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USE OF 7-POINT SCALE SUBJECTIVE GLOBAL ASSESSMENT (SGA) TO ASSESS MALNUTRITION AMONG HAEMODIALYSIS PATIENTS IN SERI KEMBANGAN, SELANGOR

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BY

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

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List of Abbreviations

BIA	Bioelectrical Impedance Analysis
BMI	Body Mass Index
CKD	Chronic Kidney Disease
ESRD	End Stage Renal Disease
GFR	Glomerular Filtration Rate
IDWG	Inter-Dialytic Weight Gain
KDOQI	Kidney Disease Quality Outcome Initiative
MUAC	Mid Upper Arm Circumference
NKF	National Kidney Foundation
NKFM	National Kidney Foundation of Malaysia
NRR	National Renal Registry
SGA	Subjective Global Assessment
USRDS	United States Renal Data System

Abstract

USE OF 7-POINT SCALE SUBJECTIVE GLOBAL ASSESSMENT (SGA) TO ASSESS MALNUTRITION AMONG HAEMODIALYSIS PATIENTS IN SERI KEMBANGAN, SELANGOR

Mohammad Syafiq Md Ali

A cross sectional study was conducted to determine the prevalence of malnutrition assessed using 7- point scale Subjective Global Assessment (SGA) and its relationship with socio-demographic, health status, anthropometry, biochemicals and dietary intake. A total of 80 subjects were recruited from three haemodialysis centres in Seri Kembangan, Selangor. A set of interviewer-administered questionnaire was used to obtain the socio-demographic and health status data. Weight, height, Mid Upper Arm Circumference (MUAC), body fat percentage was measured after the dialysis session. Biochemical data including serum creatinine, calcium, phosphate, albumin, total protein, alkaline phosphatase (ALP), serum electrolytes, lipid profile, haemoglobin (Hb), total iron binding capacity (TIBC) and transferin were obtained from the medical reports. The dietary intake was assessed using 24-hour dietary recall. The 7-point scale SGA classified the subjects into well nourished, moderately malnourished and severely malnourished category. Subjects comprised of 49% male and 51% females with a mean age of 54.1±13.1 year old. Majority of the subjects were Malay (86%), followed by Indian (8%) and Chinese (6%). Fifty-six percent of the subjects were moderately malnourished and 44% were well nourished. Mean Body Mass Index (BMI) and energy intake of the subjects were 25.7±5.0 kg/m^2 and 17.4±7.8 kcal/kg/day respectively. The 7-point scale SGA showed significant correlation with BMI ($r=0.49$, $p<0.001$), MUAC ($r=0.52$, $p<0.001$), total body fat ($r=0.36$, $p<0.001$), percentage of body fat ($r=0.37$, $p<0.001$), serum creatinine ($r=0.33$, $p<0.001$), total protein ($r=0.23$, $p=0.04$) and ALP ($r=-0.23$, $p=0.04$). There were no significant correlation between socio-demographic, health status and dietary intake with the 7- point scale SGA. The use of 7-point scale SGA was able to determine the prevalence of malnutrition among the haemodialysis patients. A longitudinal study is required to further determine the mechanism between the associated factors and malnutrition.

Abstrak

PENGGUNAAN PENILAIAN SUBJEKTIF GLOBAL (7-SKALA) UNTUK MENILAI MALPEMAKANAN DALAM KALANGAN PESAKIT HEMODIALISIS DI SERI KEMBANGAN, SELANGOR

Mohammad Syafiq Md Ali

Kajian keratan rentas telah dilakukan untuk menilai pesakit hemodialisis yang mengalami malpemakanan dengan menggunakan penilaian subjektif global (7-skala). Kajian antara maklumat sosio demografi, taraf kesihatan, antropometri, biokimia dan pemakanan dengan status malpemakanan seperti yang dinilai menggunakan penilaian subjektif global (7-skala) telah dilakukan. Seramai 80 orang subjek dari tiga pusat hemodialisis di Seri Kembangan telah terlibat dengan kajian ini. Borang soal selidik telah digunakan untuk mengetahui maklumat sosio demografi dan taraf kesihatan subjek. Berat, tinggi, lilitan lengan (*MUAC*) dan peratusan lemak dalam badan telah diukur selepas subjek melakukan sesi hemodialisis. Maklumat biokimia seperti kandungan kreatinin, kalsium, fosforus, albumin, jumlah protein, fosfatase alkali, elektrolit, profil lemak, haemoglobin (*Hb*), jumlah besi-pengikat kapasiti (*TIBC*) dan transferin dalam darah telah direkod dari laporan perubatan subjek. Maklumat pemakanan telah diambil dengan menggunakan sejarah diet (*24-hour dietary recall*). Penilaian Subjektif Global (7-skala) telah mengklasifikasikan pesakit kepada tiada masalah malpemakanan, masalah malpemakanan sederhana dan masalah malpemakanan yang serius. Subjek terdiri daripada 49% lelaki dan 51% wanita dengan min umur 54.1±13.1. Subjek didominasi oleh kaum Melayu (86%), diikuti kaum India (8%) dan kaum Cina (6%). Peratusan subjek yang mengalami masalah malpemakanan sederhana adalah 56% dan 44% daripada subjek tidak mengalami masalah malpemakanan. Min BMI dan tenaga yang diambil seharian adalah 25.7±5.0 kg/m² dan 17.4±7.8 kkal/kg/hari. Penilaian Subjektif Global (7-skala) telah menunjukkan perkaitan dengan BMI ($r=0.49$, $p<0.001$), MUAC ($r=0.52$, $p<0.001$), jumlah lemak ($r=0.36$, $p<0.001$), peratusan lemak ($r=0.37$, $p<0.001$), kandungan kreatinin ($r=0.33$, $p<0.001$), jumlah protein ($r=0.23$, $p=0.04$) dan fosfatase alkali ($r=-0.23$, $p=0.04$). Tiada perkaitan antara maklumat sosio demografi, taraf kesihatan dan maklumat pemakanan dengan penilaian subjektif global (7-skala). Penilaian subjektif global (7-skala) dapat mengenal pasti pesakit hemodialisis yang mengalami masalah malpemakanan. Kajian jangka masa panjang diperlukan untuk mengetahui mekanisma antara faktor yang berkait dengan masalah malpemakanan.

CHAPTER 1

INTRODUCTION

1.1 Background

End-stage Renal Disease (ESRD) is an advanced stage of Chronic Kidney Disease (CKD) which requires individuals to commence dialysis (White, Cass, Atkins & Chadban, 2005). The prevalence of CKD and ESRD is increasing worldwide. In 2010, the prevalence of ESRD in Taiwan was 2,584 per million, while in Japan and the United States, the rates are 2,260 and 1,870 respectively (United States Renal Data System [USRDS], 2012). The number of ESRD in Malaysia has increased from 16,805 in 2006 to 25,411 in 2010 (USRDS, 2012). Since the prevalence of ESRD in Malaysia is increasing, the number of ESRD patients receiving dialysis treatment also increases (Malaysian Dialysis and Transplant Registry, 2013).

The common problem encountered by haemodialysis patients is malnutrition (Kalantar-Zadeh, Ikizler, Block, Avram & Kopple, 2003). There are several causes of malnutrition among haemodialysis patients which include inadequate food intake, hormonal and gastrointestinal disorders, dietary restrictions, drugs that alter nutrient absorption, insufficient dialysis, and presence of underlying disease such as diabetes and hypertension (Oliveira, Andrade, Acurcio, Cherchiglia & Correia, 2011). A study by Chan, Kelly, Batterham and Tapsell (2012) shows that haemodialysis

patients that are malnourished have higher risk of mortality. The prevalence of malnutrition among haemodialysis patient was increased over time (Kadiri, Nechba & Oualim, 2011). In Malaysia, the estimated prevalence of malnutrition among haemodialysis patients is more than 50% (Karupaiah et al., 2012).

Several methods should be used to assess the nutritional status of the haemodialysis patients concurrently. This is because no single method is able to detect malnutrition among haemodialysis patients accurately (Jones, Wolfenden & Wells, 2004). The common assessment methods include the use of Subjective Global Assessment (SGA), anthropometry measurement and biochemical value (Tayyem & Mrayyan, 2008). Other assessment methods that can be used are bioelectrical impedance analysis (BIA) and dual energy x-ray absorbtiometry (DEXA) but these methods are very costly (Chumlea, 2004).

SGA was originally developed by Detsky, McLaughlin and Baker (1987). The SGA has 4 components of a medical history (weight change, dietary intake, gastrointestinal symptoms, and functional impairment that is related to nutrition) and components of a physical examination which examine the signs of fat and muscle wasting, edema and ascites. The subject is then assigned a rating of well nourished (A), moderately undernourished (B), or severely undernourished (C) according to the overall data collected in all the components without having a rigid scoring system (Detsky et al., 1987).

1.2 Problem Statement

SGA was recommended by National Kidney Foundation (NKF) to assess malnutrition among adult dialysis population (NKF, 2000). A prospective study among 206 ESRD patients in Sweden highlighted that the SGA was not influenced

by gender and therefore it can be used as a suitable nutritional assessment tool among haemodialysis patients (Stenvinkel, Barany, Chung, Lindholm & Heimburger, 2002). Apart from that, a retrospective clinical cohort study in Sydney, Australia by Chan et al. (2012) revealed that malnutrition has an association with mortality and the malnutrition among haemodialysis patients can be diagnosed using the SGA. Meanwhile, a study by Jones et al. (2004) in 72 haemodialysis patients in York District Hospital, England found that the SGA may not be a reliable assessment tool because the SGA had not accurately classified the malnourished patients. Due to the inconsistent findings found in these studies, SGA was modified to enhance its reliability to assess nutritional status among haemodialysis patients.

This assessment tool has been modified into several types such as modified SGA (mSGA), 7-point scale SGA, dialysis malnutrition score (DMS), malnutrition inflammation score (MIS), and patient generated SGA (Steiber et al., 2004). In Malaysia, the original SGA had been used to assess the nutritional status of 90 haemodialysis patients that were recruited from Hospital Kuala Lumpur and dialysis centres of the National Kidney Foundation of Malaysia (Baizura, Chan, Zalilah & Choo, 2008). Apart from that, there is a study in Malaysia that compared the specificity of mSGA with the MIS among 155 haemodialysis patients and the result from that study shows that mSGA have greater sensitivity (Karupaiah et al., 2012). There is limited study in Malaysia that used the 7-point scale SGA to assess nutritional status of the haemodialysis patients. Hence, this study aims to determine the prevalence of malnutrition as well as to examine the relationship between socio-demographic factors, health status, anthropometry, biochemical data, dietary intake with the malnutrition assessed by 7-point scale SGA among haemodialysis patients in a selected haemodialysis unit in Seri Kembangan, Selangor.

1.3 Significance of the study

The present study will provide baseline data regarding the prevalence of malnutrition among haemodialysis patients in selected haemodialysis centre in Seri Kembangan, Selangor. Apart from that, this study will contribute to the body of knowledge about the 7-point scale SGA. Besides, the relationship between the socio-demographic, health status, anthropometry, biochemical data, dietary intake and the malnutrition assessed by the 7-point scale SGA can also be determined. Furthermore, the malnourished haemodialysis patients assessed by the SGA will provide important information on the potential nutritional interventions that can be taken to prevent the risk of morbidity and mortality among haemodialysis patients.

