Assessment of perceived fatigue and its associated factors among patient with End Stage Rental Disease and undergoing hemodialysis at King Khaled Hospital.

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Abstract

The literature regarding the experience of fatigue in hemodialysis patients indicates that fatigue seems to impact primarily the physical and mental domains. Physical fatigue was described by patients as a constant lack of energy, which seemed worse on dialysis days. Fatigue is negatively correlated with physical functioning, role limitations, activity levels, and mental and physical quality of life. ***Aim****: assess level of fatigue and its associated factors among hemodialysis patients with End Stage Renal Diseases.*

Research design: *Descriptive Correlational research design was used in this study.* ***Setting:*** *the current study was conduct in hemodialysis unit, Medical surgical wards, outpatient clinic in king Khaled hospital in Jeddah, Saudi Arabia. Sample: sample of 100 adult patients randomly chosen and enrolled according to the inclusive and exclusive criteria.* ***Tool:*** *Two tools were used for data collection in this study; first one is a personal and medical information form (PMIF) and second one is A Greek Version of Fatigue Assessment Scale (FAS) which collects information related to the perceived fatigue consisting of 10 questions.* ***Results:*** *majority of patients had post dialysis fatigue, (72%) of them reported moderate fatigue and (20%) of them reported severe level of fatigue with mean score (29.25±5.46). there is a relation between gender, marital status, residency, and level of education Logistic regression analysis shows that clinical and biomedical variable not associated with fatigue, Only age and gender could predict fatigue level.* ***Conclusion:*** *the study concluded that fatigue level vary from moderate to severe, some demographic characteristic of participate were related to fatigue, there is no association between clinical and biomedical variable and fatigue only age and gender could be a predictors for post-dialysis fatigue level.* ***Recommendations:*** *the study recommended that, increase nurses awareness to deal with post-dialysis fatigue symptoms by educational program. And routine screen of hemodialysis patient to detect contributing factor of fatigue early and alleviating its effects.*

Keywords— fatigue, hemodialysis, End stage renal disease, FAS scale, Chronic Kidney Disease.

Introduction

End stage renal disease (ESRD) is a serious disease that causes irreversible impairment of the renal functions. The impairment of the renal functions can lead to fluids and electrolyte imbalance, retention of body waste and taxation. The treatment can prevent or reduce the risk to develop complications. The number of patients with end stage renal disease (ESRD) is rapidly increasing worldwide. **Zyga S et al (2015) & Bahgat Z et al (2016**). According to a research done in The Renal Medicine Department, The Royal Hospital, Oman: "the prevalence of ESKD was 49, 916, and 2386 in 1983, 2001, and 2013 respectively. Among patients with

ESKD on RRT, a progressive rise was seen in diabetic nephropathy, with 5.8%, 32.1%, and 46% in 1983, 2001, and 2013 respectively" **Al Ismaili et al (2016).** The dialysis statistics prepared by the Saudi Center for Organ Transplantation (SCOT) at the end of 2017 showed a total of 19,659 dialysis patients, 18,270 of them are treated by hemodialysis (HD) and the remaining 1,389 by peritoneal dialysis (PD). The prevalence of end-stage renal failure treated by dialysis is estimated to be 604 cases/PMP, total death was 1,726 (9%), while the incidence of treated end-stage renal disease is estimated at 163 cases/PMP. **Saudi Center for Organ Transplantation SCOT (2018).**

The most effective treatment beside the kidney transplantation is hemodialysis (HD) which is separate and remove the toxic metabolic substances from the patient's blood by a semi-permeable membrane into a dialysis solution. There are some non-medicational interventions are used in some hospitals or educated to the family to reduce the patient's fatigue such as sleep disorders treatment, stress management, sports, nutrition therapy, Yoga, depression treatment and acupressure **Horigan A. et al (2013).**

Fatigue is the most unpleasant symptoms or side effect experienced by large number of adult patients who are undergoing hemodialysis (HD) sessions for long term. It's can affect the patient's mental and physical functions, concentrating difficulties, impact their quality of life, decreased appetite and decrease the survival rate. Also, it will decrease the self-care ability, the independency and make the patients more dependent on others which is can lead to low confidence and self-esteem, make them more isolated, general weakness, loss of energy and mood changes frequently. Other components that can affect the level of fatigue include sleep disorders, anaemia and depression **Bayumi H et al (2015)**.

