATE IN THE STUDY?

Your participation is not suitable if you are:

a) Non-Malaysian
b) Physically disabled
c) Presence of any inflammatory illness, lung or heart failure or liver diseases
d) Had been hospitalised for the past three months

5. WHAT WILL BE THE BENEFITS OF THE STUDY:

(a) TO YOU AS THE SUBJECT?

You will get to know your sleep quality, hydration status, level of physical activity, nutritional status and presence of night eating syndrome.

You will not be paid by participating in this study but a small door gift will be given as a token of appreciation.

(b) TO THE INVESTIGATOR?

The finding of this study will be used to find out the association between several factors with the sleep quality among haemodialysis patients. Such information allow relevant authorities to plan appropriate intervention to improve sleep quality among haemodialysis patients in the future.

6. WHAT ARE THE POSSIBLE RISKS?

There is no possible risk poses for this study as it only involve completing the questionnaire and antropometry measurement.

7. WILL THE INFORMATION THAT YOU PROVIDE AND YOUR IDENTITY REMAIN CONFIDENTIAL?

Yes, all of the information collected are for research purpose only and will remain strictly confidential.

8. WHO SHOULD YOU CONTACT IF YOU HAVE ADDITIONAL QUESTIONS DURING THE COURSE OF THE RESEARCH?

Ethics Committee for Research Involving Human Subject UPM (JKEUPM) Review Panel has approved the study, and may be reached through the following address for information regarding rights of study participants, including grievances and complaints.

Ethics Committee for Research Involving Human Subject UPM (JKEUPM)
Research Management Centre
Office of The Deputy Vice Chancellor (Research & Innovation)
University Putra Malaysia
43400 UPM Serdang, Selangor

Should you have any additional questions, please directly contact with the researcher of this study Ms. Ng Jing Wen at 6016-7944 381 (email: 193338@student.upm.edu.my) or supervisor of the study, Associate Professor Dr. Chan Yoke Mun at 03-97692433 (email: cym@upm.edu.my)

Please initial here if you have read and understood the contents of this page_____

9. CONSENT

I ……..…… Identity Card No. ……..……
address……..
……..hereby voluntarily agree to take part in the research stated above *(clinical /drug trial/video recording/ focus group/interview-based/ questionnaire-based).

I have been informed about the nature of the research in terms of methodology, possible adverse effects and complications (as written in the Respondent's Information Sheet). I understand that I have the right to withdraw from this research at any time without giving any reason whatsoever. I also understand that this study is confidential and all information provided with regard to my identity will remain private and confidential.

I* wish / do not wish to know the results related to my participation in the research

I agree/do not agree that the images/photos/video recordings/voice recordings related to me be used in any form of publication or presentation (if applicable)

* delete where necessary

Signature ……..…… Signature ……..……..
(Respondent) (Witness)

Date :……..…… Name :……..…..

I/C No. :……..…..

I confirm that I have explained to the respondent the nature and purpose of the above-mentioned research.

Date ……..…… Signature ……..……..
(Researcher)

Appendix D - Questionnaire

JKEUPM Ref No: JKEUPM-2019-021

FACULTY OF MEDICINE AND HEALTH SCIENCES

DEPARTMENT OF NUTRITION AND DIETETICS

Questionnaire Form

Research Title:

Sleep Quality and its associated factors Among Hemodialysis Patients in Selected Dialysis Centres

Kualiti tidur dan faktor-berkaitan dalam kalangan pesakit hemodialisis di pusat dialisis tertentu.

Researcher's Name: Ng Jing Wen

Matric Number : 193338

Supervisor's Name: Associate Professor Dr. Chan Yoke Mun

Date: 4/2/2020

Confidential and for research purpose only
Sulit dan untuk kegunaan kajian sahaja

Instruction:

This study is conducted for academic purpose. All information will be kept private and confidential. Thank you for your cooperation in answering this questionnaire.

Arahan: Kajian ini dijalankan untuk kegunaan akademik sahaja. Semua maklumat dalam kajian ini akan disimpan secara sulit. Terima kasih kerana menjawab borang ini.

SECTION A

1. Age / *Umur* : _____ years old / *tahun*
2. Date of Birth / *Tarikh lahit*: _____ (dd/mm/yyyy)
3. Sex / *Jantina*:
   ( ) Male / *Lelaki*
   ( ) Female / *Perempuan*
4. Ethnicity / *Bangsa*:
   ( ) Malay / *Melayu*
   ( ) Chinese / *Cina*
   ( ) Indian / *India*
   ( ) Others, please specify / *Lain-lain, sila nyatakan*: _____
5. Marital Status / *Status Perkahwinan*:
   ( ) Single / *Bujang*
   ( ) Married / *Berkahwin*
   ( ) Divorce / Berc*erai*
6. Educational Level / *Latar belakang pendidikan*:

( ) No formal education / *Tiada Pendidikan Formal*

( ) Primary Education / *Sekolah Rendah*

( ) Secondary Education / *Sekolah Menengah*

( ) Tertiary (Diploma/ Degree/ Master/ PhD) / *Pendidikan IPTA, Diploma ke atas*

( ) others, please specify / *Lain-lain, sila nyatakan* _____

7. Currently working / *Adakah andabekerja*?

   ( ) Yes / *Ya*

   ( ) No / *Tidak*

8. Occupation / *Pekerjaan*: _____ (Part Time / *Sambilan*) (Full Time / *Sepenuh masa*)

9. Monthly household income / *Pendapatan bulanan isi rumah*: RM_____

10. How long had you been on hemodialysis / *Berapa lamakah anda telah menerima rawatan hemodialysis*?

    _____ month(s)/year(s) / *bulan/tahun*

11. Were you on other modality treatments before? (Peritoneal Hemodialysis, kidney transplant) / *Adakah anda pernah menerima rawatan modaliti yang lain? (Dialisi peritoneum, pemindahan buah pinggang)*

    ( ) Yes / *Ya*

    Reason for changing the modality treatment / *Alasan pertukaran jenis rawatan*?

    _____-

    ( ) No / *Tidak*

12. Have you met dietitian before / *Adakah anda pernah jumpa dengan dietitian*?

    ( ) Yes / *Ya*

    What is the advice given / *Apakah nasihat yang diberi*? _____

    ( ) No / *Tidak*

SECTION B

Instruction: Please read each of the following statement and circle the number which indicates how much the statement applied to you. There are no right or wrong answers.

Arahan: Sila baca semua soalan dengan teliti dan bulatkan jawapan yang paling sesuai dengan anda. Tiada jawapan yang betul atau salah.

MALNUTRITION INFLAMMATION SCORE (M.I.S) / *SCORE MALNUTRISI*

(A) Patient's related medical history: *(A) Sejarah perubatan pesakit:* 1. Change in end dialysis dry weight (overall change in past 3-6 months): *1. Perubahan dalam berat kering akhir dialysis (Perubahan keseluruhan dalam 3 – 6 bulan lepas):*							
0		1		2		3	
No decrease in dry weight or weight loss < 9.5 kg *Tiada kekurangan dalam berat kering atau kehilangan berat badan < 9.5 kg*		Minor weight loss (≥ 0.5 kg but < 1 kg) *Kekurangan minor dalam berat badan (≥ 0.5 kg tapi < 1 kg)*		Weight loss more than 1 kg but < 5% *Kehilangan berat badan lebih daripada 1kg tapi < 5%*		weight loss > 5% *Kehilangan berat badan > 5%*	
2. Dietary Intake: *2. Pengambilan makanan:*							
0		1		2		3	
Good appetite and and no deterioration of the dietary intake pattern		Somewhat sub-optimal solid diet intake *Sesetengah kekurangan dalam pengambilan*		Moderate overall decrease to full liquid diet *Kekurangan secara sederhana hingga*		Hypo-caloric liquid to starvation *Cecair yang rendah dalam*	