1.4 Research Questions

1. What is the prevalence of malnutrition among haemodialysis patients assessed using the 7-point scale SGA?

2. What are the relationships between socio-demographic, health status, anthropometry, biochemical data, dietary intake with malnutrition assessed using the 7-point scale SGA?

1.5 Objectives

1.5.1 General Objective:

To determine the prevalence of malnutrition and its associating factors among haemodialysis patients assessed using 7-point scale SGA.

1.5.1 Specific Objectives:

1. To determine the socio-demographic, health status, anthropometry,

biochemical data, dietary intake and malnutrition among haemodialysis patients.

2. To determine the relationship between socio-demographic, health status, anthropometry, biochemical data, dietary intake with malnutrition assessed using 7-point scale SGA.

1.6 Null Hypotheses

Ho1: There is no significant association between socio-demographic status, health status and the 7-point scale SGA.

Ho2: There is no significant correlation between anthropometric measurements and 7-point scale SGA.

Ho3: There is no significant correlation between biochemical measurements and 7-point scale SGA.

Ho4: There is no significant correlation between dietary intake and 7-point scale SGA.

1.7 Conceptual Framework

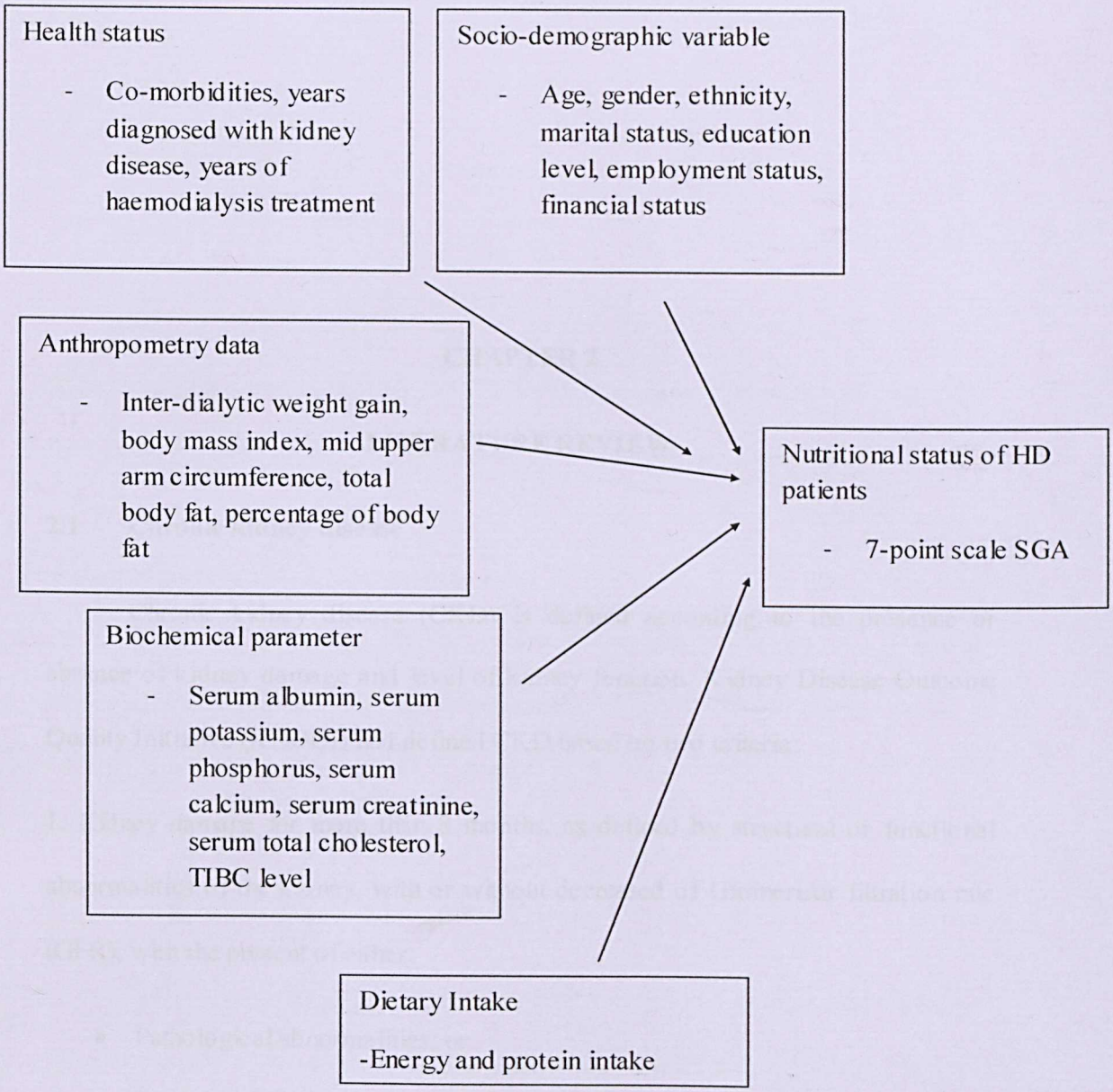

Figure 1.1: Conceptual framework for socio-demographic, health status, anthropometry, biochemical, dietary intake and 7-point scale SGA among haemodialysis patients in Seri Kembangan

CHAPTER 2

LITERATURE REVIEW

2.1 Chronic kidney disease

Chronic kidney disease (CKD) is defined according to the presence or absence of kidney damage and level of kidney function. Kidney Disease Outcome Quality Initiative (KDOQI) had defined CKD based on two criteria:

1. Kidney damage for more than 3 months, as defined by structural or functional abnormalities of the kidney, with or without decreased of Glomerular filtration rate (GFR), with the present of either:

- Pathological abnormalities; or
- Markers of kidney damage, including abnormalities in the composition of the blood or urine, or abnormalities in imaging tests

2. GFR is less than 60 mL/min/1.73m² for more than 3 months, with or without kidney damage

Table 2.1: Stages of chronic kidney disease (KDOQI)

Stage	Description	GFR (mL/min/1.73m²)
1	Kidney damage with normal or ↑GFR	≥ 90
2	Kidney damage with mild or ↓GFR	60-89
3	Moderate ↓ GFR	30-59
4	Severe ↓ GFR	15-29
5	Kidney failure	< 15 (or dialysis)

(Source: KDOQI, 2002)

GFR was the indicator to know the level of kidney function and determine the stage of kidney disease. GFR can be calculated from the blood creatinine level, age, body size and gender (National Kidney Foundation, 2014). In young men, the normal values are approximately 130 ml per minute per 1.73 m² and in young women, the normal values are 120 ml per minute per 1.73 m² (Stevens, Coresh, Greene & Levey, 2006). In the early stages of CKD, usually there will be no physical symptoms shown but the blood tests will shows abnormalities especially slightly elevated serum creatinine. In the ESRD, several prominent symptoms will be shown such as easy bleeding, fatigue, nausea, vomiting and itchy skin (National Kidney Centre, 2014).

2.2 Renal replacement therapy (RRT)

When GFR value drop to less than 15mL/min/1.73m², the functions of kidney only works 10-15% and the individual should starts RRT either by haemodialysis, peritoneal dialysis or renal transplant (White et al., 2005). Haemodialysis is a procedure used to maintain a patient with ESRD by using an artificial kidney machine or a dialysis machine to replace the excretory function of the failed kidneys (Victorian Renal Health, 2014). Blood from the patient is pumped from the body through special tubing to the dialysis machine, where it travels through the dialyser and back to the patient. The recommendation by KDOQI (2006) states that patients

should at least undergo haemodialysis treatment three times a week and with the minimum dialysis time of three hours each session.

In peritoneal dialysis session, the dialysing fluid is inserted into the peritoneal (abdominal) cavity at regular intervals, and the waste products diffuse into it. The peritoneum is the membrane that lines the abdominal cavity and it is across this membrane that the chemical exchange between the blood capillaries and the dialysing fluid takes place. After a period of time the dialysing fluid is drained from the cavity (Victorian Renal Health, 2014). There are three types of peritoneal dialysis which are continuous peritoneal dialysis (CAPD), continuous cyclic peritoneal dialysis (CCPD), and nocturnal intermittent peritoneal dialysis (NIPD) (McPhee & Papadakis, 2010). Patients on CAPD will exchange the dialysate four to six times in a day. In CCPD and NIPD, the dialysis treatment only done at night with the use of the cycler machine that automatically perform the treatment.

Kidney transplant is the most carried out transplantation globally and generally it is accepted as the best treatment both for quality of life and cost effectiveness (World Health Organization [WHO], 2014). Based on National Kidney Foundation Malaysia (NKFM), 2012, a transplant operation takes about 3 to 4 hours and is handled by healthcare professionals. The transplanted kidney is placed in the right or left side of the lower belly. The new kidney's artery and vein are joined to an artery and vein in the pelvic area. The urine tube (ureter) from the kidney is attached to the bladder. The challenge of renal transplantation was the rejection of the new organ by the recipients itself. From the year 1988, the use of immunosuppressive drugs in renal transplantation had improved the overall outcome (Hariharan et al., 2000). Usually, if the transplant works well for the first year, the chances for the transplanted kidney will function for many years to come is high. However, if the

first transplant fails, the second transplant usually will work and give better result (NKFM , 2012).

2.3 Malnutrition in haemodialysis patients

Malnutrition among haemodialysis patients is very common. There are many factors that contribute to the malnutrition among haemodialysis patients. A study done by Kadiri et al. (2011), found that advancing age, presence of cardiovascular disease (CVD), decreased fat mass, low serum albumin and severe anemia are several factors that contribute to the malnutrition. According to KDOQI, 2006, the dose of haemodialysis are expressed as (Kurea × Td)/ Vurea (abbreviated as Kt/V), where Kurea is the effective (delivered) dialyzer urea clearance in milliliters per minute integrated over the entire dialysis, Td is the time in minutes measured from beginning to end of dialysis, and Vurea is the patient's volume of urea distribution in milliliters. Low kt/v and less weekly dialysis time were also associated with malnutrition (Kadiri et al., 2011).

To evaluate nutritional status of the dialysis patients, there are various assessment that can be done. Several parameters such as body mass index (BMI), body fat mass, co-morbid disease, biochemical value (albumin, pre-albumin, transferrin, and other liver-derived proteins), and the use of SGA can be done to assess the nutritional status of the dialysis patients (Locatelli et al., 2002). SGA was developed originally to assess nutritional status among postoperative patients (Detsky et al., 1987). SGA is inexpensive, rapid to conduct, reproducible, valid and reliable and also can be used by different health care professional such as nurse, dietitians and physicians (Jones et al., 2004). Over time, SGA had been improved

and had been used among other patients such as haemodialysis patients (Steiber et al., 2004).