The fatigue itself is a subjective manifestation describe as self-recognized condition that may be difficult for some patient to express or describe, but they usually use words such as lethargic, exhausted or tired to express their fatigue. Fatigue can be objective data when there is an obvious impaired performance such as slowed movement and lack of energy. And the severity of the fatigue are vary from patient to another and for some of them fatigue is vary from sever to extremely sever. The health care providers in the renal department face many obstacles when trying to reduce fatigue in dialysis patients because of the lack of a reliable and valid fatigue scale which is complicate the accurate identification of the symptom **Horigan, Ann. (2018).**

Significance of the study:

This study will focus on assessment of the levels of fatigue and associated factors among hemodialysis (HD) patients with End Stage Renal Diseases (ESRD). The purpose of the study are to measure the levels of fatigue and how that affects on patient, and assess the association between fatigue and factors among hemodialysis (HD) patients with End Stage Renal Diseases (ESRD). The results of the study will be useful for HD patients because the majority of them complain of "nonspecific symptoms" which are assessed by health professionals as "irrelevant" to fatigue. Therefore, the diagnosis of fatigue is important in order to achieve early detection and treatment.

Aim of the Study:

The aim of this study was to assess level of fatigue and its associated factors among hemodialysis patients with End Stage Renal Diseases.

Specific Objectives:

1- Measure level of fatigue among end stage renal disease (ESRD) patients undergoing hemodialysis.

2- Identify associated factors that lead to fatigue in patients with end stage renal failure (ESRF).

Material and methods:

Study Design:

Descriptive Correlational research design was used to describe and correlate the level of fatigue with its' associated factors.

Setting:

The study was conducted at King Khaled Hospital which is 531-beds military hospital located in Jeddah, the Western Region of Saudi Arabia This study will focus on hemodialysis unit, Medical surgical wards, and outpatient clinic in king Khaled hospital.

Study Subjects:

The study subjects were 100 adult patients randomly chosen, who have End Stage Renal Disease and undergoing hemodialysis and were available at the time of data collection during October and November 2018 in previously mentioned setting with the following inclusion and exclusion criteria.

Inclusion Criteria:

1. Adult patient (18 years or older).
2. Both Male and Female.
3. Ability to write and read.
4. Patient undergoing hemodialysis at least for 6 months.

Exclusion criteria:

1. Younger than 18years.
2. Patients with history of mental illness.
3. Patients with serious mobility or eye problems.

Measuring Instrument:

Two tools were used for data collection in this study:

1. **A personal and medical information form (PMIF):** Is related to the demographic characteristics of patients (gender, age, marital and employment status, educational level). And medical information (albumin, blood urea nitrogen (BUN) before and after dialysis, and creatinine level), presence of depression.

2. **A Greek Version of Fatigue Assessment Scale(FAS):** FAS is a tool which collects information related to the perceived fatigue It was constructed by **Michielsen et al (2003)** consisting of 10 questions It takes only two minutes to complete. The patients' responses on 10 questions are summed in order to construct the score. The coding of responses is as follows. 1 = never, 2 = sometimes, 3 = regularly, 4 = often, 5 = always. Therefore, the score ranges between 10-50. Five questions are related to the physical fatigue and the other five (questions 3 and 6-9) to mental fatigue.

