



Multidimensional Fatigue Syndrome and Dialysis Adequacy among Elderly Patients under Hemodialysis Treatment

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Abstract

Background: Multidimensional fatigue syndrome (MFS) is referred to as extreme inability accompanied by decline in physical functional capacity and impairment of intellectual function, such as loss of concentration. Elderly people are more prone to MFS comparing to other age groups. It is expected that adequacy of dialysis affect the process of MFS among patients under dialysis. The purpose of the study is to assess MFS and its association to adequacy of dialysis among dialysis patients.

Methods: This cross-sectional study is conducted on patients under dialysis aged 50 years and above. Convenience sampling was used to collect the data. The main instrument of the study was Multidimensional Fatigue Symptom Inventory- Short Form (MFSI-SF). To assess subjects' mental status Mini Mental Status Exam (MMSE) was applied. Subjects with MMSE greater than 18 were included in the study.

Results: The participants' range of age were 50 to 81 and the mean age of them were 62 years old. According to the findings of this study, of 43 eligible participants, 33 patients (76.7%) were suffering from different level of MFS. Moreover, adequacy of dialysis among dialysis patients were favorably high in 10 patients (23.2%), moderate in 24 patients (55.8%) and low in 9 patients (21%). Multiple regression showed that MFS ($P=0.01$) and anemia ($P=0.04$) were significantly associated with adequacy of hemodialysis among elderly patients.

Conclusions: This study is in line with hypothesis of the study that adequacy of hemodialysis reduces MFS among elderly patients under hemodialysis. It is highly recommended that adequacy of hemodialysis and Hb level should be under close monitoring to overcome MFS among senior citizens under hemodialysis treatment.

Keywords: MFS, Dialysis adequacy, Elderly patients, Hemodialysis.

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Fatigue Syndrome (MFS) is referred to as extreme inability accompanied by decline in physical functional capacity and impairment of intellectual function, such as loss of concentration.⁷⁻⁹ Contrary to the normal physiological tiredness, it is not relieved by sufficient sleep or rest.¹⁰ Fatigue is perceived as a potentially treatable symptom requiring adequate diagnosis and interventions.^{10,12} Multidimensional Fatigue Syndrome was first introduced to assess fatigue in patients⁷ with cancer or under chemotherapy.¹⁰ Few studies have investigated Multidimensional Fatigue Syndrome among End Stage Renal Disease (ESRD) patients. While these findings are important, they do little to expand our knowledge regarding the Multidimensional Fatigue Syndrome among elderly patients on hemodialysis.¹³⁻¹⁴ Moreover, elderly patients under treatment of hemodialysis are generally neglected in previous related studies. It is recommended to evaluate whether dialysis is removing enough urea. The dialysis clinic should periodically (normally once a month) test a patient's blood to measure dialysis adequacy.^{2,12} The most reliable method to assess dialysis adequacy is to measure Kt/V as an index for dialysis adequacy. In medicine, Kt/V is a number used to quantify hemodialysis, where K is dialyzer clearance of urea, t is the dialysis time and V is the volume of distribution of urea, approximately equal to patient's total body water.¹⁵

Since, adequacy of dialysis can promote quality of life among patient with ESRD under dialysis,¹³ it is imperative to explore its determinants such as Multidimensional Fatigue Syndrome. The purpose of this study was to investigate the association of adequacy of hemodialysis and multidimensional fatigue syndrome among near old ESRD patients under hemodialysis treatment.

Materials and Methods

This cross-sectional study was conducted in referral dialysis center covering urban and rural area with population of some 140000, people. More than 70 patients were under treatment of hemodialysis at the time of the study. Subjects of this study were 48 patients 50 years old and above. Other inclusion criteria were being under hemodialysis during last 12 months. Of all 48 eligible subjects, one patient declined to participate the research process and four subjects excluded from the study because of low Mini-Mental Status Examination (MMSE) score (below 18). The remaining 43 subjects were under continuous hemodialysis three sessions a week, each lasting 3-4 hours.

Introduction

The number of patients on hemodialysis dialysis is increasing in many countries.¹⁻³ Previous studies have concluded that ESRD seems to be more prevalent at higher ages.² Fatigue is one of the most frequent complaints of dialysis patients and is associated with impaired health-related quality of life.⁴ ESRD patients undergoing chronic hemodialysis suffer from numerous complications including fatigue.⁵⁻⁷ The prevalence of fatigue ranges from 60% to as high as 97% in patients on long-term renal replacement therapy.⁴⁻⁷ Previous researches suggest that fatigue is a multidimensional phenomenon, composed of physical, psychological, and possibly other aspects.⁷⁻⁸ Multidimensional

In this study all patients were treated by bicarbonate hemodialysate with conventional biocompatible membrane. The calcium content of dialysate varied between 1.5 and 1.75 mmol / L. The dialysis process was the same in terms of dialysate content and temperature, daytime and standard vessel access.