A review by Steiber et al. (2004) showed that original SGA had been modified into several types such as modified SGA (mSGA), 7-point scale SGA, dialysis malnutrition score (DMS), malnutrition inflammation score (MIS), and patient generated SGA. Modified SGA also known as DMS (Kalantar-Zadeh, Kleiner, Dunne, Lee, & Luft, 1999). DMS had 7 components that were given a numerical score which include weight change, dietary intake, Gastro Intestinal symptoms, functional capacity, comorbidity, subcutaneous fat stores, and signs of muscle wasting. Each feature was given a numerical score from 1 (normal) to 5 (very severe). The comorbidity score also included the time on dialysis and advanced age but the type of comorbidity was not accounted in the score. Kalantar-Zadeh et al., (1999) found that the DMS score correlated with mid-arm muscle circumference (MAMC), BMI, total iron binding capacity (TIBC), and serum albumin level.

60 haemodialysis patients in Australia had participated in a study conducted by Desbrow, Bauer, Blum, Kandasamy, McDonald, and Montgomery (2005). The study had used PG-SGA, anthropometric measurement (BMI, TSF, weight loss in the past 6 months, and MAMC) and albumin to assess nutritional status. According to the PG-SGA, 80% of the subjects were well nourished, 20% of them were moderately malnourished and none were seriously malnourished. The study did not find any significant correlation between the PG-SGA with the BMI, TSF and MAMC. Nevertheless, the researchers had found a significant correlation between PG-SGA with the percentage of weight loss in the past 6 months and with the serum albumin. This study found that PG-SGA showed a correlation with the

anthropometry measurement even though not many significant association was found.

The Malnutrition-Inflammation Score (MIS) is inexpensive and easy to use assessment tools to determine malnutrition and inflammation among haemodialysis patients. MIS had a score of 0 to 30 and it includes 7 components of the Subjective Global Assessment, with additional components of BMI, and serum albumin and transferrin concentrations. A 5 year cohort study was done by Rambod et al. (2009) to assess the nutritional status of haemodialysis patients by using the MIS. 809 stable haemodialysis outpatients were recruited and followed up for 5 years (October 2001 to December 2006). The study found that each 2-unit increase in MIS was associated with a 2-fold greater death risk. Besides, the MIS was associated with inflammation, nutritional status, quality of life of the haemodialysis patients.

2.4 Anthropometry Measurement

2.4.1 Body mass index

Body Mass Index (BMI) is a simple index of weight-for-height that is commonly used to classify underweight, overweight and obesity in adults. It is defined as the weight in kilograms divided by the square of the height in metres (kg/m^2).

Table 2.2: Classification of body mass index (BMI)

Classification	BMI (kg/m²)	
	Principal cut-off points	Additional cut-off points
Underweight	< 18.50	< 18.50
Severe thinness	<16.00	< 16.00
Moderate thinness	16.00 – 16.99	16.00 – 16.99
Mild thinness	17.00 – 18.49	17.00 – 18.49
Normal Range	18.50 – 24.99	18.50 – 22.99
		23.00 – 24.99
Overweight	≥ 25.00	≥ 25.00
Pre-obese	25.00 – 29.99	25.00 – 27.49
		27.50 – 29.99
Obese	≥ 30.00	≥ 30.00
Obese class I	30.00 – 34.99	30.00 – 32.49
		32.50 – 34.99
Obese class II	35.00 – 39.99	35.00 – 37.49
		37.50 – 39.99

(Source: WHO, 2014)

In the general population, a high body mass index (BMI; in kg/m²) is associated with increased risk of cardiovascular disease, diabetes and hypertension. In contrast, the effect of overweight or obesity in CKD patients undergoing maintenance haemodialysis (MHD) shows positive effect to the survival rate of the patients (Kalantar-Zadeh, Abbott & Salahudeen, 2005). Another study by Leavey, McCullough, and Hecking (2001) also found that increased in body sizes correlates with a decreased mortality risk among haemodialysis patients. Therefore, assessment of BMI can predict nutritional status among haemodialysis patients.

2.4.2 Mid upper arm circumference (MUAC)

MUAC is the circumference of the left upper arm, measured at the mid-point between the tip of the shoulder and the tip of the elbow (olecranon process and the acromium). To measure the MUAC, equipment such as measuring tape is needed. Bishop et al. (1981) had proposed the reference value for the anthropometrics (TSF and MUAC). MUAC value that is less than 5th percentile is considered as

malnourished. A study was done in South China regarding the assessment of nutritional status among haemodialysis patients using MUAC and mSGA (Chen et al. 2013). It was found that MUAC is an effective marker to assess nutritional status as it correlates well with mSGA.

2.5 Biochemical Parameters

2.5.1 Serum albumin

Albumin is a negatively charged, water-soluble protein that is synthesized in the liver. The functions is to maintain osmotic pressure and transport a variety of circulating molecules (Rothschild, Oratz, & Schreiber, 1988). Serum albumin levels are determined by rates of hepatic synthesis and secretion, exchanges between the intra and extra vascular compartments, lymphatic uptake, alterations in volume of distribution, protein degradation, and body losses. The factors that affect synthesis of albumin are nutritional intake and illness (Rothschild et al., 1975). In CKD patients, the level of serum albumin usually low due to reduction in the glomerular filtration rate which leads the patients to have hypoalbuminemia (Friedman & Fadem, 2010).

Serum albumin was widely used as an assessment tool in haemodialysis patients since it is one of the biochemical markers that can predict mortality (Iseki, Kawazoe & Fukiyama, 1993). According to the NKF, serum albumin equal to or greater than 4 g/dL is the outcome goal for the haemodialysis patients (NKF, 2000). Studies by Dewar, Soyibo & Barton (2012) had used SGA and correlate it with measured serum nutritional biomarkers. Besides, they also identified nutritional biomarkers that can be used to assess nutritional status of patients with ESRD. The study had found that low serum albumin and low serum cholesterol were associated with malnutrition among the ESRD patients. In other studies by Honda et al. (2006),

the multivariate analysis had showed serum albumin, interleukin-6 and C-reactive protein can predict malnutrition among patients with ESRD.

2.5.2 Serum creatinine

Creatinine is a chemical waste molecule that is generated from muscle metabolism. Muscle metabolism involves breakdown of creatine (molecule that give energy to muscle). Approximately 2% of the body's creatine is converted to creatinine every day. Creatinine is transported through the bloodstream to the kidneys. The kidneys filter out most of the creatinine and dispose of it in the urine. Creatinine has been found to be a fairly reliable indicator of kidney function. As the kidneys become impaired, the creatinine level will rise. Abnormally high levels of creatinine may indicate that there is malfunction or failure of the kidneys. The range for normal serum creatinine in adult is from 0.7 – 1.5 mg/dL or from 62 – 133 µmol/dL (Lee, 2009).

Low level of serum creatinine could result in poor outcome among dialysis patients (Kalantar-Zadeh, Block, Humphreys & Kopple, 2003). Pifer et al. (2002) had analyzed several nutritional indicators (mSGA, BMI, serum albumin, serum creatinine, normalized protein catabolic rate (nPCR), serum bicarbonate, lymphocyte count, nuetrophil count) with the outcome of the haemodialysis for six months. Result from Pifer study found that lower baseline measurements of mSGA, BMI, serum albumin, serum creatinine, and lymphocyte count were independently associated with significantly higher risk of mortality among the patients. A cross sectional study were done on 128 haemodialysis patients in Sweden to identify factors that can predicts malnutrition among haemodialysis patients (Qureshi et al., 1998). The study found that biochemical factors associated with malnutrition were

low serum levels of albumin and creatinine and low plasma levels of insulin-like growth factor 1 (IGF-1) and branched-chain amino acids (isoleucine, leucine and valine).

2.6 Dietary intake

2.6.1 Energy and protein requirement

According to NKF (2000), the recommended daily energy intake for a maintenance haemodialysis or chronic peritoneal dialysis patients is 35 kcal/kg body weight/day for those who are less than 60 years of age and at least 30-35 kcal/kg body weight/day for those who are 60 years of age or older. The recommended dietary protein intake for clinically stable maintenance haemodialysis patients is 1.2 g/kg body weight/day (NKF, 2000). Inadequate energy and protein intake among haemodialysis patients will lead to protein energy malnutrition which subsequently increase the mortality risk. Kopple (1997) stated that the three most important factors to cause protein-energy malnutrition in maintenance dialysis patients is the nutritional status of the patient before commencing dialysis therapy, inadequate protein and energy intakes after they become dialysis patients, and acute and chronic illnesses.

2.7 Nutritional Status of Haemodialysis Patients

2.7.1 Seven-point scale Subjective Global Assessment (SGA)

7-point scale SGA is an example of the modified SGA which has been developed in a multicentre study conducted in Canada and United States, Canada-USA (CANUSA) (Churchill, Taylor, & Keshaviah, 1996). The 7-point scale SGA had been tested by several researchers to evaluate its reliability and validity in

assessing nutritional status of the haemodialysis patients. The 7-point scale SGA had two sections: history and physical examination. History section contributed 60% while physical examination contributed about 40% from the overall score (McCann, 1999). The history has 5 sub-sections which evaluate weight changes, dietary intake, GI symptoms, functional capacity and disease state through a series of questions. Each section was rated between 1 and 7. The physical examination involved a visual assessment of muscle mass and fat stores. Scores of 1 or 2 indicated severe malnutrition, 3 or 4 or 5 indicated moderate malnutrition and scores of 6 or 7 indicated well nourished. Each section was assigned an individual score. The total score for the 7-point scale SGA was decided from other scores and it was not calculated as an average of all the score.

Visser, Dekker, Boeschoten, Stevens and Krediet (1999) had assessed the inter-observer and intra-observer reliability of the 7-point scale SGA. The study was done in 13 haemodialysis and 9 peritoneal dialysis patients in the Academic Medical Center, Amsterdam and in the Dianet dialysis center, Utrecht. This study found that 7-point scale SGA has sufficient inter-observer reliability and good intra-observer reliability. Apart from that, this study also shows that 7-point scale SGA has correlation with the anthropometry (BMI, percentage of body fat, mid arm circumference (MAC) and mid arm muscle circumference (MAMC)) and biochemical parameters (prealbumin, insulin-like growth factor and serum albumin). This study concludes that 7-point scale SGA is a valid and reliable method to assess nutritional status among haemodialysis patients.

Other study that pilot tested the use of 7-point scale SGA was done by Jones et al. (2004). In this study, the 7-point scale SGA was compared with the composite nutritional score that is derived from SGA, BMI, percent of reference weight, triceps

skinfold (TSF), MAMC, and serum albumin. The points in composite nutritional score are given according to the degree of deviance from reference values. A score of 0 in the composite nutritional score indicates normal nutrition and an increasing score indicates worsening nutritional state. 72 haemodialysis patients that received their dialysis treatment in York District Hospital were recruited in this study. Several anthropometric measurement, biochemical parameter and dietary intake were assessed. From One-Way Analysis of Variance (ANOVA) test, the result shows that MAC, MAMC, serum creatinine level, and composite nutrition score were statistically significantly different by the 7-point SGA score. Besides that, this study found that patients that have a decreased nutrition intake will have decreased score on the 7-point scale SGA and this study also shows that the 7-point scale SGA able to discriminate patients that have normal and abnormal nutrition score as compared with the composite nutritional score. This study concludes that 7-point scale SGA able to discriminate level of malnutrition among the haemodialysis patients.