An answer to every question has to be given, even if the person does not have any complaints at the moment. Scores on question 4 and 10 should be recoded (1=5, 2=4, 3=3, 4=2, 5=1). Subsequently, the total FAS score can be calculated by summing the scores on all questions (recoded scores for questions 4 and 10). Patients are categorized as "non-fatigued" if the FAS score is below 22, "fatigued" if the FAS score is higher or equal to 22 and "extremely fatigued" if the FAS score is higher or equal to 35. Psychometrics properties of Greek version have been tested and the internal consistency of the scale was found to be equal to 0.76

Pilot study

After translating the tool to Arabic version, a pilot study was carried out for purpose of testing the tool, to determine clarity, relevance, feasibility of the tool. To achieve that, the tools were tested over 6 patients. Content validity were reviewed and determined by a panel of five expert professors in medical surgical nursing.

Methods:

Data was collected over a period of two months October and November 2018. The researchers interviewed randomly selected names to inform them that they have been selected to participate in the study .Those who agree to participate singed the consent form and was given the questionnaire to fill. The consent form explains to the participants the purpose of the study, their rights to withdraw from the study at any point of time without penalty and their names will be kept anonymous.

Ethical Considerations:

After approval of KAIMRC (King Abdulaziz International Medical Research Center) to conduct the study. All the respondents were fully informed about the research purpose, the nature of the study. All respondents were required to indicate their willingness to participate in the study by signing a consent form and their right to withdraw from the study at any time. Confidentiality will be ensured in this study by using code names rather than respondents' real names during data collection and analysis. The questionnaire used for data collection will be handled by only the research team.

Statistical Analysis:

Statistical package for social science software (SPSS version 20) were used for statistical analysis. Descriptive statistics were calculated to describe the demographical characteristics of the respondents, level of fatigue. In addition to this, the relationship between perceived fatigue of patients with their sociodemographic data and fatigue associated factors were determined. A logistic regression analysis was used to determine the independent factors which had an effect on fatigue. Values of $p < .05$ were considered statistically significant.

Results

Table (1) revealed that the demographic characteristics of the study participants, with Mean age (62.91± 15.78), 57% male and 43% female. 81% of them live in urban area and rest of them 19% live in suburban area. Regarding to education level most of them 49 % have university level of education followed by 18 % can read and write (literate), 16% & 14 % had primary had intermediate level of education respectively. As regards to their marital status, 76% of them married followed by 14% were widow, 8% were single and 2% divorced. Considering occupation, it was observed Majority of the sample 41% were housework and retired.

Table (2) illustrated that descriptive statistics of physiological and psychological variables for study participants. Physiological factors included laboratory data (Hgb, Albumin, URR) and duration of HD, taken from medical records. For univariate analysis, all laboratory data were classified into the categories low, normal, and high using the normal range of each indicator given by the laboratory. Most of the patients had below normal levels of albumin and haemoglobin while URR was within normal range. The mean duration of HD was 3.51±.45 hrs. Regarding psychological variable 77% of participants stated that they are feeling depressed.

Table (3) display the responses of patients in FAS scale questions. While the descriptive data of the fatigue indicators are given in Table 3.1. The mean FAS score was 29.25±5.46. It was observed that most of patient 71% were fatigue followed by 20% were extremely fatigue 8% were non fatigue.

Table (4) shows analysis of influence of participant sociodemographic characteristics in the mean values for the FAS and its' subscales of the study participant. It was observed that there is no statistical significant change in their fatigue level with increasing of their age although however the mental fatigue is increasing statistically significant with the age. Women had more fatigue than men, their fatigue level changed with the residency place, the resident of the suburban area had more fatigue than urban area. As educational level increased, fatigue increased. Widow participant had higher fatigue followed by Married and divorced than single participants this difference were found to be statistically significant ($p < .05$) There is no significant difference in fatigue level in relation to occupation.

Table (5) Represent the correlation of total FAS scores with factors might associated with fatigue. It was found that the only statistically significant independent negative predicator of the total fatigue score were the age and gender (r 0.351, p <5). While duration of hemodialysis session, albumin, Hgb and are you depressed were a positive predictors. Among these variables, only age and gender were found to be an independent predictor of fatigue in logistic regression analysis.

Table 1): Number and Percent Distribution of Study Participants according to their Demographic Characteristics.

