UNIVERSITI PUTRA MALAYSIA

ASSOCIATIONS OF SOCIO-DEMOGRAPHIC CHARACTERISTICS, CLINICAL FACTORS, ANTHROPOMETRY PARAMETERS, PERSONAL FACTORS, AND PSYCHOLOGICAL FACTORS WITH HEALTH-RELATED QUALITY OF LIFE OF HEMODIALYSIS PATIENTS IN SELANGOR DURING COVID-19 PANDEMIC

CHIA JING PEI

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ASSOCIATIONS OF SOCIO-DEMOGRAPHIC CHARACTERISTICS, CLINICAL FACTORS, ANTHROPOMETRY PARAMETERS, PERSONAL FACTORS, AND PSYCHOLOGICAL FACTORS WITH HEALTH-RELATED QUALITY OF LIFE OF HEMODIALYSIS PATIENTS IN SELANGOR DURING COVID-19 PANDEMIC

CHIA JING PEI (201939)

DEPARTMENT OF DIETETICS

FACULTY OF MEDICINE AND HEALTH SCIENCES UNIVERSITI PUTRA MALAYSIA

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ASSOCIATIONS OF SOCIO-DEMOGRAPHIC CHARACTERISTICS, CLINICAL FACTORS, ANTHROPOMETRY PARAMETERS, PERSONAL FACTORS, AND PSYCHOLOGICAL FACTORS WITH HEALTH-RELATED QUALITY OF LIFE OF HEMODIALYSIS PATIENTS IN SELANGOR DURING COVID-19 PANDEMIC

BY

CHIA JING PEI

A project submitted as a partial fulfillment of the requirement for the degree of Bachelor of Science in Dietetics with Honours from the Faculty of Medicine and Health Sciences, Universiti Putra Malaysia

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This project entitled “Associations of socio-demographic characteristics, clinical factors, anthropometry parameters, personal factors, and psychological factors with health-related quality of life of hemodialysis patients in Selangor during COVID-19 pandemic” was prepared by Chia Jing Pei and submitted to the Faculty of Medicine and Health Sciences as partial fulfillment of the requirement for the degree of Bachelor of Science in Dietetics with Honours from Faculty of Medicine and Health Sciences, Universiti Putra Malaysia.

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Received and examined by:

_____

(Prof. Dr. Chan Yoke Mun)

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List of Abbreviations

Chronic Kidney Disease	CKD
Body Mass Index	BMI
Burden of Kidney Disease	BKD
Cardiovascular Diseases	CVD
Coronavirus Disease	COVID-19
Effect of Kidney Disease	EKD
Glomerular Filtration Rate	GFR
Hospital Anxiety and Depression Scale	HADS
Interdialytic Weight Gain	IDWG
Kidney Disease Quality of Life	KDQoL
Kidney Disease Quality of Life – 36 items	KDQoL 36
Mental Component Score	MCS
Mini Nutritional Assessment – Short Form	MNA-SF
Physical Component Score	PCS
Pittsburgh Sleep Quality Index	PSQI
Quality of Life	QoL
Symptoms and Problems of Kidney Disease	SPKD

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ABSTRACT

ASSOCIATIONS OF SOCIO-DEMOGRAPHIC CHARACTERISTICS, CLINICAL FACTORS, ANTHROPOMETRY PARAMETERS, PERSONAL FACTORS, AND PSYCHOLOGICAL FACTORS WITH HEALTH-RELATED QUALITY OF LIFE OF HEMODIALYSIS PATIENTS IN SELANGOR DURING COVID-19 PANDEMIC

Chia Jing Pei

This cross-sectional study aimed to determine the associations of selected variables with health-related quality of life (HRQoL) of hemodialysis patients in Selangor during COVID-19 pandemic. Petaling district was chosen from the total of nine districts of Selangor based on purposive sampling. A total of 81 participants were recruited from two dialysis centers in Petaling, Malaysia. Socio demographic characteristics, clinical factors, body mass index, interdialytic weight gain, sleep quality, nutritional status, anxiety and depression level were ascertained, with Kidney disease quality of life 36 items (KDQOL36) questionnaire was used to assess the HRQoL of subjects. Subjects in this study was predominantly male (60.5%), Chinese (55.6%), married (67.9%), retired with source of income were mainly pension/Employees' Provident Fund /savings (50.6%). Hypertension was the most common comorbidy (76.5%). About 40% of subjects experiencing protein energy malnutrition. A majority of the subjects had good fluid adherent (67.9%), were poor sleepers (63%-65.6%) and well nourished (66.7%). Approximately15% of the subjects experienced abnormal anxiety and depressed, respectively. Amongst the five domains of quality of life, subjects scored lowest for burden of kidney disease, indicating that majority of the hemodialysis patient feel like a burden to their family and being defeated as they had to dependent on others. Age, change of employment status and dialysis vintage were correlated with domains of KDQOL36. This study depicted a comparable data on KDQoL before and during COVID-19 pandemic. This finding found that hemodialysis patients in Malaysia had a better score in symptoms and problems of kidney disease (SPKD) while burden of kidney disease subscale (BKD) ranked the lowest during COVID-19 pandemic. This study demonstrated that BMI, nutritional status, sleep quality, depression and anxiety was associated with domains of KDQOL-36. Considering the long-term impacts of HRQoL on hemodialysis patients, intervention focus on related variables is worthy.

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ABSTRAK

PERKAITAN CIRI-CIRI SOSIO-DEMOGRAFI, FAKTOR KLINIKAL, PARAMETER ANTROPOMETRI, FAKTOR PERIBADI DAN FAKTOR PSIKOLOGI DENGAN KUALITI HIDUP BERKAITAN KESIHATAN PESAKIT HEMODIALISIS DI SELANGOR SEMASA PANDEMIK COVID-19

Chia Jing Pei

Kajian ini bertujuan untuk menentukan perkaitan pembolehubah terpilih dengan kualiti hidup berkaitan kesihatan (HRQoL) pesakit hemodialisis di Selangor semasa pandemik COVID-19. Daerah Petaling dipilih daripada keseluruhan sembilan daerah di Selangor berdasarkan persampelan bertujuan. Seramai 81 peserta dari dua pusat dialisis di Petaling, Malaysia telah menyertai kajian ini. Ciri sosio demografi, faktor klinikal, indeks jisim badan, penambahan berat badan interdialitik, kualiti tidur, status pemakanan, kebimbangan dan tahap kemurungan telah dipastikan, soal selidik kualiti hidup penyakit buah pinggang 36 item (KDQOL36) digunakan untuk menilai HRQoL subjek. Subjek dalam kajian ini kebanyakannya lelaki (60.5%), Cina (55.6%), berkahwin (67.9%), bersara dengan punca pendapatan kebanyakannya adalah pencen/Kumpulan Wang Simpanan Pekerja/simpanan (50.6%). Hipertensi adalah komorbid yang paling biasa (76.5%). Kira-kira 40% subjek mengalami kekurangan zat tenaga protein. Majoriti subjek mempunyai pematuhan cecair yang baik (67.9%), kurang tidur (63%-65.6%) dan berkhasiat (66.7%). Kira-kira 15% daripada subjek mengalami kebimbangan yang tidak normal dan tertekan, masing-masing. Di antara lima domain kualiti hidup, subjek mendapat markah terendah untuk beban penyakit buah pinggang, menunjukkan bahawa majoriti pesakit hemodialisis berasa seperti beban kepada keluarga mereka dan dikalahkan kerana terpaksa bergantung kepada orang lain. Umur, perubahan status pekerjaan dan vintaj dialisis dikaitkan dengan domain KDQOL36. Kajian ini menggambarkan data yang setanding tentang KDQoL sebelum dan semasa wabak COVID-19. Dapatan ini mendapati pesakit hemodialisis di Malaysia mempunyai skor yang lebih baik dalam gejala dan masalah penyakit buah pinggang (SPKD) manakala beban subskala penyakit buah pinggang (BKD) berada pada kedudukan terendah semasa pandemik COVID-19. Kajian ini menunjukkan bahawa BMI, status pemakanan, kualiti tidur, kemurungan dan kebimbangan dikaitkan dengan domain KDQOL-36. Memandangkan kesan jangka panjang HRQoL terhadap pesakit hemodialisis, tumpuan intervensi pada pembolehubah yang berkaitan adalah wajar.

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Chapter 1

INTRODUCTION

1.1 Background

Chronic kidney disease (CKD) is a long-term disorder which is characterised by a progressive decline of kidney function. It is a kidney damage with glomerular filtration rate (GFR) of less than 60 mL/min/1.73 m2 for more than 3 months, regardless of aetiology (Levey et al., 2005). A majority of CKD progresses and deteriorates over time. The severity of the disease and the rate at which it progresses can further stratify the likelihood of negative outcomes (National Kidney Foundation, 2002).

When glomerular filtration rate (GFR) falls less than 15 mL/min, patient is considered as at End-Stage Renal Disease (ESRD) (National Kidney Foundation, 2002), whereby renal replacement therapy is needed to prolong life (Fujii et al., 2018). At-present, CKD has climbed to the forefront of Malaysia's public health concerns (Saminathan et al., 2020) with a 6.4% increase in the prevalence of CKD in Malaysia from 2013 (9.07%) to 2018 (15.48%). This is attributed to the increasing trend of non-communicable diseases such as diabetes, hypertension and obesity, as well as changes in population demography and population aging (Saminathan et al., 2020). Diabetes mellitus and hypertension has been the leading causes of ESRD in new dialysis patients in the previous twenty years (26th Report of Malaysian Dialysis & Transplant Registry, 2018). Among the renal replacement therapies (RRT) (hemodialysis, peritoneal dialysis, hemofiltration, hemodiafiltration and kidney transplant), hemodialysis accounted for the highest proportion of RRT among CKD patients (26th Report of Malaysian Dialysis & Transplant Registry 2018), with about 90% of the total dialysis patients receive hemodialysis as their treatment modality.

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Coronavirus disease (COVID-19) is an infectious disease caused by the SARS-CoV-2 virus (World Health Organization, WHO, 2021). In January 2020, the World Health Organization (WHO) declared that COVID-19 had become a Public Health Emergency of International Concern and after two months, it had advanced to be a pandemic worldwide. In Malaysia, the first case of COVID-19 was discovered on January 25, 2020. The number of positive cases surpassed 500 in the middle of March 2020, prompting declaration of Movement Control Order (MCO). In fact, the outbreak in Malaysia was once under-controlled. However, in the middle of 2021, the number of COVID-19 new cases skyrocketed, exceeding 10 thousand new cases per day. In these one and a half years, Malaysia encountered drastic change in terms of economic, social and political aspects. COVID-19 created an extreme impact on the health of the general population (Algahtani et al., 2021) and acute or chronic illness patients (O'Dwyer et al., 2021), with CKD or hemodialysis patients are of no exemption.

Quality of Life (QoL)is defined as '*Individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns*' (WHO, 2012). Quality of life has multiple meanings for different people and academic disciplines. In the health-related quality of life (HRQoL) aspect, it is defined as the inclusion of all the domains of QoL that have been proved to have an impact on physical or mental health (Centers for Disease Control and Prevention, CDC, 2019). It is crucial for clinicians to improve HRQoL of hemodialysis patients besides traditional clinical outcomes especially during the pandemic. All in all, it is worth noting that study on HRQoL of

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hemodialysis patients during COVID-19 pandemic is lacking either at local context or world widely.

1.2 Problem Statement

Past research clearly shown that hemodialysis patients had poorer HRQoL compared to general population (Mazairac et al., 2010; Abraham & Ramachandran, 2012; Cleary & Drennan, 2005). Inevitably, COVID-19 pandemic outbreak had severely affected Malaysian's life. Few studies documented the unfavourable effect of COVID-19 pandemic on the psychological change such as depression, anxiety and fear of COVID-19 among hemodialysis patients (Parlak & Şahİn, 2021; Yang et al., 2021; Antoun et al., 2021). While there are growing evidence on HRQoL and psychological factors in other aspects, to the best of knowledge, there is no study available on HRQoL and other variables besides psychological factors among hemodialysis patients during COVID-19 pandemic in Malaysia.

While sociodemographic characteristics such as sex, age and employment were among the most studied variables, its associations with HRQoL of hemodialysis patients had yield inconsistent findings. For instance, earlier study illustrated that male hemodialysis patients reported lower HRQoL than female patients (Bayoumi et al., 2013), while a majority of studies substantiated that female hemodialysis patients had poorer HRQoL (Mandoorah et al., 2014; Mingardi, 1999; Zyoud et al., 2016). Racial differences and HRQoL deserves further explore as such relationships could help explain racial differences in perceptions of health. Publications on HRQoL in hemodialysis patients regarding race is limited. In Singapore, Chinese hemodialysis patients had poorer

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HRQoL as compared to their counterparts (Wang et al., 2012). With a different ethnicity composition, study in Penang, Malaysia had revealed that there was no significant difference between racial and HRQoL (Ramatillah et al., 2017). On the other hand, with the pandemic strikes, Malaysia is experiencing an economic hardship recently, whereby unemployment rate and average income of Malaysians have encountered a drastic change (Amanina et al., 2021; Zhang & Lee, 2021). It is believed the economic changes may have an impact on the HRQoL among hemodialysis patients, and hence deserve further exploration.

Correlation of nutritional status and HRQoL has often been an interest among researchers. Malnutrition is highly prevalent among HD patients (Rimsevicius et al., 2016; Omari et al., 2019) and can negatively impacts the prognosis, quality of life and is linked to an increase in morbidity and mortality in dialysis patients (Hafi et al., 2021). Previous studies demonstrated the positive correlation between nutrition status and HRQoL (Cepeda Marte et al., 2019; Nagy et al., 2020), with improvement in nutritional status was proven to enhance QoL of hemodialysis patients (Feroze et al., 2011). Poor nutrition status was found interrelated to poor QOL in Malaysia (Nor Baizura et al., 2013; Fatin Izzati et al., 2019). However, studies on nutrition status and QOL are still lacking in the local context, signifying the need on this aspect. On the other hand, HD patients had poorer sleep quality as compared to the general population (Ho et al., 2021). While earlier study demonstrated that poor sleep quality worsened the QoL of hemodialysis patients (He et al., 2018; Shen et al., 2016; Parvan et al., 2013), there is scarcity of this data at the local context.

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Interdialytic weight gain (IDWG) is a critical indicator for fluid adherence among dialysis patients. Studies had exemplified that higher IDWG is associated with poorer QoL (Sari et al., 2020; Visweswaran et al., 2020). Nonetheless, it does not imply that the lower the IDWG, the better the QOL. Interdialytic weight gain lower than 3% or higher than 5% will contribute harmful effects to the patient (Kahraman et al., 2015). In the local context, the association of IDWG and HRQoL is poorly understood, marking the need for such study. Besides IDWG, Body Mass Index (BMI) is another anthropometric parameter that is frequently studied among CKD patients. While overweight patients (25 kg/m2 - 29.9 kg/m2) and mildly obese patients (30 kg/m2 - 34.9 kg/m2) were associated with better clinical outcomes (Park et al., 2014; Rhee et al., 2016), previous local study revealed that only about 30% of the hemodialysis patients achieved favourable BMI (>24kg/m2) (Nor Baizura et al., 2013). Research on the association of BMI and QOL showed conflicting results, with both positive findings (Liu et al., 2013) and neutral findings (Fatin Izzaty et al., 2019) were reported. Hence, the relationship between IDWG, BMI and HRQoL should be explored further.

Hemodialysis patients are associated with depression and anxiety which can lead to greater mortality and poorer HRQoL (Kang et al., 2015; Kusztal et al., 2018; Oliveira-Campos et al., 2013). Study documented negative effect of COVID-19 pandemic on psychological factors in general population (Ferreira et al., 2021) and advanced chronic kidney disease (CKD) elderly patients (Voorend et al., 2021). Both populations were reported to have greater levels of anxiety, depression and poorer HRQoL during this pandemic. In addition, few recent studies have shown that COVID-19 pandemic negatively affects the psychological aspects of hemodialysis

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patients (Al Naamani et al., 2021; Antoun et al., 2021; Parlak & Şahİn, 2021; Yang et al., 2021), with inconsistency exists (Lee et al., 2020). Use of different research instruments may partially explain the findings discrepancy. Acknowledging the high possibility of depression and anxiety among dialysis patients, its potential association with QoL among dialysis patients warrant further exploration.

Before 2021, studies about HRQoL and hemodialysis patients in Malaysia are limited, let alone in this Covid-19 pandemic. To allow the conduct of pertinence intervention to improve HRQoL of hemodialysis patients and ascertain the current situation and effect of Covid19 pandemic of hemodialysis patients, study about association of sociodemographic factors, clinical factors, personal factors, anthropometry parameter, psychological factors and HRQoL of hemodialysis patients in Selangor, Malaysia is deem needed.

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

1. What are the socio-demographic characteristics, clinical factors, personal factors, anthropometry parameter and psychological factors among hemodialysis patients in Selangor, Malaysia during COVID-19 pandemic?
2. What are the HRQoL among hemodialysis patients during COVID-19 pandemic?
3. What are the associations between socio-demographic characteristics, clinical factors, anthropometry parameters, personal factors, psychological factors and HRQoL among hemodialysis patients in Selangor, Malaysia during COVID-19 pandemic?

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1.3 Significance of Study

COVID-19 pandemic had made a huge impact on people worldwide, along with acute and chronic diseases patients. To the best of knowledge, there is absent of study on HRQoL among hemodialysis patients during COVID-19 in Malaysia. Hence, it is hope that this study can provide some insight on HRQoL and its associations with socio-demographic factors, clinical background, personal factors, anthropometry parameters and psychological factors among hemodialysis patients in Selangor during COVID-19 pandemic.

The dissemination of the study findings would provide important information for relevant professionals to identify population that are susceptible to poor HRQoL and assist them in the development of tailored intervention strategics to improve HRQoL among hemodialysis patients. Furthermore, the identification of factors that contribute to HRQoL will certainly be able to assist policy makers in the development and formulation of appropriate health policy that beneficial to hemodialysis patients.

All in all, it is imperative to carry out this study in view of the limited information about HRQoL among hemodialysis patients during COVID-19 pandemic in Malaysia.

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1.4 Objective

General Objective:

To determine the associations of socio-demographic factors, clinical background, personal factors, anthropometry parameters and psychological factors with Health-related Quality of Life (HRQoL) among hemodialysis patients in Selangor.

Specific Objective:

1. To determine socio-demographic characteristics (age, gender, ethnic, marital status, change of household income and employment status), clinical factors (comorbidities, duration of kidney disease, dialysis vintage, frequency of dialysis per week and duration of dialysis each time), personal factors (sleep quality, nutritional status), anthropometry parameters (body mass index, interdialytic weight gain) and psychological factors (depression, anxiety) of hemodialysis patients
2. To determine Health-related Quality of Life (HRQoL) of hemodialysis patients.
3. To determine the associations of socio-demographic characteristics, clinical factors, personal factors, anthropometry parameters and psychological factors with Health-related Quality of Life among hemodialysis patients in Selangor during COVID-19 pandemic.