A study by Steiber et al. (2007) had tested the reliability and validity of 7-point scale SGA among 153 haemodialysis patients in a multi-centre study from haemodialysis unit in United States, Canada and New Zealand. The reliability was determined by comparing the result of the 7-point scale SGA between two different dietitians. The validity was determined by comparing the 7-point scale SGA with anthropometry, biochemical and dietary intakes of the haemodialysis patients. This study suggested a fair inter-rater reliability and substantial intra-rater reliability in the use of 7-point scale SGA. Besides, there are statistically significant result between the 7-point scale with the BMI and serum albumin which indicates that the 7-point scale SGA was a valid assessment tool.

7-point scale SGA also can distinguish different degree of malnutrition among the haemodialysis patients. de Mutsert et al., (2009) had done a study to determine the association of the 7-point scale SGA with the risk of mortality among the ESRD patients that undergone haemodialysis in Netherlands. About 1601 patients were recruited in this study and the patients were assessed using the 7-point scale SGA every 6 months for 7 years of follow up. It was found that the 7-point scale SGA score decreased significantly with the year of the dialysis treatment.

7-point scale SGA was also been used in a study in Jeddah, Saudi Arabia (Alharbi, & Enrione, 2012). The purpose of the study was to test if the 7-point SGA correlates with anthropometric such as BMI, Tricep Skinfold Thickness (TSF), Mid-Arm Muscle Circumference (MAMC), and albumin. 270 haemodialysis patients were assessed in this cross sectional study. The malnutrition was assessed by using 7-point scale SGA and this study found that 47.8% of the subjects were moderately malnourished and 6.3% from them were severely malnourished. The study also figures out that the 7-point scale SGA had a correlation with the anthropometry and biochemical value. This study shows that as albumin, BMI, TSF, and MAMC decreased, the malnutrition became more severe.

Another study done by Vero, Byham-Gray, Parrott, and Steiber (2013) had use 7-point scale SGA to predict health-related quality of life (HRQoL) in stage 5 chronic kidney disease patients on maintenance haemodialysis. It was a cross-sectional study that involved haemodialysis patients that received therapy 3 times a week at dialysis centers located in the United States, Canada, and New Zealand. Nutritional status was assessed using the 7-point SGA. HRQoL was determined using the Medical Outcomes Study 36-item Short Form (SF-36). Result from the study showed that 7-point scale SGA score had significant association with HRQoL

physical health. However, no association was found between the 7-point scale SGA score and HRQoL mental health. A decreased in HRQoL of the patients on was associated with mortality, complications, and reduced compliance with treatment. Therefore, using the 7-point scale SGA to measure nutritional status can be a tool to help identify dialysis patients with a lower HRQoL in terms of physical health.

CHAPTER 3

METHODOLOGY

3.1 Study Design

This was a cross-sectional study. A cross-sectional or prevalence study is a type of observational study. It is a type of study that is conducted at a single point in time and can be used to estimate the prevalence of a health issue. Besides that, it can be used to estimate the levels of knowledge about any given health threat or health protective behaviour , and health-related attitudes, beliefs, opinions, and behaviours. Usually, this type of study will examines the relationship between diseases and other variables of interest as they exist in a defined population at one particular of time. For example, the present study will examine the relationship between malnutrition and other factors such as socio-demography, health status, anthropometry, biochemical and dietary intake data. A cross-sectional study is limited in inferring causation, and unable to establish directionality.

3.2 Location of Study

This study was conducted at three haemodialyis centre in Seri Kembangan area. The three dialysis centre namely Medi-Nefron Dialysis Centre, Nefro I Care Dialysis Centre and Nilam Dialysis Centre. Medi-Nefron Dialyis Centre is one of the

main panels of haemodialysis centre for Universiti Putra Malaysia. This dialysis centre had become a non government organization on 5th January 2010. While, Nefro I Care Dialysis Centre was operated under Deen Revolution Sdn. Bhd. It was a government organization and had started the operation on 15th November 2010. Nilam Dialysis centre was one of the panel below the Public Service Department of Malaysia and was operated to help ESRD patients undergone the dialysis treatment.

3.3 Study Subject

All patients undergoing treatment in the centre were screened for eligibility. Several inclusion and exclusion criteria were stated as in Table 3.1.

Table 3.1: Inclusion and exclusion criteria of the subjects.

INCLUSION CRITERIA	EXCLUSION CRITERIA
i. Have undergone haemodialysis treatment at least more than 3 months.	i. Patients that are hospitalised.
ii. Age: 18 years old and above.	ii. Patients that have psychiatric illness.
iii. Malaysian.	iii. Pregnant women.
	iv. Communication / language barrier.

3.4 Sample Size Calculation

Sample size formula:

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

(Cole, 1997)

Where,

n = minimum sample size

$Z_{n-\alpha/2} = 1.96$ (level of significance)

$Z_{1-\beta} = 0.84$ (power)

d = correlation between 7-point scale SGA score and the Body Mass Index of haemodialysis patients (Alharbi & Enrione, 2012)

= 0.33

$$n = \frac{(1.96_{+}0.84)^2}{0.33^2/(1-0.33^2)} + 5$$

= 64 respondents

To detect a correlation of SGA score with nutritional parameters, with 80% power at 5% significance, at least 64 respondents will be required. However, an extra of 20% will be added to account for missing data, unavailability of respondents, refusal to participate and non-respondent rate. Thus, 77 respondents will be recruited in this study. But the total respondents that involve in this study were 80 respondents.

3.5 Sampling method

The sampling method used was non probability purposive sampling. This is due to the fact that the characteristic of the sample chosen is homogenous, as individual are chosen because they are patients on haemodialysis treatment. Any subjects from the three haemodialysis centres that have inclusion criteria and agreed to participate were recruited in this study.

3.6 Pre-test of questionnaire

A pre-test was conducted prior to data collection. Five haemodialysis patients in Hospital Serdang were asked to be the respondent for the pre-test. A dietitian from

Faculty of Medicine and Health Sciences, University Putra Malaysia had given the training on the use of 7-point scale SGA. The purpose of the pre-test was to test the applicability of the questionnaire and to practice the use of 7-point scale SGA in assessing nutritional status of the haemodialysis patients. After the pre-test, several changes of the questionnaire were made to improve data collection. The flow of data collection from the subjects was carefully planned after doing the pre-test.

3.7 Data collection

Data collection was carried out from February 2014 until March 2014. A face to face interview was conducted for each of the patient. Patients were approached for their participation. The objectives of the study were explained and patient information sheet were given. Informed consent was obtained prior to data collection.

3.8 Instrument

A set of questionnaire was used in this study. Face to face interviewed questionnaires were used.

3.8.1 Socio-demographic status and health status

Socio-demographic profiles such as age, gender, ethnicity, income, occupation, marital status and others were assessed during the interview session. Health status of the patients regarding co-morbidity, years of diagnosed with kidney disease and years on haemodialysis treatment were asked in the questionnaire.

3.8.2 Anthropometric measurement

The variables that were measured include patients post dialysis weight, height, BMI, MUAC, inter-dialytic weight gain and % body fat. The patients post dialysis weight were measured after they had finished their dialysis session on data collection day. The patients height were taken from patients medical record. Interdialytic weight gain was measured by subtracting the patients weight at the beginning of the haemodialysis session on the day of the data collection with the patients weight after the previous haemodialysis session. The BMI was calculated according to the patients post-dialysis weight (kg) divided by height (cm) squared.

MUAC were measured with a flexible non stretchable measure tape (Figure 3.1). The patients were asked to stand with his/her feet together, shoulders relaxed, and arms hanging freely at the sides. The non access (fistula/graft free) arm was located to avoid the possibility of an inaccurate measurement due to fluid retention in the arm with the fistula. The midpoint on the posterior aspect of the upper arm was established between the acromial and olecranon and marked with a pencil. The measuring tape was placed around the upper arm at midpoint and pulled snugly enough to ensure contact with the arm. The measurement was recorded to the nearest centimeter. Two measurements of MUAC were obtained and then the average was calculated. The body fat percentages were assessed using Omron Body Fat Analyzer (Figure 3.2).

It was recommended that the measurement of anthropometrics is taken on dominant side of the body (Bishop et al., 1981). However, if patients have fistulas (for dialysis access) on the dominant side of the body, anthropometrics measurement that may exert pressure as such TSF must be avoided to prevent the fistula from

become damage. Therefore, patient's dominant side is used when there is no fistula on this side.

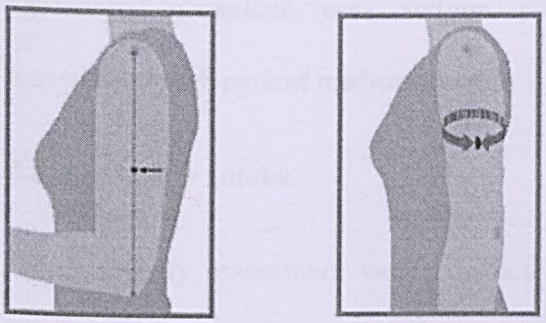

Figure 3.1 : Measurement of MUAC

The subject's left arm are bent at the elbow at a 90 degree angle, with the upper arm held parallel to the side of the body. The distance between the bony protrusion on the shoulder (acromion) and the point of the elbow (olecranon process) were measured and the mid-point were marked. The subject were asked to let arm hang loose and measurement around the upper arm at the mid-point was done. The tape measure was snug but not tight.

Figure 3.2: Body Fat Analyzer

3.8.3 Biochemical parameters

Biochemical parameters such as serum albumin, total protein, total cholesterol, phosphate, urea, sodium, potassium, chloride, and creatinine were assessed through patient medical record.

3.8.4 Dietary Intake

Dietary assessment were conducted by 24-hour dietary recall. Foods and drinks that patients had consume for the past 24 hour were asked including the types along with the household measurement of the food taken. The data were recorded and total macronutrient intake such as carbohydrate, protein, fat and total energy were calculated by the software Nutritionist Pro. The total energy and protein intake of the patients were compared with the nutritional recommendations among haemodialysis patients.

3.8.5 7-point Scale SGA

The 7-point scale SGA contain three sections. The history, physical examination and overall SGA classification section. The history section have three components: weight changes, food intake and gastrointestinal symptoms. The physical examination sections have two components: Loss of subcutaneous fat and muscle wasting. The overall SGA classification section is to determine the final rating of the SGA which classify the level of malnutrition among the haemodialysis patients. Each section of the 7-point scale SGA was rated on a scale from one to seven. If the patients is rated 6 or 7 in most section, patients were classified as well nourished. A rating of 3-5 in most section had categorized the patients as moderately malnourished and patients were classified as severely malnourished if most of the rating in the section is 1 to 2.

