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Association of socio-demographic characteristics, nutritional status, risk of malnutrition and depression with quality of life among elderly haemodialysis patients

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ABSTRACT

Introduction: A compromised quality of life (QOL) as a result of haemodialysis (HD) is a rising global issue. Elderly HD patients face more challenges than younger counterparts. This study determined the association of socio-demographic characteristics, nutritional status, risk of malnutrition and depression with QOL, among elderly HD patients. **Methods:** A cross-sectional study was conducted among 112 HD elderly patients in selected dialysis centres in Selangor, Malaysia. The patients completed interview-based questionnaires on socio-demographic characteristics, risk of malnutrition (Dialysis Malnutrition Score, DMS), depression (Patient Health Questionaire-9, PHQ-9) and QOL (KDQOL-36). Anthropometric measurements, 24-hour dietary recall and food intake information were obtained from them and biochemical data from their medical records. **Results:** Just over half (50.9%) of the patients had a normal body mass index while 85.7% had optimal albumin levels. The proportion of patients who met the recommended energy and protein intakes were 19.0% and 3.4%, respectively. Patients were at moderate risk of malnutrition, had minimal depression level and perceived better QOL in terms of effects and symptoms of kidney disease. There was a significant positive correlation between protein intake and the physical domain of QOL (p=0.02) and negative correlation between risk of malnutrition with physical and mental composites of QOL (p<0.001). There was significant negative correlation between depression and physical composite, mental composite, burden, effects and the symptoms of kidney disease (p<0.001). **Conclusion:** The present findings provide better insight on QOL for future screening, preventive measures and intervention. Further investigation regarding factors associated with QOL among elderly patients is recommended.

Keywords: Quality of life, nutritional status, depression, haemodialysis, elderly

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INTRODUCTION

Chronic kidney disease (CKD) is a serious health problem that affects 10% of the world's population (El-Sayead, Mohamed Ahmed & Ali Mahmoud, 2015). Haemodialysis (HD) is one of renal replacement therapy (RRT) modalities that is used to prevent progression to complications such as anemia, cardiovascular disease, metabolic bone disease and dyslipidemia among end-stage renal disease (ESRD) patients (Iyasere *et al.*, 2016). In fact, the prevalence rate of HD in Malaysia had increased rapidly from 2006 to 2015. In 2015, 33,456 HD patients representing prevalence rate of 1097 per million populations were reported by the 23rd Report of the Malaysian Dialysis and Transplant Registry 2015 (Wong & Goh, 2015). According to the Malaysia Country Report, elderly is defined as people who aged 60 and above, a definition that is in consonance with those of the Ministry of Health and United Nations. The elderly patients face more challenges than their younger counterparts as the presence of geriatric syndromes, such as functional impairment, fall and frailty compromise their QOL and survival (Beberashvili *et al.*, 2016).

Quality of Life (QOL) can be defined as an individual's perception and satisfaction in life with regard to goals, social relationships, expectations, standards and independency. QOL can be used as prognosis and prediction for outcomes including survival rate. Poor QOL is high among HD patients and it is associated with increased hospitalisation and mortality rates (Morsch, Goncalves & Barros, 2006). HD results in a reduced QOL as it is time-consuming and as expensive for patients in the low to middle income groups. In addition, patients on HD are required to restrict themselves in order to have better control of their serum potassium and phosphorus level (Mujais *et al.*, 2009; Choi & Ha, 2013). In the long term, HD patients will develop a caregiver dependency and be deprived of freedom, employment opportunities, social interaction and family life.

The socio-demographic characteristics of HD patients have a great influence on their QOL. Advanced age contributes to poorer QOL because physical and cognitive functions deteriorate as age increases. Women were found to have a lower QOL and this may be the result of psychological effects that are secondary to hormonal changes (Guerra-Guerrero *et al.*, 2012). HD patients with a higher education level are able to perceive a better QOL. Kimmel & Patel (2006) stated that highly educated patients could access better economic opportunities and more information. Better education improved the compliance to therapeutic regimes and provided better adaption to changes in life (Ebrahimi *et al.*, 2016; Anees *et al.*, 2018). Social and family supports are crucial to QOL. HD patients who lived with other family members were found to have higher expectations for their future (Kim & Park, 2015).