Selera yang baik dan tiada kerosotan dalam pengambilan makanan		*makanan pepejal*		*makanan cecair*		*kalori hingga kelaparan*	
3. Gastrointestinal (GI) symptoms: *3. Gejala gastrousus:*							
0		1		2		3	
No symptoms with good appetite *Tiada gejala dengan selera yang baik*		Mild symptoms, poor appetite or nauseated occasionally *Sesetengah gejala, selera yang tidak baik atau sentiasa loya*		Occasional vomiting or moderate GI symptoms *Sentiasa loya atau gejala gastrousus yang sederhana*		Frequent diarrhea or vomiting or severe anorexia *Kerap cirit-birit atau loya atau anoreksia yang serius*	
4. Functional capacity (nutritionally related functional impairment):: *4. Kapasitii fungsi (berkaitan dengan nutrisi badan):*							
0		1		2		3	
Normal to improved functional capacity, feeling fine *Biasa hingga bertambah baik, rasa sihat*		Occasional difficulty with baseline ambulation, or feeling tired frequently *Kadang-kadang susah dengan asas ambulasi, atau kerap rasa letih*		Difficulty with otherwise independent activities (e.g. going to bathroom) *Susah dengan aktiviti bebas yang lain (contohnya pergi ke tandas)*		Bed/chair-ridden, or little to no physical activity *Tidur di atas katil/ duduk di atas kerusi koda, sedikit atau tiada aktiviti fizikal*	
5. Co-morbidity, including number of years on dialysis: *5. Komorbiditi, termasuk jumlah tahun dalam menjalankan dialysis:*							

0		1		2		3	
On dialysis < 1 year and healthy otherwise *Dialisis selama < 1 tahun dan sihat*		Dialyzed for 1-4 years, or mild co-morbidity (excluding MCC*) *Dialisis selama 1 - 4 tahun atau sederhana komorbiditi (Kecuali MCC*)*		Dialyzed > 4 years, or moderate co-morbidity (including one MCC*) *Dialisis selama >4 tahun atau sederhana komorbiditi (Termasuk satu MCC*)*		Any severe, multiple co-morbidity (2 or more MCC*) *Sebarang serius, pelbagai jenis komorbiditi (2 atau lebih MCC*)*	
(B) Physical Exam (according to SGA Crieteria): *(B) Peperiksaan fizikal (menurut kepada kriteria SGA)* 6. Decreased fat stores or loss of subcutaneous fat (below eyes, triceps, biceps, chest): *6. Keturunan dalam penyimpanan lemak badan atau kehilangan lemak subkutaneus (Di bawah mata, triseps, biseps, dada)*							
0		1		2		3	
Normal (no change) *Biasa (Tiada perubahan)*		Mild *Ringan*		Moderate *Sederhana*		Severe *Teruk*	
7. Signs of muscle wasting (temple, clavicle, scapula, ribs, quadriceps, knee, interosseous): *7. Gejala kehilangan otot (pelipis, tulang selangka, tulang belikat, tulang rusuk, quadriseps, lutut, interosseous)*							
0		1		2		3	
Normal (no change) *Biasa (Tiada perubahan)*		Mild *Ringan*		Moderate *Sederhana*		Severe *Teruk*	

(C) Body Mass Index: *(C) Indek berat badan* 8. Body mass index: BMI = Wt (kg)/ Ht^2 (m) *8. Indeks berat badan = Berat badan (kg)/ Tinggi^2 (m)*							
0		1		2		3	
BMI ≥ 20 kg/m^2		BMI 18 - 19.99 kg/m^2		BMI 16 - 17.99 kg/m^2		BMI < 16 kg/m^2	
(D) Laboratory Parameters: *(D) Parameter biokimia:* 9. Serum albumin							
0		1		2		3	
Albumin ≥ 4.0 g/dL		Albumin 3.5 - 3.9 g/dL		Albumin 3.0 - 3.4 g/dL		Albumin < 3.0 g/dL	
10. Serum TIBC (Total Iron Binding Capacity):							
0		1		2		3	
TIBC ≥ 250 mg/dL Transferrin > 200 mg/dL		TIBC 200 -249 mg/dL Transferrin 170 -200 mg/dL		TIBC 150 -199 mg/dL Transferrin 150 -169 mg/dL		TIBC < 150 mg/dL Transferrin < 150 mg/dL	
Total score = sum of above 10 components (0 – 30): *Jumlah markah = Jumlah daripada 10 komponent di atas (0 – 30):*							

*MCC (Major Comorbid Conditions): include CHF class III or IV, full blown AIDS severe CAD, moderate to severe COPD, major neurologic sequelae, and metastatic malignancies or s/p recent chemotherapy.

**MCC (Syarat Comorbid Utama): termasuk CHF kelas III atau IV, CAD berat parah AIDS, COPD sederhana hingga teruk, kes sektik neurologi utama, dan keganasan metastatik atau suntikan kemoterapi baru-baru ini.*

SECTION C

Instruction: Please read each of the following statement and answer all the question. There are no right or wrong answers.

Arahan: Sila baca semua soalan dengan teliti dan berikan jawapan yang paling sesuai dengan anda. Tiada jawapan yang betul atau salah.

Night Eating Questionnaire/ *Soal Selidik Makan Malam*

1. How hungry are you usually in the morning? *1. Bagaimana lapar anda biasanya pada waktu pagi?*				
0	1	2	3	4
Not at all *Tiada*	A little *Sedikit*	Somewhat *Sesetengah*	Moderately *Sederhana*	Very *Sanagat lapar*
2. When do you usually eat for the first time? *2. Bilakah anda biasanya makan untuk kali pertama?*				
0	1	2	3	4
Before 9 am *Sebelum 9am*	9:01 to 12 pm *9:01 hingga 12 pm*	12:01 to 3 pm *12:01 hingga 3 pm*	3:01 to 6 pm *3:01 hingga 6 pm*	6:01 or later *Selepas 6pm*
3. Do you have cravings or urges to eat snacks after supper, but before bedtime? *3. Adakah anda mempunyai keinginan untuk makan makanan ringan selepas makan malam, tetapi sebelum tidur?*				
0	1	2	3	4
Not at all *Tiada*	A little *Sedikit*	Somewhat *Sesetengah*	Very much so *Sangat*	Extremely so *Terlalu sangat*
4. How much control do you have over your eating between supper and bedtime? *4. Berapa banyakkah kawalan yang anda miliki sepanjang makan antara makan malam dan waktu tidur?*				
0	1	2	3	4

None at all *Tiada*	A little *Sedikit*	Some *Sesetengah*	Very much *Banyak*	Complete *Sepenuhnya*
5. How much of your daily food intake do you consume *after* suppertime? *5. Berapa banyak pengambilan makanan harian anda yang anda makan selepas suppertime?*				
0	1	2	3	4
0% (none) *(tiada)*	1—25% (up to a quarter) *(sehingga satu perempat)*	26—50% (about half) *(lebih kurang separuh)*	51—75% (more than half) *(lebih daripada separuh)*	76—100% (almost all) *(hampir semua)*
6. Are you currently feeling blue or down in the dumps? *6. Adakah anda sedang merasa tidak selesa?*				
0	1	2	3	4
Not at all *Tiada*	A little *Sedikit*	Somewhat *Sesetengah*	Very much so *Sangat*	Extremely *Sepenuhnya*
7. When you are feeling blue, is your mood lower in the: *7. Apabila anda berasa rendah, mood anda lebih rendah dalam:*				
0	1	2	3	4
Early morning *Awal pagi*	Late morning *Lewat pagi*	Afternoon *Tengah hari*	Early evening *Awal petang*	Late evening/ Nighttime *Lewat petang/ Malam*
___check if your mood does not change during the day ___*Periksa jika mood anda tidak berubah pada siang hari*				
8. How often do you have trouble getting to sleep? *8. Berapa kerapkah anda menghadapi masalah untuk tidur?*				
0	1	2	3	4
Never	Sometimes	About half the time	Usually	Always