3.9 Data Analysis

Data were analysed using the SPSS version 21.0 software. Descriptive statistics such as frequency, means and standard deviation were used to describe the data (socio-demographic, health status, anthropometry data, biochemical data and dietary intake). Pearson correlation tests were done to determine the relationship between socio-demographic, health status, anthropometry data, biochemical data and dietary information with the malnutrition score of 7-point scale SGA. A statistical probability level of $p < 0.05$ will be considered as significant.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Socio-demographic profiles

A total of 80 subjects that undergone their dialysis treatment at three haemodialysis centres in Seri Kembangan, Selangor were recruited in this study. The socio-demographic status of the study sample was summarised in Table 4.1. The percentage of male and female subjects were 49% and 51% respectively. In contrast, National Renal Registry Malaysia [NRRM] (2012) reported that since 2001 the proportion of dialysis male patients is higher than female patients where the percentage is 55% to 45% respectively. In this study, percentage of patients that is more than 55 years old is 45% with the mean age of 54.1±13.1, ranged from 27 to 79 years old . However, in 2012, 57% of new dialysis patients were at least 55 years old at the onset of dialysis (NRRM, 2012).

Majority of the subjects were Malay (86.3%), followed by Indian (7.5%) and Chinese (6.2%). The percentage of married subjects was 85% and the percentage of other subjects that is single (unmarried or had become widow or widower) were 15%. Most of the interviewed subjects had been to secondary school (45%). Twenty

one percent of the subjects have pursue their study in university while others only received primary education from their primary school (34%).

Table 4.1: Distribution of subjects according to socio-demographic profiles

Demographic Variables	n (%)	Mean ± SD	Range
Male	39(48.8)		
Female	41(51.2)		
Age (year)		54.1 ± 13.1	27-79
< 55	44 (55)		
≥ 55	36 (45)		
Ethnicity			
Malay	69(86.3)		
Chinese	5(6.2)		
Indian	6(7.5)		
Marital Status			
Single	11(15.0)		
Married	68(85.0)		
Level of Education			
Primary School	27(33.8)		
Secondary School	36(45.0)		
University	17(21.2)		
Employment			
Yes	27(33.8)		
No	53(66.3)		
Household Income (RM)			
≤ 3000	44(55)		
>3000	36(55)		
Financial Support			
Yes	26(32.5)		
No	54(67.5)		

Most of the subjects were unemployed (66%) and the percentage of subjects that had household income which is less than RM3000 was 55%. Other subjects that were employed work as teacher, secretary, taxi driver and run a business. For unemployed patients, they still have a household income since they live with their

others family members. Besides, only 32.5% of the subjects have received financial support from welfare foundation and others association. A higher rate of unemployment among haemodialysis patients were high compared to the general populations because they need to undergone haemodialysis treatment at least three times a week with duration of 4 hour each session. Since most of their time was spent on the dialysis treatment, they tend to become unemployed (Muehrer et al., 2011).

4.2 Health Status

Figure 4.1 shows the distribution of subjects by types of co-morbidities. Majority of the subjects have both hypertension and diabetes as their co-morbidities (46%). The percentage of subjects that have diabetes, hypertension and cardiovascular disease only were 5%, 18% and 0% respectively. The percentage of subjects that do not have any co-morbidities are 11%. The percentage of subjects that have cardiovascular disease was the lowest and this contradicts with the study by Eiam-Ong & Sitprija (2002) that found cardiovascular diseases are the most common co-morbidities and the most common causes of mortality in ESRD patients. These three types of co-morbidities were asked because they were the common co-morbidities among ESRD patients as supported by Eiam-Ong et al. (2012) study that shown hypertension, diabetes and cardiovascular disease are the leading co-morbidities. NRRM (2012) had reported that the common primary causes of CKD for new dialysis patients were diabetes mellitus (58%), hypertension (11%) and unknown causes (25%). This explains high percentage of hypertension and diabetes mellitus among the subjects.

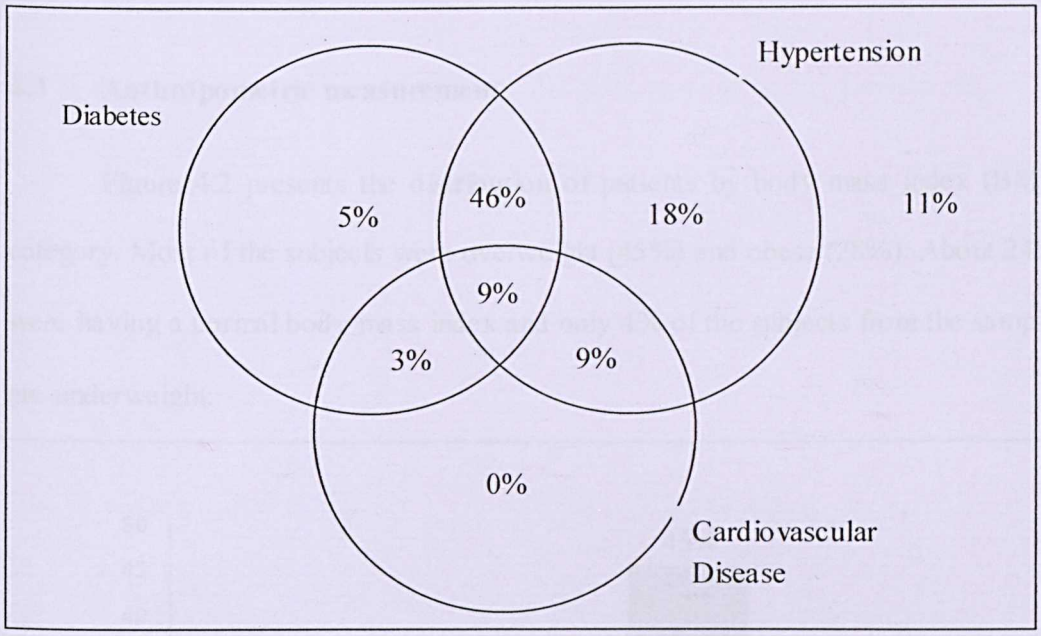

Figure 4.1: Distribution of subjects by types of co-morbidities

Table 4.2 shows patients health status data. The mean years of diagnosed with kidney failure was 3.8±3.0 years with range of 0.3 to 16 years. The mean years of having dialysis was 3.1±2.5 years, range from 0.25 to 14 years. There were no significant differences between male and female in terms of years diagnosed with kidney failure and years of having haemodialysis.

Table 4.2: Means and standard deviations of health status

Health Status Data	**Mean ± SD**				
	Male (n=39)	Female (n=41)	Total (n=80)	**t**	**p value**
Years of diagnosed Kidney failure	3.6 ±3.4	4.0±2.6	3.8±3.0	-0.55	0.59
Years of having Haemodialysis	2.7±2.6	3.4±2.3	3.1±2.5	-1.31	0.20

4.3 Anthropometric measurement

Figure 4.2 presents the distribution of patients by body mass index (BMI) category. Most of the subjects were overweight (45%) and obese (28%). About 24% were having a normal body mass index and only 4% of the subjects from the sample are underweight.

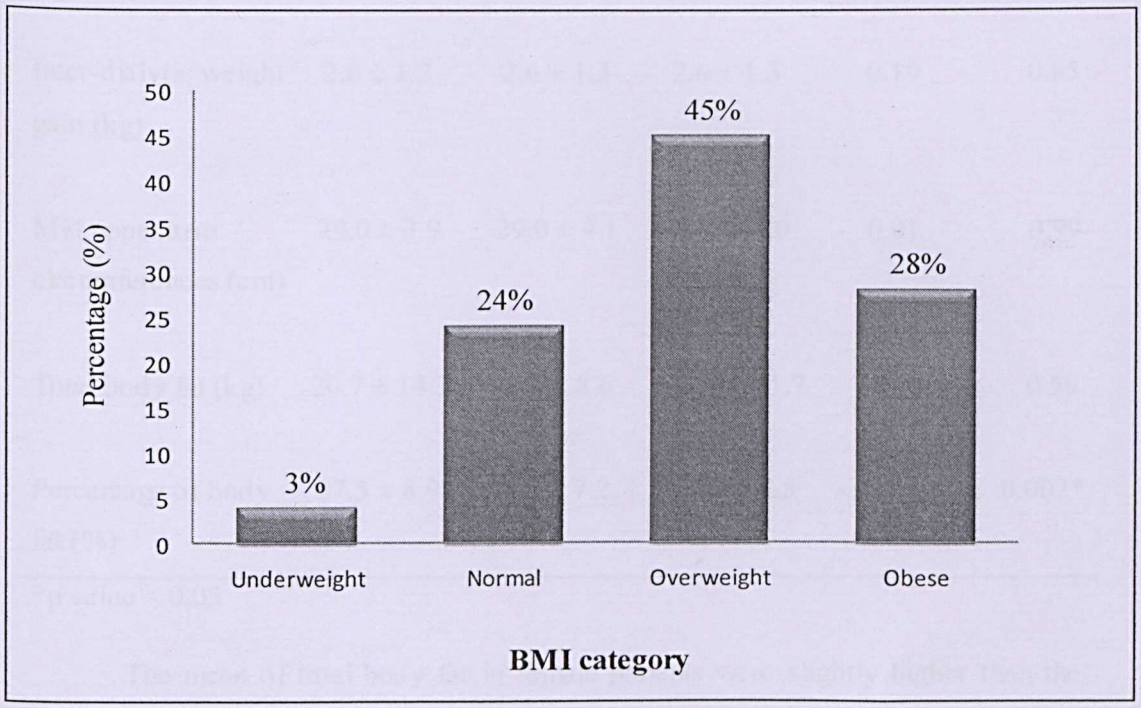

Figure 4.2: Distribution of subjects by body mass index (BMI)

Table 4.3 shows the mean and standard deviation of anthropometric measurements of the subjects. The differences in the mean of the anthropometric measurement among male and female was compared using independent sample t-test. The mean BMI for the study sample is 25.7 ± 5.0 kg/m². The study sample has a mean inter-dialytic weight gain of 2.6 ± 1.3 kg within the range of 0.4kg and 6.0kg. The mean MUAC for male and female patients were 29.0 ± 3.9 cm and 29.0 ± 4.1 cm respectively.

Table 4.3: Mean and standard deviation of anthropometric measurements

Anthropometric Measurement (unit)	Mean ± SD			t	p value
	Male (n=39)	Female (n=41)	Total (n=80)		
Body mass index (kg/m²)	24.9 ± 4.8	26.5 ± 5.1	25.7 ± 5.0	-1.43	0.16
Inter-dialytic weight gain (kg)	2.6 ± 1.2	2.6 ± 1.3	2.6 ± 1.3	0.19	0.85
Mid upper arm circumferences (cm)	29.0 ± 3.9	29.0 ± 4.1	29.0 ± 4.0	0.01	0.99
Total body fat (kg)	20.7 ± 14.3	22.1 ± 8.6	21.4 ± 11.7	-0.54	0.59
Percentage of body fat (%)	27.5 ± 8.9	33.4 ± 7.2	30.5 ± 8.5	-3.23	0.002*

*p value < 0.05

The mean of total body fat in female patients were slightly higher than the male patients but no significant difference was found. However, there was a significant difference in the percentage of body fat between male and female subjects.