1.5 Hypothesis

There are no associations of socio-demographic characteristics, clinical factors, personal factors, anthropometry parameters and psychological factors with Health-related Quality of Life of hemodialysis patients in Selangor during COVID-19 pandemic.

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1.6 Conceptual Framework

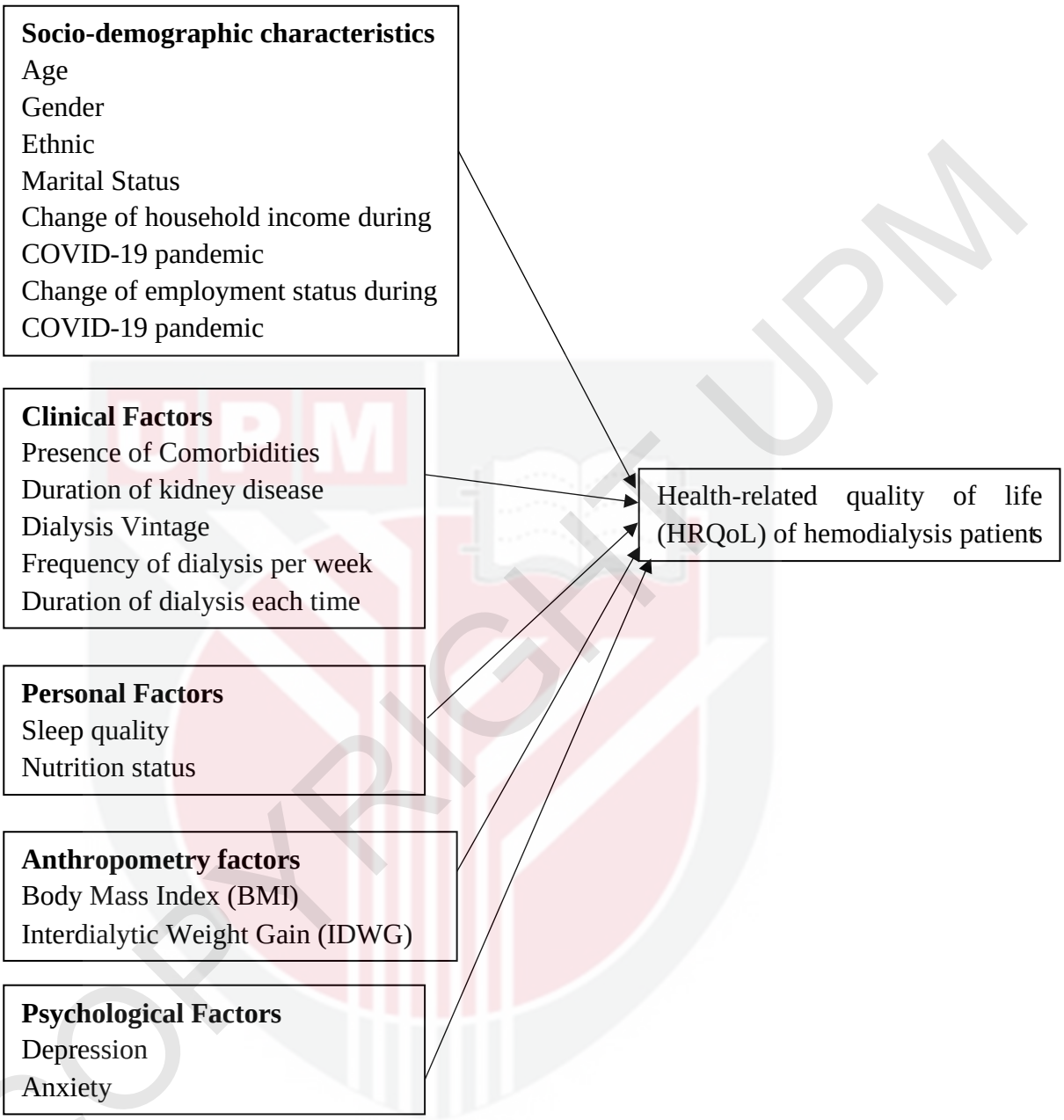

Figure 1.1 Conceptual Framework of Study

Figure 1.1 shows the conceptual framework of the study. Health related quality of life were the dependent variable while socio-demographic, clinical factors, personal factors, anthropometry parameter as well as psychological factors were the independent variables.

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Chapter 2

LITERATURE REVIEW

2.1 Health-related quality of life

Since the commencement of renal replacement treatment, the concept of quality of life (QOL) in dialysis has developed beyond simply survival to enjoying a more satisfying life. Patient-centered quality of life has been mirrored in measuring the progress of dialysis outcomes, which indicate that health related quality of life (HRQoL) is closely related to objective patient outcomes (Kalantar-Zadeh & Unruh, 2005). Poor HRQoL is associated with chronic kidney disease (CKD) even in the early stages of disease, and worsen across CKD stages (Pagels et al., 2012). Notwithstanding hemodialysis treatment is lifesaving, it is evident that hemodialysis patients had poorer QOL compared to the general population (Mazairac et al., 2010; Abraham & Ramachandran, 2012; Cleary & Drennan, 2005) and patients with end-stage renal disease without hemodialysis therapy (Kamal et al., 2012).

During the COVID-19 pandemic, studies worldwide had reported higher levels of anxiety and worse QOL among the general population (Ferreira et al., 2021; Vitorino et al., 2021; Zhang & Ma, 2020), including children and adolescence (Nobari et al., 2021). However, there were inconsistent results of HRQoL among patients with different diseases during COVID-19 pandemic. Haematological cancer (Ellehuus et al., 2021) were reported to have impaired HRQoL, while brain tumor patients (Troschel et al., 2021) presented a stable QoL over the twelve weeks study period. To the best of knowledge, there were two independent studies on HRQoL among CKD patients during COVID-19 pandemic in Netherlands. Mental HRQoL was found to

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be remained unchanged among older CKD patients (Voorend et al., 2021). This was supported by another study which documented that the mental health of dialysis patients appears to be unaffected by the COVID-19 pandemic in Netherland (Bonenkamp et al., 2021). In the later study, dialysis patients were presumed to have high resilience and are less impacted by social distancing measures, which enable them to cope better with the pandemic. Notwithstanding, despite mental HRQoL and emotional symptoms among the CKD patients were unchanged during COVID-19, the subjects suffered from disease-related anxiety about COVID-19, presented increased depressive symptoms, and reduced physical HRQoL during the COVID-19 pandemic (Voorend et al., 2021). The association of COVID-19 and HRQoL among hemodialysis patients remains unclear. More in-depth investigation on disease-related COVID-19 concerns and its implications for the CKD population is needed.

2.2 Assessment of quality of life

Various instruments (questionnaire) are available to assess quality of life and the questionnaires are categorized into generic and disease-specific questionnaires. Generic questionnaires are for populations with or without disease. Even though generic questionnaires are not sensitive to particular disease, it is applicable across a broad population and interventions, irrespective of type or number of illnesses (Chen et al. 2005). On the other hand, disease-specific questionnaires are designed for a particular patient group. Nevertheless, the results of disease specific instruments are difficult to interpret in persons with multiple diseases (Chen et al. 2005). In the local context, Short Form 36 (SF-36), Kidney-Disease Quality of Life- Short Form (KDQOL-SF), Kidney-Disease Quality of Life36 (KDQOL-36) are the most frequently used questionnaire used in the assessment of QoL among hemodialysis

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patients (Fatin Izzaty et al, 2019; Khan et al., 2019; Ng et al., 2020; Nor Baizura et al., 2013). Study proved that KDQOL-36 had a good completion rate, and scores were comparable across dialysis modalities (Cohen et al., 2019). Moreover, SF-36 questionnaire consists of 8 domains (physical functioning, role physical, bodily pain, general health, vitality, social functioning, role emotional, and mental health) while KDQOL consist only 5 domains (generic measure: Physical Component Summary, Mental Component Summary; issues specific: Burden of Kidney Disease, Symptoms and Problems of Kidney Disease, and Effects of Kidney Disease). Study shown that the SF-36's suitability as an HRQoL evaluation instrument in patients with stage 5 CKD is hampered by its floor and ceiling effects, as well as its low reactivity to change in this population whereby it had excluded domains that become increasingly relevant as the condition progresses such as comfort and peace of mind (Erez et al., 2016). Even though KDQOL-36 is not without limitations specifically regarding symptoms/problem of kidney disease domain (Cohen et al., 2019), its psychometric symptoms (Cohen et al., 2019) and disease specific domains enable it becomes the most suitable instrument for the present study.

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2.3 Factor associated with HRQoL of hemodialysis patients

2.3.1 Sociodemographic factors

Age and ethnicity were associated with QoL of dialysis patients in Singapore, while other socio-demographic factors including gender, educational level, marital status or housing type failed to document significant association (Yang et al., 2015). Older patients and Malays patients were found to be associated with better QoL. The fact that older patients had superior QoL than younger patients could be attributed to better adaptability to chronic disease and reduced expectations (Yang et al., 2015). These findings were consistent with previous studies showing that hemodialysis patients aged 60 and above were reported to have better QoL compared to younger patients (Bayoumi et al., 2013; Mandoorah et al., 2014; Yang et al., 2015). Nevertheless, there was a contradict discovery in a Palestine study whereby patients aged 34-49 were more satisfied and acclimated enough with their kidney disease (El Kass et al., 2020). On the other hand, previous study in Singapore revealed that Malays had superior family functioning and religious belief than Chinese, which could explain the superior QoL of Malays (Leow et al., 2013). Earlier local study indicated Muslim dialysis patients had significantly higher physical, psychological, social, environmental and achieved better overall QoL score compared with Hindus or Christians patients (Liu et al., 2013). As all Malays are Muslims hence It is difficult to tease out whether the effect on QOL was due to race or religion. Previous study in our neighbouring country, Singapore also revealed that Malays had better QoL which could have attributed to superior family functioning and religious belief (Leow et al., 2013). Religion may be associated with increased patient satisfaction with life and increased levels of social support (Koenig, 2000).

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Research on the association of gender and QoL showed conflicting results, with positive findings (Albatineh & Ibrahimou, 2019; Bayoumi et al., 2013; Mandoorah et al., 2014; Zyoud et al., 2016) and neutral finding (Elhadad et al., 2020) were reported. Quality of Life was generally lower QoL among female hemodialysis patients (Albatineh & Ibrahimou, 2019; Mandoorah et al., 2014; Zyoud et al., 2016) despite discrepancy findings exist in others (Bayoumi et al., 2013). Some possible reasons that attribute to lower QoL among female patients are females tend to be uncertain about future and exhausted from the responsibility to fulfil multiple traditional norms, such as being a wife, a mother and even also working. All of these contribute to poorer psychological status of female hemodialysis patients compared to male (Najafi et al., 2016)

With regards to civil status or marital status, single patients had the highest QoL, followed by married, widowed and divorced patients in a hierarchy order (Elhadad et al., 2020), this is consistent with studies that revealed single status had a positive association on QOL (Anees, 2014; Kunnath et al., 2020). Nevertheless, the above study was no in line with other studies (Bayoumi et al., 2013; Khatib et al., 2018; Zhou et al., 2017). Earlier local study showed civil or marital status may influence different aspects of QoL of dialysis patients independently (Liu et al., 2013). While married patients had better social score compared with singles, there were no significant differences on other aspects of QoL including physical, psychological, environmental or overall QoL between married or single patients.

In the employment status aspect, employed patients are found to have greater QoL than unemployed patients who either stopped working after dialysis or before dialysis (Albatineh & Ibrahimou, 2019; Bayoumi et al., 2013; Elhadad et al., 2020; El Kass et al., 2020). Furthermore, study found that income was found to be an

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independent negative predictor of QoL in hemodialysis patients (Joshi et al., 2017). This finding was in congruent with other studies in which high income was associated with superior QoL among hemodialysis patients (Albatineh & Ibrahimou, 2019; Anees et al., 2018). Due to COVID-19 pandemic, the number of unemployed Malaysians surged by about 40 thousand from May 2021 (788.1 thousand) to June 2021 (768.7 thousand) (Department of Statistics Malaysia Official Portal, 2021). The unstable economy of the market will influence the monthly income of Malaysians as well (Department of Statistics Malaysia Official Portal, 2021). Hence, change of employment status and income will be accessible in this study to detect the change HRQoL of hemodialysis patients in this pandemic.

2.3.2 Clinical Factors

2.3.2.1 Comorbidities

Presence of comorbidities is common among CKD patients. In Malaysia, the prevalence of CKD has increased due to the continuing popularity of non-communicable diseases including diabetes mellitus (DM) (Ministry of Health, 2016). Prolonged high blood glucose will gradually damage the nephrons in kidneys (Centers for Disease Control and Prevention, CDC, 2021), which eventually lead to diabetic nephropathy. In a 2020 Malaysia study, diabetes mellitus was identified as one of the significant factors associated with CKD (Saminathan et al., 2020). Tragically, the new dialysis patients with diabetes mellitus in Malaysia had increased 21% from 2000 to 2016 and 50% of unadjusted dialysis patients with diabetes pass aways after initiating 4 years of dialysis (24th report of the Malaysia Dialysis and Transplant Registry 2016).

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Hypertension was found to be the most popular comorbidities among CKD patients (Cha & Han, 2020; Mandoorah et al., 2014; Nayana et al., 2017). In one recent study, prevalence of hypertension (66.4%) was two times higher than diabetes (33.2%) and other comorbidities such as hyperlipidemia and cerebrovascular disease among CKD patients (Lee et al., 2018). The pathophysiology of hypertension in CKD is complex and is a sequela of multiple factors. Several putative mechanisms contribute to elevated BP in patients with CKD including reduced nephron mass, increased sodium retention and extracellular volume expansion, sympathetic nervous system overactivity, activation of hormones namely the renin-angiotensin-aldosterone system and endothelial dysfunction (Ku et al., 2019).

In addition to diabetes mellitus and hypertension, cardiovascular diseases (CVD) are prevalent among CKD patients. The prevalence of CVDs was 26.8%, 33.4%, 39.1% and 47.2% in CKD patients in Japan, US, Spain, and UK, respectively (Martínez-Castelao et al., 2011; Iimori et al., 2015; Ritchie et al., 2013; Shah et al., 2015). Chronic kidney disease patients are at increased risk for cardiovascular events or death than for progression to end-stage renal disease (ESRD) (Keith et al., 2004). On the other hand, it is worth noting that CVD is the primary risk factor of mortality of CKD, with more than half of the death was related to CVD (Collins et al., 2012).

Comorbidities among hemodialysis patients were found correlated significantly to HRQoL (Ware et al., 2019; Yang et al., 2015). In a recent study, HRQoL scores varied greatly depending on the number of comorbidities among hemodialysis patients (Cha & Han, 2020). In the above study, patients with diabetes had present adverse HRQoL compared to other comorbidities such as hypertension and cardiovascular disease (Cha & Han, 2020). This was supported by earlier local

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study whereby presence of DM was associated with lower score of HRQoL (Nor Baizura et al., 2013). The above finding was not in agreement with study in the above study, peripheral vascular disease had the greatest impact on hemodialysis patients' QoL followed by diabetes (Mandoorah et al. 2014). This may be due to the incomprehensive collection of comorbidities among hemodialysis patients. The study about comorbidities and HRQoL in Malaysia during COVID-19 pandemic is limited, more study is needed to allow better understanding on how these variables may affect QoL among hemodialysis patients.

2.3.2.2 Duration of Kidney Disease

Chronic kidney disease that permanently changes the function and structure of the kidney over months or years, correlates with negative clinical outcomes including cardiovascular events, death, and poor quality of life for survivors in general (Bansal et al., 2017; Tannor et al., 2019; Yuan et al., 2017). Due to coexisting comorbidities, significant symptom and treatment burden, people with chronic kidney disease (CKD) tend to have lower quality of life (Krishnan et al., 2020). In all stages of CKD, the quality of life was reduced while physical functioning, somatic pain, vitality, and social functioning were decreased as the stage of CKD progressed (Kefale et al., 2019), which was in accordance with studies in Indonesia (Sihombing et al., 2017), Ghana (Tannor et al., 2019) and Nepal (Mahato et al., 2020) . In the later study, CKD patients at Stage I through stage IV had better QoL than those who were at stage V, with a 21.24-fold difference.

2.3.2.3 Dialysis Vintage

Dialysis vintage is the length of months or years a patient has been on dialysis. In patients with CKD who are on dialysis, there has been a considerable drop in HRQoL measurements with time (Mujais et al., 2009). Previous literature had shown

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conflicting findings between duration of dialysis and QoL among hemodialysis patients. Some studies shown significant association between dialysis vintage and QoL whereas the longer the duration of dialysis, the poorer the QoL (Bayoumi et al., 2013; Kamal et al., 2012; Kang et al., 2015; Noto et al., 2021), which was not in accordance with others (Barzegar et al., 2017; Kim et al., 2013; Shery et al., 2019). It is worth noting than dialysis vintage may influence domains of QoL differently. In a recent study among older HD patients in Japan, dialysis vintage affected changes in physical but not mental domain of QoL (Ishiwatari et al., 2020). This was follow-suit by study in US who commented there was slightly more variability in change in MCS than in PCS regardless of hemodialysis vintage. Such data is scarce at the local context, which signifies more work are needed.

2.3.2.4 Frequency of dialysis per week

Most patients suffering from ESKD will need hemodialysis two or three times a week. A study found that there is no association between frequency of hemodialysis per week with QoL (Barzegar et al., 2017). This study was conflicting with other studies while they successfully demonstrated association between frequency of hemodialysis per week with QoL. A study in China found that there is no difference of QoL score in two-times and three-times weekly dialysis groups (Bieber et al., 2014; Park et al., 2017) while there are studies stated that patients who dialysed less per week had poorer HRQoL compared to those had more frequent dialysis per week (Garg et al., 2017; Kim et al., 2021). One of the studies explained that patient with frequent shorter hour daily hemodialysis had better HRQoL because increase weekly frequency made them feel more normal and less uncomfortable (Garg et al., 2017).

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2.3.4.5 Duration of dialysis (average treatment time)

Study shows that patient with longer duration of dialysis per session had better QoL compared to those with shorter dialysis session (Mousa et al., 2018), this is suspected due to the inadequate of dialysis (Manns et al., 2002). However, there is contrast findings shown that longer dialysis session is associated with longer recovery time and recovery time is inversely related to the HRQoL (Rayner et al., 2014). This is consistent with studies that elucidate that the longer the hemodialysis session, the worsen the quality of life (Gerasimoula et al., 2015).