Tidak pernah	*Kadang-kadang*	*Separuh masa*	*Biasanya*	*Sentiasa*
9. Other than only to use the bathroom, how often do you get up at least once in the middle of the night? *9. Selain daripada menggunakan bilik mandi, berapa kali anda bangun sekurang-kurangnya sekali pada tengah malam?*				
0	1	2	3	4
Never *Tidak pernah*	Less than once a week *Kurang daripada sekali dalam seminggu*	About once a week *Sekali dalam seminggu*	More than once a week *Lebih daripada sekali dalam seminggu*	Every night *Setiap malam*
********** IF 0 on #9, PLEASE STOP HERE ********** ********** *JIKA 0 PADA #9, SILA BERHENTI DI SINI* **********				
10. Do you have cravings or urges to eat snacks when you wake up at night? *10. Adakah anda mempunyai keinginan untuk makan makanan ringan apabila anda bangun pada waktu malam?*				
0	1	2	3	4
Not at all *Tidak pernah*	A little *Sedikit*	Somewhat *Sesetengah*	Very much so *Sangat*	Extremely so *Sepenuhnya*
11. Do you need to eat in order to get back to sleep when you awake at night? *11. Adakah anda perlu makan untuk tidur semula apabila awak terjaga pada waktu malam?*				
0	1	2	3	4
Not at all *Tidak pernah*	A little *Sedikit*	Somewhat *Sesetengah*	Very much so *Sangat*	Extremely so *Sepenuhnya*
12. When you get up in the middle of the night, how often do you snack? *12. Apabila anda bangun di tengah malam, berapa kerap anda menghidangkan?*				
0	1	2	3	4
Never	Sometimes	About half the	Usually	Always

Tidak pernah	*Kadang-kadang*	time *Separuh masa*	*Biasanya*	*Sentiasa*

********** IF 0 on #12, PLEASE STOP HERE **********

********** *JIKA 0 PADA #12, SILA BERHENTI DI SINI* **********

13. When you snack in the middle of the night, how aware are you of your eating?

13. Apabila anda makan tengah malam, betapa anda menyedari makanan anda?

0	1	2	3	4
Not at all *Tidak pernah*	A little *Sedikit*	Somewhat *Sesetengah*	Very much so *Sangat*	Completely *Sepenuhnya*

14. How much control do you have over your eating while you are up at night?

14. Berapa banyak kawalan yang anda dapat atas pengambilan makanan anda semasa anda bangun pada waktu malam?

0	1	2	3	4
None at all *Tidak pernah*	A little *Sedikit*	Some *Sesetengah*	Very much *Sangat*	Complete *Sepenuhnya*

How long have your current difficulties with night eating been going on?

***Berapa lamakah kesukaran semasa anda dengan makan malam berjalan?* **

_____ months. _____ years

_____ *bulan.* _____ *tahun*

15. How upsetting is your night eating to you?

15. Bagaimanakah menjengkelkan adalah makan malam anda?

0	1	2	3	4
Not at all *Tidak pernah*	A little *Sedikit*	Somewhat *Sesetengah*	Very much so *Sangat*	Extremely *Sepenuhnya*

16. How much has your night eating affected your life?

16. Berapakah makan malam anda mempengaruhi kehidupan anda?				
0	1	2	3	4
Not at all *Tidak pernah*	A little *Sedikit*	Somewhat *Sesetengah*	Very much so *Sangat*	Extremely *Sepenuhnya*

PITTSBURGH SLEEP QUALITY QUESTIONNAIRE / *SOAL SELIDIK KUALITI TIDUR UNIVERSITI PITTSBURGH*

INSTRUCTIONS:

The following questions relate to your usual sleep habits during the past month (last 30 days) only. Your answers should indicate the most accurate reply for the majority of days and nights in the past month. Please answer all questions.

ARAHAN:

Soalan-soalan berikut adalah berkaitan dengan tabiat tidur anda yang biasa dalam tempoh bulan yang lalu (30 hari yang lalu) sahaja. Jawapan-jawapan anda harus menunjukkan keadaan yang paling tepat bagi kebanyakan waktu siang dan malam dalam tempoh bulan yang lalu. Sila jawab semua soalan.

---

1. During the past month, what time have you usually gone to bed at night?

   BED TIME _____

1. *Dalam tempoh bulan yang lalu, pada pukul berapakah biasanya anda masuk tidur pada waktu malam?*

   WAKTU MASUK TIDUR _____

2. During the past month, how long (in minutes) has it usually taken you to fall asleep each night?

   NUMBER OF MINUTES _____

2. *Dalam tempoh bulan yang lalu, berapa lamakah (dalam minit) biasanya anda ambil untuk mula tidur pada setiap malam?*

   JUMLAH MINIT _____

3. During the past month, what time have you usually got up in the morning?

   GETTING UP TIME _____

3. *Dalam tempoh bulan yang lalu, pada pukul berapakah biasanya anda bangun dari katil pada waktu pagi?*

WAKTU BANGUN DARI KATIL _____

4. During the past month, how many hours of actual sleep have you got at night? (This may be different from the number of hours you spent in bed.)

HOURS OF SLEEP PER NIGHT _____

4. *Dalam tempoh bulan yang lalu, berapa jamkah sebenarnya anda tidur pada waktu malam? (Ini mungkin berbeza dengan jumlah jam yang anda gunakan untuk berbaring di atas katil.)*

JUMLAH JAM TIDUR UNTUK SATU MALAM _____

For each of the remaining questions, tick the one best response. Please answer all questions.

Bagi setiap soalan-soalan di bawah, tandakan jawapan yang paling sesuai. Sila jawab semua soalan.

5. During the past month, how often have you had trouble sleeping because you . . .

5. *Dalam tempoh bulan yang lalu, berapa kerapkah anda telah mengalami masalah tidur kerana anda . . .*

a) Could not get to sleep within 30 minutes

Not during the past month_____	Less than once a week_____	Once or twice a week_____	Three or more times a week_____

a) Tidak boleh tidur dalam tempoh 30 minit

Tidak dalam tempoh bulan yang lalu_____	*Kurang daripada sekali seminggu_____*	*Satu atau dua kali seminggu_____*	*Tiga kali atau lebih seminggu_____*

b) Woke up in the middle of the night or early morning

Not during the past month_____	Less than once a week_____	Once or twice a week_____	Three or more times a week_____

b) *Bangun pada waktu tengah malam atau awal pagi*

Tidak dalam tempoh bulan yang lalu_____	*Kurang daripada sekali seminggu_____*	*Satu atau dua kali seminggu_____*	*Tiga kali atau lebih seminggu_____*

c) Had to get up to use the toilet

Not during the past month_____	Less than once a week_____	Once or twice a week_____	Three or more times a week_____

c) *Perlu bangun tidur untuk menggunakan tandas*

Tidak dalam tempoh bulan yang lalu_____	*Kurang daripada sekali seminggu_____*	*Satu atau dua kali seminggu_____*	*Tiga kali atau lebih seminggu_____*

d) Could not breathe easily

Not during the past month_____	Less than once a week_____	Once or twice a week_____	Three or more times a week_____

d) *Tidak boleh bernafas dengan selesa*

Tidak dalam tempoh bulan yang lalu_____	*Kurang daripada sekali seminggu_____*	*Satu atau dua kali seminggu_____*	*Tiga kali atau lebih seminggu_____*

e) Coughed or snored loudly

Not during the past month_____	Less than once a week_____	Once or twice a week_____	Three or more times a week_____

e) *Batuk atau berdengkur dengan kuat*

Tidak dalam tempoh bulan yang lalu_____	*Kurang daripada sekali seminggu_____*	*Satu atau dua kali seminggu_____*	*Tiga kali atau lebih seminggu_____*

f) Felt too cold

Not during the	Less than	Once or twice	Three or more
past month_____	once a week_____	a week_____	times a week_____

f) Rasa begitu sejuk

Tidak dalam tempoh	*Kurang daripada*	*Satu atau dua kali*	*Tiga kali atau lebih*
bulan yang lalu_____	*sekali seminggu_____*	*seminggu_____*	*seminggu_____*

g) Felt too hot

Not during the	Less than	Once or twice	Three or more
past month_____	once a week_____	a week_____	times a week_____

g) Rasa begitu panas

Tidak dalam tempoh	*Kurang daripada*	*Satu atau dua kali*	*Tiga kali atau lebih*
bulan yang lalu_____	*sekali seminggu_____*	*seminggu_____*	*seminggu_____*

h) Had bad dreams

Not during the	Less than	Once or twice	Three or more
past month_____	once a week_____	a week_____	times a week_____

h) Mengalami mimpi yang buruk

Tidak dalam tempoh	*Kurang daripada*	*Satu atau dua kali*	*Tiga kali atau lebih*
bulan yang lalu_____	*sekali seminggu_____*	*seminggu_____*	*seminggu_____*

i) Had pain

Not during the	Less than	Once or twice	Three or more
past month_____	once a week_____	a week_____	times a week_____

i) Mengalami kesakitan

Tidak dalam tempoh	*Kurang daripada*	*Satu atau dua kali*	*Tiga kali atau lebih*
bulan yang lalu_____	*sekali seminggu_____*	*seminggu_____*	*seminggu_____*

j) Other reason(s), please describe_____

_____

How often during the past month have you had trouble sleeping because of this?