4.4 Biochemical measurement

Table 4.4 presents the mean and standard deviation of biochemical parameters of the subjects by gender. There is a significant difference in serum creatinine level by gender. Mean serum creatinine in male is significantly higher than female (t=2.30,p=0.02). This was consistent with Vernaglione et al. (2003) study where the serum creatinine was significantly higher in males than in females, it was

9.7±2.8 in males and 8.7±1.8 mg/dl in females (p=0.004). Creatinine is a chemical waste molecule that is generated from muscle metabolism. Since female have lower muscle tissue compared to male, it is common for female to have a lower creatinine level.

Table 4.4: Means and standard deviations of biochemical parameters

Biochemical Parameters	Mean ± SD			t	Sig-p
	Male	Female	Total		
Serum Creatinine (umol/L)	699.0 ± 198.9	607.4 ± 154.8	652.1 ± 182.5	2.30	0.02*
Serum Calcium (mmol/L)	2.0 ± 0.4	2.1 ± 0.2	2.1 ± 0.3	-1.43	0.16
Serum Phosphate (mmol/L)	1.9 ± 0.5	1.7 ± 0.6	1.8 ± 0.5	1.66	0.10
Serum Albumin (g/L)	36.9 ± 6.8	36.2 ± 4.5	36.6 ± 5.7	0.48	0.63
Total Protein (g/L)	70.2 ± 6.1	70.9 ± 7.4	70.6 ± 6.8	-0.44	0.66
Alkaline Phosphatase (U/L)	132.7 ± 95.1	149.1 ± 91.2	141.1 ± 92.9	-0.78	0.44
Serum Sodium (mmol/L)	136.4 ± 3.3	135.8 ± 4.0	136.1 ± 3.7	0.80	0.43
Serum Chloride (mmol/L)	98.9 ± 3.3	98.7 ± 4.6	98.8 ± 4.0	0.16	0.88
Serum Potassium (mmol/L)	4.9 ± 0.7	4.9 ± 0.9	4.9 ± 0.8	-0.16	0.88
TG (mmol/L)	2.1 ± 2.0	2.2 ± 1.8	2.2 ± 1.9	-0.17	0.87
Total cholesterol (mmol/L)	4.5 ± 1.1	5.6 ± 5.3	5.1 ± 3.9	-1.20	0.23
HDL (mmol/L)	0.9 ± 0.5	1.2 ± 1.0	1.1 ± 0.8	-1.34	0.18
LDL (mmol/L)	2.7 ± 0.9	2.9 ± 0.9	2.8 ± 0.9	-0.68	0.50
Hemoglobin (g/dL)	12.8 ± 17.0	9.9 ± 1.8	11.3 ± 12.0	1.10	0.27
TIBC (umol/L)	35.3 ± 6.8	33.1 ± 8.7	34.2 ± 7.9	1.26	0.21
Transferin (g/L)	1.6 ±0.3	1.8 ± 1.8	1.7 ± 1.3	-0.73	0.47

*p value <0.05

Table 4.5 present the distribution of subjects by different common biochemical parameters that need to be assessed among haemodialysis patients as proposed by KDOQI (2003).

Table 4.5: Distribution of subjects by different biochemical parameters

Biochemical Parameters	n (%)	Range (g/L)
Serum albumin (g/L)		23-46
< 35	28(35)	
35-40	36(45)	
>40	16(20)	
Serum potassium (mg/dL)		3.3-8.0
< 3.5	2(3)	
3.5-5.5	65(81)	
> 5.5	13(16)	
Serum calcium (mmol/L)		0.31-2.85
< 2.0	26(33)	
2.0-2.6	53(66)	
> 2.6	1(1)	
Serum phosphate (mmol/L)		0.33-3.19
< 0.8	1(1)	
0.8-1.6	34(43)	
> 1.6	45(56)	
Serum cholesterol (mmol/L)		1.90-9.30
< 5.2	58(73)	
>5.2	22(27)	
LDL (mmol/L)		0.03-5.16
<3.8	68(85)	
>3.8	28(15)	
HDL (mmol/L)		0.40-6.20
<1.2	65(81)	
>1.2	15(19)	
Triglyceride (mmol/L)		0.45-9.56
<1.6	38(48)	
>1.6	42(52)	
Haemoglobin (g/dL)		5.80-13.9
<11	57(71)	
>11	23(29)	

Majority of the subjects (45%) have albumin level within normal range. However, low level of albumin was present in 35% of the subjects. Serum albumin is a valid and clinically useful measure of protein-energy nutritional status in

maintenance haemodialysis patients (NKF, 2000). Since 65% of the subjects did not have a low serum albumin level, they might have low risk of protein energy malnutrition. Eighty one percent of the subjects having normal serum potassium level and only 3% from the total subjects have low level of potassium. It is important for the subjects to have normal level of serum potassium since subjects with either too high or too low of serum potassium was associated with an increased risk of mortality (Kovesdy et al., 2007).

More than 60% of the subjects have optimal level of serum calcium and 33% of the subjects have low level of serum calcium. Study done by Miller, Kovesdy, & Norris (2010) had found low or high level of serum calcium was associated with higher death risk among the haemodialysis patients. Therefore, it is important for the subjects to have serum calcium within normal range. Majority of the subjects have high serum phosphate level (56%) and only 1% of them have low level of serum phosphate. Therefore, majority of the subjects might have low health status since high level of phosphate is associated with increased blood pressure, hyperkinetic circulation, increased cardiac work, and high arterial tensile stress (Marchais, Metivier, Guerin, & London, 1999). Among the subjects, 73% had a serum cholesterol level less than 5.2 mmol/L and 27% had a higher serum cholesterol level. Serum cholesterol is a component of the lipid profile and this biochemical marker can be used to assess the cardiovascular risk in haemodialysis patient (KDOQI, 2003).

Eighty five percent of the subjects had normal level of LDL and only 15% of them had a high LDL level. Apart from that, it was found that 81% of the subjects had low HDL level and only 19% had a normal level of HDL. It was found that more than 50% of the subjects had a high triglyceride level and 48% had a normal

triglyceride level. Other lipid profile (LDL, HDL and triglyceride) was also associated with the increase risk of morbidity and mortality among the dialysis patients. A study done by Maheshwari, Ansari, Darshana, Lal, and Ahmed (2010) among haemodialysis patients in Pakistan had shown high level of triglyceride and low HDL could contribute to atherosclerosis and cardiovascular disease. In this study, it was found that 71% of the subjects had low haemoglobin level and only 29% of the subjets had a normal haemoglobin level. Low level of haemoglobin was associated with anaemia and other study by Ayus, Go, & Valderrabano (2005) also found that there is a high prevalence of haemodialysis patients with low haemoglobin level that below recommended level.

4.5 Dietary intake

Table 4.6 presents the mean energy and protein intake among the subjects. The mean energy and protein intake among the subjects was 17.4±7.8 kcal/kg/day and 0.7 ± 0.5 g/kg/day respectively. There was no significant difference between gender for the energy and protein intake.

Table 4.6: Mean and standard deviation of energy and protein intake

Dietary Intake	**Mean ± SD**			
	Male (n=39)	**Female (n=41)**	**Total (n=80)**	**t**
Sig-p				
Energy	18.3 ± 9.1	16.4 ± 6.2	17.4 ± 7.8	1.08
0.28				
(kcal/kg/day)				
Protein	0.7 ± 0.6	0.7 ± 0.3	0.7 ± 0.5	0.25
0.80				
(g/kg/day)				

Table 4.7 shows distribution of subjects according to energy and protein requirement. The percentage for not achieving the energy requirement for subjects less than 60 years old was 96% and only 4% of the subjects achieved the requirement.

Table 4.7: Distribution of subjects by energy and protein requirement

Energy and Protein Requirement	n (%)	Range
Energy requirement for subjects < 60 years old (kcal/kg/day)		7-45 kcal/kg/day
<35	48 (96)	
>35	2 (4)	
Energy requirement for subjects > 60 years old (kcal/kg/day)		7-28 kcal/kg/day
<30	30 (100)	
>30		
Protein requirement (g/kg/day)		0.2-3.9 g/kg/day
<1.2	73 (91)	
>1.2	7 (9)	

In this study, it was found that all of the subjects whose age more than 60 years did not achieved their energy requirement recommendation. The percentage of subjects that have low protein intake was 91% while the others had achieved the requirement. Most of the subjects did not achieve their energy and protein requirement regardless of their age. Low energy and protein intake among the subjects might be due to the aneroxia symptoms that usually present among haemodialysis patients (Bossala et al., 2005).

4.6 Seven-point scale SGA score

The total mean and standard deviation of the 7-point scale SGA score was 5.1 ± 0.9. The mean and standard deviation of 7-point scale SGA score in male and female were 5.0±0.9 and 5.2±0.9 respectively. The mean score of female subjects was higher compared to male subjects. However, there was no significant difference was found between the genders. Table 4.8 shows the distribution of subjects according to SGA classification. There was no severely malnourished subjects was found in the population. This study found that, the percentage of malnourished was high in male subjects (67%) while the percentage of well nourished was high in female subjects (54%).

Table 4.8: Distribution of subjects according to SGA classification

7-point scale SGA classification	n (%)
Well nourished	35 (44)
Male	26 (33)
Female	43 (54)
Moderately malnourished	45 (56)
Male	54 (67)
Female	37 (46)

4.7 Hypothesis Testing

Ho1: There is no significant correlation between socio-demographic status (age) and health status (year of diagnosed kidney failure, year of haemodialysis treatment) and 7-point scale SGA

A Pearson product-moment correlation coefficient was computed to assess the correlation between age, year of diagnosed kidney failure, and year of haemodialysis treatment of the subjects (Table 4.9). The null hypothesis was failed to

be rejected for age, year diagnosed with kidney disease and year of haemodialysis treatment as they have no significant correlation with 7-point scale SGA score. These findings were in contrast with the findings by Alharbi et al. (2012) research. Alharbi had assessed malnutrition among haemodialysis population in Saudi Arabiah by using 7-point scale SGA. Result from her study shows significant correlation between age and malnutrition. Besides, another study by Basaleem, Alwan, Shmed, and Al-Sakkaf (2004) also found that older patients were more malnourished than younger patients.

Table 4.9: Pearson correlation analysis of socio-demographic status, health status and 7-point scale SGA

	7-point scale SGA score	
	r	**p**
Socio-demographic variable		
Age	-0.16	0.15
Health status		
Year diagnosed with kidney disease	-0.11	0.35
Year of haemodialysis treatment	-0.17	0.14

In this study, there is negative correlation found between year of haemodialysis treatment and 7-point scale SGA. The range of haemodialysis treatment among the subjects was between 3 months and 14 years with the mean and standard deviation of 3.1±2.5. The percentage of subjects that had a dialysis treatment for more than a year was 78%. This finding was supported by Chertow, Johansen, Lew, Lazarus and Lowrie (2000) which they found that vintage of haemodialysis of more than a year were associated with a significant decline in all measured nutritional parameters. It is common for haemodialysis patients treated

with haemodialysis for a long period of time prone to became malnourished (Chazot et al., 2001).