2.3.3 Personal Factors

2.3.3.1 Sleep Quality

Sleep quality is defined as a person's contentment with their sleep experience, which includes factors such as sleep initiation, sleep maintenance, sleep quantity, and wakefulness (Kline, 2013). Poor sleep quality tends to be more prevalent among hemodialysis patients than the general population. Studies show that about 70% - 90% of the hemodialysis patients have poor sleep quality (Masoumi et al., 2013; Mehrabi et al., 2017; Parvan et al., 2013; Shen et al., 2016) while Barros et al. (2019) and Hinz et al. (2017) had reported 29% and 36% of the general population suffer from poor sleep quality respectively.

Earlier studies prove that poor sleep quality of life is associated with poorer HRQoL (Aggarwal et al., 2017; Edalat-Nejad & Qlich-Khani, 2013; Parvan et al., 2013; Sekercioglu et al., 2015). Domains of QoL such as physical health, psychological status, disease burden, reproductive function, comorbidity and social support were found interrelated to the globalPSQI (Parvan et al., 2013). A study in

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China displayed that both Physical Component Scale (PCS) and Mental Component Scale (MCS) scores of Medical Outcomes Study 36-item Short
Form (SF-36) were associated and relatively low in poor sleep quality hemodialysis patients (Shen et al., 2016). Earlier study reported that PCS can be an independent predictor of sleep quality (Turkmen et al., 2011).

During this COVID-19 pandemic, more than 30% of hemodialysis patients reported poor sleep (Lee et al., 2020) while another study demonstrated that more than 50% of hemodialysis patients reported adverse sleep quality (Al Naamani et al., 2021). While low sleep quality is highly prevalent among hemodialysis patients in Malaysia, there is scarcity of study that relate sleep quality and HRQoL, with none is available during pandemic. The influence of the presence of COVID-19 on sleep quality and HRQoL of hemodialysis patients deserved investigation.

2.3.3.2 Nutritional status

Malnutrition is defined as "*A shortfall between dietary requirements and intake that leads to cumulative calorie, protein, or micronutrient deficiencies that can impair growth, development, and other important consequences*" (Jensen GL, 2010). End Stage Renal Disease patients who have not started dialysis often treated conservatively with a low protein diet whereas prolonged low protein diet may exacerbate the malnutrition condition of patients. Even in the early stages of CKD, malnutrition is evident among pre-dialysis patients especially when renal function deteriorates and patients age (Oluseyi & Enajite, 2016). After initiating dialysis, patients may experience changes in taste, fatigue, mealtime disruptions, and dietary restrictions which can further lead to loss of appetite and reduce oral intake (Fatin

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Izzaty et al, 2019). Studies proved that malnutrition of CKD patients may not only due to low dietary intake but may be attributed to the increasing body's metabolic rate (Kuhlmann et al., 2001), malnutrition-inflammation complex syndrome (MICS) which related to protein energy malnutrition (PEM) and inflammation (Kalantar-Zadeh et al., 2004) and rapid atherosclerosis (Stenvinkel et al., 1999), to name a few. Such conditions in CKD will eventually result in depleted energy storage and malnutrition.

Studies show that the majority of hemodialysis patients suffer from malnutrition and are associated with lower scores of HRQoL (Nagy et al., 2020; Sohrabi et al., 2015). Interrelation of malnutrition and poor QOL is linked to an increased risk of morbidity and mortality in hemodialysis patients (Hafi et al., 2021) and similar results were elucidated in Malaysia (Nor Baizura et al., 2013). A recent study in Malaysia had provided an insight about associated factors such as nutrition status with QoL whereby 45% of the hemodialysis patients had moderate risk of malnutrition and were associated with lower QoL (Fatin Izzaty et al., 2019). Nutrition status of this population is worth prompt attention to recognize and tackle, especially during this COVID-19 pandemic, the association of nutritional status and HRQoL is still scarce in local and international context.

2.3.4 Anthropometry Parameter

2.3.4.1 Interdialytic Weight Gain

Interdialytic Weight Gain (IDWG) is defined as a rise in body fluid volume accompanied by an increase in body weight during the interdialytic period (Kahraman et al., 2015). Interdialytic weight gain (IDWG) lower than 4% of dry weight is the

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ideal IDWG among hemodialysis patients (Clinical practice guidelines for Renal Replacement Therapy, 2017). During the COVID-19 pandemic, Malaysia had undergone Movement Control Order (MCO) and country lockdown for a long period of time. While Movement Control Order and lockdown are necessary to contain the COVID-19 Pandemic, negative consequences to the general population and also difficulties to hemodialysis patients for dialysis therapy exists. The skipping or shortening hemodialysis treatments may lead to excessive IDWG (Saran et al., 2003).

Previous studies reported that higher IDWG is associated with lower QoL among hemodialysis patients (Sari et al., 2020; Rayner et al., 2014; Visweswaran et al., 2020). Earlier studies showed higher IDWG predisposes dialysis patients to rapid and large-volume ultrafiltration with its associated cramp, intradialytic hypotension, dialysis-related headache (Greene et al., 2000; Skroeder et al., 1994), in-between dialysis hypertension (Antoniazzi et al., 2002) and left ventricular hypertrophy (Rahman et al., 2000). One of the explanations between the relationship of IDWG and QoL is due to the association of high IDWG with longer recovery times from dialysis sessions and IDWG can be a HRQoL predictor among hemodialysis patients (Rayner et al., 2014). However, a study has revealed a conflicting result whereas IDWG equal to or more than 3% are associated with better quality or life while malnutrition and poor quality of life is related to IDWG of 1-2 kg (Kahraman et al., 2015). This finding is similar with a recent study in India that investigated the IDWG and QoL during COVID-19 pandemic. Data showed that there was a decrease of 0.45 kg IDWG when comparing the highest IDWG prior to pandemic (Bayhakki et al., 2021), with a positive correlation between IDWG and QoL (Bayhakki et al., 2021). The discrepancy of conclusion of studies may be due to confounding factors in studies.

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More investigation is needed to delineate the relationship between IDWG and HRQoL.

2.3.4.2 Body Mass Index

The term "Obesity Paradox" was developed unexpectedly when Gurberg et al. (2002) discovered that obese and overweight individuals with coronary heart disease who underwent percutaneous coronary intervention had better outcomes than their normal-weight counterparts. This situation can be applied to the condition of hemodialysis patients who show higher survival rate among overweight or obese patients compared to underweight and normal BMI patients (Kalantar-Zadeh et al., 2010; Vashistha et al., 2014). Indeed, "Obesity Paradox" is close to another discovery that has demonstrated that the association of BMI with progression of CKD is in U-shaped, whereas low BMI is correlated to adverse kidney disease outcomes (Lu et al., 2014).

Although poor nutritional status associated with lower QOL is a widely held belief, obesity is often not equal to being well-nourished (Kalantar-Zadeh et al., 2001). Earlier study showed that patients with normal weight (BMI at20-24.99 kg/m2) and overweight (BMI at 25-29.9 kg/m2) scored lower than obese patients (BMI ≥30.0 kg/m2) on the physical composite summary (PCS) subscale of HRQoL (Zimbudzi et al., 2016). The same study also demonstrated symptom and effect of kidney disease subscales were likewise lower in overweight patients with a BMI of 25-29.9 kg/m2 . These were follow-suit by another large scale study of 20000 subjects in China, whereby class I obese patients were revealed to have superior HRQoL while underweight hemodialysis patients were reported to have poorest HRQoL (Zhu et al.,

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2015). Similar findings were elucidated in the study of renal transplant recipients and peritoneal dialysis patients whereby high BMI is one of the variables correlated to low HRQoL (Gentile et al., 2013; Orozco-González et al., 2021). Among CKD patients, low BMI was associated with a lower QoL, and this relationship weakened when estimated glomerular filtration rate (eGFR) declined (Suh et al., 2020). To note, there is study revealed that patient with BMI ≥30.0 kg/m2 obtained lower score in the PCS subscale (Pagels et al., 2012) while a study in Malaysia investigated the QoL among elderly hemodialysis patients found that there was no association between BMI and QoL (Fatin Izzaty et al, 2019). Nonetheless, the research about association of BMI and HRQoL among hemodialysis patients should be addressed in view of lacking either at local context or worldwide during COVID-19 pandemic.

2.3.5 Psychological Factor

2.3.5.1 Depression and Anxiety

Depression is a common mental illness marked by persistent sorrow as well as a loss of interest or pleasure in formerly rewarding or enjoyable activities (World Health Organisation, WHO, 2019). A number of studies have examined depression among CKD and hemodialysis patients. The majority of the CKD and hemodialysis patients suffered from psychiatric illness such as depression, anxiety and insomnia (Elhadad et al., 2020; Goyal et al., 2018). Based upon a study in India, hemodialysis patients obtain a higher percentage of depression compared to peritoneal dialysis patients and patients without dialysis (Khan et al., 2019). This may be due to the side effects of the hemodialysis process, psychosocial factors, family support and economic problems of the subjects (Khan et al., 2019).

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Studies reported 40% to 70% (Aggarwal et al., 2017; Elhadad et al., 2020; Semaan et al., 2018) and about 40% to 50% (Semaan et al., 2018; Vasilopoulou et al., 2015) of the hemodialysis patients suffered of depression and had high anxiety level, respectively, with approximately 25% of patients suffer from both depression and anxiety (Semaan et al., 2018).

Evidence is growing that presence of depression and anxiety were negatively associated with QoL whereas patients with depression and anxiety will present a total reduction of QoL score (Ćwiek et al., 2017; Elhadad et al., 2020; Kang et al., 2015; Khan et al., 2019; Semaan et al., 2018). Nevertheless, there are several precautions when obtaining information from the subjects, including inconsistent claims from the subjects and nursing staff, and possibility of patients refuse to acknowledge real conditions about their mental health situation due to spiritual belief (Semaan et al., 2018).

Interestingly, a study in Pakistan revealed that male have better QoL compared to females even if they show a higher percentage of depression and anxiety (Kalsoom, 2019). Nevertheless, Elhadad et al., (2020) and Semaan et al. (2018) found that there was no association between gender and depression in hemodialysis patients. In the local context, available study showed that the majority of the hemodialysis patients were diagnosed as mild depression, and QOL decreases when depression increases among elderly hemodialysis patients (Fatin Izzaty et al., 2019).

Inevitably COVID-19 pandemic imposed a huge impact on people worldwide including psychological aspects of patients with different illnesses. In Spain and Italy, COVID-19 resulted in higher risk of depression and anxiety among patients with Alzheimer's disease and immunodeficiency (Lara et al., 2020; Pulvirenti et al., 2020). The change in human lifestyle, country lockdown, isolation, economic depression,

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and fear of COVID-19 adversely influencing people including the mental health and HRQoL of hemodialysis patients (Al Naamani et al., 2021; Antoun et al., 2021; Parlak & Şahİn, 2021; Yang et al., 2021). Patients with CKD have an increased risk of severe COVID-19 infection-related complications and poorer prognosis including higher risks of hospitalization, intensive unit admission, mechanical ventilation, and death. On the other hand, as CKD is often associated with depression and anxiety, this may place CKD patients at more vulnerable to COVID-19-related stress (Yu et al., 2021). Two independent studies in Netherlands had documented increased presence of depressive symptoms significantly among older dialysis patients during the COVID-19 pandemic (Bonenkamp et al., 2021; Voorend et al., 2021). Hence, more study is warranted to assess the current situation of hemodialysis patients.

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CHAPTER 3

METHODOLOGY

3.1 Study Design

This was a cross-sectional study aims to investigate the associations between socio-demographic characteristics, clinical factors, personal factors, anthropometry parameters, psychological factors and HRQoL among hemodialysis patients in Selangor, Malaysia during COVID-19 pandemic.

3.2 Study Location

Selangor is bordered on the north by Perak, on the east by Pahang, on the south by Negeri Sembilan, and on the west by the Straits of Malacca. Selangor covers an area of 7931 km^2 with an estimated total population of 6.56 million in 2021 (Department of Statistics Malaysia Official Portal, 2015). Selangor and Putrajaya ranked fifth in dialysis treatment rates, with dialysis treatment rate of 231 per million population in 2016. There are 22 public dialysis centres, 104 private dialysis centres and 29 NGO dialysis centres in Selangor (24th report of the malaysia dialysis and transplant registry, 2016). Selangor consists of 9 districts which are

Gombak, Hulu Langat, Hulu Selangor, Klang, Kuala Langat, Kuala Selangor, Petaling, Sabak Bernam and Sepang.

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3.3 Subjects

Subjects of this study were hemodialysis patients. Subjects' eligibility was depicted on Table 3.1. Criteria for inclusion and exclusion were determined according to literatures.

Table 3.1 Inclusion and Exclusion Criteria for Subjects

Inclusion Criteria	Exclusion Criteria
Malaysian (All ethnic group)	Pregnant women
Female or Male	Patient with physical disabilities
Aged 18 years old or above	Patients had been hospitalised for the past three months
Minimum 3-month hemodialysis duration	Diagnosed with major psychological disorder such as dementia
Able to understand and speak English, Malay or Chinese	

3.4 Sample Size Determination

Since the main objective of this study was to determine the correlation between HRQoL and other variables, as such the sample size determined using correlation formula (Cole, 1997) as below

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

Where n = The calculated sample size r= The expected correlation coefficient

$Z_{1-\alpha/2}$= Z score for level of significance a in two-sided test

$Z_{1-\beta}$= Z score for power of the test

Given that

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Significance level $\alpha$to 5% Power $(1-\beta)$ to 90%

Correlation r of 0.5

$(Z_{1-\alpha/2}+Z_{1-\beta})^2$= 10.5

Table 3.2 Calculation of Sample Size

Sample size calculation studies		
Correlation studies	**Correlation, r**	**Sample size, N**
Socio-demographic characteristics Relatiopship between age and HRQoL amonf hemodialysis patients (Kang et al., 2015)	-0.362	75
Personal factors Relationship between sleep quality and HRQoL among hemodialysis patients (He et al, 2018)	-0.20	257
Personal factors Relationship between nutritional status and HRQoL among hemodialysis patients (Fatin Izzati et al., 2019)	-0.368	73
Psychological factors Relationship between depression and HRQoL among hemodialysis patients (Kang et al., 2015)	-0.380	68

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Table 3.2 summarizes sample size calculations based on previous studies. The highest sample size needed in this study was 257. Nevertheless, due to financial and time-constraint, calculation with the second highest number whereby 75 respondents were chosen. An additional 20% of subjects were included in this study to address the possibility for missing data, unavailability of respondents, reluctance to participate, and non-response rate.

$$N = 75 + (75\ x\ 20\%) = 90$$

Hence, the total sample size required is 90 subjects.

3.5 Sampling Design

Multistage sampling design was used in this study. Figure 3.1 represents the workflow of data collection. Due to financial and transportation constraints, Petaling district was chosen from the total of nine districts based on purposive sampling. With an estimation of 35 patients were available at each dialysis centre, a total of 3 hemodialysis centres were required. All the dialysis centres in Petaling were approached through phone call but only two centres consented to study. Upon approval, patients receiving treatment at the respective hemodialyis centres were approached and invited to participate in the study.

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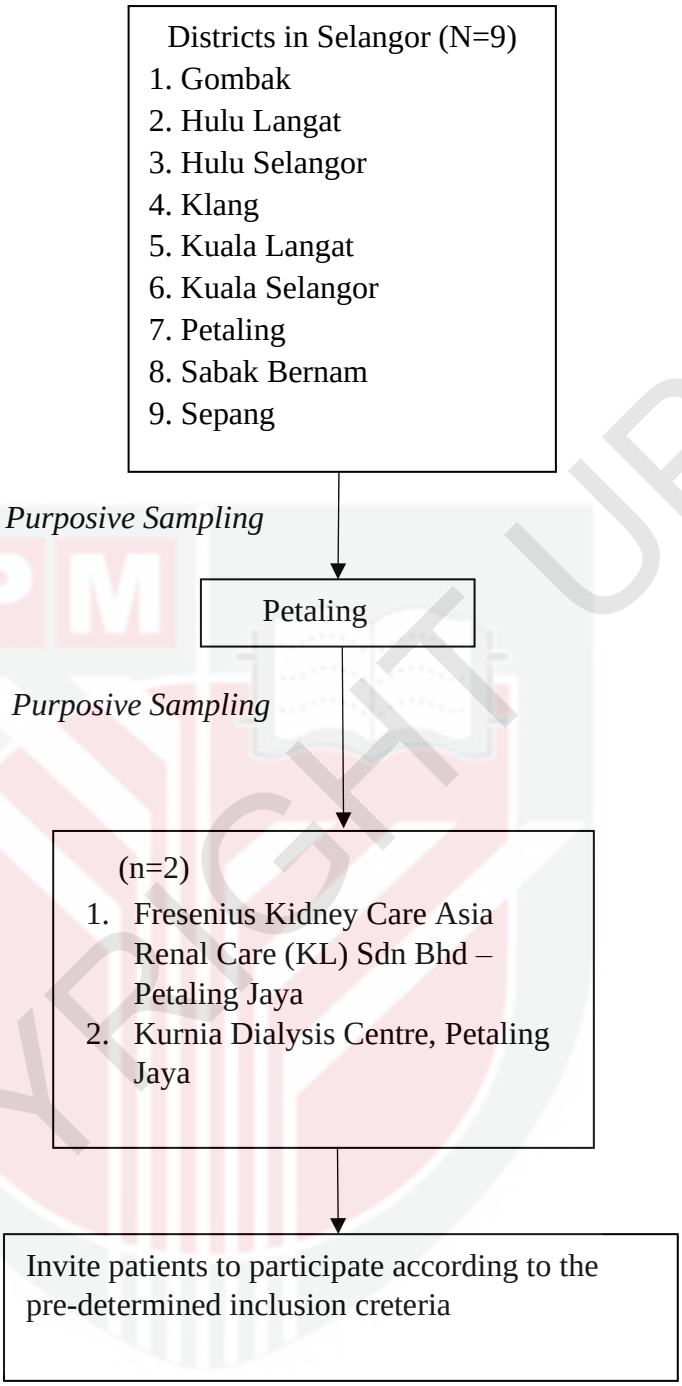

Figure 3.1: Workflow of Data Collection

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3.6 Research Instrumentations

Instrumentations used for the study were elaborated in detail in this section as depicts in Table 3.3 below. Data collection was obtained using a pre-tested questionnaire that comprises of the assessments. Accessor interviewed all the subjects face to face using printed questionnaire (appendix G).