Not during the	Less than	Once or twice	Three or more
past month_____	once a week_____	a week_____	times a week_____

*j) Alasan (-alasan) yang lain, sila terangkan*_____

_____

Berapa kerapkah dalam tempoh bulan yang lalu anda telah mengalami masalah tidur kerana alasan tersebut?

Tidak dalam tempoh	*Kurang daripada*	*Satu atau dua kali*	*Tiga kali atau lebih*
bulan yang lalu_____	*sekali seminggu_____*	*seminggu_____*	*seminggu_____*

6. During the past month, how would you rate your sleep quality in general?

Very good _____

Fairly good _____

Fairly bad _____

Very bad _____

6. Dalam tempoh bulan yang lalu, bagaimanakah anda nilai kualiti tidur anda secara keseluruhan?

Sangat baik _____

Agak baik _____

Agak buruk _____

Sangat buruk _____

7. During the past month, how often have you taken medicine to help you sleep (prescribed or "over the counter")?

Not during the	Less than	Once or twice	Three or more
past month_____	once a week_____	a week_____	times a week_____

7. *Dalam tempoh bulan yang lalu, berapa kerapkah anda telah mengambil ubat untuk membantu anda untuk tidur (ubat yang dinasihati oleh doktor anda atau ubat yang dibeli sendiri tanpa preskripsi)?*

Tidak dalam tempoh	*Kurang daripada*	*Satu atau dua kali*	*Tiga kali atau lebih*
bulan yang lalu_____	*sekali seminggu_____*	*seminggu_____*	*seminggu_____*

8. During the past month, how often have you had trouble staying awake while driving, eating meals, or taking part in social activities?

Not during the	Less than	Once or twice	Three or more
past month_____	once a week_____	a week_____	times a week_____

8. *Dalam tempoh bulan yang lalu, berapa kerapkah anda mengalami masalah untuk berjaga semasa memandu kenderaan, makan, atau melibatkan diri dengan aktiviti sosial?*

Tidak dalam tempoh	*Kurang daripada*	*Satu atau dua kali*	*Tiga kali atau lebih*
bulan yang lalu_____	*sekali seminggu_____*	*seminggu_____*	*seminggu_____*

9. During the past month, how much of a problem has it been for you to keep up enough enthusiasm to get things done?

No problem at all _____

Only a very slight problem _____

Quite a problem _____

A very big problem _____

9. *Dalam tempoh bulan yang lalu, berapa banyakkah masalah anda untuk memastikan anda cukup semangat untuk menyelesaikan kerja?*

Tiada masalah langsung _____

Hanya sedikit masalah _____

Agak banyak masalah _____

Satu masalah yang besar _____

10. Do you share your bed or accommodation with someone?

I do not share my bed or accommodation with someone _____

Someone in other room _____

Someone in same room, but not same bed _____

Someone in same bed _____

10. Adakah anda mempunyai teman sekatil atau teman serumah?

Tiada teman sekatil atau teman serumah _____

Teman/teman serumah di dalam bilik lain _____

Teman dalam bilik yang sama, tetapi bukan atas katil yang sama _____

Teman atas katil yang sama _____

If you share your bed or accommodation with someone, ask him/her how often in the past month you have had . . .

Jika anda mempunyai teman serumah atau teman sekatil, tanya dia berapa kerapkah dalam tempoh bulan yang lalu anda mengalami . . .

a) Periods of loud snoring

Not during the Less than Once or twice Three or more

past month_____ once a week_____ a week_____ times a week_____

a) *Dengkur yang kuat*

Tidak dalam tempoh bulan yang lalu_____ | *Kurang daripada sekali seminggu_____* | *Satu atau dua kali seminggu_____* | *Tiga kali atau lebih seminggu_____*

b) Long pauses between breaths while asleep

Not during the past month_____ | Less than once a week_____ | Once or twice a week_____ | Three or more times a week_____

b) *Masa berhenti yang panjang di antara pernafasan semasa sedang tidur*

Tidak dalam tempoh bulan yang lalu_____ | *Kurang daripada sekali seminggu_____* | *Satu atau dua kali seminggu_____* | *Tiga kali atau lebih seminggu_____*

c) Legs twitching or jerking while asleep

Not during the past month_____ | Less than once a week_____ | Once or twice a week_____ | Three or more times a week_____

c) *Sentakan kaki semasa anda tidur*

Tidak dalam tempoh bulan yang lalu_____ | *Kurang daripada sekali seminggu_____* | *Satu atau dua kali seminggu_____* | *Tiga kali atau lebih seminggu_____*

d) Periods of disorientation or confusion when waking up at night

Not during the past month_____ | Less than once a week_____ | Once or twice a week_____ | Three or more times a week_____

d) *Episod-episod kebingungan apabila bangun dari tidur pada waktu malam*

Tidak dalam tempoh bulan yang lalu_____ | *Kurang daripada sekali seminggu_____* | *Satu atau dua kali seminggu_____* | *Tiga kali atau lebih seminggu_____*

e) Other types of restlessness while asleep, please describe _____

_____

Not during the past month_____	Less than once a week_____	Once or twice a week_____	Three or more times a week_____

*e) Gangguan yang lain semasa anda tidur, sila terangkan*_____

_____

Tidak dalam tempoh bulan yang lalu_____	*Kurang daripada sekali seminggu_____*	*Satu atau dua kali seminggu_____*	*Tiga kali atau lebih seminggu_____*

INTERNATIONAL PHYSICAL ACTIVITY QUESTIONNAIRE / SOAL SELIDIK AKTIVITI FIZIKAL ANTARABANGSA

We are interested in finding out about the kinds of physical activities that people do as part of their everyday lives. The questions will ask you about the time you spent being physically active in the **last 7 days**. Please answer each question even if you do not consider yourself to be an active person. Please think about the activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport.

*Kami berminat untuk mengetahui aktiviti fizikal yang dilakukan oleh masyarakat umum dalam kehidupan harian mereka. Soalan-soalan berikut akan menyoal anda tentang jumlah masa yang anda gunakan untuk berada dalam keadaan aktif secara fizikal dalam tempoh **7 hari yang lepas ini**. Sila jawab soalan-soalan ini walaupun anda berpendapat bahawa anda bukanlah seorang yang aktif. Sila fikirkan tentang aktiviti-aktiviti yang anda lakukan di tempat kerja, di rumah dan kawasan halaman, untuk bergerak dari satu tempat ke tempat yang lain, dan pada waktu lapang untuk rekreasi, senaman atau bersukan.*

Think about all the **vigorous** activities that you did in the **last 7 days**. **Vigorous** physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. Think *only* about those physical activities that you did for at least 10 minutes at a time.

*Fikirkan tentang semua aktiviti fizikal **berat** yang anda telah lakukan dalam tempoh 7 **hari yang lepas ini**. Aktiviti fizikal **berat** adalah aktiviti yang menggunakan daya tenaga fizikal yang kuat dan membuat anda bernafas jauh lebih kuat daripada biasa. Fikirkan hanya tentang aktiviti-aktiviti fizikal yang anda telah lakukan selama sekurang-kurangnya 10 minit pada sesuatu masa.*

1. During the **last 7 days**, on how many days did you do **vigorous** physical activities like heavy lifting, digging, aerobics, or fast bicycling?