Ho2: There is no significant correlation between anthropometric measurement (BMI, IDWG, MUAC, total body fat, percentage of body fat) and 7-point scale SGA

A statistical analysis of Pearson correlation was performed to assess the correlation between anthropometric measurement of the subjects and scores of 7-point scale SGA (Table 4.10). There was a significant correlation between BMI, MUAC, total body fat, percentage of body fat and 7-point scale SGA. The null hypothesis was rejected for these anthropometric measurements. However, the null hypothesis was failed to be rejected for IDWG since it has no significant correlation with 7-point scale SGA. According to NKF (2000), anthropometric measurements such as body mass index, tricep skinfold thickness and mid-arm muscle circumference is a valid and clinically useful indicators to assess PEM among HD patients.

Table 4.10: Pearson correlation analysis of anthropometric measurement and 7-point scale SGA

	7-point scale SGA score	
	r	**p**
Anthropometric variable		
BMI	0.49	0.00**
IDWG	0.16	0.16
MUAC	0.52	0.00**
Total body fat	0.36	0.00**
Percentage of body fat	0.37	0.00**

*p value < 0.05, **p value< 0.01

There was positive correlation between BMI and SGA (r=0.49, p=0.00). This finding was similar to the findings by Alharbi et al. (2012). In her study, there is a significant association between BMI and 7-point scale SGA score. Higher BMI leads to improvement in health status of haemodialysis patients and this was supported by Johansen, Young, Kaysen and Chertow (2004) which found that higher BMI improved survival among haemodialysis patients. Study done by Tayyem and Mrayyan (2008) assessed the correlation between several anthropometric parameters (dry weight, body mass index, fat percentage, fat mass, triceps skinfold thickness, mid-arm circumference, mid-arm muscle circumference, and arm muscle area) with malnutrition among haemodialysis patients. Tayyem et al. (2008) found that significant decrease of MUAC, total body fat and body fat percentage were associated with advanced malnutrition. This support the finding of this study where there are significant correlation between MUAC (r=0.52, p=0.00), total body fat (r=0.36, p=0.00) and percentage of body fat (r=0.37, p=0.00) with 7-point scale SGA score.

Ho3: There is no significant correlation between biochemical measurement and 7-point scale SGA

Statistical analysis of Pearson correlation coefficient was conducted to determine the correlation between the biochemical parameters of the subjects and 7-point scale SGA (Table 4.11). The null hypothesis was failed to be rejected for serum calcium, serum phosphate, serum albumin, serum sodium, serum chloride, serum potassium, triglyceride, total cholesterol, HDL, LDL, haemoglobin, TIBC and transferin as they have no significant correlation with 7-point scale SGA. The null hypothesis was rejected for serum creatinine, total protein and alkaline phosphatase.

Serum creatinine and total protein were positively correlated with 7-point scale SGA while alkaline phosphatise was negatively correlated with 7-point scale SGA.

Table 4.11: Pearson correlation analysis of biochemical measurement and 7-point scale SGA

	7-point scale SGA score	
	r	p
Biochemical Data		
Serum Creatinine	0.33	0.00**
Serum Calcium	0.20	0.08
Serum Phosphate	0.17	0.14
Serum Albumin	0.02	0.87
Total Protein	0.23	0.04*
Alkaline Phosphatase	-0.23	0.04*
Serum Sodium	0.02	0.86
Serum Chloride	-0.18	0.11
Serum Potassium	0.04	0.73
TG	0.13	0.27
Total cholesterol	-0.08	0.48
HDL	0.09	0.43
LDL	0.17	0.14
Hemoglobin	0.10	0.37
TIBC	0.05	0.65
Transferrin	-0.13	0.24

*p value < 0.05, **p value< 0.01

Serum creatinine (r=0.33, p=0.00) and total protein (r=0.23, p=0.04) were positively correlated with 7-point scale SGA. The observed increment of serum creatinine in the subjects may be due to the improvement in the dose and quality of the dialysis treatment which lead to appetite improvement and increased of muscle mass and vitality. A low serum creatinine level might decrease the nutritional status of the subjects and a study had found that decreased in serum creatinine significantly associated with higher mortality risk (Pifer et al., 2002). Positive correlation between total protein in this study was supported by other study. Gurreebun, Hartley, Brown,

Ward and Goodship (2007) showed that cholesterol, total protein, and albumin were significantly lower in those patients with lower score of 7-point scale SGA.

Other study by Tayyem and Mrayyan (2007) found that total protein and albumin decreased with the degree of malnutrition. Both the study by Gurreebun et al. (2007) and Tayyem & Mrayyan (2007) shows a positive correlation between albumin and malnutrition. In contrast with this study, there is no significant correlation was found between albumin and 7-point scale SGA. This shows that serum albumin is not a reliable parameter to detect malnutrition as it could be affected by other factors such as inflammation, infection, hydration status, and acute or chronic stress (Jones, Akbani, Croft, & Worth, 2002). Other factors that may affect serum albumin level in CKD patient was poor energy and protein intake, age, co-morbidities, external protein lossess, fluid overload (NKF, 2005). It was consistent with the study done by Tapiawala, Vora, Patel, Badve, and Shah (2006) where they found no correlation was found between serum albumin and malnutrition among haemodialysis patients.

Alkaline phosphatase ($r=-0.23$, $p=0.04$) was found to be negatively correlated with 7-point scale SGA. Similar findings was found in a study by Shantouf, Kovesdy, and Kim Yet (2009). They also found that high serum levels of alkaline phosphatase were associated with increased death risk among haemodialysis patients. It was supported by other study that shows higher risk of mortality is associated with high level of alkaline phosphatase (Kalantar-Zadeh et al., 2006).

Ho4: There is no significant correlation between dietary intake (energy and protein intake) and 7-point scale SGA

A Pearson product-moment correlation coefficient was computed to determine correlation between energy and protein intake with 7-point scale SGA (Table 4.12). The null hypothesis for this variable was failed to be rejected since there is no significant correlation between dietary intake and 7-point scale SGA. This was consistent with study by Tapiawala et al. (2006) that shows there are no significant correlations between energy and protein intake with the level of malnutrition. In contrast, de Araujo et al. (2006) showed a positive correlation between protein and energy intake with the nutritional status of the haemodialysis patients. Futhermore, Jahromi (2010) had test the correlation between protein and energy intake with mSGA. In his study, it was found that poor protein and energy intake cause the patients become malnourished. Apart from that, low daily protein and energy intake increase the risk of mortality of the haemodialysis patients (Shinaberger et al., 2006). Therefore, adequate protein and energy intake among haemodialysis patients were important to improve their nutritional status.

Table 4.12: Pearson correlation analysis of dietary intake and 7-point scale SGA

	7-point scale SGA score	
	r	**p**
Dietary Intake		
Energy	0.09	0.45
Protein	0.14	0.21

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

Seven-point scale SGA had identified more than half of the subjects as moderately malnourished. As showed by other studies, the high prevalence of malnutrition is common among haemodialysis patients. In this study, several anthropometric (BMI, MUAC, total body fat, percentage of body fat) and biochemical indicators (serum creatinine, total protein, alkaline phosphate) had showed a significant correlation with the 7-point scale SGA. Other studies that use 7-point scale SGA also had found a correlation between several anthropometric and biochemical indicators. This shows that, objective and subjective measurements are required to have better outcome when assessing health status of the haemodialysis patients. There are other variables that have no significant correlation with 7-point scale SGA due to several limitations that exist in this study. However, this study shows that 7-point scale SGA is a type of assessment tool that can help identify haemodialysis patients that are having malnutrition problem.

5.2 Limitation

There are not many studies originated from Asia or those with similar background to our population that investigate correlation between the socio-

demographic, anthropometry, biochemical and dietary intake with the 7-point scale SGA. Therefore, majority of the information regarding the use of 7-point scale was taken from studies in other region. Besides, this study is a cross sectional study whereby the data were collected at one point of time. The nature of this study design had prevented researcher from detecting the causal-effect relationship of the variables. The result from this study are not representative and cannot be generalized to the haemodialysis population because this study involves only a small number of subjects as well as the use of purposive sampling technique that was used. Apart from that, the use of 24-hour dietary recall was not able to represents subjects usual protein and energy intake. However, the technique was implemented due to time constraint.

5.3 Recommendation

Future studies in Malaysia should recruit more subjects from different haemodialysis setting and random sampling technique should be done to have reliable results. Besides that, to get more representative data regarding the protein and energy intake, method such as 3-day food record or recall can be done. Future longitudinal study is required to further determine the mechanism between the associated factors and malnutrition.

According to NKF guideline, the nutritional status of haemodialysis patients needs more attention and regular periodic nutrition assessment needs to be implemented at least once every 6 months to monitor their nutritional status. Furthermore, health care professionals such as nephrologists, physicians and dietitians should involve in the management of the haemodialysis patients to improve their nutritional and health status.

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APPENDICES

APPENDIX A

APPROVAL LETTER

APPENDIX B

INFORMATION SHEET & CONSENT FORM

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

FORM B1: RESPONDENT'S INFORMATION SHEET AND CONSENT

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

1. STUDY TITLE :

Use of 7-point Scale Subjective Global Assessment (SGA) to Assess Malnutrition Among Haemodialysis patients.

2. INTRODUCTION:

The aim of this study is to assess malnutrition among haemodialysis patients using 7-point Scale SGA. Besides that, information regarding socio-demographic factors, anthropometry data, biochemical data and food intake will be assessed. The relationship between the socio-demographic factors, anthropometry data, biochemical data and food intake and malnutrition score will be determined.

3. WHAT WILL YOU HAVE TO DO?

Respondents need to fill in the consent form as an agreement to involve in this study. Respondents need to answer a few questions related to socio-economic status and daily food intake. Measurement of Mid Upper Arm Circumference (MUAC) and percentage of body fat will be conducted. Other anthropometry data and biochemical data will be assessed through medical records. Lastly, respondent will be assessed using the 7-point scale SGA to determine the nutritional status.

4. WHO SHOULD NOT PARTICIPATE IN THE STUDY?

Haemodialysis patients that are hospitalised, patients that have psychiatric illness, and pregnant women.

5. WHAT WILL BE THE BENEFITS OF THE STUDY:

(a) TO YOU AS THE SUBJECT?

You will be able to know your weight, height, Body Mass Index, percentage of body fat and nutritional status level.

9. CONSENT

I ..... Identity Card No. .....

address.....

.....hereby voluntarily agree to take part in the questionnaire-based research above.

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 :.....

Signature .....
(Witness)

Name :.....

I/C No. :.....

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

Date .....