Malnutrition is common in dialysis patients and worsens with age. Over one-third of dialysis patients have mild to severe malnutrition. Nutritional status is chief determinants in QOL in dialysis patients (Lacquaniti *et al.*, 2009). Uraemia reduces appetite and muscle mass, and induces negative nitrogen balance in HD patients. Accumulation of urea together with metabolic acidosis speeds up muscle protein catabolism (Kadiri, Nechba & Oulim, 2011). Dialysis-related factors induce higher demand for energy and protein requirements because some nutrients are lost into the dialysate during HD (Agboton *et al.*, 2017).

ESRD patients who receive maintenance dialysis exhibit a high prevalence of depression. Early diagnosis of depression is often missed,

most probably due to the similarities between depressive symptoms and uremic symptoms (Palmer *et al.,* 2015). The prevalence among elderly patients in hospital setting and nursing home is 40% and is 15% in the community setting (Ibrahim & El Salamony, 2008). Severity of depression has been found to be associated with serum phosphorus levels and the intensity of uraemia pruritus, which, in turn, have a negative effect on vitality, emotional functioning and social functioning (Zyoud *et al.*, 2016). Body pain has been found to be associated with more severely depressed patients.

The findings of the associations of socio-demographic characteristics, nutritional status, risk of malnutrition and depression with QOL are inconsistent. In addition, limited research related to the associations has been done on elderly HD patients in Malaysia. The aim of this cross-sectional study was to assess these associations among HD elderly patients in selected two dialysis centres in Selangor.

MATERIALS AND METHODS

Participants

Two private dialysis centres in each subdivision of the districts of Hulu Langat and Petaling in the state of Selangor in Malaysia were randomly selected for this study. A total of 112 HD elderly patients consisting of 62 males (55.4%) and 50 females (44.6%), were recruited. Their mean age was 67.4±7.0 years (range 60-95 years). The inclusion criteria were patients who had been on HD for at least three months, were aged 60 years and above and who were clinically stable. The study excluded patients with major sensory, motor or cognitive impairment, those who were hospitalised for more than 7 days during the previous month and those with a history of renal transplantation.

Materials

Socio-demographic data were obtained by way of an interview-based questionnaire. Anthropometric measurements were conducted to obtain height and pre- and post- dialysis weights to assess nutritional status. Data of serum albumin, creatinine and haemoglobin were obtained from patients' latest blood test result available in medical record upon visit to the respective HD centres. Medical Nutrition Therapy Guideline for CKD (MOH, 2005) was used as reference for the biochemical parameters with cut-off point of >35 g/L and >11 g/L for albumin and haemoglobin, respectively. There was no definite cut-off point for serum creatinine as patients with renal failure always demonstrate abnormal high creatinine level which could biased the result given that the normal range of creatinine fro healthy population is 53-97 mcg/l according to 5th Edition of Mobsby's Manual of Diagnostic and Laboratory Tests (Pagana & Pagana, 2014). Energy and protein intake of patients were assessed by way of 24-hour dietary recall for non-HD days and a food record for HD days. Food intake was recorded using household measurements that were converted into weight (g). Energy and protein intake were then analysed by using the Nutritionist Pro (Axxya Systems, USA) software.

The risk of malnutrition was assessed using the Dialysis Malnutrition Score (DMS) (Kalantar-Zadeh *et al.*, 1999). DMS consists of two parts with seven components each of which is graded on a scale of 5-points. The two main parts are: (1) Patient's related medical history (weight change, dietary intake, gastrointestinal symptoms, functional capacity, co-morbidity) and (2) Physical examination (subcutaneous fat and signs of muscle wasting) (Kalantar-Zadeh *et al.*, 1999). The malnutrition score is the sum of all seven components and the

DMS score can range from 7 (normal) to 35 (severely malnourished).

The Patient Health Questionaire-9 (PHQ-9) was used to measure the depression among the respondents (Kroenke, Spitzer & Williams, 2001). Nine items of PHQ-9 symptoms that were assessed were of the previous two weeks and were scored from 0 (absence of symptoms) to 3 (presence of symptoms nearly every day). The total score was the sum of each item thus, the score ranged from 0-27, with higher scores indicating more severe depressive symptoms.