_____ **days per week**

☐ No vigorous physical activities → ***Skip to question 3***

1. *Dalam tempoh 7* ***hari yang lepas ini****, berapa harikah anda telah melakukan aktiviti fizikal berat, contohnya mengangkat barang berat, mencangkul, senaman aerobik atau berbasikal laju?*

_____ ***hari seminggu***

☐ *Tiada aktiviti fizikal berat* → ***Lompat ke soalan 3***

2. How much time did you usually spend doing **vigorous** physical activities on one of those days?

_____ **hours per day**
_____ **minutes per day**

☐ Don't know/Not sure

2. *Berapakah masa yang anda biasa gunakan untuk melakukan aktiviti fizikal* ***berat*** *pada salah satu daripada hari berkenaan?*

_____***jam*** _____***minit sehari***

☐ *Tidak tahu / Tidak pasti*

Think about all the **moderate** activities that you did in the **last 7 days**. **Moderate** activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal. Think only about those physical activities that you did for at least 10 minutes at a time.

*Fikirkan tentang semua aktiviti fizikal **sederhana** yang anda telah lakukan dalam tempoh 7 **hari yang lepas ini.** Aktiviti fizikal **sederhana** adalah aktiviti yang menggunakan daya tenaga fizikal yang sederhana dan membuatkan anda bernafas agak lebih kuat daripada biasa. Fikirkan hanya tentang aktiviti-aktiviti fizikal yang anda telah lakukan selama sekurang-kurangnya 10 minit pada sesuatu masa.*

3. During the **last 7 days**, on how many days did you do **moderate** physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking.

_____ **days per week**

☐ No moderate physical activities → ***Skip to question 5***

3. *Dalam tempoh 7 **hari yang lepas ini**, berapa harikah anda telah melakukan aktiviti fizikal **sederhana**, contohnya mengangkat muatan ringan, mengelap lantai, berbasikal pada kelajuan biasa, atau bermain badminton beregu? Ini tidak termasuk berjalan kaki.*

_____***hari seminggu***

☐ *Tiada aktiviti fizikal sederhana* → ***Lompat ke soalan 5***

4. How much time did you usually spend doing **moderate** physical activities on one of those days?

_____ **hours per day**
_____ **minutes per day**

☐ Don't know/Not sure

4. *Berapakah masa yang anda biasa gunakan untuk melakukan aktiviti fizikal sederhana pada salah satu daripada hari berkenaan?*

_____***jam*** _____***minit sehari***

☐ *Tidak tahu / Tidak pasti*

Think about the time you spent **walking** in the **last 7 days**. This includes at work and at home, walking to travel from place to place, and any other walking that you have done solely for recreation, sport, exercise, or leisure.

*Fikirkan tentang masa yang anda telah gunakan untuk **berjalan kaki** dalam tempoh 7 **hari yang lepas ini**. Masa ini merangkumi berjalan kaki di tempat kerja dan di rumah, berjalan kaki dari satu tempat ke tempat yang lain, dan berjalan kaki semata-mata untuk rekreasi, bersukan, bersenam atau pada masa lapang.*

5. During the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time?

_____ **days per week**

☐ No walking → ***Skip to question 7***

5. *Dalam tempoh 7 **hari yang lepas ini**, berapa harikah anda telah **berjalan kaki** selama sekurang-kurangnya 10 minit pada sesuatu masa?*

_____***hari seminggu***

☐ *Tiada berjalan kaki* → ***Lompat ke soalan 7***

6. How much time did you usually spend **walking** on one of those days?

_____ **hours per day**
_____ **minutes per day**

☐ Don't know/Not sure

6. *Berapakah masa yang anda biasa gunakan untuk **berjalan kaki** pada salah satu daripada hari berkenaan?*

_____***jam*** _____***minit sehari***

☐ *Tidak tahu / Tidak pasti*

The last question is about the time you spent **sitting** on weekdays during the **last 7 days**. Include time spent at work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting friends, reading, or sitting or lying down to watch television.
*Soalan terakhir ini adalah berkaitan masa yang anda telah gunakan untuk **duduk** pada hari-hari bekerja dalam tempoh **7 hari yang lepas ini.** Masukkan masa yang di habiskan duduk di tempat kerja, di rumah, sewaktu belajar dan di masa lapang. Masa ini juga merangkumi waktu yang di habiskan duduk di meja, menziarahi kawan-kawan, membaca, atau duduk atau baring sambil menonton televisyen.*

7. During the **last 7 days**, how much time did you spend **sitting** on a **week day**?

_____ **hours per day**
_____ **minutes per day**

☐ Don't know/Not sure

7. *Dalam tempoh **7 hari yang lepas ini**, berapakah masa yang anda telah gunakan untuk **duduk** pada **sesuatu hari bekerja?***
_____***jam*** _____***minit sehari***

☐ *Tidak tahu / Tidak pasti*

SOCIAL SUPPORT (Multidmensional Scale of Perceived Social Support (MSPSS))

We are interested in knowing how you feel on the social support you received. I will read to you several statements, kindly let us know how you feel about each statement by indicating either you **Very Strongly Disagree, Strongly Disagree, Mildly Disagree, Neutral, Mildly Agree, Strongly Agree or Very Strongly Agree.**

Kami berminat untuk mengetahui bagaimana perasaan anda terhadap sokongan sosial yang anda terima. Kami akan memberikan beberapa kenyataan, sila beritahu kami bagaimana perasaan anda tentang setiap pernyataan dengan menunjukkan sama ada anda ***Sangat Tidak Bersetuju, Tidak Bersetuju, Agak Tidak Bersetuju, Neutral, Agak Bersetuju, Bersetuju, Sangat Bersetuju.***

	Very Strongly Disagree/ ***Sangat Tidak Bersetuju***	**Strongly Disagree/** ***Tidak Bersetuju***	**Mildly Disagree/** ***Agak Tidak Bersetuju***	**Neutral/** ***Neutral***	**Mildly Agree/** ***Agak Bersetuju***	**Strongly Agree/** ***Bersetuju***	**Very Strongly Agree/*Sangat Bersetuju***
1. There is a special person who is around when I am in need. *Ada orang istimewa yang ada ketika saya memerlukan.*	1	2	3	4	5	6	7
2. There is a special person with whom I can share joys and sorrows. *Ada orang istimewa dengan siapa saya boleh berkongsi kegembiraan dan kesedihan.*	1	2	3	4	5	6	7
3. My family really tries to help me. *Keluarga saya benar-benar cuba membantu saya.*	1	2	3	4	5	6	7
4. I get the emotional help and support I need from my family. *Saya mendapat bantuan emosi dan sokongan yang saya perlukan dari keluarga saya.*	1	2	3	4	5	6	7
5. I have a special person who is a real source of comfort to me. *Saya mempunyai orang istimewa yang merupakan sumber keselesaan yang*	1	2	3	4	5	6	7

sebenar kepada saya.							
6. My friends really try to help me. *Rakan-rakan saya benar-benar cuba membantu saya.*	1	2	3	4	5	6	7
7. I can count on my friends when things go wrong. *Saya boleh bergantung kepada rakan saya apabila keadaan menjadi salah.*	1	2	3	4	5	6	7
8. I can talk about my problems with my family. *Saya boleh bercakap tentang masalah saya dengan keluarga saya.*	1	2	3	4	5	6	7
9. I have friends with whom I can share my joys and sorrows. *Saya mempunyai kawan dengan siapa saya boleh berkongsi kegembiraan dan kesedihan saya.*	1	2	3	4	5	6	7
10. There is special person in my life who cares about my feelings. *Ada orang istimewa dalam hidup saya yang peduli terhadap perasaan saya.*	1	2	3	4	5	6	7
11. My family is willing to help me make decisions. *Keluarga saya bersedia membantu saya membuat keputusan.*	1	2	3	4	5	6	7
12. I can talk about my problems with my friends. *Saya boleh bercakap tentang masalah saya dengan kawan saya.*	1	2	3	4	5	6	7