Signature .....
(Researcher)

APPENDIX C

QUESTIONNAIRE AND 7-POINT SCALE SGA FORM

Ref. No:

Faculty of Medicine and Health Sciences
Department of Nutrition and Dietetics

Title: Use of 7-point scale Subjective Global Assessment to Assess Malnutrition Among Haemodialysis Patients in Pusat Dialisis Pakar Medi-Nefron, Seri Kembangan, Selangor

(Questionnaire)

NAME OF RESEARCHER: MOHAMMAD SYAFIQ BIN MD ALI

NAME OF SUPERVISOR'S: DR. ZURIATI BINTI IBRAHIM

Researcher contact details:

Name: Mohammad Syafiq Bin Md Ali
Address: Kolej 17, Universiti Putra Malaysia, 43400 Serdang, Selangor.
Phone no: 013-6361353
Email: mohammadsyafiq14@gmail.com

Part A: Socio-Demographic Profile

1. Age: _____

2. Gender: ( ) Male ( ) Female

3. Ethnicity: ( ) Malay ( ) Chinese
( ) Indian Others (please specify) : _____

4. Marital status:

( ) Single ( ) Widow/widower
( ) Divorce
( ) Married

5. Level of education:

( ) UPSR or PMR/SRP
( ) SPM or STPM/A-Level
( ) Diploma or Degree
( ) Master or PHD

6. Are you employed?

( ) Yes ( ) No

a. If YES, what is your occupation: _____

b. Monthly income:

( ) ≤ RM 500 ( ) RM 2001- RM 3000
( ) RM 501- RM 1000 ( ) > RM 3000
( ) RM 1001- RM 2000 ( ) No income

7. What is your household income monthly?

( ) ≤ RM 1000 ( ) RM 3001 – RM 4000
( ) RM 1001-RM 2000 ( ) RM 4001- RM 5000
( ) RM 2001- RM 3000 ( ) > RM 5000

8. Have you received any financial support?

( ) Yes ( ) No

If YES, what is the source:_____

9. How many years you have had kidney disease?

_____

10. How long have you been on haemodialysis?

_____

11. Do you have any chronic disease which is diagnosed by the doctor?

( ) Yes ( ) No

If YES, please specify: _____

Part B. Anthropometry Measurement

	Parameters	Measurement		
		1st	2nd	Average
1.	Height (cm)			
2.	Inter-Dialytic Weight Gain (kg) [IDWG = W3-W2]			
3.	Body Mass Index (kg/m²) [post-dialysis weight/ height²]			
4.	Mid Upper Arm Circumference (cm)			
5.	Total Body Fat (kg)			
6.	Percentage of Body Fat (%)			

Inter-Dialytic Weight Gain Trend

Date				
Dialysis	Pre-dialysis (W1)	Post-dialysis (W2)	Pre-dialysis (W3)	Post-dialysis (W4)
Weight (kg)				

Part C. Biochemical Parameters

	Indices	Reading	Date
1.	***Renal Function Test***		
	Serum Creatinine (µmol/L)		
	Serum Calcium (mmol/L)		
	Serum Phosphorus (mmol/L)		
2.	***Liver Function Test***		
	Serum Albumin (g/dL)		
	Total Protein (g/dL)		
	Alkaline Phosphatase (µg/dL)		
3.	***Electrolytes***		
	Serum Sodium (mmol/L)		
	Serum Chloride (mmol/L)		
	Serum Potassium (mmol/L)		
4.	***Lipid Profile***		
	Triglyceride (mmol/L)		
	Total cholesterol (mmol/L)		
	HDL		
	LDL		
5.	***Others***		
	Hemoglobin (g/dL)		
	TIBC		
	Transferrin		

Part D. Diet history

Time	Food and drinks	Household Measurement
Breakfast		
Morning Tea		
Lunch		
Afternoon Tea		
Dinner		
Supper		

7-Point Scale SGA Form

SUBJECTIVE GLOBAL ASSESSMENT RATING FORM

ID #: **Date:**

HISTORY

WEIGHT/WEIGHT CHANGE: ***(Included in K/DOQI SGA)*** **Rate 1-7**

1. Baseline Wt: _____(Dry weight from 6 months ago)
Current Wt: _____(Dry weight today)
Actual Wt loss/past 6 mo: _____ **% loss:**_____(actual loss from baseline or last SGA)

2. Weight change over past two weeks:

_____No change _____Increase _____Decrease

DIETARY INTAKE No Change_____(Adequate)
No Change_____(Inadequate)
1. Change: Sub optimal Intake: _____ Protein _____ Kcal _____
Duration_____

Full Liquid:_____ Hypocaloric Liquid ____ Starvation _____

GASTROINTESTINAL SYMPTOMS
(Included in K/DOQI SGA-anorexia or causes of anorexia)

Symptom:	**Frequency:**	**Duration:**
_____ None	_____	_____
_____ Anorexia	_____	_____
_____ Nausea	_____	_____
_____ Vomiting	_____	_____
_____ Diarrhea	_____	_____

Never, daily, 2-3 times/wk, 1-2 times/wk > 2 weeks, < 2 weeks

FUNCTIONAL CAPACITY

Description	**Duration:**
_____No Dysfunction	_____
_____Change in function	_____
_____ Difficulty with ambulation	_____
_____ Difficulty with activity (Patient specific "normal")	_____
_____ Light activity	_____
_____ Bed/chair ridden with little or no activity	_____
_____ Improvement in function	_____

DISEASE STATE/COMORBIDITIES AS RELATED TO NUTRITIONAL NEEDS

Primary Diagnosis_____ Comorbidities_____

Normal requirements ____ Increased requirements___ Decreased requirements _____ Acute Metabolic Stress: _____None _____Low _____Moderate _____High	
PHYSICAL EXAM	
_____ Loss of subcutaneous fat (Below eye, triceps, biceps, chest) ***(Included in K/DOQI SGA)*** ____Some areas _____All areas _____ Muscle wasting (Temple, clavicle, scapula, ribs, quadriceps, calf, knee, interosseous ***(Included in K/DOQI SGA)*** ____Some areas _____All areas _____ Edema (Related to undernutrition/use to evaluate weight change)	
OVERALL SGA RATING	
Very mild risk to well-nourished = 6 or 7 most categories or significant, continued improvement. **Mild-moderate** = 3, 4, or 5 ratings. No clear sign of normal status or severe malnutrition. **Severely Malnourished** = 1 or 2 ratings in most categories/ significant physical signs of malnutrition.	

EXTENDED ABSTRACT

USE OF 7-POINT SCALE SUBJECTIVE GLOBAL ASSESSMENT (SGA) TO ASSESS MALNUTRITION AMONG HAEMODIALYSIS PATIENTS IN SERI KEMBANGAN, SELANGOR

Mohammad Syafiq Md Ali

Introduction: The number of end stage renal disease patients in Malaysia and patients that commence haemodialysis was increasing gradually. Common problems encountered by haemodialysis patients was malnutrition. Malnutrition among haemodialysis increases the risk of morbidity and mortality. Therefore, an appropriate nutritional assessment tool is required to identify patients that experiencing malnutrition. Several objective methods such as anthropometry and biochemical value can be used to assess the nutritional status of the patients. However, assessment by using objective method alone was not able to identify malnourished patients accurately. Subjective method such as 7-point scale SGA can also be used to assess nutritional status of the haemodialysis patients. Seven-point scale SGA is an assessment tool that had been improved from the original subjective global assessment. However, there was limited study in Malaysia that used the 7-point scale SGA to assess nutritional status among haemodialysis patients. Hence, this study aims to determine the prevalence of malnutrition and to determine the relationship between socio-demographic, health status, anthropometry, biochemical data, dietary intake with the malnutrition assessed by 7-point scale SGA among haemodialysis patients in the selected haemodialysis centres in Seri Kembangan, Selangor.

Methodology: A total of 80 subjects were interviewed from three dialysis centres in Seri Kembangan, Selangor. A face to face interview questionnaire was used to collect data on socio-demographic status, comorbidities, years of diagnosed with kidney diasease, years of treatment of haemodialysis. Weight, height, mid upper arm circumference (MUAC), total

body fat, percentage of body fat was measured among the subjects. Biochemical data on serum creatinine, calcium, phosphate, albumin, total protein, alkaline phosphatase (ALP), serum electrolytes, lipid profile, haemoglobin (Hb), total iron binding capacity (TIBC) and transferin were obtained from the medical reports. Assessment of dietary intake to know total energy and protein that were consumed by the subjects were assessed using 24-hour dietary recall. The 7- point scale SGA was done to assess nutritional status of the subjects. Overall score of 1 or 2 in the 7-point scale SGA classified the subjects into severely malnourished. While overall score of 3, 4 or 5 classified the subjects into moderately malnourished and overall score of 6 or 7 classified the subjects into well nourished. Mean and standard deviation were used to present descriptive data. Pearson correlation was performed to assess the relationship between socio-demographic, health status, anthropometry, biochemical data, dietary intake with the 7-point scale SGA.

Result: Subjects comprised of 49% male and 51% females with a mean age of 54.1±13.1 year old. Majority of the subjects were Malay (86%), followed by Indian (8%) and Chinese (6%). The highest types of co-morbidities found among the subjects were hypertension (81%) and this study shows that only 20% of the subjects had cardiovascular disease. The mean of years of having hamodialysis treatment was 3.1±2.5. Using 7-point scale SGA had classified 56% of the subjects were moderately malnourished and 44% were well nourished. Mean BMI and energy intake of the subjects were 25.7±5.0 kg / m^2 and 17.4±7.8 kcal/kg /day respectively. The 7-point scale SGA score of the subjects showed significant correlation with BMI ($r=0.49$, $p<0.001$), MUAC ($r=0.52$, $p<0.001$), total body fat ($r=0.36$, $p<0.001$), percentage of body fat ($r=0.37$, $p<0.001$), serum creatinine ($r=0.33$, $p<0.001$), total protein ($r=0.23$, $p=0.04$) and ALP ($r=-0.23$, $p=0.04$). An increased in BMI, MUAC, total body fat and percentage of body fat was associated with a better nutritional status among the subjects. Positive correlation was found between total protein, serum creatinine and 7-point scale SGA.

However, there was a negative correlation between ALP with 7-point scale SGA. This study did not found correlation between socio- demographic , health status (co-morbidities, year of having haemodialysis, years of diagnosed with CKD) and dietary intake with the 7- point scale SGA.

Discussion: Several studies had shown that haemodialyis patients with higher BMI had better nutritional status. This was similar with the finding of this study. This study showed that there are association between MUAC and malnutrition. When MUAC value decreases, the risk of malnutrition was higher. Serum creatinine and total protein were positively correlated with 7-point scale SGA. The observed increment of serum creatinine in the patients may be due to the improvement in the dose and quality of the dialysis treatment which lead to appetite improvement and increased of muscle mass and vitality. Higher alkaline phosphatase level was found to increased the risk of malnutrition among the subjects. Other study also had found that high serum levels of alkaline phosphatase was associated with increased death risk among haemodialysis patients.

Conclusion: 7- point scale SGA had identified more than half of the subjects as moderately malnourished. Several anthropometric (BMI, MUAC, total body fat, percentage of body fat) and biochemical indicators (serum creatinine, total protein, alkaline phosphate) had showed an association with the 7 - point scale SGA.

Recommendation: A longitudinal study is required to further determine the mechanism between the associated factors and malnutrition. Health care professionals such as nephrologists, physicians and dietitians should involve in the management of the haemodialysis patients to improve their health status.