Table 3.3: Instrumentation used in study

Dependent variable	Research Tools
HRQoL	Kidney Disease Quality of Life Instrument – 36 (KDQOL-36)
Independent variables	**Research Tools**
Socio-demographic characteristics	Self-administered questionnaire
Clinical factors	Self-administered questionnaire
Anthropometry parameters	Self-administered questionnaire
Psychological factors (Depression)	Hospital Anxiety and Depression Scale (HADS)
Personal factors (Sleep quality)	Pittsburgh Sleep Quality Index (PSQI)
Personal factors (Nutrition Status)	Mini Nutritional Assessment -Short Form (MNA-SF)

3.6.1 Socio-demographic Characteristics

Sociodemographic characteristics of subjects including age, gender, ethnicity, marital status, change of household income and employment status before and during COVID-19 were accessed using self- administered questionnaires.

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3.6.2 Clinical Factors

Presence of comorbidities such as diabetes mellitus, hypertension, and hyperlipidemia of hemodialysis patients, duration of kidney disease, dialysis vintage, frequency of dialysis per week and duration of dialysis each time were ascertained via self-administered questionnaire.

3.6.3 Anthropometry Parameters

3.6.3.1 Interdialytic Weight Gain (IDWG)

As an indicator of fluid adherence, absolute interdialytic weight gain (IDWG) of two consequence sessions of subjects were retrieved as secondary data from the dialysis records. Further computation was made by averaging the absolute IDWG and applied formula below

$$\frac{Average\ absolute\ IDWG}{Dry\ weight} \text{ x } 100\%$$

IDWG lower than 4% of dry weight was commendatory (Clinical practice guidelines for Renal Replacement Therapy, 2017), with IDWG <4% cut off point was applied to determine fluid adherence of the subjects.

3.6.3.2 Body Mass Index

Body mass index (BMI) and interdialytic weight gain (IDWG) were the components needed in anthropometry parameters. Height and dry weight of the subjects were obtained from medical record, which allow computation of BMI using the following formula,

$$\text{BMI} = \frac{Mass(kg)}{Height\ (m^2)}$$

BMI of the subjects was classified based on Protein-Energy Wasting (PEW) criteria and Kidney Disease Improving Global Outcomes (KDIGO) 2020 as Table 3.4 below

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Table 3.4: Classification of BMI of subjects

BMI ($kg/m^{2)}$	Nutritional Status
<23	Protein energy malnutrition
≥ 24	Ideal / goal value
>30	Obese (Weight loss will be beneficial)

(Fougue et al., 2008; Ikizler et al., 2020)

3.6.4 Personal Factors

Personal factors of subjects namely sleep quality and their nutritional status will be assessed using appropriate instruments as follow.

3.6.4.1 Sleep quality

Sleep quality of subjects was assessed using Pittsburgh Sleep Quality Index (PSQI) questionnaire (Buysse et al., 1989). Pittsburgh Sleep Quality Index (PSQI) contains 19 questions in total which can be categorized into 7 components, namely subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction (Buysse et al., 1989). The range of values for each item is from 0 to 3, whereby "0" reflects no difficulty and "3" reflects the severe difficulty. Each component will be summed up to allow the computation of a global score, ranging from 0 to 21 (Buysse et al., 1989), whereby the higher the score, the worse the sleep quality. Sleep quality of subjects cwere further classified as good sleep quality (PSQI score ≤ 5) or poor sleep quality (PSQI score > 5) (Buysse et al., 1989). Note that question 10 was not used in the scoring of PSQI and was omitted during data collection.

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PSQI is widely used among hemodialysis patients in local settings (Ho et al. 2021; Ling et al., 2019). It has a good reliability with a Cronbach's coefficient alpha of 0.75 for global score (Buysse et al., 1989). A local paper that had tested the reliability of PSQI in the Malay version reported that Cronbach's alpha coefficients for the overall score was 0.82, with 0.64 – 0.82 for each domain, showing good internal consistency (Musa et al., 2018).

3.6.4.2 Nutritional Status

Nutritional status of subjects was determined using Mini Nutritional Assessment Scale - short form (MNA-SF) (Rubenstein et al., 2001). Mini Nutritional Assessment Scale - short form comprises six questions (question A-F) about appetite loss, weight loss, mobility, acute disease, depression or dementia and body mass index (BMI). A score of zero was given for severe decrease in food intake, a score of one for moderate decrease in food intake, and a score of two for no decrease in food intake. A score of 0, 1, 2 and 3was given for subjects who experienced unintentional weight loss of greater than 3 kg for the past 3 months, for those does not know, who experienced weight loss between 1 and 3 kg, and subjects without weight loss, respectively.

Besides food intake and weight loss, subjects' mobility is ascertained. A score of zero was given for subjects who are bed or chair bound, a score of one for those who are able to get out of bed or chair, but does not go out, and a score of two for those who are mobile and can leave home. Presence of psychological stress or acute disease in the past three months among the subjects were ascertained with a score of zero was given for subjects who had psychological stress or acute disease and a score of one for those who absence from psychological stress or acute disease. In addition, subjects who presented with neuropsychological problems such as severe dementia

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or depression will be given a score of zero, while a score of 1 and 2 will be given to subjects who have mild dementia, and with no psychological problems, respectively. In regard to BMI, a score of 0, 1, 2 and 3 was given when subjects' BMI is less than 19, BMI between 19- 21, BMI between 21-23, and BMI of 23 or greater, respectively. Subjects' score was computed from the six constructs with possible score ranges from 0 to 14, which allow classification of nutritional status as shows in Table 3.5

Table 3.5: Classification of nutritional status of subjects

Score	Nutritional Status
12-14	well nourish
7-11	at risk of malnourished
0-7	malnourished

Mini Nutritional Assessment Scale - short form is recommended as a tool for determining nutritional status in dialysis patients (Holvoet et al., 2020). It had been used previously among dialysis patients worldwide (Cindoğlu & Beyazgül, 2021; Günalay et al., 2018). The MNA-SF demonstrated an excellent sensitivity (0.95) and specificity (0.63) for not being well nourished in the full score, and a significant negative predictive value (0.91) after recalibrating the MNA full score for the specificity of some of its domains for dialysis patients (Holvoet et al., 2020).

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3.6.5 Psychological Factor

3.6.5.1 Depression and Anxiety

Hospital Anxiety and Depression Scale (HADS) was used to access the depression of hemodialysis patients in this study. This tool consists of seven items each for the assessment of anxiety (HAD-A) and depression (HAD-D) respectively (Zigmond & Snaith, 1983). To assess the anxiety and depression status of respondents, respondents were requested to self-rate the below questions based on the feeling in the past week. Response for each item was scored on a 4 points Likert scale ranging from 0 to 3. Table 3.6 shows the questions related to anxiety (HADS-A) and depression (HADS-D).

Table 3.6: Assessment of Anxiety and Depression among the subjects

	0	1	2	3
I feel tense or 'wound up'	Not at all	From time to time, occasionally	A lot of the time	Most of the time
I still enjoy the things I used to enjoy	definitely as much	no quite so much	only a little	hardly at all
I get a sort of frightened feeling as if something awful is about to happen	Not at all	A little, but it doesn't worry me	Yes, but not too badly	Very definitely and quite badly
I can laugh and see the funny side of things	as much as I always could	No quite so much now	definitely not so much now	not at all

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Worrying thoughts go through my mind	Only occasionally	From time to time, but not too often	A lot of the time	A great deal of the time
I feel cheerful	most of the time	sometimes	not often	not at all was score
I can sit at ease and feel relaxed	Definitely	Usually	Not Often	Not at all
I feel as if I am slowed down	not at all	sometimes	very often	nearly all the time
I get a sort of frightened feeling like 'butterflies' in the stomach	Not at all	Occasionally	Quite Often	Very Often
I have lost interest in my appearance	I take just as much care as ever	I may not take quite as much care	I don't take as much care as I should	definitely
I feel restless as I have to be on the move	Not at all	Not very much	Quite a lot	Very much indeed
I look forward with enjoyment to things	as much as I ever did	rather less than I used to	definitely less than I used to	hardly at all
I get sudden feelings of panic	Not at all	Not very often	Quite often	Very often indeed
I can enjoy a good book or radio or TV program	often	sometimes	not often	very seldom

Anxiety and depressive status of patients were classified into four categories as depicts on Table 3.7

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Table 3.7: Classification of anxiety/ depressive status of subjects

Score	Anxiety / Depressive status
<8	normal
8-10	mild
11-14	moderate
15-21	severe

HADS has been used previously among medical student (Gan & Hue, 2019), type 2 diabetes outpatients (Ganasegeran et al., 2014) and peritoneal dialysis patients (Griva et al., 2016) in Malaysia and has shown good reliability with Cronbach' coefficient alpha 0.88 (Khalil et al., 2021). HADS has shown good internal consistency in the Malay version (coefficient alpha of 0.73) and the Chinese version (coefficient alpha of 0.70) as well (Yong et al., 2016).

3.6.6 Health-related Quality of Life

Kidney Disease Quality of Life - 36 items (KDQOL-36) questionnaire was used to assess QOL of the subjects (Hays et al., 1997). It includes Short Form Survey-12 (SF-12) as generic core and burden, symptoms and effects of kidney disease scales from Kidney Disease Quality of Life - Short Form (KDQOL-SF). The KDQOL-36 instruments are divided into five subscales, namely physical composite summary (PCS) and mental composite summary (MCS) (item 1-12), Burden of Kidney Disease subscale (item 13-16), symptoms and problems subscale (item 17-28b) and effect of kidney disease on daily life subscale (item 29-36). On a 100-point scale, the lower scores indicate worse health-related quality of life. Previous studies had shown validity and reliability of KDQOL-36 in assessing HRQoL among dialysis patients (Cohen et al., 2019; Peipert et al., 2018). KDQOL-36 is also used in previous studies

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to assess the HRQoL among end stage renal disease patients and hemodialysis patients worldwide and in local context (Kim et al., 2021; Fatin Izzaty et al., 2019). KDQOL-36 subscale (PCS, MCS, symptoms and problem, burden of kidney disease and effect of kidney disease on daily life) showed a good internal consistency with Cronbach's alpha 0.737, 0.704, 0.906, 0.822 and 0.801 respectively (Yang et al., 2013). On the other hand, it is evident that KDQOL-36 had a high overall internal sample reliability, $\alpha = 0.946$ (Zazzeroni et al., 2017). The Malay version of KDQOL-36 had an overall Cronbach alpha of 0.715 and Cronbach's alpha values ranged from 0.872 to 0.901 for the subscales, showing good reliability as well (Goh et al., 2019).

3.7 Pre-testing

Due to COVID-19 pandemic, a pre-testing was performed by posting the questionnaire to dialysis centre, and eight hemodialysis patients meeting the inclusion and exclusion criteria were chosen for pre-testing. Participants in the pre-testing were not included in the actual data collection. The clarity of the instructions and comprehension of all the questionnaire's questions were evaluated. All the difficulties were identified and corrected from their input and feedback. Time needed to complete questionnaire was obtained. Following the pre-testing, the instrument was reassessed, and relevant changes were made prior to actual data collection.

3.8 Procedures

Prior to the commencement of the study, the proposed study was sought ethical clearance from UPM's Ethics Committee for Research Involving Human Subjects (JKEUPM, ref no: UPM/TNCPI/RMC/JKEUPM/1.4.18.2) (Appendix A), as well as approval from the hemodialysis centres. Subjects Information Sheet regarding the study's objectives and participant’s rights was made available, prior to

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online consent through google form from subjects. The data collection was conducted physically from April to May 2022 through questionnaire.

3.9 Statistical Analysis

Statistical Package for Social Scientists (SPSS) version 26 was used for data analysis. Descriptive data was presented as means and standard deviations for continuous variable, or frequencies and percentages for categorical variables. Pearson's Product Moment Correlation Test was used to confirm the correlation between continuous variables (eg age and HRQoL) for parameter test, meanwhile for the non-parameter test, Spearman's Rank Correlation Coefficient was used. The association between categorical variables (eg ethinic under socio-demographic factors, comorbidities under clinical factors) and continuous variable (HRQoL) was analysed using One-way ANOVA test as parametric test or Mann-Whitney test and Kruskal– Wallis test as non-parametric test. Statistical analysis was considered significant at $p<0.05$.

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CHAPTER 4

RESULTS AND DISCUSSION

The main objective of this study was to determine the associations of socio-demographic characteristics, clinical factors, personal factors, anthropometry parameters and psychological factors with Health-related Quality of Life among hemodialysis patients in Selangor during COVID-19 pandemic. During COVID-19 pandemic, ESRD patients including those on hemodialysis are identified as extremely clinically vulnerable. This was supported by a meta-analysis of pooled data which revealed a significant association between CKD and more severe COVID-19 infection besides a much greater mortality rate than the general population (Henry et al, 2020). Following this, most dialysis centers restricted access for data collection at dialysis unit. A similar scenario was reported in Italy (Quintaliani et al., 2020). This is further complicated by the enforcement of containment strategy (Movement Control Order) which aimed at limiting COVID-19 transmission. Notwithstanding the above challenges, the present study was able to be accomplished with 81 complete data set with no missing data.

4.1 Sociodemographic factors of the subjects

Table 4.1 showed the distribution of subjects according to sociodemographic characteristics. The age of the subjects ranged from 29 to 85 years with a mean age of 58 ± 2 years old. Most of the subjects aged above 65, which is in agreement of the national data whereby the highest treatment rate is among Malaysian adults aged equal or greater than 65 years old (26th Report of the Malaysia Dialysis and Transplant Registry 2018). A total of 81 subjects comprised 60.5% male and 39.5% female were

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recruited with consent. This was corresponding to the local study (Surendra et al., 2019) and national data which males outnumber females in the male-to-female ratio in dialysis ratio (26th Report of the Malaysia Dialysis and Transplant Registry 2018). In terms of ethnicity, majority of the subjects are Chinese (55.6%), followed by Indian (25.9%) and Malay (18.5%). This finding was consistent with studies in Kuala Lumpur (Bayoumi et al., 2013), but conflicting with the results of other studies conducted in Penang (Surendra et al., 2019) and Selangor (Shahrin et al., 2019), whereby their subjects were predominantly Malay ethnicity. Discrepancies are as expected attributed to demographic distribution according to regions. Regarding marital status, approximately two-third of the subjects were married, followed by single (17.3%), widow/widower (9.9%) and divorced (4.9%). Furthermore, approximately half of the subjects are retired/housewife, with a quarter of the subjects remained employed during COVID-19 pandemic. Approximately 14% of the subjects loss their job during COVID-19, which was lower compared to the change of employment status (26.5%) during COVID-19 pandemic in South India (Ram et al., 2017). It is worth noting that the loss of employment status of subjects during pandemic might not totally due to pandemic as some patients initiated their hemodialysis therapy during pandemic. Approximately 80% of the subjects had stabile or income remained unchanged during pandemic, inclusive of closed to half of them were depending on pension, employees' provident fund (EPF) or savings. Meanwhile, 22% of the subjects had lower income as the impact of the pandemic.

Table 4.1: Distribution of subjects according to sociodemographic characteristic (n=81)

Variables	n (%)	Mean ± SD (range)
Age (years old)		58.46 ± 1.55 (29-85)
18-24	0 (0)	
25-34	4 (4.9)	
35-44	10 (12.3)	

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45-54	18 (22.2)
55-64	19 (23.5)
65+	30 (37)
Gender	
Male	49 (60.5)
Female	32 (39.5)
Ethnicity	
Malay	15 (18.5)
Chinese	45 (55.6)
Indian	21 (25.9)
Marital Status	
Single	14 (17.3)
Married	55 (67.9)
Divorced	4 (4.9)
Widow/Widower	8 (9.9)
Change of Employment status	
Unemployed before COVID-19	9 (11.1)
Unemployed during COVID-19	11 (13.6)
Remain employed	20 (24.7)
Retired/housewife	41 (50.6)
Change of Income	
Remain unchanged	26 (32.1)
RM1 – RM1500	8 (13.6)
>RM1500	7 (8.7)
Pension/EPF/savings	40 (49.4)

4.2 Clinical factors of the subjects

Table 4.2 illustrating the distribution of subjects according to clinical factors. Hypertension (76.5%) was the most dominant comorbidity among the subjects followed by diabetes mellitus (42%) and hyperlipidemia (32.1%). The above findings were comparable to studies which revealed that hypertension was the most prevalent disease among hemodialysis patients, with diabetes mellitus follows (Cha & Han., 2020; Surendra et al., 2019; Nayana et al., 2017). There is a cyclic relationship between hypertension (HTN) and chronic kidney disease (CKD), whereby CKD can secondary to HTN when kidney function worsen through uncontrolled blood pressure; CKD can be a risk factor to HTN when decline kidney function can exacerbate blood

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pressure control (Ku et al., 2019). Diabetes mellitus (DM) is the leading cause of CKD as well when uncontrolled blood glucose level can damage renal blood vessels and results in diabetic nephropathy (Hahr & Molitch, 2015). Presence of anemia was exceptional low. This data must be interpreted cautiously in light of the commonly reported iron-deficiency anemia among CKD patients (Alagoz et al., 2020; Alemu et al., 2021; Stauffer & Fan, 2014). Iron-deficiency anemia among dialysis patients is multifaceted, including decrease in endogenous erythropoietin (EPO) production (Babitt et al., 2021; Portolés et al., 2021), increased rate of blood loss during dialysis, frequent phlebotomies (Besarab & Ayyoub., 2007), and blood remaining in the dialysis tubing (Babitt et al., 2021), which contribute to additional iron loss, decreased gastrointestinal iron absorption and poor dietary iron intake (Babitt et al., 2021; Gafter-Gvili et al., 2019).

Mean duration of diagnosis of kidney diseases was 10.69 ± 8.39, more than 10 years, with rather comparable proportion of duration of diagnosis between the first 5 years, 5 to 10 years, and more than 10 years, respectively. Relating to dialysis vintage, the mean duration was 5.4 ± 0.61 years, with 25.9%, 35.8% and 24.7% of the subjects has been on hemodialysis for less than a year, 1 to 5 years and 5-10 years, respectively. Mean duration of dialysis among the subjects was lower than other populations (FIM Shahrin et al., 2019; Sahathevan et al., 2015), attributed to the lower mean age of subjects and small proportion of subjects with long dialysis vintage (more than 10 years). A majority of the subjects (95%) did not miss their dialysis treatment despite during COVID-19. The rate of deviation from dialysis was lower than other countries (Tannor et al., 2022; Prasad et al., 2020). In India, approximately 30% of dialysis patients were found to deviate from dialysis treatment, with some of the reasons being inability to reach the dialysis units because of lack of transport, and on medical advice

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due to reduction in capacity secondary to curtailment in the number of available dialysis stations to meet with the pandemic norms (Prasad et al., 2020). A total of 3.7% of patients receive hemodialysis twice a week for a variety of reasons, which probably due to remaining kidney function, ability to comply to dietary restrictions, or quality of life (Savla et al., 2016). Shorter dialysis times might be caused by a lack of adherence to dialysis treatment or a short prescription time as well (Tandon et al., 2013).