PATIENTS' PERCEPTIONS ON FLUID RESTRICTIONS

No	Statements	*Yes*	*No*	*Don't know or Not applicable*
		1	*2*	*3*
1	Do you think it is important for you to control / limit your fluid intake?/ *Adakah anda fikir adalah penting untuk anda mengawal / mengehadkan pengambilan air anda?*	1	2	3
	If your answer is ***Yes***, why do you think it is important for you to limit your fluid intake?/ *Sekiranya jawapan anda Ya, mengapa anda fikir adalah penting bagi anda untuk mengehadkan pengambilan cairan anda?*			
	a) Because I fully understand that my kidney condition requires limiting fluid intake/*Kerana saya memahami sepenuhnya bahawa keadaan buah pinggang saya memerlukan menghadkan pengambilan cecair.*	1	2	3
	b) Because limiting fluid intake is important to keep my body healthy/*Kerana mengehadkan pengambilan cecair adalah penting untuk menjaga kesihatan badan saya.*	1	2	3
	c) Because a medical professional (my doctor, nurse, dietitian, or other medical staff) told me to do so/*Kerana seorang profesional perubatan (doktor, jururawat, pegawai dietetik, atau kakitangan perubatan lain) memberitahu saya untuk berbuat demikian.*	1	2	3
	d) Because I was hospitalized after I drank lots of fluid/ *Kerana saya dimasukkan ke hospital selepas saya minum banyak cecair.*	1	2	3
	e) Because limiting fluid intake will make me feel more comfortable before, during and after dialysis sessions/*Oleh kerana mengehadkan pengambilan cairan akan membuatkan saya berasa lebih selesa sebelum, semasa dan selepas sesi dialisis*	1	2	3
	f) Others/*Lain-lain*, _____			
	If your answer is *No*, why do you think it is not important for you to limit your fluid intake?/*Jika jawapan anda Tidak, kenapa anda merasakan tidak penting untuk mengehadkan pengambilan cairan*			

	anda?			
	a) Because I don't have any complications even if I drink more water/*Kerana saya tidak mempunyai komplikasi walaupun saya minum lebih banyak air*	1	2	3
	b) Because I don't know how to control / limit my fluid intake/*Kerana saya tidak tahu bagaimana untuk mengawal / mengehadkan pengambilan cairan saya*	1	2	3
	c) Because I do not think controlling fluid intake is important to me/*Kerana saya tidak fikir mengawal pengambilan cairan adalah penting kepada saya*	1	2	3
	d) Because I just cannot resist drinking/*Kerana saya tidak dapat menahan rasa hendak minum*	1	2	3
	e) Others/*Lain-lain*, _____			
2	In your opinion, do you think you have good adherence on fluid intake?/*Pada pendapat anda, adakah anda fikir anda mempunyai pematuhan yang baik terhadap pengambilan cecair?*	1	2	3
3	Taking fluid more than the recommendation can cause swelling in the body (eg: face or legs)/*Mengambil cecair lebih daripada syor boleh menyebabkan bengkak di dalam badan (misalnya: muka atau kaki).*	1	2	3
4	How much fluid I take does not have any effect on my blood pressure. /*Berapa banyak cecair yang saya ambil tidak mempunyai kesan ke atas tekanan darah saya.*	1	2	3
5	Excess fluid intake will make me difficult to breath or cause shortness of breath./ *Pengambilan cecair yang berlebihan akan membuatkan saya sukar bernafas atau menyebabkan sesak nafas.*	1	2	3
6	Consuming the following foods may increase my desire for fluid./ *Mengambil makanan berikut boleh meningkatkan keinginan saya untuk cecair.*			
	a) Spicy foods/ *Makanan Pedas*	1	2	3
	b) Salty foods eg salted vegetables, potato chips, pickles/ *Makanan masin seperti sayur-sayuran masin, kerepek kentang, jeruk*	1	2	3
	c) Dry food items eg fried fish, biscuits/ *Makanan kering seperti ikan goreng, biskut*	1	2	3
	d) Sugary drinks eg carbonated beverages, syrups/ *Minuman berkarbonat seperti minuman berkarbonat, syrup*	1	2	3

7	Which of the following foods are considering as fluids / *Antara makanan berikut yang manakah akan mengandungi cecair?*			
	a) Rice/*Nasi*	1	2	3
	b) Porridge/*Bubur*	1	2	3
	c) Pudding/*Puding*	1	2	3
	d) Biscuits/*Biskut*	1	2	3
	e) Yogurt/*Yogurt*	1	2	3
	f) Soups/*Sup*	1	2	3
	g) Fruit juices/*Jus buah*	1	2	3
	h) Vegetables (eg: Cabbage, *kangkung*, potato, pumpkin, yams, carrots)/ *Sayur-sayuran (contohnya: Kubis, kangkung, kentang, labu, keladi, lobak merah)*	1	2	3
	i) Ice cream/*Ais-krim*	1	2	3
	j) Fruits (eg guava, apple, oranges)/*Buah-buahan (contohnya: jambu, epal, oren)*	1	2	3
	k) Fruits (eg watermelon)/*Buah tembikai*			
	l) Tea, coffee, malted drinks (eg *Milo*)/*Teh, kopi, minuman malt*			
8	Which of the following foods contain high sodium/salt?/ *Makanan manakah mengandungi garam yang tinggi?*			
	a) Sauces (eg: soy sauce, oyster sauce, fish sauce)/ *Sos seperti kicap, sos tiram, sos ikan*	1	2	3
	b) Chips (potatoes, yam, tapioca)/ *Kerepek seperti kentang, keladi, ubi kayu.*	1	2	3
	c) Canned food (eg: canned vegetable, canned meats/poultry). /*Makanan bertin seperti sayuran/ayam dan daging dalam tin*	1	2	3
	d) Egg whites/*Telur putih*	1	2	3
	e) Baked foods (biscuits, cakes, pizza)/*makanan dibakar seperti biskut, kek, pizza*	1	2	3
	f) White rice/ *Nasi Putih*	1	2	3
	g) Lemon/*Lemon*	1	2	3
	h) Sport drinks/*Minuman sukan*	1	2	3
	i) Sausages, bacon, patties/ *sosej, bacon, patty*	1	2	3
	j) Pickles/ *Jeruk*	1	2	3
9	When you feel thirsty, what will you do?/*Apabila anda merasa dahaga, apa yang akan anda lakukan?*			
	a) Take Lemon wedges/*Ambil lemon*	1	2	3
	b) Take hard sour candies/*Ambil gula-gula masam yang keras*	1	2	3
	c) spray with breath mints/*semburkan dengan semburan nafas*	1	2	3

	d) use chewing gums/*menggunakan gula-gula getah*	1	2	3
	e) sucking on ice cubes/*menghisap ketulan ais*	1	2	3
	f) Drink warm water/*minum air suam*	1	2	3
	g) Drink cold water/*minum air sejuk*	1	2	3
	h) Gauge my mouth with water or mouthwash/*Kumur mulut dengan air atau pengkumur mulut*	1	2	3
	i) I do nothing/*Saya tidak membuat apa-apa.*	1	2	3
10	I always keep track of how much I drink in a day./*Saya sentiasa mengira berapa banyak saya minum dalam sehari.*	1	2	3
11	Do you use measuring container to quantify how much fluid you take in a day?/*Adakah anda menggunakan bekas untuk mengukur berapa banyak cecair yang anda ambil dalam sehari?*	1	2	3
12	Are you taking the following on daily basis? If *Yes*, how much do you take?/*Adakah anda mengambil yang berikut setiap hari? Jika ya, berapa yang anda ambil?*			
	a) Plain water (warm or cold)/*Air kosong (suam/sejuk)* _____ cups / mugs / bottles / ml			
	b) Coffee or tea/*Kopi atau teh* _____ cups / mugs / ml			
	c) Soups/*Sup* _____ bowls / ml			
13	If you have any urine output, can you take more fluid intake?/ *Sekiranya anda mempunyai sebarang pengeluaran air kencing, anda boleh mengambil lebih banyak pengambilan cecair?*	1	2	3
14	A good IDWG goal is to gain not more than 4% between dialysis treatments/*Matlamat IDWG yang baik adalah untuk mendapatkan tidak lebih daripada 4% antara rawatan dialisis.*	1	2	3
15	I keep away from activities that cause me to drink too much fluid/ *Saya menjauhkan diri dari aktiviti yang menyebabkan saya minum terlalu banyak cecair.*	1	2	3
16	Do you weigh yourself at home? / *Adakah anda menimbang sendiri di rumah*	1	2	3

Beck Depression Inventory

Read the statements carefully and circle the score between 0-3 about your feelings in past 1 week including today.