QOL was measured using KDQOL-36 (Hays *et al.*, 1994). This instrument comprises 36 items with two main elements: (1) 12 items of Medical Outcomes Survey (MOS) SF-12 survey to assess the perceptions of subjects of their own mental and physical functioning and (2) 24 kidney-disease targeted items. The five subscales of KDQOL-36 had average scores from 0-100 with higher scores indicating better perceived health-related quality of life.

Procedure

The data collection was conducted over six months. Ethical approval was obtained from the Ethics Committee for Research involving Human Subjects (JKEUPM) of Universiti Putra Malaysia (Project reference number: FPSK [EXP17] P003). An approval letter was obtained from the two haemodialysis centres involved before study was conducted. The content of the interview was explained to patients and their informed consent was obtained on a signed form before the start. The HD patients completed the interview-based questionnaire on socio-demographic characteristics, risk of malnutrition, depression and QOL. Anthropometric measurements were done before HD session, the interview was conducted during HD session and biochemical data was obtained after dialysis session. All data collected were analysed using the IBM SPSS Statistics 23 software package. The Nutritionist Pro software was used to analyse the dietary intake of the subjects. The correlation between continuous variables was determined by using the Pearson's Product Moment Correlation Test.

RESULTS

Mean age of the subjects was 67±7 years old. Majority of the patients was from the Malay (62.5%) and Muslim (64.3%) communities. Approximately 77.6% of the patients were married and most had of them received a secondary education (47.3%). Almost all of the patients (96.4%) were either unemployed or retired while the employed patients (3.6%) worked in private sector. A large proportion (82.1%) of the patients did not have any income and were financially supported either by their children or grandchildren's (Table 1).

The anthropometric, biochemical and nutritional data of patients are shown in Table 2. Half of the patients (50.9%) were in the normal weight category while 27.7% and 9.8% of patients fell into overweight and obese categories, respectively. Most of the patients (85.7%) recorded albumin levels within the reference intervals. The mean haemoglobin level was 10.2±2.2 g/L and 58.9% of the patients had low haemoglobin level. The mean serum creatinine level of the patients was 678±183 μmol/L with 100% of the patients had serum creatinine level above the normal value of 53-97 mcg/L. The mean energy and protein intakes of patients were 20±8 kcal/kg and 0.8±0.4 g/kg, respectively. Both intakes were low with 91.0% of patients did not have adequate energy intake whereas 86.6% of them did not have adequate protein intake.

The mean DMS score was 12.9±3.3 (range 7-24) and 45.5% of the patients

Table 1. Socio-demographic characteristics of subjects (n=112)

Characteristics	*n (%)*
Sex	
Male	62 (55.4)
Female	50 (44.6)
Ethnicity	
Malay	70 (62.5)
Chinese	26 (23.2)
Indian	16 (14.3)
Others	0 (0.0)
Religion	
Islam	72 (64.3)
Buddhism	25 (22.3)
Christianity	2 (1.8)
Hinduism	13 (11.6)
Others	0 (0.0)
Marital Status	
Single	5 (4.5)
Married	87 (77.6)
Divorce/Widowed	20 (17.9)
Education Level	
No formal education	14 (12.5)
Primary education	29 (25.9)
Secondary education	53 (47.3)
Diploma/Bachelor/Master/PhD	16 (14.3)
Current Employment Status	
Unemployed/Retired	108 (96.4)
Private	4 (3.6)
Monthly Household Income	
No income	92 (82.1)
<RM1000	6 (5.4)
RM1000-RM2000	5 (4.5)
RM2001-RM3000	6 (5.4)
≥RM3001	3 (2.7)

Table 2. Anthropometric, biochemical and dietary intake data of patients (*n*=112)

Characteristics	*Mean±SD*	*Range*
Anthropometric		
Height (cm)	160.7±8.8	138.0-188.2
Dry Weight (kg)	62.2±13.4	35.5-111.8
BMI (kg/m^2)	24.1±4.8	14.8-42.3
Biochemical		
Albumin (g/L)	38.0±4.3	21.0-50.0
Haemoglobin (g/L)	10.2±2.2	2.5-16.2
Creatinine (umol/L)	678±183	354-1220
Dietary Intake		
Energy (kcal/kg)	20±8	7-48
Protein (g/kg)	0.8±0.4	0.2-2.2