Table 4.2: Distribution of subjects according to clinical factors (n=81)

Variables	n (%)	Mean ± SD (range)
Comorbidities*		
Hypertension	62 (76.5)	
Diabetes Mellitus	34 (42)	
Hyperlipidemia	26 (32.1)	
Cardiovascular disease	21 (25.9)	
Cancer	3 (3.7)	
Anemia	2 (2.5)	
Duration of Kidney Disease (years)		10.69 ± 8.39 (0.25 - 30)
≤ 1 year	5 (6.2)	
1 to <5 years	21 (25.9)	
5 to <10 years	24 (29.6)	
10 to < 20 years	19 (23.5)	
≥ 20 years	12 (14.8)	
Dialysis Vintage (years)		5.4 ± 0.61 (0.25 – 25)
≤ 1 year	21 (25.9)	
1 to <5 years	29 (35.8)	
5 to <10 years	20 (24.7)	
10 to < 20 years	9 (11.1)	
≥ 20 years	2 (2.5)	
Frequency of dialysis per week		2.96 ± 0.21
2 sessions per week	3 (3.7)	
3 sessions per week	78 (96.3)	
Duration of dialysis each session		-
2 hours per session	2 (2.5%)	
4 hours per session	79 (97.5)	

*Multiple responses

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4.3 Anthropometry parameters of the subjects

Table 4.3 showed the distribution of subjects according to anthropometry parameters. The mean body mass index of subjects was 24.50 ± 0.49 kg/m^2, ranged from 15.90 kg/m^2 to 38.83 kg/m^2. Almost half of the subjects had ideal weight (48.2%) while 40.7% of subjects were protein energy malnutrition and 11.1% were obese. The mean BMI of current study was higher than the mean BMI of previous local studies which was 21.3 ± 6.5 kg/m^2 (Chan et al., 2019) and 23.57 ± 4.1 kg/m^2 (Khan et al., 2019), respectively. Possible factors include lower physical activity level compared to period before pandemic which result in higher risk of sedentarism, increased consumption of meal or snacks due to quarantine whereby patients have better availability to access food at home (Pellegrini et al., 2020). However, factors listed are based on a study among general Italy population, it deserves confirmation from future studies if the trend of increasing BMI happen in the upcoming studies among hemodialysis patients.

Mean interdialytic weight gain of the subjects was 3.45 ± 1.16%, ranged from 1.21% to 6.25%. A majority of the subjects had IDWG less than 4% (67.9%), indicating more than two-thirds of the subjects had good fluid adherence. This prevalence was higher compared to previous indigenous research whereby a majority of the patients (86.8%) had IDWG greater than 4% (Chan et al., 2019). Mean IDWG was also lower than hemodialysis patients in Saudi Arabia (Ibrahim et al., 2015). This can indirectly indicate that the overall IDWG acquired in this study was positive and satisfactory. This can possibly be explained by the fact that patients have better self-efficacy, thirst management and well-controlled sodium intake (Wahyuni et al., 2019); whereas high sodium intake can lead to thirst and resulting in greater fluid intake and IDWG (Fan et al., 2013). Besides, patients with superior health literacy (Chen et al.,

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2020) and received education about fluid consumption from healthcare professional (Septiyanti et al., 2019) were more likely to adhere to fluid limits as well.

Table 4.3: Distribution of subjects according to anthropometry parameters (n=81)

Variables	n (%)	Mean ± SD (range)
Body Mass Index (BMI) (kg/m^2)		24.50 ± 0.49 (15.90 – 38.83)
Protein energy malnutrition (<23)	33 (40.7)	
Ideal/goal (23-29.9)	39 (48.2)	
Obese (weight loss will be beneficial) (≥ 30)	9 (11.1)	
Interdialytic Weight Gain (IDWG) (%)		3.45 ± 1.16 (1.21 – 6.25)
<4%	55 (67.9)	
≥4%	26 (32.1)	

4.4 Personal factors of the subjects

As depicted in Table 4.4.1, approximately two-thirds of subjects were well nourished (66.7%) with only one subject was malnourished. This finding was incompatible with a recent local study whereby more than 60% of patients were at risk of malnourished or malnourished (Nor Hisham et al., 2018). The prevalence of malnourishment among the subjects in this study was also lower compared to hemodialysis patients in Pakistan (Arshad et al., 2020). However, the existing data does not allow a definitive judgement on that is generating this disparity. The potential reason of lower rate of malnutrition in this study may be due to the under-rate of instruments used in the current study. Earlier study revealed that Mini Nutritional Assessment – Long form (MNA- LF) was a more reliable indicator of protein energy malnutrition in hemodialysis patients while Mini Nutritional Assessment – Short form (MNA- SF) may underestimate the nutritional status of the patients (Tsai & Chang,

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2011). When compared to Subjective Global Assessment (SGA), MNA-SF may not be a reliable approach for detecting moderate malnutrition (Afsar et al., 2006).

Table 4.4.1: Distribution of subjects according to personal factors (n=81)

Variables	n (%)	Mean ± SD (range)
Sleep quality (hemodialysis day)		6.96 ± 4.27 (0 - 17)
Good	28 (34.6)	
Poor	53 (65.6)	
Sleep quality (non-hemodialysis day)		6.74 ± 4.36 (0 - 17)
Good	30 (37)	
Poor	51 (63)	
Nutritional Status		12 ± 1.82 (6 – 14)
Malnourished	1 (1.2)	
At risk of malnourished	26 (32.1)	
Well nourish	54 (66.7)	

As reported in Table 4.4.2, the percentage of good sleeper among hemodialysis patient was rather similar during hemodialysis and non-hemodialysis day. More than 60% of hemodialysis patients were poor sleepers, reaffirmed the findings of local studies which poor sleep quality is common among hemodialysis patients (Al Naamani et al., 2021; Ho et al., 2021; Ng et al., 2020). High prevalence of poor sleep quality among hemodialysis patients can be explained by the disruption of homeostasis due to inadequate glomerular filtration, imbalance vital metabolic products (Knezevic et al., 2013), high prevalence of hypoalbuminemia, hyperphosphatemia and hyperkalemia (Ezzat & Mohab, 2015; Ling et al., 2019; Ng et al., 2020) among hemodialysis patients. In addition, the onset of symptoms and concomitant disorders that are common in chronic dialysis patients including bone pain and pruritis secondary to renal osteodystrophy may further contribute to poor sleep quality among hemodialysis patients (Sabbatini, 2002). However, it is worth noting that there were 76.5% of subjects perceived good sleep quality, designated that

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self-perceived sleep quality was not the reason of poor sleep quality in this study. Sleep latency was common in this study cohort with 67.9% of hemodialysis sleep had sleep latency, regardless on hemodialysis day or non-hemodialysis day. This result was compatible with a recent study whereby 66.2% of patients sleep without latency (Velu et al., 2022). This may due to the inconsistent sleep schedule on a regular basis of in-center dialysis patient which caused by early shift of hemodialysis treatment, shorter total sleep time and greater sleep fragmentation (Cukor et al., 2021).

Mean sleep duration was 6.24 hours and 6.5 hours during hemodialysis day and non-hemodialysis day, respectively. The current data was compatible with previous studies which had reported an average sleep duration of 6.2 hours (Williams et al., 2017) and 5.56 hours to 6.55 hours among in center daytime and nocturnal hemodialysis patient (Eloot et al., 2021). The findings were however in disagreement with another study that reported a lower average sleep duration (4.9 hours) among hemodialysis patients (Čengić et al., 2010). Mean of sleep duration was higher on non-hemodialysis day as compared to hemodialysis day. This was supported by the fact that there were an additional 10% patients had more than 7 hours sleep on non-hemodialysis day. Earlier study showed there was a substantial increase in the number of minutes slept the night before hemodialysis day and the night following hemodialysis day for patients dialyzed on the first shift (Williams et al., 2017).

In addition, about 40% of subjects had sleep efficiency lower than 85%, with higher proportion of subjects with sleep in-efficiency on non-hemodialysis days. This finding was consistent with other studies that demonstrated that hemodialysis patients usually will possess poor sleep efficiency (Hashem et al., 2022; Masoumi et al., 2013). Approximately 9 in 10 subjects experienced sleep disturbance and this was higher compared to other sleep components, consistent with previous studies ((Roumelioti et

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al., 2020; Čengić et al., 2010), likely attributed to restless legs syndrome, insomnia, excessive daytime sleepiness and nightmares. Study found that individuals with sleep disturbances may experience sleepiness (Lindner et al., 2015; Merlino et al., 2008), impaired daytime functioning (Lindner et al., 2015), inferior quality of life (Lindner et al., 2015; Medic et al., 2017), increased mortality (Benz et al., 2000; Harris et al., 2011; Lindner et al., 2015; Merlino et al., 2008) and health related risk (Lindner et al., 2015; Merlino et al., 2008). The prevalence of sleep disturbance in this study cohort was higher than a recent study among hemodialysis patients in Belgium (Eloot et al., 2021), probably due to the different instrument used in assessing sleep disturbance as the later study used actigraphy as objective measure. Meanwhile, approximately 50% of the subjects experienced daytime dysfunction. Earlier study suggested excessive daytime somnolence may due to high incidence of periodic limb movement, sleep apnea and high daytime melatonin levels among hemodialysis patients (Maung et al., 2016). On the other hand, use of sleep medication among subjects was low, similar to the findings of a local study (Ho et al., 2019).

Table 4.4.2: Distribution of subjects according to component of sleep quality (n=81)

Component of Sleep Quality	n (%)	Mean ± SD (range)
Subjective Sleep Quality		
Good	62 (76.5)	
Bad	19 (23.5)	
Hemodialysis day		
Sleep Latency		
Without latency (≤30mins)	26 (32.1)	
With latency (>30mins)	55 (67.9)	
Sleep Duration		6.24 ± 2.32
>7 hours	32 (39.5)	
5-7 hours	26 (32.1)	
<5 hours	23 (28.4)	
Sleep Efficiency		
>85%	49 (60.5)	
≤85%	32 (39.5)	
Non hemodialysis day		6.51 ± 2.21
Sleep Latency		

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Without latency	26 (32.1)
With latency	55 (67.9)
Sleep Duration	
>7 hours	39 (48.1)
5-7 hours	23 (28.4)
<5 hours	19 (23.5)
Sleep Efficiency	
>85%	51 (63)
≤85%	30 (37)
Sleep Disturbance	
Yes	73 (90.1)
No	8 (9.9)
Use of Sleep Medication	
Yes	6 (7.4)
No	75 (92.6)
Daytime dysfunction	
Yes	40 (49.4)
No	41 (50.6)

4.5 Psychological factors of the subjects

As shown in Table 4.5.1, most of the subjects were absent from anxiety, while less than 10% of the subjects had mild anxiety. It is worth noting that there were four subjects (5%) had either moderate or severe anxiety. While prevalence of depression was low among this study cohort, the presence of 11.1% , 3.7% and 1.2% of subjects with mild, moderate and severe depression deserved further investigation. Anxiety and depression among CKD patients often co-occur and seem to exacerbate each other through combined effects. The above data or findings should be interpreted cautiously in light of the high prevalence of anxiety and depression (45%) among hemodialysis patients in a previous multicenter study in Malaysia (Bujang et al., 2015). The concern is without unnecessary considering findings of a recent multicenter prospective follow-up study in Malaysia which reported more than 70% of patients were suffered from depression (Khan et al., 2019).

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The prevalence of anxiety (13.6%) and depression (16%) of current study was lower than other studies in China, Taiwan and Spain. In a study in Northern China, more than 50% of hemodialysis patients experienced depression and a quarter of patients experienced anxiety (Meng et al., 2022). Study in Taiwan demonstrated more than 95% patients presented with severe depression and about 60% of patient presented with severe anxiety (Kao et al., 2020) while in Spain, 20% and 16% of hemodialysis patients had anxiety and depression, respectively (Masià-Plana et al., 2022).

Patients with depression commonly experienced substantial psychosocial stress as a result of the loss of physical abilities, renal function, sexual function, employment, cognitive ability, and family role (Cheng et al., 2022; Wang et al., 2015). Besides, patients tend to have an unfavorable opinion and uncertainty of their health, citing decreased physical function related to comorbidities and illness progression, might eventually give rise to psychological stress as well (Cheng et al., 2022). Previous research had indicated a major prevalence of depression and its effects on hemodialysis patients, including increased suicidal ideation, weakened coping abilities, decreased self-deterministic health behaviour and hampered self-care compliance (Goh & Griva, 2018; Kim & Kim, 2019). Anxiety and depression exacerbate hemodialysis patients' physical and cognitive impairment, gave rise in hospitalization rates and health-care utilization (Vasilopoulou et al., 2015). Hence, in view of the severe impact of unhealthy mental status on hemodialysis patients, more studies are warranted to allow better understanding on this aspect.

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Table 4.5.1: Distribution of subjects according to psychological factors (n=81)

Variables	n (%)	Mean ± SD (range)
Anxiety		3.16 ± 3.74 (0 - 16)
Normal	70 (86.4)	
Mild	7 (8.6)	
Moderate	2 (2.5)	
Severe	2 (2.5)	
Depression		4.23 ± 3.33 (0 -15)
Normal	68 (84.0)	
Mild	9 (11.1)	
Moderate	3 (3.7)	
Severe	1 (1.2)	

As shown in Table 4.5.2, there were 63%, 24.7% and 19.8% had worrying thoughts, feel tense and had frightened feeling occasionally. Meanwhile as depicts on Table 4.5.3, majority of subjects still manage to enjoy a good book, radio or TV program (82.7%), laugh and see the funny side of things (81.5%), enjoy the things they used to enjoy (60.5%) and looking forward with enjoyment to things. The data was in line with the results that most of the subjects was not present with anxiety and depression. The reasons behind may be due to patient's superior spiritual well-being (Senmar et al., 2020), higher satisfaction with life and subjective happiness (Mota Sousa et al., 2019).

Table 4.5.2: Distribution of subjects according to anxiety's component (n=81)

Components	**n (%)**	**Mean ± SD**	**Range**
I feel tense or "wound up"			
Not at all	48 (59.3)		
From time to time, occasionally	20 (24.7)		
A lot of the time	12 (14.8)		
Most of the time	1 (1.2)		
I get a sort of frightened feeling like 'butterflies' in the stomach			

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Not at all	53 (65.4)	34.6
Occasionally	16 (19.8)	
Quite often	11 (13.6)	
Very often	1 (1.2)	
I get a sort of frightened feeling as if something awful is about to happen		
Not at all	55 (67.9)	32.1
A little, but it doesn't worry me	10 (12.3)	
Yes, but not too badly	14 (17.3)	
Very definitely and quite badly	2 (2.5)	
I feel restless as I have to be on the move		
Not at all	55 (67.9)	32.1
Not very much	15 (18.5)	
Quite a lot	9 (11.1)	
Very much indeed	2 (2.5)	
Worrying thoughts go through my mind		
Only occasionally	51 (63.0)	37
From time to time, but not too often	18 (22.2)	
A lot of the time	9 (11.1)	
A great deal of the time	3 (3.7)	
I get sudden feelings of panic		
Not at all	65 (80.2)	19.8
Not very much	10 (12.3)	
Quite a lot	4 (4.9)	
Very much indeed	2 (2.5)	
I can sit at ease and feel relaxed		

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Definitely	70 (86.4)
Usually	7 (8.6)
Not often	3 (3.7)
Not at all	1 (1.2)

Table 4.5.3: Distribution of subjects according to depression's component (n=81)

Components	n (%)	Mean ± SD	Range
I still enjoy the things I used to enjoy			
definitely as much	49 (60.5)		
not quite so much	24 (29.6)		
only a little	4 (4.9)		
hardly at all	4 (4.9)		
I can laugh and see the funny side of things			
as much as I always could	66 (81.5)		
not quite so much now	13 (16.0)		
definitely not so much now	0		
not at all	2 (2.5)		
I feel cheerful			
not at all	2 (2.5)		
not often	9 (11.1)		
sometimes	17 (21.0)		
most of the time	53 (65.4)		
I feel as if I am slowed down			
nearly all the time	12 (14.8)		
very often	22 (27.2)		
sometimes	29 (35.8)		

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not at all	18 (22.2)	
I have lost interest in my appearance		
definitely	5 (6.2)	
I don't take as much care as i should	18 (22.2)	
I may not take quite as much care	12 (14.8)	
I take just as much care as ever	46 (56.8)	
I look forward with enjoyment to things		
as much as I ever did	48 (59.3)	
rather less than I used to	19 (23.5)	
definitely less than I used to	13 (16.0)	
hardly at all	1 (1.2)	
I can enjoy a good book or radio or TV program		
often	67 (82.7)	
sometimes	10 (12.3)	
not often	3 (3.7)	
very seldom	1 (1.2)	98.8

4.6 Health-related quality of life

As depicted in Table 4.6, mean scores for physical component (PCS), mental component (MCS), burden of kidney disease (BKD), symptom and problem of kidney disease (SPKD) and effect of kidney disease (EKD) was 37.26 ± 8.91, 50.83 ± 11.79, 34.95 ± 31, 74.54 ± 18.53 and 65.05 ± 26.02, respectively. The findings were coherent to a study in Hong Kong, with comparable mean scores between the two studies (Chen et al., 2017). In comparing to local studies, while mean scores of PCS, MCS and

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SPKD were comparable (Yusop et al., 2013; Shahrin et al., 2019), the EKD and BKD scores of the current study was 8% and 20% lower (Shahrin et al., 2019), probably attributed to the differences on sociodemographic characteristics as the previous study enrolled older adults with higher mean age. A similar scenario was documented with lower BKD and EKD among the subjects in this study when compared to a study cohort in the United States (Cohen et al., 2019). Such a mismatch in the outcomes of the two studies could be due to some social or environmental variables influencing the participants.