A questionnaire containing information regarding demographics, hemodialysis treatment dose, and other comorbid conditions was applied. In addition, the Multidimensional Fatigue Symptom Inventory- Short Form (MFSI-SF) was applied to assess subjects' fatigue. The Multidimensional Fatigue Symptom Inventory- Short Form is a 30-item of the MFSI that yield scores for the empirically derived subscales.¹⁸ Preliminary research suggests that it has acceptable psychometric properties and may be used as a substitute for the MFSI when time constraints and scale length are of concern.^{7-8;14} In fact, the Multidimensional Fatigue Symptom Inventory- Short Form (MFSI-SF) is a self-report instrument designed to measure fatigue. It covers the dimensions of general, physical, mental, emotional fatigue and vigor.⁷ Each dimension of fatigue is assessed by 6 questions, separately. For total scoring of fatigue, the scores of all subscales including general, physical, mental, emotional fatigue and vigor are added. Scoring the items in subscale of vigor is inversed. The range of scores in MFSI-SF is between 0 and 120. Scores of 0 to 30 indicate no multidimensional fatigue syndrome. Subjects' scores of 31 to 60, 61 to 90 and 91 to 120 show low, moderate and high MFS, respectively.⁷⁻⁸

In order to assess validity and reliability of the scale, 2 bilingual faculty members and one native English speaker who was completely unaware of the test and its purpose, conducted the forward- backward translation process. Ten faculty members assessed the translated version of the scale. They approved face and content validity of the translated version of the scale, after some minor modifications.

The National Kidney Foundation recommend that adult hemodialysis patients receive a minimum dialysis dose by single-pooled Kt/V (spKt/V) of 1.2 or greater.¹⁵ In medicine, Kt/V is an equation used to assess the quantity of hemodialysis and treatment adequacy, where K is dialyzer clearance of urea, t is the dialysis time and V is the volume of urea. In the context of hemodialysis, Kt/V is dependent on the pre- and post-dialysis BUN concentration. The US National Kidney Foundation Kt/V target is ≥ 1.3 .¹⁶

Hemoglobin (Hb) is the main parameter to assess anemia.¹⁷⁻¹⁸ In fact, anemia is a deficiency of oxygen-carrying red blood cells, measured in unit volume concentrations of Hb.¹⁷ A recent study (2014) defines anemia as an Hb level <12 g/dL for women and <13 g/dL for men. This figure for hemodialysis patient is lowered to 10 mg/dl. Moreover, anemia may be associated with the aging process, as its prevalence increases with age.¹⁹

All data were entered into a database and were verified by a second independent person. Statistical analysis was performed

using SPSS version 19. Descriptive statistics was applied to calculate Mean (M) and Standard Deviation (SD) of interval variables. In addition, univariate analysis (Chi-Square) was applied for correlated variables of Multidimensional Fatigue Syndrome. Multiple logistic regression analysis was used to calculate Kt/V and Hb. adjusted odds ratios for all variables. Variables with $P < 0.05$ were chosen to be entered into the final model.

Results

The participants' range of age was 50 to 81 and the mean age of them were 62 years old. The number of male and female subjects of the study were 25 (58%) and 18 (42%), respectively. The length of hemodialysis treatment ranged from 1 to 22 years. The mean (M) and standard deviation (SD) of interval variables of the study including five subscales of MFS score among subjects of the study are summarized in Table 1.

Table 2 presents Chi-Square results for correlated variables of multidimensional fatigue syndrome. The results of the study regarding adequacy of hemodialysis, indicated 21 percent of the subjects (n=9) were suffering from very low adequacy of hemodialysis ($Kt/V \leq 1.2$), 56 percent (n=24) subjects had normal adequacy of hemodialysis ($Kt/V > 1.2-1.6$) and the remaining 23% (n=10) of the subjects had high adequacy of hemodialysis ($Kt/V \leq 1.7$). Chi-Square results showed that there was a significant relationship between participants' adequacy of hemodialysis and MFS score ($P < 0.001$) of all 43 participants of the study, 19 patients (44%) had hemoglobin lower than 10 mg/dL and were under treatment of Erythropoietin at the time of study. Moreover, the results indicated a significant relationship between subjects' level of hemoglobin and MFS score ($P = 0.04$).

Table 1. Mean and standard deviation of the participants' characteristics

	Range	Mean	SD
Age (year)	50 to 81	62.3	4
Length of Dialysis (year)	1-22	7.6	2
Level of Hb (mg/dL)	6-12.3	9.5	2
Kt/V	0.7- 1.8	1.1	0.6
Calcium	6.2- 10.3	8.3	1.6
MFS			
General	4-25	21	4
Physical	5-28	22	5
Mental	5-26	18	3
Emotional	6-24	22	5
Vigor	5-23	23	6
Total	25-126	106	4.6

The results of multiple logistic regressions are shown in Table 3. According to Table 3, after controlling for covariates, lower Hb levels and low adequacy of hemodialysis were significantly associated with MFS. Based on, multiple logistic regressions showed that one unit decrease in Kt/V would increase the risk of fatigue by 1.85 times (95% CI 1.73, 1.96). Moreover, any one unit decrease in Hb would increase the fatigue by 1.65 times (95% CI 1.48, 1.85).