Table 3. Quality of Life (QOL) subscales of patients

Items	*Mean±SD*
SF-12 components	
SF-12 Physical Composite	54.8±27.7
SF-12 Mental Composite	69.7±19.6
Kidney-disease specific	
Burden of kidney disease	51.1±27.7
Effects of kidney disease	80.3±14.4
Symptom/ Problem list	81.2±16.9

had a moderate risk of malnutrition. In the assessment for depression, the mean score of PHQ-9 was 5.0±3.9 with half of the patients (50.0%) having mild depression. Patients scored better in the two elements of QOL assessment, namely, in term of effects and symptoms of kidney disease, with mean scores 80.3±14.4 and 81.2±16.9, respectively (Table 3). On the contrary, patients scored lower in physical composite and burden of kidney disease subscales compared to other subscales.

The present study demonstrated that age was not associated with QOL of patients. There was no significant correlation between nutritional status and QOL except that between protein intake and the physical composite subscale of QOL. This study revealed that protein intake was poor but showed significant positive correlation with the physical composite of QOL (r=0.193, p=0.042) (Table 4). There was significant negative correlation between the risk of malnutrition and physical and mental composites of QOL (r=-0.417; r=-0.343, p<0.001). Depression correlated with all subscales of KDQOL-36. Significant negative correlations were found between PHQ-9 mean score and physical composite, mental composite, burden, symptoms and effects of kidney disease, respectively (r=-0.458; r=-0.501; r=-0.321; r=0.443; r=-0.299, p<0.001) (Table 4).

DISCUSSION

Almost all the patients in this study were either unemployed or retired. This might be due to the long duration of HD treatment and complications of kidney disease which lead to the early retirement of HD patients (Guerra-Guerrero *et al.,* 2012). Although majority of the HD patients were of normal weight, over a third (37.5%) was found to be overweight or obese. Most of the patients had normal albumin levels but showed reduced haemoglobin. Inflammation and metabolic acidosis were assumed to be well-controlled among patients due to normal albumin levels. Low haemoglobin levels are common among HD patients as their kidneys lose function to produce erythropoietin. Even if erythropoietin-stimulating agent is given, it might be ineffective since elderly patients might have reduced response to this therapy (Jung *et al.,* 2015). Most of the patients did not have adequate intake of energy and protein intake. This may have been due to altered taste, lethargy, disrupted mealtime and dietary restriction after dialysis initiation (Lynch *et al.,* 2013).

Patients in this study had a moderate risk of malnutrition. Some experienced a small weight loss, decreased functional capacity to carry out routine activities such as walking a great distance, climbing stairs and carrying a heavy load besides they complained of their ability to tolerate with suboptimal diet.

Table 4. Pearson's product moment correlation between age, nutritional status, risk of malnutrition, depression and quality of life (QOL) among subjects (n=112)

	Total Score		*SF-12 Physical Composite*		*SF-12 Mental Composite*		*Burden of Kidney Disease*		*Symptom/ Problem List*		*Effects of Kidney Disease*	
	r	*p*	*r*	*p*	*r*	*p*	*r*	*p*	*r*	*p*	*r*	*p*
Socio-demographic												
Age	-0.039	0.680	-0.098	0.304	-0.400	0.672	-0.098	0.305	0.022	0.819	0.065	0.499
Nutrition Status												
BMI	-0.068	0.479	-0.049	0.608	-0.088	0.357	0.400	0.677	-0.074	0.440	-0.048	0.616
Serum albumin	0.062	0.518	0.700	0.462	0.035	0.713	0.121	0.203	0.069	0.472	-0.077	0.420
Haemoglobin	0.044	0.642	-0.092	0.333	-0.030	0.751	0.035	0.717	0.107	0.262	0.139	-0.063
Serum creatinine	0.136	0.152	0.020	0.833	0.089	0.353	0.051	0.594	0.036	0.703	-0.063	0.512
Energy intake	0.119	0.210	0.050	0.602	0.118	0.215	0.031	0.747	-0.010	0.915	0.086	0.365
Protein intake	0.219*	0.020	0.193*	0.042	0.162	0.089	0.048	0.612	0.108	0.255	0.121	0.204
Risk of Malnutrition												
DMS Score	-0.368**	<0.001	-0.417**	<0.001	-0.343**	<0.001	-0.176	0.064	-0.183	0.054	-0.162	0.089
Depression												
PHQ-9	-0.579**	<0.001	-0.458**	<0.001	-0.501**	<0.001	-0.321**	0.001	-0.443**	<0.001	-0.299**	<0.001