	Number =100	**%**
Age (Mean ± SD)		62.91± 15.78
• 15-24	1	1%
• 25-34	6	6%
• 35-44	7	7%
• 45-54	13	13%
• ≥ 55	73	73%
Gender		
• Male	57	57%
• Female	43	43%
Residency		
• Urban Area	81	81%
• Suburban Area	19	19%
Education		
• Literate	18	18%

• Primary	16	16%
• Intermediate school	14	14%
• High school	3	3%
• University	49	49%
• Postgraduate	0	0%
Marital status		
• Single	8	8%
• Married	76	76%
• Divorced	2	2%
• Widow	14	14%
Occupation:		
• Unemployed	5	5%
• Private Employee	2	2%
• Government employee	5	5%
• Free business	4	4%
• Housework	41	41%
• Retired	41	41%
• Student	2	2%
• Other	5	5%

Table 2): Descriptive Statistics of Physiological and Psychological Variables for study participants.

	Number=100	**%**
Albumin (Mean ± SD)	36.10±6.147	
Range	35-50	
• Below	75	75%
• Normal	25	25%
Hgb (Mean ± SD)	10.903±3.6598	
Range	11.5-16.5	
• Below	65	65%
• Normal	35	35%
URR (Mean ± SD)	7.316±7.1991	
Range	1.9-5.7	
• Below	2	2%
• Normal	62	62%
• Above	36	36%
Duration of hemodialysis (Mean ± SD)		3.51±.45
• 1-2	3	3%
• 3-4	97	97%
• 5-6	0	0%
• 7-8	0	0%
Depression		
• NO	23	23%
• Yes	77	77%

Table 3: The Fatigue Assessment Scale

	Frequency (%)				
	Never	**Sometimes**	**Regularly**	**Often**	**Always**
1. 1 am bothered by fatigue	10(10%)	45(45%)	17(17%)	8(8%)	20(20%)
2. I get tired very quickly	13(103%)	36(36%)	14(14%)	10(10%)	27(27%)
3. I don't do much during the day	19(19%)	15(15%)	18(18%)	14(14%)	34(34%)
4. I have enough energy for everyday life	16(16%)	31(31%)	19(19%)	8(8%)	26(26%)
5. Physically, I feel exhausted	13(13%)	40(40%)	11(11%)	11(11%)	25(25%)
6. I have problems to start things	16(16%)	27(27%)	9(9%)	16(16%)	32(32%)
7. I have problems to think clearly	26(26%)	25(25%)	33(33%)	3(3%)	13(13%)
8. I feel no desire to do anything	27(27%)	7(7%)	28(28%)	5(5%)	33(33%)
9. Mentally, I feel exhausted	62(62%)	16(16%)	11(11%)	3(3%)	8(8%)
10. When I am doing something, I can concentrate quite well	4(4%)	21(21%)	27(27%)	5(5%)	43(43%)

Table 3.1. Descriptive characteristics of fatigue indicators

	N=100	**%**
Total FAS Score (Mean ± SD)	29.25±5.46	
Non-fatigued (>22)	8	8%
Fatigued (≤22-34)	72	72%
Extremely fatigued (≤35)	20	20%
Total	**100**	**100%**

Table 4. Influence of sociodemographic characteristics in fatigue indicators.

	Total FAS	**P Value**	**Physical Fatigue**	**P Value**	**Mental Fatigue**	**P Value**
Age						
• 15-24	22(0)	Kruskal-Wallis= 0.14	8 (0)	Kruskal - Wallis= 0.089	14(0)	Kruskal - Wallis= 0.013
• 25-34	24(4.05)		12.67(2.50)		11.33 (2.42)	
• 35-44	28.29(6.87)		15 (3.74)		13.29(3.30)	
• 45-54	26.77(5.10)		14.23(3.59)		12.54(2.22)	
• ≥ 55	30.32(5.12)		15.49(3.36)		14.82(2.93)	
Gender						
• Male	28.72(5.87)	.000	14.91(3.61)	.000	13.81(3.26)	.000
• Female	29.95(4.85)		15.23(3.29)		14.20(2.57)	
Residency						