Across the different domains, notably, mean score was highest on the SPKD domain among the 5 subscales of KDQOL, which echo earlier studies (Cohen et al., 2019; Hall et al., 2018; Nurdina & Anggraeni, 2022), charactering that most patients did not suffer much from the symptom and problem of kidney disease. On the other hand, subjects scored lowest for BKD, indicating that majority of the hemodialysis patient feel like a burden to their family and being defeated as they had to dependent on others. This finding was coherent with other studies (Thenmozhi, 2018; Nurdina & Anggraeni, 2022; Wassef et al., 2018) but deviate with another study which reported PCS obtained the lowest mean score (Hall et al., 2018). The disparity most probably due to the differences on age as the targeted subjects of prior study was older adults. When comparing QOL of peritoneal dialysis patients and hemodialysis patients, QOL of peritoneal dialysis patients was significantly higher than that of hemodialysis patients after eliminating the possible effects from other confounding variables (Hsu et al., 2020). Nevertheless, the mean value of MCS and SPKD of current study were slightly higher than a Singapore study, only EKD was 4 points lower than the peritoneal dialysis patients (Yang et al., 2017). Figure 4.6.1 displayed

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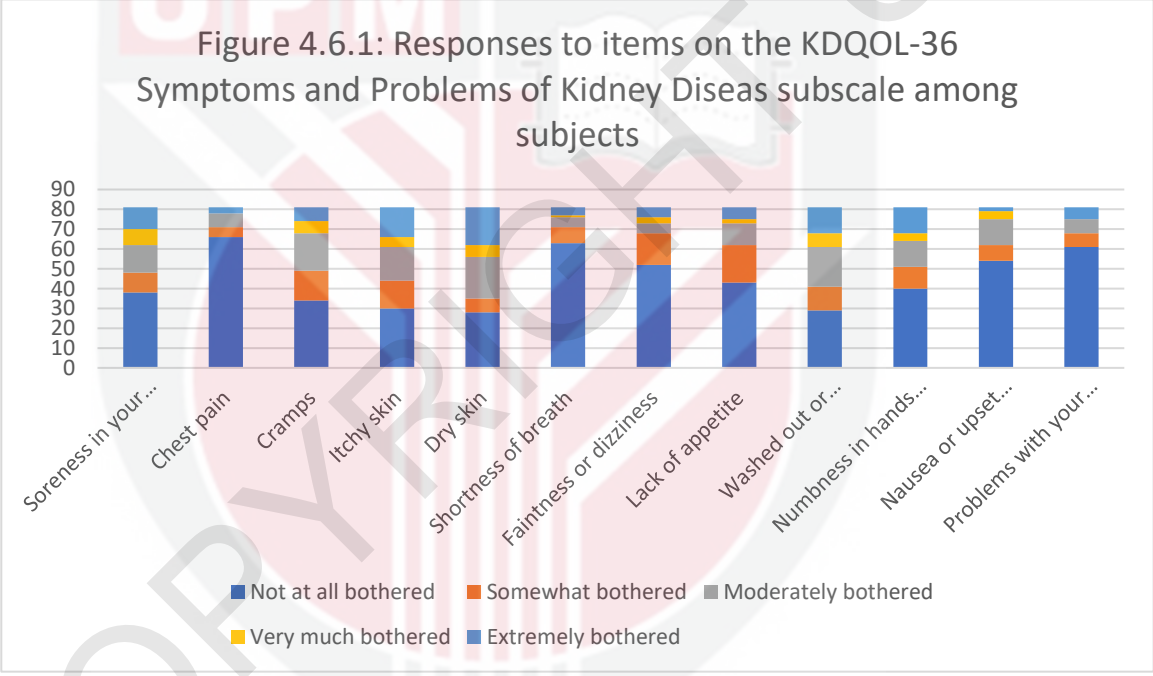
the individual item of SPKD subscale. From the survey, itchy skin and dry skin were the most popular and bothering problems faced by subjects.

Table 4.6 Distribution of Subjects according to KDQOL

Domain	Mean ± SD
SPKD	74.54 ± 18.53
EKD	65.05 ± 26.02
MCS	50.83 ± 11.79
PCS	37.26 ± 8.91
BKD	34.95 ± 31



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4.7 Hypothesis testing

$H_0$1: There were no significant associations between sociodemographic characteristics （age, gender, ethnic, marital status, change of household income, change of employment status during COVID-19 pandemic）and health-related quality of life among hemodialysis patients in Selangor during COVID-19 pandemic.

Correlation between age and domain of Kidney Disease Quality of Life 36 items (KDQOL-36) were presented in Table 4.7.1. Results showed that there was a weak negative correlation between physical component score (PCS) and age (r=-0.322, p=0.005), indicating older hemodialysis patients was associated with lower physical component score. Compared to healthy individuals, patients on renal replacement treatment have a higher risk of sarcopenia and frailty than healthy individuals due to comorbidity, chronic inflammation, long-term starvation, in addition to aging (Matsuzawa, 2022), which eventually influence the physical functioning of older hemodialysis patient. It is worth noting that there was weak positive correlation between mental component score (MCS) and age (r=0.302, p=0.006), indicating older patients were associated with better mental component score. The fact that older patients generally have better adaption and lower expectations to their health status (Yang et al., 2015) may partially explained the above correlation. In general, the findings between association of PCS, MCS and age were congruent with studies (Germin-Petrović et al., 2011; Shahrin et al., 2019), partially agreed by another study whereas the study demonstrated that there was no association between age and MCS (Pan et al., 2017).

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As shown in Table 4.7.2, there was no significant difference in scores of PCS, MCS, burden of kidney disease (BKD), symptoms/problems of kidney disease (SPKD), effect of kidney disease (EKD) and sex. This was in contradiction with other studies among hemodialysis patient whereas female had poorer quality of life as compared to their male counterparts (Albatineh & Ibrahimou, 2019; Bayoumi et al., 2013; Mandoorah et al., 2014; Zyoud et al., 2016), but consistent with another study (Elhadad et al., 2020).

Similarly to sex, there were no significant associations between domains of KDQOL-36 with marital status, ethnicity and change of income. In respect of marital status, earlier study demonstrated that single patients were significantly associated with better physical health domain, whereby single patients took less responsibility for the entire family and financial burden (Anees at al., 2014). On the other hand, the association of marital status and quality of life (QOL) had been inconsistent, with both positive findings (Elhadad et al., 2020; Kunnath et al., 2020) and neutral findings (Khatib et al., 2018; Zhou et al., 2017) were reported. With regard to ethnicity, the current finding was compatible with the results of a local study whereas there was no significant relationship found between race and kidney disease quality of life – short term 24 (KDQOL-SF24) (Ramatillah et al., 2017). The finding was however not in agreement with another study whereby religion was associated with psychological, environment and overall domain of QoL (Liu et al., 2014) and Muslims (In Malaysia, all Malays are Muslims) have superior QOL compared to other religion (Liu et al., 2014). Further study is needed to draw a conclusion on the relationship between race, religion and other socioeconomic characteristics with HRQOL. In terms of incomes, earlier study showed a positive correlation between income with physical domain, social domain and environmental domain of WHOQOL-BREF (Joshi et al., 2017),

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with consistent findings in other studies (Lemos et al., 2015; Liu et al., 2014). The present study failed to echo earlier findings. Although the variable "change in income" is not the same as "income," prior research showed that patients' financial status had such an impact on their life satisfaction and quality of life (Anees et al., 2014; Sanchez et al., 2021). Further study is warranted to investigate the impact of change of income during pandemic and health-related quality of life.

There was statistically significant difference between MCS and change of employment status (H(3)=7.941, *p*=0.047), EKD and change of employment status (F(3,77)=4.025, *p*=0.010). A Turkey post-hoc test revealed that the score of EKD was statistically lower when unemployed during COVID-19 (48.01 ± 30.47, *p=0.028*) compared to retired (71.88 ± 23.92). Nevertheless, earlier studies illustrated that employed patients had significantly better physical, psychological and social domain compared to those unemployed and retired (Anees et al., 2014; Liu et al., 2013). The insufficient study that investigated about the change of employment status during COVID-19 pandemic and HRQOL, further research is required.

Table 4.7.1: Pearson's product moment correlation between demographic background (age) with domain of KDQOL-36 among subjects (n=81)

Variable	PCS		MCS		BKD		SPKD		EKD	
	r	*p-value*	*r*	*p-value*	*r*	*p-value*	*r*	*p-value*	*r*	*p-value*
Age	-0.322**	0.003	0.302**	0.006	-0.073	0.517	0.013	0.911	0.122	0.278

Note:Physical component score (PCS); *Mental component score* (MCS); *Burden of Kidney Disease* (BKD)*; Symptoms/Problems of Kidney Disease* (SPKD); *Effect of Kidney Disease* (EKD)

**Correlation is significant at the 0.01 level (2-tailed)

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Table 4.7.2: Independent samples t-test between demographic factor (sex) with domain of KDQOL-36 among subjects (n=81)

Variable	PCS		MCS		BKD		SPKD		EKD	
	t value	*p-value*	t value	*p-value*	t value	*p-value*	t value	*p-value*	t value	*p-value*
Gender	1.026	0.308	-1.040	0.302	-0.687	0.494	0.762	0.449	-0.898	0.372

Note:Physical component score (PCS); *Mental component score* (MCS); *Burden of Kidney Disease* (BKD)*; Symptoms/Problems of Kidney Disease* (SPKD); *Effect of Kidney Disease* (EKD)

Table 4.7.3: One-way Anova between demographic factor (ethnicity, marital status, change of employment status, change of income) with domain of KDQOL-36 among subjects (n=81)

Variable	PCS		MCS		BKD		SPKD		EKD	
	F value	*p-value*	F value	*p-value*	F value	*p-value*	F value	*p-value*	F value	*p-value*
Ethnicity	0.726	0.487	1.900	0.156	0.396	0.675	1.321	0.273	2.321	0.105
Marital Status	2.101	0.107	H (3) 3.614 [a]	0.306	0.606	0.613	0.231	0.874	H(3) 3.026[a]	0.388
Change of Employment status	0.702	0.553	H(3) 7.941[a]	0.047*	1.976	0.125	H(3) 3.444[a]	0.328	4.025	0.010**
Change of Income	1.040	0.380	1.436	0.239	1.286	0.285	2.232	0.091	1.134	0.341

Note:Physical component score (PCS); *Mental component score* (MCS); *Burden of Kidney Disease* (BKD)*; Symptoms/Problems of Kidney Disease* (SPKD); *Effect of Kidney Disease* (EKD)

*Correlation is significant at the 0.05 level (2-tailed)

**Correlation is significant at the 0.01 level (2-tailed)

[a] Kruskal Wallis Test

$H_0$2: There were no significant associations between clinical factors and health-related Quality of Life among hemodialysis patients in Selangor during COVID-19 pandemic.

As shown in Table 4.7.4, there were no significant associations between duration of kidney disease with physical component score (PCS) (r=-0.018, p=0.875) and mental component score (MCS) (r=0.09, p=0.425). These findings were in opposed to a recent study whereby MCS and PCS were significantly associated with duration of kidney disease whereby the score of MCS is lower than PCS, indicating that the kidney disease burden has a higher influence on patients' mental health, which

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is often underestimated by healthcare professional (Tannor et al., 2019). Furthermore, hemodialysis session per week and hemodialysis duration each session failed to depict any correlation with domains of HRQoL. The findings were supported by earlier studies (Mousa et al., 2018; Visweswaran et al., 2020). Nonetheless, these findings were contradicted with another prior study whereas significant association was observed between physical functioning, patient's pain, general health and frequency of hemodialysis (Al Salmi et al., 2021). In terms of hemodialysis duration each session, while previous studies reported that there was significant correlation between hemodialysis duration and QoL score (Gerasimoula et al., 2015; Mousa et al., 2018), the present study was unable to echo the above studies. It is however worth mentioning the findings of the above two studies were inconsistent. While longer duration of hemodialysis was associated with better QoL among dialysis patients in Palestine (Mousa et al., 2018), longer duration of hemodialysis inferior the QoL among patients in Greece (Gerasimoula et al., 2015). The mismatched discovery in this case can be explained by imbalance data of hemodialysis session per week and hemodialysis duration each session obtained from the subjects, as majority of the patient have 3 sessions per week and 4 hour per session.

A weak positive correlation between dialysis vintage and burden of kidney disease (BKD) was evident in the current study (r=0.272, p=0.014), characterizing that the longer the dialysis vintage, the better the score of BKD. The above finding was not in agreement with studies that illustrated PCS (Daniel et al., 2020; Ishiwatari et al., 2020; Shahrin et al., 2019) and MCS (Daniel et al., 2020; FIM Shahrin et al., 2019) were significantly correlated to dialysis vintage. The local study did report opposite results compared to this study whereas a negative correlation was found between BKD and dialysis vintage (Shahrin et al., 2019). On the other hand, other

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studies demonstrated no significant differences between dialysis vintage and quality of life among dialysis patients (Mousa et al., 2018; Zyoud et al., 2016). The incompatible association of dialysis vintage and HRQoL in this study with others may be partially explained by the better psychological parameter (lower depression and anxiety) and personal factors (age, ethnicity, marital status, employment status) among the subjects in the present study. Future studies should engage larger sample size to allow more in-depth statistical analysis including multivariate or logistic analysis to elucidate the possible influence of hemodialysis treatment on quality of life among hemodialysis patients.

Table 4.7.4: Pearson's product moment correlation between clinical factors (duration of kidney disease, dialysis vintage, hemodialysis session per week) with domain of KDQOL-36 among subjects (n=81)

Variable	PCS		MCS		BKD		SPKD		EKD	
	r	*p-value*	*r*	*p-value*	*r*	*p-value*	*r*	*p-value*	*r*	*p-value*
Duration KD	-0.018	0.875	0.090	0.425	0.193	0.085	0.044	0.696	0.126	0.262
Dialysis Vintage	0.083	0.460	0.114	0.311	0.272*	0.014	0.023	0.160	0.160	0.155

Physical component score (PCS); *Mental component score* (MCS); *Burden of Kidney Disease* (BKD)*; Symptoms/Problems of Kidney Disease* (SPKD); *Effect of Kidney Disease* (EKD); *Duration of kidney disease* (duration KD)

*Correlation is significant at the 0.05 level (2-tailed)

Table 4.7.5: Spearman's Rank Order correlation coefficient between clinical factors (duration of dialysis each time) with domain of KDQOL-36 among subjects (n=81)

Variable	PCS		MCS		BKD		SPKD		EKD	
	r	*p-value*	*r*	*p-value*	*r*	*p-value*	*r*	*p-value*	*r*	*p-value*
HD session per week	0.075	0.503	0.036	0.747	-0.041	0.718	0.032	0.775	0.097	0.391
HD duration each session	-0.034	0.763	0.119	0.290	0.109	0.517	0.152	0.176	0.213	0.056

Physical component score (PCS); *Mental component score* (MCS); *Burden of Kidney Disease* (BKD)*; Symptoms/Problems of Kidney Disease* (SPKD); *Effect of Kidney Disease* (EKD); *Hemodialysis session per week* (HD session per week); *Hemodialysis duration each session* (HD duration each session)

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Table 4.7.6 showed the correlations of presence of co-morbidities with different domains or subscales of HRQoL. Mean score on PCS was significantly lower among the hemodialysis presented with hyperlipidemia (34.18 ± 7.76 vs 38.72 ± 9.11; *t*=2.190, *p=0.031*). This finding was in line with previous study in Saudi Arabia (Mandoorah et al., 2014). In contrast, the present study failed to support recent studies whereby presence of hypertension impacted the physical items of QOL and overall HRQoL (Cha & Han, 2020; Visweswaran et al., 2020). On the other hand, even though the present study unable to echo presence of diabetes can impact HRQoL or its domains (Bayoumi et al., 2013; Cha & Han, 2020; Visweswaran et al., 2020), but the current results demonstrated a possible trend association between diabetes and PCS (p= 0.06). Congruent trend was found in another study whereby there was a possible trend between physical functioning and diabetes mellitus (*p=0.076)*. In response to hypertension, study discovered that coexisting CKD significantly affected HRQoL among hypertensive hemodialysis patients in pain or discomfort (Aslam et al., 2022). Among hemodialysis patients with diabetes mellitus, frequent blood glucose testing, insulin injections, burden of medication and hospitalization and dietary limitation had hugely influence them compared to end-stage renal disease patients without diabetes (Cha & Han, 2020; Kim et al., 2006). The researcher had no absolute answer for the finding's discrepancies, but the homogeneity of data with more than 70% and 40% of the subjects had hypertension and diabetes mellitus may restrict the exploration on the impact of hypertension and diabetes mellitus on HRQoL in the present study. More work is needed to delineate the above aspects.

Recent study showed patients with cardiovascular disease (CVD) had lower score of PCS as compared to their non-CVD counterparts (Cha & Han, 2020). Due to reduced cardiac function, patients with cardiovascular disease, such as coronary artery

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disease, heart failure, and arrhythmia, are limited in their physical activities, resulting in a lower QOL (Cha & Han, 2020). The present study failed to detect similar findings. Nonetheless, there was significant lower score on symptom and problems of kidney disease (SPKD) among patients with CVD (66.47 ± 19.43 vs 77.36 ± 17.50) This may be due to the high prevalence of subjects that suffered from itchy skin and dry skin, whereby the above two symptoms are commonly seen in cardiovascular diseases patients (Iklasson et al., 2015; Ponikowska et al., 2019). In addition, study concluded that anemia was a massive strain on chronic kidney disease patients (Hanna et al., 2020) and another study documented a negative correlated between anemia and physical QOL score (Wassef et al., 2018). Nevertheless, present analysis only found a possible trend between anemia and SPKD (*t*=-1.784, *p*=0.084). Fail of demonstrating the correlation between anemia and domains of KDQOL-36 may due to the extremely small proportion of subjects with anemia in this study. Similar scenario was observed for cancer. Further study is warrant to investigate the association of cancer and anemia on HRQoL among hemodialysis patients.

Table 4.7.6: Independent samples t-test between clinical factors (comorbidities) with domain of KDQOL-36 among subjects (n=81)

Variable	PCS		MCS		BKD		SPKD		EKD	
	t value	*p-value*	t value	*p-value*	t value	*p-value*	t value	*p-value*	t value	*p-value*
Comorbidities										
Hypertension	0.443	0.659	0.878	0.383	0.937	0.351	-0.375	0.709	1.346	0.182
Diabetes Mellitus	1.905	0.060	-0.855	0.395	1.098	0.276	0.591	0.556	0.992	0.324
Hyperlipidemia	2.190*	0.031	-0.800	0.426	0.978	0.332	0.112	0.911	-1.807	0.076
Cardiovascular disease	1.929	0.057	0.949	0.346	0.277	0.783	2.385	0.019*	1.667	0.100
Cancer	-0.386	0.700	0.236	0.814	0.210	0.834	0.351	0.727	1.974	0.052
Anemia	-0.583	0.561	-0.846	0.400	-0.984	0.328	-1.748	0.084	-0.460	0.704

Physical component score (PCS); *Mental component score* (MCS); *Burden of Kidney Disease* (BKD)*; Symptoms/Problems of Kidney Disease* (SPKD); *Effect of Kidney Disease* (EKD)

*Correlation is significant at the 0.05 level (2-tailed)

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$H_0$3: There were no significant associations between personal factors and health-related quality of life among hemodialysis patients

Table 4.7.7 depicted the association of nutritional status and sleep quality with HRQoL during hemodialysis and non-hemodialysis day. Current findings successfully illustrated that nutritional status of hemodialysis patient was significantly correlated with mental component score (MCS) (r=0.228, $p=0.041$). A recent publication highlighted the importance of nutritional status in its associations with symptoms/problems of kidney disease (SPKD), effect of kidney disease (EKD), burden of kidney disease (BKD), physical component score (PCS) and MCS of dialysis patients (Visiedo et al., 2022). It is worth noting that findings were inconsistent across available studies, at which a negative correlation was observed between nutritional status with physical and psychological component (Melissa et al., 2018). The later study (Melissa et al., 2018) used different instruments to quantify QOL (WHOQOL-BREF) and nutritional status (Dialysis malnutrition score, DMS), hence limit the direct comparison between studies.