* Correlation is significant at p<0.05
** Correlation is significant at p<0.01

The presence of hypoguesia and metallic taste may have affected the appetite of HD patients, resulting in diminished dietary intake and weight loss (Lynch *et al.,* 2013). Nausea and vomiting are known side effects of dialysis whereas diarrhoea may occur from intestinal infection or electrolyte imbalance during dialysis process. Aging, increase in duration of the dialysis treatment, co-morbidity, physical inactive as well as a prolonged inadequate dietary intake may impair the physical ability of HD patients (Harvinder *et al.,* 2016).

Most of the patients had mild depression. Patients also suffered from post-dialysis lethargy and fatigue all the day and insomnia during bedtime. This contributed to sleepiness and drowsiness during daytime. These conditions could be explained by elevated levels of plasma orexin which, disturbs the metabolism of melatonin thereby interfering with sleep and contributing to wakefulness (Jhamb *et al.,* 2008; Li *et al.,* 2016). QOL of patients that was evaluated by five subscales of KDQOL-36 and patients scored better QOL in terms of the mental composite, effects and symptoms of kidney disease. The desirable mental outcome can be explained by adaptation of expectation towards chronic disease and dialysis-induced complications that the patients had developed after certain period of time. The results indicated that there was no significant correlation between age and all subscales of QOL. This may be because previous studies included patients aged 18 and above, as against the present study which only had patients aged 60 and above (Calvancante *et al.,* 2013).

Protein intake was low but showed significant positive correlation with the physical composite of QOL. The reason may be due to protein from dietary intake helps to replenish the protein loss from catabolic process of dialysis to re-synthesise muscle protein. Inadequate protein intake could result in fatigue, susceptibility to infection and weight loss or muscle wasting. Consequently, the effects of inadequate protein accelerate the depletion in physical performance of patients (Johansen *et al.,* 2003; Raimundo *et al.,* 2006). The findings of the present study supported the previous findings which stated that energy, protein and some key micronutrient deficiencies could exert a negative effect on QOL of HD patients Ohri-Vachaspati & Sehgal, 1999; Raimundo *et al.,* 2006).

There was significant negative correlation between risk of malnutrition and the physical and mental composites of QOL. Similar results were obtained in previous studies although those studies used different measures to determine the malnutrition of HD patients. Ibrahim & El Salamony (2008) and Sohrabi *et al.,* (2015) showed a negative correlation between risk of malnutrition and QOL, in which Malnutrition Inflammation Score was used as measure of malnutrition. Lower physical and mental functions were found in more severe malnourished patients. Depression was correlated with all subscales of KDQOL-36 in this study. Significant negative correlations were found between the PHQ-9 mean score and with the physical composite, mental composite, burden, effects and symptoms of kidney disease. Similar findings were found in the studies of Oliveira *et al.* (2012), Li *et al.* (2016) and Ganu *et al.* (2018) which demonstrated moderate to strong negative correlation between depression and quality of life with $p<0.001$ for the former and $p<0.01$ for the later. Itching and pain in joint or bone could be found in more severe depressed patients together with low self- image and low expectation for future.

CONCLUSION

Age, body mass index, serum albumin, creatinine, haemoglobin and energy intake were not found to be associated with QOL. An increase in protein intake may improve QOL, especially physical function. Severe malnutrition is associated with poorer physical and mental health. Depressed HD patients suffered from impaired physical, mental function, burden, effects and symptoms of kidney disease. QOL decreases as severity of depression increases. The present findings provide better insight on mechanism of nutritional status and depression and their associations with QOL for future screening, preventive measures and intervention. Further investigation regarding factors associated with QOL in elderly patients in the Malaysia setting is recommended.

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Authors' contributions

FIMS, led the data collection in Hulu Langat district; LZY, conceptualized the study, responsible for data analysis and interpretation and prepared the draft of the manuscript; NO, principal investigator, advised on the data analysis and interpretation and reviewed the manuscript; NFZ & ZAMD, research committee member, reviewed the manuscript.

Conflict of interest

The authors declared of no conflict of interest.

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