• Urban Area	28.84(5.47)	.000	14.88(3.54)	.000	13.96(2.98)	.000
• Suburban Area	31(5.22)		15.79(3.10)		15.21(2.95)	
Education						
• Illiterate	28.78(7.43)	Kruskal-Wallis= .001	15.11(4.50)	Kruskal - Wallis= .008	13.67(3.71)	Kruskal - Wallis= 0.009
• Primary	26.81(5.34)		13.56(3.69)		13.25(2.77)	
• Intermediate school	25.50(3.50)		13.14(1.88)		12.36(2.44)	
• High school	31.00(1.00)		17.33(4.04)		13.67(3.51)	
• University	31.18(4.42)		15.92(2.97)		15.27(2.57)	
• Postgraduate	0(0)		0(0)		0(0)	
Marital status						
• Single	24(4.90)	Kruskal-Wallis= 0.0.016	12.38(3.46)	Kruskal - Wallis= .074	11.63(2.62)	Kruskal - Wallis= .026
• Married	29.3(5.45)		15.1(3.52)		14.22(3.03)	
• Divorced	29.50(7.78)		16(5.66)		13.50(2.12)	
• Widow	31.93(3.67)		16.29(2.23)		15.64(2.31)	
Employment:						
• Unemployed	27.8(6.8)	Kruskal-Wallis= .191	12.8(4.21)	Kruskal - Wallis= .135	15(3.46)	Kruskal - Wallis= .347
• Private Employee	22(5.66)		10(2.83)		12(2.83)	
• Government employee	28.4(4.78)		15.4 (2.07)		13(2.92)	
• Free business	32(3.92)		16.5(2.52)		15.5(2.08)	
• Housework	30.05(4.93)		15.34(3.33)		14.71(2.62)	
• Retired	29.15(5.83)		15.29(3.55)		13.85(3.38)	
• Student	22.50(.71)		11(1.41)		11.5(.71)	
• Other	0(0)		0(0)		0(0)	

Significant difference at P level at ≤ 0.05

Table 5. Logistic regression analysis for the factors affecting fatigue.

Covariates	**B**	**Standard Error**	**Wald (χ2)**	**Exp. (B)**	**95% CI**	**p**
Age	-2.045	.733	7.783	.129	.031-.544	**.005**
Gender	-1.923	.897	4.593	.146	.025-.849	**.032**
Duration of dialysis session	1.265	1.263	.018	3.542	.298-42.097	.317
Albumin	1.113	.931	1.429	3.042	.491-18.855	.232
Hgb	-.168	.975	.018	.845	.125-5.716	.863

Are you depressed?	.983	1.254	.614	2.672	.229-31.199	.433
B, logistic regression. Dependent variable: fatigue. Covariates: age, gender, duration of dialysis, albumin, Hgb level and Are you depressed? Data in bold were significantly different from the others.						

Significant difference at P level at ≤ 0.05

Discussion:

The literature regarding the experience of fatigue in hemodialysis patients indicates that fatigue seems to impact primarily the physical and mental domains. Physical fatigue was described by patients as a constant lack of energy, which seemed worse on dialysis days. Fatigue is negatively correlated with physical functioning, role limitations, activity levels, and mental and physical quality of life. **Horigan A. (2012)**. So this study was done to measure level of fatigue perceived by hemodialysis patients and identify its' associated factors.

Generally, finding of our study show the majority of patients had post dialysis fatigue, (72%) of them reported moderate fatigue and (20%) of them reported severe level of fatigue with mean score (29.25±5.46) this value is higher than the value reported in study was conducted by **Zyga s. etal (2015)** that approximately two-thirds of the studied patients on maintenance HD were having moderate to severe degrees of fatigue with mean fatigue level is (24.99 ±8.093), and in another study also was done by Georgios T (2015) who found that 47.1% have moderate to very high stress levels while 52.9% of patients showing low fatigue rates in addition **Zyga S. et al (2017)** found the mean fatigue level is (25.97±6.105) of hemodialysis patients.