There were significant negative correlations between sleep quality with all the subscales of HRQoL, with the exception on PCS. The lower the global score of sleep quality indicating the better the sleep quality. Hence, the negative correlations can be elucidated by the lower global score of sleep quality, the better the HRQoL of hemodialysis patients. Similar trends were observed regardless of whether on hemodialysis or non-hemodialysis day, and such findings were consistent with other studies (Parvan et al., 2013; Shen et al., 2016).

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Table 4.7.7: Pearson's product moment correlation between personal factors (nutritional status, sleep quality) with domain of KDQOL-36 among subjects (n=81)

Variable	PCS		MCS		BKD		SPKD		EKD	
	r	*p-value*	*r*	*p-value*	*r*	*p-value*	*r*	*p-value*	*r*	*p-value*
NS	0.053	0.637	0.228*	0.041	0.167	0.136	0.146	0.192	0.285	0.002
SQ (H)	-0.149	0.186	-0.370**	0.001	-0.350**	0.001	-0.431**	0.000	-0.366**	0.001
SQ (N)	-0.187	0.094	-0.342**	0.002	-0.347**	0.001	-0.422**	0.000	-0.339**	0.002

Physical component score (PCS); *Mental component score* (MCS); *Burden of Kidney Disease* (BKD)*; Symptoms/Problems of Kidney Disease* (SPKD); *Effect of Kidney Disease* (EKD); *Nutritional status* (NS); *Sleep quality* (SQ); *Hemodialysis day* (H); *Non-hemodialysis day* (N)

*Correlation is significant at the 0.05 level (2-tailed)

**Correlation is significant at the 0.01 level (2-tailed)

*Correlation is significant at the 0.05 level (2-tailed)

Independent samples t-tests were conducted to compare sleep latency with HRQoL of subjects. As shown in Table 4.7.7, sleep latency was correlated with poorer MCS (*t*=2.312, *p=0.024)*, BKD (*t*=2.071, *p=0.045)*, and SPKD (*t*=3.090, *p=0.003)*. The score of MCS, BKD and SPKD was statistically higher among patients without sleep latency, indicating that patients who can fall asleep within 30 minutes had better MCS, BKD and SPKD in contrast to those who had sleep latency more than 30 minutes. In addition, it is worth noting that 5 domains of KDQOL-36 were correlated to sleep disturbance, whereby patients without sleep disturbance had better health - related quality of life compared to those with sleep disturbance. These findings showed sleep disturbance was a strong indicator when determining HRQOL of hemodialysis patients. Furthermore, BKD was correlated to the use of sleep medication among hemodialysis patients (*t*=4.318, *p=0.001*), whereby mean score of BKD was lower among patients who use sleep medication (9.37 ± 12.96) compared to non-users (37.00 ± 31.14). Daytime dysfunction were significantly associated with lower SPKD (*t*=2.361, *p=0.021)* and EKD (*t*=2.761, *p=0.007)*, indicating that

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daytime dysfunction is one of the components which can influence SPKD and EKD of patients.

As shown in Table 4.7.9, it is interesting to note that while sleep duration was associated with PCS (F(2,78)=4.658, *p*=0.012), SPKD (F(2,78)=7.364, *p*=0.001) and EKD (H(2)11.779, *p*=0.003), patients with shorter sleep duration (less than 5 hours) and longer (more than 7 hours) were correlated with higher PCS during hemodialysis day. This statement was supported by the lower PCS of patients who slept 5-7 hours (33.07 ± 8.36) in comparison to the two groups mentioned before. In addition, patients with longer sleep duration had better SPKD compared to those who slept less than 7 hours, consistent results were reported during non-hemodialysis days. Higher EKD was reported among patients who slept more than 7 hours compared to those who slept less than 5 hours, suggesting that longer sleep duration has a positive association to EKD.

Table 4.7.8: Independent samples t-test between personal factors (component of sleep quality) with domain of KDQOL-36 among subjects (n=81)

Variable	PCS		MCS		BKD		SPKD		EKD	
	t value	*p-value*	t value	*p-value*	t value	*p-value*	t value	*p-value*	t value	*p-value*
SSQ	0.490	0.366	0.805	0.423	1.788[a]	0.08	1.817	0.073	1.183	0.240
Hemodialysis Day										
SLatency	1.701	0.093	2.312[a]*	0.024	2.071[a]*	0.045	3.090*	0.003	1.228	0.223
SEficiency	0.339	0.736	1.895[a]	0.063	0.729	0.468	1.811	0.074	1.318	0.191
Non hemodialysis day										
SLatency	1.701	0.093	2.312[a]*	0.024	2.071[a]*	0.045	3.090*	0.003	1.228	0.223
SEficiency	1.248	0.216	1.816[a]	0.075	0.870	0.387	1.957	0.054	1.488	0.141
SDisturbance	5.396[a]*	0.000	3.203[a]*	0.005	5.213*	0.000	7.159[a]*	0.000	6.205[a]*	0.000
Use of medication	-0.182	0.856	1.246[a]	0.265	4.318[a]*	0.001	1.375	0.173	0.096	0.924

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Daytime Dysfunction	1.340	0.184	1.891[a]	0.062	1.975	0.052	2.361*	0.021	2.761*	0.007

Note: Physical component score (PCS); *Mental component score* (MCS); *Burden of Kidney Disease* (BKD)*; Symptoms/Problems of Kidney Disease* (SPKD); *Effect of Kidney Disease* (EKD); *Subjective sleep quality* (SSQ); *Sleep latency* (SLatency); *Sleep efficiency* (SEfficiency); *Sleep disturbance* (SDisturbance)

[a] Equal variances not assumed

*Correlation is significant at the 0.05 level (2-tailed)

Table 4.7.9: One-way Anova between sleep duration with domain of KDQOL-36 among subjects (n=81)

Variable	PCS		MCS		BKD		SPKD		EKD	
	F value	*p-value*	F value	*p-value*	F value	*p-value*	F value	*p-value*	F value	*p-value*
Hemodialysis day										
SDuration	4.658*	0.012	H(2)=4.193	0.123	1.186	0.311	7.364*	0.001	H(2)11.779*	0.003
Non hemodialysis day										
SDuration	2.694	0.074	1.695	0.190	H(2)1.355	0.508	5.508*	0.006	3.179*	0.047

Note:Physical component score (PCS); *Mental component score* (MCS); *Burden of Kidney Disease* (BKD)*; Symptoms/Problems of Kidney Disease* (SPKD); *Effect of Kidney Disease* (EKD); *Sleep duration* (SDuration)

*Correlation is significant at the 0.05 level (2-tailed)

Table 4.7.10: Correlations of components of sleep quality with Health-related Quality of Life among subjects (n-81)

Variable	PCS	MCS	BKD	SPKD	EKD
SLatency					
With	-	48.95 ± 12.27	29.54 ± 26.14	70.38 ± 18.46	-
Without	-	54.80 ± 9.77	46.39 ± 37.38	83.33 ± 15.62	-
SDisturbance					
With	36.24 ± 8.67	50.10 ± 12.10	29.79 ± 27.43	72.35 ± 18.12	62.07 ± 25.50
Without	46.62 ± 4.63	57.50 ± 5.16	82.03± 20.71	94.53 ± 6.39	92.19 ± 10.83
Hemodialysis day					
SDuration					
>7 hours	39.26 ± 7.88	-	-	83.59 ± 14.92	-
5-7 hours	33.07± 8.36	-	-	67.95 ± 16.46	-
<5 hours	39.24 ± 7.88	-	-	69.38 ± 20.71	-
Non-Hemodialysis day					
SDuration					
>7 hours	-	-	-	81.25 ± 15.02	70.11 ± 24.01
5-7 hours	-	-	-	67.84± 18.14	66.85 ± 24.00
<5 hours	-	-	-	68.86 ± 21.43	52.47 ± 29.34
Use of medication					
With	-	-	9.37 ± 12.96	-	-

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Without	-	-	37.00 ± 31.14	-	-
Daytime Dysfunction					
With	-	-	-	69.87 ± 19.13	57.47 ± 25.92
Without	-	-	-	79.32 ± 16.81	72.81 ± 24.03

$H_0$4: There were no significant associations between anthropometry parameters and health-related quality of life among hemodialysis patients

There was a weak negative but significant association between body mass index (BMI) with symptoms/problems of kidney disease (SPKD) (r=-0.385, p=0.000) and effect of kidney disease (EKD) (r=-0.335, p=0.002), indicating that the higher the body mass index (BMI), the lower the score of and SPKD and EKD. Current findings were partially compatible with another study which had successfully demonstrated significant associations between BMI with physical component score (PCS) (in normal range), SPKD and EKD (obese range) (Zimbudzi et al., 2016). Besides, these data were in line with a recent study that reported no association between BMI, physical functioning and mental health (Al Salmi et al., 2021) To note, a recent study reported the relationship between obesity and HRQoL in the CKD cohort was only limited to the mobility dimension of EuroQol five-dimension scale questionnaire (EQ-5D) whereby obesity had reduced mobility significantly in both general and CKD populations (Suh et al., 2020). More interestingly, study found that as kidney function deteriorated, the impact of obesity on HRQoL was significantly reduced (Suh et al., 2020). Anthropometrically as defined by obesity has limitations in predicting HRQoL in CKD patients, and hence the importance of metabolic status based on laboratory data as well as inflammation which substantially related with low HRQoL are crucial (Fouque et al., 2008; Suh et al., 2020; Yun et al., 2018).

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While majority of the studies successfully revealed the correlation between interdialytic weight gain (IDWG) and QOL (Bayhakki et al., 2021; Kahraman et al., 2015; Visweswaran et al., 2020), the present study failed to demonstrate significant association between IDWG and HRQoL, but was coherent with another study in India (Veerappan & Arvind, 2012). The disparity in results could be explained by variances in IDWG used and its cut-offs (Bayhakki et al., 2021; Visweswaran et al., 2020; Kahraman et al., 2015; Veerappan & Arvind, 2012).

Table 4.7.11: Correlation between anthropometry parameters (BMI, IDWG) with domain of KDQOL-36 among subjects (n=81)

Variable	PCS		MCS		BKD		SPKD		EKD	
	r	*p-value*	*r*	*p-value*	*r*	*p-value*	*r*	*p-value*	*r*	*p-value*
BMI	0.010	0.931	-0.141	0.210	-0.086	0.446	-0.385**	0.000	-0.335**	0.002
IDWG	0.012	0.917	-0.115	0.305	0.015	0.895	0.063	0.575	0.001	0.994

Physical component score (PCS); *Mental component score* (MCS); *Burden of Kidney Disease* (BKD)*; Symptoms/Problems of Kidney Disease* (SPKD); *Effect of Kidney Disease* (EKD); *Body mass index* (BMI); *Interdialytic weight gain* (IDWG)

**Correlation is significant at the 0.01 level (2-tailed)

$H_0$5: There were no significant associations between psychological factors and health-related quality of life among hemodialysis patients

Current findings illustrated that there were significant moderate negative correlations between anxiety with mental component score (MCS) (r=-0.564, p=0.000) and symptoms/problems of kidney disease (SPKD) (r=-0.502, p=0.000). In addition, there were weak but significant negative correlations between anxiety with burden of kidney disease (BKD) (r=-0.389, p=0.000) and effect of kidney disease (EKD) (r=-0.345, p=0.002). There was no significant association between anxiety and physical component score (PCS) (r=-0.142, p=207). The above findings (with exception on PCS) showed that the lower the anxiety, the higher the quality of life on individual

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domains of HRQoL, which were in congruence with other studies (Al‐Nashri & Almutary, 2021; Jalal et al., 2019; Ottaviani et al., 2016).

On the other hand, there were weak or moderate negative correlations between depression and SPKD (r=-0.404, p=0.000), PCS (r=-0.273, p=0.014), MSC (r=-0.347, p=0.001), BKD (r=-0.340, p=0.002) and EKD (r=-0.345, p=0.002). In general, the present study showed the lower the depression, the higher the quality of life on individual domains of HRQoL. These findings were in agreement with earlier studies (Al‐Nashri & Almutary, 2021; Shahrin et al., 2019). The high prevalence of depressive symptoms among hemodialysis patients could be due to the influence of unemployment, low income, and severe changes in one's life as a result of spending roughly 3 hours per day for hemodialysis treatment (Ganu et al., 2018). Another study reported the limitations of social activity imposed by hospital visits and treatment, as well as distinct psychological characteristics were among the leading causes of depression among hemodialysis patients (Takahashi et al., 2020).

There were growing evidence that depression and anxiety were negatively associated with QOL (Ćwiek et al., 2017; Elhadad et al., 2020; Kang et al., 2015; Khan et al., 2019; Semaan et al., 2018). According to a meta-analysis, anxiety and depression were independent variables for QOL (García-Llana et al., 2014), alerting the importance of health professional to pay attention on this issue.

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Table 4.7.12: Pearson's product moment correlation between psychological factors (anxiety, depression) with domain of KDQOL-36 among subjects (n=81)

Variable	PCS		MCS		BKD		SPKD		EKD	
	r	*p-value*	*r*	*p-value*	*r*	*p-value*	*r*	*p-value*	*r*	*p-value*
Anxiety	-0.142	0.207	-0.564**	0.000	-0.389**	0.000	-0.502**	0.000	-0.345**	0.002
Depression	-0.273	0.014*	-0.347**	0.001	-0.340**	0.002	-0.404**	0.000	-0.345**	0.002

Note:Physical component score (PCS); *Mental component score* (MCS); *Burden of Kidney Disease* (BKD)*; Symptoms/Problems of Kidney Disease* (SPKD); *Effect of Kidney Disease* (EKD)

*Correlation is significant at the 0.05 level (2-tailed)

**Correlation is significant at the 0.01 level (2-tailed)

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CHAPTER FIVE

CONCLUSION, STRENGTHS, LIMITATIONS AND RECOMMENDATIONS

5.1 Conclusion

The study depicted a comparable data of KDQoL of hemodialysis patients during COVID-19 pandemic and before COVID-19 pandemic. Using KDQOL-36 as the instrument to quantify health-related quality of life, this finding found that hemodialysis patients in Malaysia had a better score in symptoms and problems of kidney disease (SPKD) while burden of kidney disease subscale (BKD) ranked the lowest during COVID-19 pandemic, echo the findings of other studies before and during COVID-19 pandemic. Moreover, This study found that BMI, nutritional status, sleep quality, depression and anxiety was associated with domains of KDQOL-36. Protein energy malnutrition was prevalent among the subjects. Coherent with previous studies, poor sleep quality especially sleep latency and sleep in-efficient was evident. Sleep problem is not routinely monitored by clinical health care team, the growing evidence on its impact on health-related quality of life among hemodialysis patients however signify proper monitoring and intervention are needed. While the relatively low prevalence of depression and anxiety among the subjects should be interpreted cautiously, the correlations of the above variables with HRQoL among the hemodialysis patients deserve further work. It is worth noting that clinical factors including presence of hyperlipidemia and cardiovascular disease were correlated to physical component score (PCS) and SPKD respectively, while possible trends were observed between diabetes mellitus and PCS, and anemia and SPKD. To the best of

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knowledge, there was no intervention studies on how the improvement of clinical factors may augment HRQoL. Considering the long term impacts of HRQoL on hemodialysis patients, such intervention is worthy.

5.2 Strength

To the best of understanding, this is the first study in Malaysia investigating the health-related quality of life (HRQOL) of hemodialysis patient during COVID-19 pandemic. The findings of present study generated valuable insights and information about hemodialysis patient during this pandemic. Under the grim situation, this study able to conduct physically face-to-face interview with subjects by fully following the standard operating procedure. This encouraged subjects to have a better understanding on the questionnaire and provide more reliable data when they can rectified their doubts on questionnaire with the researcher.

5.3 Limitations

There were a few flaws that require acknowledgements in the present study. To begin with, this study was conducted in only two settings, limiting its generalizability to whole Malaysia. Next, most of the subjects unable to answer the questionnaire by themselves whereas they are illiteracy, presbyopia or drained due to the hemodialysis therapy. The study is highly reliant on subjects' honesty and literacy levels. Therefore, it is feasible that the subjects provide misleading and socially desirable answer to accessors.

5.4 Recommendation

More studies about HRQOL of hemodialysis patients in Malaysia during COVID-19 is deem needed to ascertain the current situation and influence of pandemic to hemodialysis patient. A large-scale study which including rural area and

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urban area with Malaysian from different states should conducted locally, to generate a more conclusive conclusion on the health-related quality of life (HRQOL) of hemodialysis patient during COVID-19 pandemic. Further research about this issue should focus on establishing strategies and intervention for all variables that contribute to inferior HRQOL in hemodialysis patients. Highlighted the HRQOL indicators to healthcare professionals and policy maker to ensure pertinence plan of action or policies that benefit hemodialysis patients can be develop. Last but not least, even though Malaysia's government had lifted the movement control order (MCO) and people are gradually get used to live under COVID-19, the HRQOL of hemodialysis patients is also worthy of more attention from researchers, to ensure the patients are living a more fulfilling life but not merely surviving.

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Appendix A: JKEUPM APPROVAL LETTER

Ref. no: UPM/TNCPI/RMC/JKEUPM/1.4.18.2 (JKEUPM)
Date: 09 February 2022

Dear Prof./Dr./Mr./Ms.,

APPLICATION FOR JKEUPM ETHICAL CLEARANCE: APPROVED

With reference to the above, I am pleased to inform you that your application for ethical clearance for the research project entitled **'ASSOCIATIONS OF SOCIO-DEMOGRAPHIC CHARACTERISTICS, CLINICAL FACTORS, ANTHROPOMETRY PARAMETERS, PERSONAL FACTORS, AND PSYCHOLOGICAL FACTORS WITH HEALTH-RELATED QUALITY OF LIFE OF HEMODIALYSIS PATIENTS IN SELANGOR DURING COVID-19 PANDEMIC'** has been approved.

The approval is **valid from 09 FEBRUARY 2022 until 09 FEBRUARY 2023**.