Baca penyataan dengan teliti dan bulatkan markah 0-3 tentang peraasan anda pada minggu lepas termasuk hari ini.

0	I do not feel sad *Saya tak rasa sedih*
1	I feel sad *Saya rasa sedih*
2	I am sad all the time and I can't snap out of it *Saya kesedihan sepanjang masa dan sukar meredakannya*
3	I am so sad and unhappy that I can't stand it *Saya sangat sedih atau tak gembira sehingga tak mampu menanggungnya lagi*
0	I am not particularly discouraged about the future *Saya tak rasa lemah semangat mengenai masa depan*
1	I feel discouraged about the future *Saya rasa lemah semangat tentang masa depan*
2	I feel I have nothing to look forward to *Saya rasa tiada apa yang hendak diharapkan*
3	I feel the future is hopeless and that things cannot improve *Saya rasa masa depan saya mengecewakan dan keadaan takkan bertambah baik*
0	I do not feel like a failure *Saya tak rasa saya seorang yang gagal*
1	I feel I have failed more than the average person. *Saya rasa saya dah gagal lebih dari orang biasa*
2	As I look back on my life, all I can see is a lot of failures *Apabila terkenangkan masa lalu, saya hanya nampak banyak kegagalan*
3	I feel I am a complete failure as a person *Saya rasa saya seorang manusia yang benar-benar gagal*
0	I get as much satisfaction out of things as I used to *Saya dapat kepuasan daripada perkara yang pernah saya lakukan*
1	I don't enjoy things the way I used to *Saya tak seronok seperti dulu*
2	I don't get real satisfaction out of anything anymore *Saya tak dapat kepuasan sebenar daripada apa sahaja*
3	I am dissatisfied or bored with everything *Saya tak puas hati atau bosan dengan segalanya*

0	I don't feel particularly guilty *Saya tak rasa begitu bersalah*
1	I feel guilty a good part of the time *Saya rasa bersalah sekali-sekala sahaja*
2	I feel quite guilty most of the time *Saya rasa agak bersalah hampir setiap masa*
3	I feel guilty all of the time *Saya rasa bersalah sepanjang masa*
0	I don't feel I am being punished *Saya tak rasa saya sedang dihukum*
1	I feel I may be punished *Saya rasa saya mungkin dihukum*
2	I expect to be punished *Saya percaya saya akan dihukum*
3	I feel I am being punished *Saya rasa saya sedang dihukum*
0	I don't feel disappointed in myself *Saya tak rasa kecewa dengan diri saya*
1	I am disappointed in myself *Saya kecewa dengan diri saya*
2	I am disgusted with myself *Saya rasa meluat dengan diri saya*
3	I hate myself *Saya benci diri saya*
0	I don't feel I am any worse than anybody else *Saya tak rasa saya lebih teruk daripada orang lain*
1	I am critical of myself for my weaknesses or mistakes *Saya sentiasa mencari kelemahan dan kesilapan diri sendiri*
2	I blame myself all the time for my faults *Saya menyalahkan diri saya setiap kali berlaku kesilapan*
3	I blame myself for everything bad that happens *Saya menyalahkan diri sendiri atas setiap perkara buruk yang berlaku*
0	I don't have any thoughts of killing myself *Saya tak terfikir untuk bunuh diri*
1	I have thoughts of killing myself, but I would not carry them out *Saya ada terfikir untuk bunuh diri, tapi saya tak akan melakukannya*
2	I would like to kill myself *Saya ingin bunuh diri*
3	I would kill myself if I had the chance *Saya akan bunuh diri jika berpeluang*

0	I don't cry any more than usual *Saya tak menangis lagi daripada kebiasaannya*
1	I cry more now than I used to *Saya kerap menangis sekarang daripada biasa*
2	I cry all the time now *Saya kini menangis sepanjang masa*
3	I used to be able to cry, but now I can't cry even though I want to *Saya biasanya boleh menangis, tapi kini saya tak dapat menangis walaupun saya mahu*
0	I am no more irritated by things than I ever was *Saya tidak lagi sakit hati seperti sebelum ini*
1	I am slightly more irritated now than usual *Saya lebih mudah meradang atau sakit hati daripada biasa*
2	I am quite annoyed or irritated a good deal of the time *Saya rasa sakit hati sepanjang masa*
3	I feel irritated all the time *Saya tak lagi rasa sakit hati dengan perkara yang selalunya menyakitkan hati saya sebelum ini*
0	I have not lost interest in other people *Saya tak hilang minat terhadap orang lain*
1	I am less interested in other people than I used to be. *Saya kurang minat terhadap orang lain berbanding dulu*
2	I have lost most of my interest in other people *Saya hampir hilang minat terhadap orang lain*
3	I have lost all of my interest in other people *Saya tak berminat langsung dengan orang lain*
0	I make decisions about as well as I ever could *Saya cuba buat keputusan sebaik mungkin*
1	I put off making decisions more than I used to *Saya lebih sering menangguh urusan membuat keputusan*
2	I have greater difficulty in making decisions more than I used to *Saya sukar buat keputusan berbanding dulu*
3	I can't make decisions at all anymore *Saya tidak lagi mampu membuat keputusan*
0	I don't feel that I look any worse than I used to *Saya tak kelihatan teruk berbanding dulu*
1	I am worried that I am looking old or unattractive *Saya risau kelihatan tua atau tak menarik*
2	I feel there are permanent changes in my appearance that make me look unattractive *Saya rasa ada perubahan kekal pada penampilan saya yang membuat saya kelihatan kurang menarik*

3	I believe that I look ugly *Saya percaya saya kelihatan hodoh*
0	I can work about as well as before *Saya boleh bekerja dengan baik seperti biasa*
1	It takes an extra effort to get started at doing something *Ia mengambil usaha yang lebih untuk memulakan sesuatu kerja*
2	I have to push myself very hard to do anything *Saya harus memaksa diri saya untuk buat sesuatu*
3	I can't do any work at all *Saya tak boleh lansung membuat apa-apa kerja*
0	I can sleep as well as usual *Saya boleh tidur macam biasa*
1	I don't sleep as well as I used to *Saya tak tidur nyenyak seperti biasa dan sukar untuk tidur semula*
2	I wake up 1-2 hours earlier than usual and find it hard to get back to sleep *Saya terjaga 1-2 jam awal daripada biasa dan sukar untuk tidur semula*
3	I wake up several hours earlier than I used to and cannot get back to sleep *Saya bangun awal beberapa jam daripada biasa dan tak boleh tidur semula*
0	I don't get more tired than usual *Saya tak rasa letih lebih dari biasa*
1	I get tired more easily than I used to *Saya lebih mudah letih dari biasa*
2	I get tired from doing almost anything *Saya letih ketika melakukan apa saja*
3	I am too tired to do anything *Saya terlalu letih untuk buat apa sahaja*
0	My appetite is no worse than usual *Selera makan saya tak seteruk dulu*
1	My appetite is not as good as it used to be *Selera makan saya tak sebagus seperti selalu*
2	My appetite is much worse now *Selera makan saya makin teruk*
3	I have no appetite at all anymore *Saya langsung tak ada selera*
0	I haven't lost much weight, if any, lately *Saya tak hilang banyak berat badan akhir-akhir ini*
1	I have lost more than 2kg *Saya hilang berat badan lebih dari 2kg*
2	I have lost more than 4kg *Saya hilang berat badan lebih dari 4kg*

3	I have lost more than 6kg *Saya hilang berat badan lebih dari 6kg*
0	I am no more worried about my health than usual *Saya tak lagi bimbangkan kesihatan saya lagi seperti kebiasaannya*
1	I am worried about physical problems like aches, pains, upset stomach, or constipation *Saya risau masalah fizikal seperti sengal dan kesakitan; perut sebu; atau sembelit*
2	I am very worried about physical problems and it's hard to think of much else *Saya risau dengan masalah fizikal ini hingga sukar untuk memikirkan perkara lain*
3	I am so worried about my physical problems that I cannot think of anything else *Saya sangat risau dengan masalah fizikal saya sehinggakan langsung tak dapat fikir hal lain*
0	I have not noticed any recent change in my interest in sex *Saya rasa tiada perubahan dalam keinginan seks saya*
1	I am less interested in sex than I used to be *Saya kurang keinginan seks berbanding dahulu*
2	I have almost no interest in sex *Saya semakin tiada keinginan terhadap seks*
3	I have lost interest in sex completely *Saya langsung tiada keinginan terhadap hubungan seks*

Frailty Phenotype Questionnaire (FPQ)

Based on the questions below, choose the correct answers from the answer options regarding your status.