As regard influence of sociodemographic characteristics in participants' fatigue indicators the finding of the current study revealed that their total fatigue level was not affected with increasing of their age however their mental fatigue was increasing statistically significant with the age this finding is in the same line with **Zyga S. etal (2015)** who said that none of the fatigue indices were statistically significantly correlated with the patient's age. Among the gender our study demonstrated that the women had more fatigue than men this finding is congruent with **Sajadi A. et al (2010)** and **Georgios T. et al (2015)** who reported that women has been reported to have a significantly more fatigue than men. This finding in contrast with Bayumi H (2015) who said that in our study more than half of hemodialysis patients had severe fatigue in male than female. And **Zyga S. et al (2015)** who found that the gender did not affect significantly any of the three indices of the fatigue.

In the present study regarding to participant residency, their fatigue level changed significantly with the residency place, the resident of the suburban area had more fatigue than urban area. This finding is in contrast with **Bahgat Z et al (2016)** who found that half of the sample (50%) with sever fatigue lives in urban areas and 4.9% of them with no fatigue lives in rural areas on the other hand this finding in line with **Zyga S. et al (2015)** who said that place of residence influences the level of fatigue since patients living in suburban areas noted lower indicator of overall fatigue and physical fatigue than those who live in the city center. This may be due to the extra time to dispose patients of heavy populated cities in order to be in time at the hemodialysis unit.

As regard the educational level the current study shows that as the educational level increased, fatigue increased. This result was consistent with Zyga S. et al (2017) who found a correlation between fatigue and educational level, especially among people with a high educational level, in contrast to the findings of **Zyga S. et al (2015)** and **Sajadi et al (2010)**. Furthermore our research findings revealed that widow had higher fatigue than Married, divorced and single participants, this difference were found to be statistically significant ($p < .05$), this may be due to absence of the spouse as a supporter which increase stress, and reduce coping with chronic disease, as same as results found by **Zyga S. et al (2017)** and conversely with **Bahgat et al (2016)** who reported that the divorced patients had high level of fatigue. Finally, there is no significant difference in fatigue level in relation to occupation which is consistent with **Zyga S. et al (2015)** and **Sajadi A. et al (2010)**, in contrast with **Zyga et al (2017)** who found that unemployed hemodialysis patients have higher fatigue scores.

The logistic regression analysis in this present study, shows that only age and gender could predicate level of fatigue perceived by hemodialysis patients and no association between fatigue and other clinical variables (Duration of dialysis session, Albumin, Hbg, and depression). While **Mollaoglu M. (2009)** found that duration of dialysis and age were predictors for fatigue identified by logistic regression analysis. Moreover **Liu (2006)** found that only age, URR (Urea Reduction Rate), and depression could predict levels of fatigue reported by hemodialysis participants. In contrast **Jhamb M et al (2013)** identified some important correlates of fatigue, such as depressive symptoms, low albumin levels and RLS which may be targets for interventions to improve fatigue in this population similarly to our result **Sajadi A (2010)** reported that there was no significant correlation between haemoglobin, urea and creatinine was observed. As regard depression and fatigue level **Liu (2006)** and **Garcia et al. (2010)** found that fatigue scores were significantly higher for those hemodialysis patient who were depressed than for those who were not depressed and that depression was a significant predictor of fatigue in this population which is not consistent with our study.

Conclusion:

The present study conclude that post dialysis the fatigue is an important problem for hemodialysis Saudi patients , vary from moderate to severe and more in women than men. Age, gender, residency, level of education, marital status are related to perceived level of fatigue, No association between fatigue and clinical factors (duration of dialysis session, depression and biomedical variable) only age and gender can predicate post dialysis fatigue level in this population. Increase awareness of nurses regarding to hemodialysis patients fatigue is very important because she has a good chance to assess and review patients records and lab results beside she can spend more time with them during the hemodialysis cycle to help them to cope with fatigue and improve their quality of life.

Limitation:

There are limitations in this study should be addressed:

1- Number of participants which limit generalization of the study findings.