Please note that the official letter of approval will be issued as soon as possible. However, the ethical clearance is considered effective from the date of this email, and you may now proceed with your research.

Kindly remind the ethical approval is required in the case of amendments/ changes to the study documents/ study sites/ study team.

Researchers should also complete a Study Final Report upon study completion. The form can be obtained from the Ethics Committee for Research Involving Human Subjects (JKEUPM) website (http://www.tncpi.upm.edu.my/faildokumen).

If you have any enquiries, please contact at number 03-97691244/1602.

Note: Please use this reference number for any transaction:- **JKEUPM-2021-879**

Thank you.

Yours faithfully,

Prof. Dr. Zamberi Sekawi
Chair
Ethics Committee for Research Involving Human Subjects
Universiti Putra Malaysia

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Appendix D: Respondent's Information Sheet

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

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 us.

1. STUDY TITLE:

Fluid adherence and health-related quality of life among hemodialysis patients during COVID-19 pandemic.

2. INTRODUCTION:

Patients with chronic kidney disease may require renal replacement therapy in the form of kidney transplant or dialysis such as hemodialysis treatment. Chronic kidney disease patients on hemodialysis may have impaired Health-related Quality of Life (HRQoL) which is an important factors that determine treatment effectiveness in dialysis patients. At the same time, fluid adherence among HD patients is often unsatisfactory and has been recognized as the most difficult regimens to follow. Failure to adhere to fluid recommendation increases risk of health complications and comorbidities such as cardiovascular disease, which account for up to 50% fatalities. Hence, this study aims to determine the HRQoL and fluid adherence among HD patients and to explore the possible associations between the above with selected variables among hemodialysis patients in Selangor.

3. WHAT WILL YOU HAVE TO DO?

You are invited to participate in an online survey. We would like to obtain the following information from you:

a. Sociodemographic characteristics (Age, gender, ethnic, marital status, change of household income during COVID-19 pandemic, change of employment status during COVID-19 pandemic)
b. Clinical factors (Diseases, duration of kidney disease, duration of hemodialysis, frequency of dialysis per week and duration of dialysis each time)
c. Anthropometry parameters (dry weight, height, weight gain in between dialysis)
d. Personal factors (Sleep quality, nutritional status)
e. Psychological factor (Depression, anxiety)
f. Self-efficacy factor

An estimated of 30 minutes is required to complete the online questionnaire.

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Your involvement is entirely at your discretion. You have the right to withdraw from this research at any time without giving any reasons. No compensation will be given. We would like to obtain a consent from you. Please clarify your agreement to participate in this study by answering "YES" on the first page of the Google Form's question "Do you consent to participate in this study?" after reading this information sheet.

4. WHO SHOULD NOT PARTICIPATE IN THE STUDY?

If you are one of the following, your involvement is not appropriate:

1. Non-Malaysian
2. Pregnant women
3. Patient with handicapped and physical disabilities
4. Patients had been hospitalised for the past three months
5. Diagnosed with major psychological disorder such as dementia

5. WHAT WILL BE THE BENEFITS OF THE STUDY:

(a) TO YOU AS THE SUBJECT?

You will not be compensated for your participation, but with the participation in the study, you will have a better insight about your nutritional status, health status and quality of life and status of fluid adherence.

(b) TO THE INVESTIGATOR?

Approximately 90 hemodialysis patients will be included in this study. This study can provide some insight on HRQoL, fluid adherence and their associations with other factors. Moreover, the study findings enable relevant experts, allowing them to identify populations at risk of poor HRQoL and fluid adherence, assisting them in developing personalized intervention strategies. Furthermore, identifying characteristics that contribute to HRQoL and fluid adherence would undoubtedly aid policymakers in developing and formulating appropriate health policies that will benefit hemodialysis patients.

6. WHAT ARE THE POSSIBLE RISKS?

There will be no risks associated with the research.

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

All the information collected is used for academic purposes only and will be kept confidentially. No individual description will be made in any part of the research.

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

The study has been approved by the Ethics Committee for Research Involving Human Subjects UPM (JKEUPM) Review Panel, which can be reached at the following address for information on study participant rights, 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

If you have any inquiries about this study, please contact the researcher of the study Miss Chia Jing Pei at 011-35562836 (201939@student.upm.edu.my) or Tay Chin Yee at 018-9654008 (011-35562836 (203152@student.upm.edu.my) Or their supervisor, Professor Dr. Chan Yoke Mun (cym@upm.edu.my).

*Please initial here if you have read and understood the contents of this page*_____

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Appendix E: Informed Consent Form

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 ……
(Respondent)

Date :……..

Phone number: ……..

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Appendix F: Questionnaire

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FACULTY OF MEDICINE AND HEALTH SICENCES

DEPARTMENT OF DIETETICS

Questionnaire

Research Title:

Associations of socio-demographic characteristics, clinical factors, anthropometry parameters, personal factors and psychological factors with Health-Related Quality of Life of hemodialysis patients in Selangor during COVID-19 pandemic.

Researcher's Name	:	Chia Jing Pei
Matric Number	:	201939
Program	:	B.SC. (Dietetics)
Supervisor's Name	:	Professor Dr. Chan Yoke Mun

Your personal information given in this questionnaire is for research purpose only. It will be kept strictly private and confidential. Your questionnaire is needed to be returned to the researcher. Thank you for your cooperation.

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Part A

Instructions: The questions in this part will be asking about the socio demographic characteristics of the subject. Fill in the blanks or ticks (✓) in the space provided.

	Information	Answer
1.	Gender	☐Male ☐Female
2.	Age	____ (years old)
3.	Birth data	____ / ____ / _____ (day/month/year)
4.	Ethnicity	☐Malay ☐Chinese ☐Indian ☐Others: _____
5.	Change of income	☐<RM0 ☐RM0-RM500 ☐RM500-RM1000 ☐RM1000-RM1500 ☐>RM1500
6.	Change of employment status	☐Unemployed before COVID-19 ☐Unemployed during COVID-19 ☐Remain employed

Part B

Instructions: The questions in this part will be asking about comorbidities of the subject. Fill in the blanks or ticks (✓) in the space provided. More than one choice is allowed.

Type 2 Diabetes Mellitus	☐
Hypertension	☐
Hyperlipidemia	☐
Peripheral vascular disease	☐
Cardiovascular disease	☐
Other (Please state down the complications)	_____

Duration of Kidney Disease (year / month)	year month
Duration of Dialysis (year / month)	year month
Frequency of dialysis per week	
Duration of dialysis each time	hour minute

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Part C

Instructions: The questions in this part will be asking about anthropometry parameter (Interdialytic Weight Gain, Body Mass Index) of the subject. Fill in the blanks or ticks (✓) in the space provided. **Interdialytic Weight Gain**

Date	**Weight before**	**Weight after**
Dry Weight (kg)		

Body Mass Index

Height (m)	
Dry Weight (kg)	

Part D: Pittsburgh Sleep Quality Index

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

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

_____

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

_____

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

_____

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

_____

5.	During the past month, how often have you had Not during Less than Once or Three or more trouble sleeping because you…	**Not during the past month**	**Less than once a week**	**Once or twice a week**	**Three or more times a week**
a.	Cannot get to sleep within 30 minutes				
b.	Wake up in the middle of the night or early morning				
c.	Have to get up to use the bathroom				
d.	Cannot breathe comfortably				
e.	Cough or snore loudly				
f.	Feel too cold				

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g.	Feel too hot				
h.	Have bad dreams				
i.	Have pain				
j.	Other reason(s), please describe:				
6.	During the past month, how often have you taken medicine to help you sleep (prescribed or "over the counter")?				
7.	During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?				
		No problem at all	**Only a very slight problem**	**Somewhat of a problem**	**A very big problem**
8.	During the past month, how much of a problem has it been for you to keep up enough enthusiasm to get things done?				
		Very good	**Fairly good**	**Fairly bad**	**Very bad**
9.	During the past month, how would you rate your sleep quality overall?				

Part E: Mini Nutritional Assessment – Short Form (MNA-SF)

Complete the screening by filling in the boxes with the appropriate numbers. Total the number for the final screening score.

A	Has food intake declined over the past 3 months due to loss of appetite, digestive problems, chewing or swallowing difficulties? 0 = severe decrease in food intake 1 = moderate decrease in food intake 2 = no decrease in food intake [ ]
B	Weight loss during the last 3 months 0 = weight loss greater than 3kg 1 = does not know 2 = weight loss between 1 and 3 kg 3 = no weight loss [ ]
C	Mobility 0 = bed or chair bound 1 = able to get out of bed / chair but goes out 2 = goes out [ ]
D	Has suffered psychological stress or acute disease in the past 3 months?

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	0 = severe dementia or depression 1 = mild dementia 2 = no psychological problems [ ]
E	Neuropsychological problems 0 = severe dementia or depression 1 = mild dementia 2 = no psychological problems [ ]
F1	Body Mass Index (BMI) [(weight in kg) / (height in m^2)] 0 = BMI less than 19 1 = BMI 19 to less than 21 2 = BMI 21 less than 23 3 = BMI 23 or greater [ ]
Screening score (max 14 points) 12 - 14 points ☐ Normal nutrition status 8 -11 points ☐ At risk of malnutrition 0 - 7 points ☐ Malnourished	

Part F: Hospital Anxiety and Depression Scale (HADS)

Tick the box beside the reply that is closest to how you have been feeling in the past week. Don't take too long over you replies: your immediate is best.

1. I feel tense or 'wound up' ☐Most of the time ☐A lot of the time ☐From time to time, occasionally ☐Not at all
2. I still enjoy the things I used to enjoy ☐Definitely as much ☐Not quite so much ☐Only a little ☐Hardly at all
3. I get a sort of frightened feeling as if something awful is about to happen ☐Very definitely and quite badly ☐Yes, but not too badly ☐A little, but it doesn't worry me ☐Not at all
4. I can laugh and see the funny side of things ☐As much as I always could ☐Not quite so much now ☐Definitely not so much now ☐Not at all
5.Worrying thoughts go through my mind ☐A great deal of the time ☐A lot of the time ☐From time to time, but not too often

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☐Only occasionally
6. I feel cheerful ☐Not at all ☐Not often ☐Sometimes ☐Most of the time
7.I can sit at ease and feel relaxed ☐Definitely ☐Usually ☐Not Often ☐Not at all
8. I feel as if I am slowed down ☐Nearly all the time ☐Very often ☐Sometimes ☐Not at all
9.I get a sort of frightened feeling like 'butterflies' in the stomach ☐Not at all ☐Occasionally ☐Quite Often ☐Very Often
10. I have lost interest in my appearance ☐Definitely ☐I don't take as much care as I should ☐I may not take quite as much care ☐ No loss of interest – still as usual
11.I feel restless as I have to be on the move ☐Very much indeed ☐Quite a lot ☐Not very much ☐Not at all
12. I look forward with enjoyment to things ☐As much as I ever did ☐Rather less than I used to ☐Definitely less than I used to ☐Hardly at all
13. I get sudden feelings of panic ☐Very often indeed ☐Quite often ☐Not very often ☐Not at all

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14.I can enjoy a good book or radio or TV program ☐Often ☐Sometimes
☐Not often ☐Very seldom

Part G: Kidney Disease Quality of Life - 36 items (KDQOL-36)

This survey includes a wide variety of questions about your health and your life. We are interested in how you feel about each of these issues.

1.	**In general, would you say your health is:** **(Mark an (✓) in the one box that best describes your answer.)**	☐Excellent ☐Very good ☐Good ☐Fair ☐Poor
	The following items are about activities you might do during a typical day. Does your health now limit you in these activities? If so, how much? (Mark an (✓) in a box on each line.)	
2.	Moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf.	☐Yes, limited a lot ☐Yes, limited a little ☐No, not limited at all
3.	Climbing several flights of stairs	☐Yes, limited a lot ☐Yes, limited a little ☐No, not limited at all
	During the past 4 weeks, have you had any of the following problems with your work or other regular daily activities as a result of your physical health?	
4.	Accomplished less than you would like	☐Yes ☐No
5.	Were limited in the kind of work or other activities	☐Yes ☐No
	During the past 4 weeks, have you had any of the following problems with your work or other regular daily activities as a result of any emotional problems (such as feeling depressed or anxious)?	
6.	Accomplished less than you would like	☐Yes ☐No
7.	Didn't do work or other activities as carefully as usual.	☐Yes ☐No
8.	**During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the home and housework)?**	☐Not at all ☐A little bit ☐Moderately ☐Quite a bit ☐Extremely

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	These questions are about how you feel and how things have been with you during the past 4 weeks. For each question, please give the one answer that comes closest to the way you have been feeling. How much of the time during the past 4 weeks…	
6.	Have you felt calm and peaceful?	☐All of the time ☐Most of the time
		☐A good bit of the time ☐Some of the time ☐A little of the time ☐None of the time
7.	Did you have a lot of energy?	☐All of the time ☐Most of the time ☐A good bit of the time ☐Some of the time ☐A little of the time ☐None of the time
8.	Have you felt downhearted and blue?	☐All of the time ☐Most of the time ☐A good bit of the time ☐Some of the time ☐A little of the time ☐None of the time
9.	10. During the past 4 weeks, how much of the time has your physical health or emotional problems interfered with your social activities (like visiting with friends, relatives, etc.)?	☐All of the time ☐Most of the time ☐A good bit of the time ☐Some of the time ☐A little of the time ☐None of the time

How true or false is each of the following statements for you?

		Definitely true	**Mostly true**	**Don't know**	**Mostly false**	**Definitely false**
13.	My kidney disease interferes too much with my life					
14.	Too much of my time is spent dealing with my kidney disease					
15.	I feel frustrated dealing with my kidney disease					
16.	I feel like a burden on my family					

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		Not at all bothered	Somewhat bothered	Moderately bothered	Very much bothered	Extremely bothered
17.	Soreness in your muscles?					
18.	Chest pain?					
19.	Cramps?					
20.	Itchy skin?					
21.	Dry skin?					
22.	Shortness of breath?					
23.	Faintness or dizziness?					
24.	Lack of appetite?					
25.	Washed out or drained?					
26.	Numbness in hands or feet?					
27.	Nausea or upset stomach?					
28.	Problems with your access site?					

Some people are bothered by the effects of kidney disease on their daily life, while others are not. How much does kidney disease bother you in each of the following areas?

		Not at all bothered	Somewhat bothered	Moderately bothered	Very much bothered	Extremely bothered
29.	Fluid restriction?					
30.	Dietary restriction?					
31.	Your ability to work around the house?					
32.	Your ability to travel?					
33.	Being dependent on doctors and other medical staff?					
34.	Stress or worries caused by kidney disease?					
35.	Your sex life?					
36.	Your personal appearance?					

END OF QUESTIONNAIRE

THANK YOU FOR YOUR PARTICIPATION AND COOPERATION

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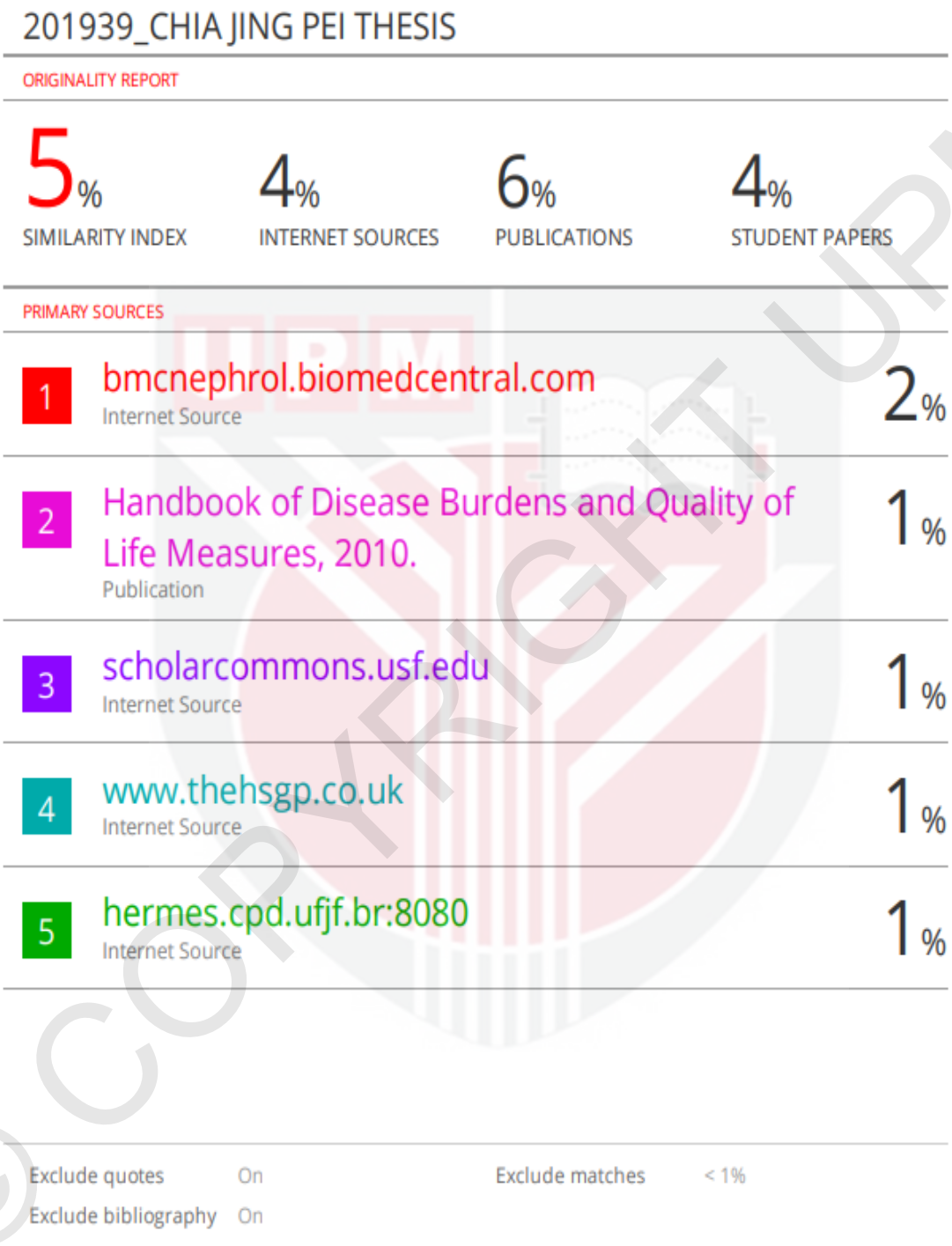
Appendix G: Turnitin Result



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5%	4%	6%	4%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	bmcnephrol.biomedcentral.com Internet Source	2%
2	Handbook of Disease Burdens and Quality of Life Measures, 2010. Publication	1%
3	scholarcommons.usf.edu Internet Source	1%
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