Table 2. Chi-Square analysis results for determinants of MFS

Outcome Variables	N (%)	MFS				P.V
		No (%)	Low (%)	Moderate (%)	High (%)	
Age	50-60	18 (41)	3 (14)	5 (28)	6 (34)	0.31
	61-70	15 (35)	4 (27)	3 (20)	3 (20)	
	>71	10 (23)	3 (30)	2 (20)	2 (20)	
Gender	Male	25 (58)	5 (20)	4 (16)	8 (32)	0.13
	Female	18 (42)	3 (17)	4 (22)	6 (33)	
Length of Dialysis	< 2 years	12 (28)	2 (17)	4 (34)	3 (25)	0.09
	2 -10 years	20 (47)	6 (30)	4 (20)	5 (25)	
	≥ 10 years	11 (26)	3 (27)	2 (18)	3 (27)	
Level of Education	Illiterate	14 (33)	3 (21)	4 (27)	4 (27)	0.21
	Primary	22 (51)	5 (23)	7 (32)	6 (27)	
	High School	7 (16)	3 (43)	2 (29)	1 (14)	
Level of Hb (mg/dL)	<Below 10	19 (44)	3 (16)	3 (16)	7 (37)	0.04
	≥10	24 (56)	8 (33)	9 (37)	5 (21)	
Diabetes	Yes	26 (60)	6 (23)	6 (23)	7 (27)	0.00
	No	17 (40)	5 (29)	4 (24)	3 (18)	
Hypertension	Yes	22 (51)	7 (32)	5 (23)	6 (27)	0.17
	No	21 (49)	4 (19)	6 (29)	6 (29)	
Kt/ V	Low	9 (21)	1 (11)	2 (22)	2 (22)	0.00
	Normal	24 (56)	8 (34)	7 (29)	5 (21)	
	High	10 (33)	5 (50)	2 (20)	2 (20)	
Calcium	Low	27 (63)	8 (30)	6 (22)	7 (26)	0.17
	Normal	16 (37)	5 (31)	4 (25)	4 (25)	

P<0.05

Table 3. The results of the multiple logistic regression analysis of the possible determinants

	Odd's ratio	95% CI		P.V
		Lower	Upper	
Kt/V	1.85	1.73	1.96	0.00
Anemia	1.65	1.48	1.85	0.04

Discussion

This is one of the first studies from Iran, presenting the prevalence of MFS. The outstanding finding of the study was the impact of adequacy of hemodialysis on MFS. To our knowledge this study is the first study to explore the relationship between hemodialysis and MFS. Findings of the study are in accordance with Lobbedez (2008) study which concluded that fatigue score were high in elderly dialysis compared with nondialysis patients. In addition, this study found that anemia was common among participants of the study. The reason behind the correlation of MFS with anemia among patients with chronic kidney disease (CKD) is evident.^{17,21} Anemia results from insufficient production of erythropoietin by the kidneys and is a common complication of chronic kidney disease.^{14,21} Anemia is most pronounced in patients with ESRD requiring dialysis, and has been reported to be associated with a variety of symptoms including fatigue, muscle weakness, impaired physical functioning, shortness of breath and depression.^{4-5,14,21} Moreover, the use of Erythropoietin Stimulating Agents (ESA) to correct anemia in dialysis patients has been shown to improve health related quality of life, fatigue, exercise tolerance and work capacity.^{8,13,18,21} The routine protocol for anemia management in Iran includes recombinant α -erythropoietin and iron source for intravascular iron.³ In fact, fatigue is a determinant element of quality of life. Erythropoiesis-stimulating agent therapy in patients with renal insufficiency and cancer revealed a consistently positive relationship between health's related quality of life and hematocrit levels, with the strongest effect on the energy/fatigue domains.¹⁸ These findings were confirmed by a

meta-analysis of the impact of epoetin alfa in patients with chronic kidney disease.²²

The finding of this study is accordance with previous studies which concluded that dialysis patients who received Erythropoiesis-stimulating agents to a target hemoglobin of 10g/dL had significantly lower fatigue levels after the target hemoglobin was reached.^{14,18,22} In addition, Canadian Erythropoietin Study Group found that patients treated with ESA also had a significant decrease in fatigue from baseline to 2 month follow-up.²¹ A large longitudinal study found that patients who received EPO to achieve a normal hemoglobin level (13.0-15.0 g/dL) had significantly better vitality scores as measured by the SF-36.^{11,23} There were some drawback for this study. The main limitation of the study was limited number of patients in the age range of participants 50 years old and above. Moreover, participants of the study were not selected randomly. Future studies are suggested to work on a large, randomly selected sample of elderly patients. In this study, researchers had access to limited number of elderly patients under treatment of hemodialysis.

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Conflict of Interest

There was no conflict of interest to be declared by the authors.

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