2- There is another factors associated with fatigue should be examined like lack of nutrition and sleep are not included in A

Greek version of FAS.

Recommendation:

1- Increase nurses awareness to deal with post-dialysis fatigue symptoms by educational program.

2- Routine screen of hemodialysis patient to detect contributing factor of fatigue early and alleviating its effects.

3- Conduct further researches with a qualitative approach to determine the effect of fatigue on hemodialysis patients' life since fatigue is a subjective concept.

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References:

1. Al Ismaili F, et al. (2017). Epidemiological Transition of End-Stage Kidney Disease in Oman. Kidney international reports. Jan 2017; 2(1): 27-35
2. Bahgat Z, Bahgat R, El- azazy H. (2016). The Effect of Fatigue on Daily Living Activities for Adults Undergoing Hemodialysis. IOSR Journal of Nursing and Health Science (IOSR-JNHS). VI (May. - Jun. 2016), PP 82-89.
3. Bayumi H. (2015). Factors Affecting Fatiguein Chronic Renal Failure Patients under Hemodialysis Treatment at Qena University Hospital in Upper Egypt. Journal of Biology, Agriculture and Healthcare. Vol.5, No.14, 2015, PP 42-49.
4. Garcia TW, Veiga JP, da Motta LD, de Moura FJ, Casulari LA. Depressed mood and poor quality of life in male patients with chronic renal failure undergoing hemodialysis. Rev Bras Psiquiatr 2010; 32:369-374.
5. Horigan E., Schneider S., Docherty S., Barroso J., The Experience and Self-Management of Fatigue in Hemodialysis Patients Nephrol Nurs J . (2013); 40(2): 113–123.
6. Horigan, A. (2018). The Diurnal Patterns of Fatigue in Patients on Hemodialysis: A Pilot Study...2018 ANNA National Symposium, Las Vegas, NV. April 15-18, 2018. Nephrology Nursing Journal (NEPHROL NURS J). 45(2): 198-198. (1/4p).
7. Horigan, A. Fatigue in Hemodialysis Patients: A Review of Current Knowledge. Journal of Pain and Symptom Management. November 2012; Vol. 44 No. 5:715-724
8. Jhamb et al. Prevalence and Correlates of Fatigue in Chronic Kidney Disease and End-Stage Renal Disease: Are Sleep Disorders a Key to Understanding Fatigue? Am J Nephrol 2013; 38:489–495
9. Liu HE. Fatigue and associated factors in hemodialysis patients in Taiwan. Research in Nursing & Health.2006; 29:40-50
10. McCann, K., & Boore, J.R. Fatigue in persons with renal failure who require maintenance haemodialysis. Journal of Advanced Nursing, (2000); 32 (5): 1132–1142.
11. Michielsen HJ, De Vries J, Van Heck GL.(2003) Psychometric qualities of a brief self-rated fatigue measure: The Fatigue Assessment Scale. J Psychosom Res.; 54: 345-352.
12. Mollaoglu M. Fatigue in People Undergoing Hemodialysis. Dialysis & Transplantation June 2009; 38(6): 216-220.
13. Sajadi A., Farmahini B., Esmaeilpoor S., Durmanesh B., & Zare M. Factors Affecting Fatigue in Chronic Renal Failure Patients Treated With Hemodialysis. Iranian Journal of Critical Care Nursing Spring 2010; Volume 3, Issue 1; 33-38
14. SCOT Data Saudi J Kidney Dis Transpl 2018;29(4):1012-1020

15. Zyga S et al. Is Quality of Life of Hemodialysis Patients Affected by Fatigue? International Journal of Health Sciences & Research. September 2017; Vol.7; Issue: 9:150-158
16. Zyga S, Alikari V, Sachlas A, Fradelos E, Stathouis J, Panoutsopoulos G, Georgopoulou M, Theophilou P, Lavdaniti M. (2015): Assessment of Fatigue in End Stage Renal Disease Patients Undergoing Hemodialysis: Prevalence and Associated Factors. PupMed. 69(6): 376-380. Doi: A.