Berdasarkan soalan di bawah, pilih pilihan yang tepat berdasarkan status anda.

Item	**Name of Question** *Nama Soalan*	**Questions** *Soalan*	**Answer Options** *Pilihan Jawapan*	**Score** *Markah*
Fatigue *Kelesuan*	Exhaustion *Keletihan*	During the past week, I felt that everything I did was and effort *Dalam seminggu yang lalu, saya rasa semua yang saya lakukan adalah satu usaha.*	1) Rare (less than one day per week) 2) Sometimes (1-2 days per week) 3) Often (3-4 days per week) 4) Most (over 5 days per week) *1) Jarang (kurang daripada satu hari seminggu)* *2) Kadang-kadang (1-2 hari seminggu)* *3) Kerap (3-4 kali seminggu)* 4) *Kebanyakan (lebih 5 hari seminggu)*	1=3) or 4) 2=1) or 2)
Resistance *Rintangan*	10 steps of stair climb *10 langkah manaiki anak tangga*	By yourself and not using aids, do you have any difficulty walking up 10 stairs without resting? *Tanpa bantuan apa-apa, adakah anda mengalami kesusahan untuk berjalan menaiki 10 anak tangga?*	1) Yes 2) No *1) Ya* 2) *Tidak*	1=1) 0=2)

Ambulation *Ambulasi*	Walking one lap of playground (400m) *Berjalan satu pusingan taman permainan (400m)*	Do you have any difficulty walking one lap of a playground track (400m)? *Adakah anda mengalami kesusahan berjalan satu pusingan taman permainan (400m)?*	1) Unable to do it 2) Very difficult 3) A bit difficult 4) Not difficult at all *1) Tidak boleh* *2) Sukar* *3) Sedikit sukar* 4) *Tidak sukar*	1=1) or 2) or 3) 0=4)
Inactivity *Tidak Aktif*	Moderate to vigorous physical activities of IPAQ *Aktiviti fizikal sederhana dan lasak dalam IPAQ*	During the past week, how often did you participate in any moderate physical activities that make you slightly breathless that usual? During the past week, how often did you engage in vigorous physical activities? *Dalam seminggu yang lalu, berapakah kekarapan anda melakukan aktiviti fizikal sederhana yang membuatkan anda sedikit termengah-mengah daripada biasa?* *Dalam seminggu yang lalu, berapakah kekerapan anda melakukan aktiviti fizikal lasak?*	1) Never 2) More than once a week 1) Never 2) More than once a week *1) Tidak pernah* *2) Lebih sekali seminggu*	1=1) on the both questions 0= Others *1=1) kedua-dua soalan* *0= Lain-lain*

			1) Tidak pernah 2) *Lebih sekali seminggu*	
Loss of weight *Penurunan Berat Badan*	Weight loss for 1 year *Penuruna berat badan dalam setahun*	Was there any unintended weight loss of 4.5kg in the past year? *Adakah anda mengalami 4.5kg penurunan berat badan yang tidak dikehendaki sepanjang setahun yang lalu?*	1) Yes 2) No *1) Ya* 2) *Tidak*	1=1) 2=2)

Dietary intake

Pemakanan seharian

Informations on dietary intake is collected for non-dialysis day and dialysis day.

Infomasi tentang pemakanan diambil untuk hari menjalani dialisis dan hari tidak menjalani dialisis.

Researchers will ask the subject on 24-hour food recall for non-dialysis day and researcher will telephone interview subject to obtain the food recall for dialysis day. *Pengkaji akan tanya subjek tentang pemakanan untuk hari tidak menjalani dialisis dan pengkaji akan menelefon subjek untuk mengambil pemakanan untuk hari menjalani dialysis.*

Non-dialysis day

Hari tidak menjalani dialisis

Meal	Meal time	Food/drink items	Amount	Method of food preparation

Dialysis day

Hari menjalani dialisis

Meal	Meal time	Food/drink items	Amount	Method of food preparation

1. What is the dosage for your phosphate binder? _____ mg

2. Do you comply with the phosphate binder prescription by doctor? / *Adakah anda mengambil ubat mengawal fosfat mengikut preskripsi doctor?*

   ( ) Yes / *Ya*

   ( ) No / *Tidak*

3. If not, how many times in the past week (7 days) you skip your phosphate binder? / *Kalau tidak, berapa kali anda tidak mengambil ubat untuk seminggu (7 hari) yang lepas?*

_____

4. May I know what are your barriers in taking the phosphate binders? */Bolehkah saya mengetahui apakah halangan anda dalam mengambil pengikat fosfat?*

( ) Forgotten to take? / *Terlupa nak ambil?*

( ) Don't know how much or when to take it? /*Tidak mengetahui berapa dan bila untuk diambil?*

( ) Feeling embarrassed or uncomfortable of taking medication when going out? /*Rasa malu dan tidak selesa untuk mengambil semasa berada di luar?*

( ) Feel uncomfortable after taking? Eg. stomach upset, diarrhea, constipation / *Rasa tidak selesa selepas mengambil? Contohnya: perut tidak selesa, cirit birit, sembelit*

( ) Bad taste, tablets were too big, difficult to swallow, or chew / *Rasa teruk, tablet terlalu besar, sukar ditelan, atau mengunyah*

( ) The doses are too much causing hard to comply. / *Dos terlalu banyak menyebabkan sukar untuk dipatuhi*

( ) Other reason / *Sebab-sebab lain*

SECTION D

Anthropometry and biochemical parameters / Interdialytic Weight Gain Measurements

Parameter anthropometri dan biokimia / Pengukuran Keuntungan Berat Interdialitik

	Anthropometry and biochemical parameters	**First reading**	**Second reading**	**Third reading**	**Average reading**
1.	Body weight / *Berat badan*				
2.	Height / *Tinggi*				
3.	BMI				
4.	Fat mass (kg) / *Berat lemak (kg)*				
5.	Body fat percentage / *Peratus lemak badan*				
6.	Lean body mass (kg) / *Berat bukan lemak (kg)*				
7.	Percentage of body water / *Peratusan komposisi air dalam badan (%)*				
8.	Waist circumference / *Lilitan pinggang*				
9.	Handgrip strength / *Kuasa genggaman*				
10.	Serum albumin / *Serum*				

	albumin				
11.	Serum phosphorus / *Serum fosfat*				
12.	Serum creatinine / *Serum creatinine*				
13.	Serum potassium / *Serum potasium*				
14.	Urea				
15.	Bone quality / *Kualiti tulang*				
16.	Quantitative ultrasound (QUS) value / *Nilai QUS*				

Date / Day *Tarikh / Hari*	Weight before hemodialysis (kg) / *Berat badan sebelum hemodialysis (kg)*	Weight after hemodialysis (kg) / *Berat badan selepas hemodialysis (kg)*
Dry Weight (kg) / *Berat kering (kg)*		

**** THE END ****
***** TAMAT *****

Thank you for answering this questionnaire.
Terima kasih kerana menjawab soal selidik ini.