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Fatigue and Its Related Factors in Korean Patients on Hemodialysis

Hye-Ryoung Kim, PhD, RN[1], Gwi-Ryung Son, PhD, RN[2]

Purpose. This study examined the characteristics of fatigue and the relationship between fatigue and its related factors in Korean patients on hemodialysis.

Methods. A cross-sectional correlational study was conducted with 104 patients on hemodialysis in Seoul, Korea.

Finding. Of a total of 104 subjects, eighty-one (77.9%) complained of fatigue. Fatigue severity was measured by the self-rating Visual Analogue Scale-Fatigue (VAS-F) with a mean score of 36.5 (SD = 17.49, range 2 - 81). The mean duration of fatigue was 3.8 hours (SD = 5.3, range 0 - 24). Depression was most significantly correlated with fatigue (beta = .43, p<.00), with interdialytic weight gain (beta = .25, p<.05) being the second most significant correlate.

Conclusion. This study shows that nursing interventions for patients who experience fatigue while on hemodialysis should be focused on both psychological problems, such as depression, as well as on physiological problems, such as interdialytic weight gain.

Key Words : Fatigue, Hemodialysis, Depression, Korean

BACKGROUND

In Korea, the number of patients in need of dialysis has increased in recent years. According to the Korean Society of Nephrology (Kim, 2001), the proportion of the population on dialysis in the year 2000 was 435.3 in 1,000,000. This number is increasing at a rate of 12-25% every year. Among these patients, approximately 77% have chosen hemodialysis as a treatment for maintaining physiological status.

Many patients on hemodialysis in Korea and other countries complain of fatigue as their most distressing problem (Barret, Vavasour, Major, & Parfrey, 1990; Chon, 1985; Parfrey, Vavasour, Bullock, & Gault, 1988; Parfrey, Vavasour, Bullock, Henry, Harnnet, & Gault, 1989). Chon (1985) found that 86.7% of 113 Korean patients on hemodialysis complained of lack of energy and of feeling ill and tired. McCann and Boore (2000) reported that all 39 patients on hemodialysis experienced fatigue. While Parfrey et al. (1988) reported that 79% of 75 patients on hemodialysis complained of fatigue, 24% of these had such severe fatigue that it caused serious problems in their lives. In addition, Kim (1986) reported that 48 patients on hemodialysis complained of continuous fatigue, not only during hemodialysis but throughout all aspects of their lives. Of these patients, 35.4% experienced the highest amount of fatigue immediately following dialysis, while 12.5% experienced fatigue the day before dialysis, 10.4% just before dialysis, and 25% experienced fatigue during overtime work.

Fatigue has a negative effect on many aspects of patients' lives. Patients who experience severe fatigue may

1. Inje University, College of Medicine, Department of Nursing, Pusan, Korea
2. University of Michigan, School of Nursing, Ann Arbor, Michigan, USA
Corresponding author: Hye-Ryoung Kim, PhD, RN, Department of Nursing, College of Medicine Inje University, 633-165, Kaegum-Dong, Pusanjin-Gu, Pusan, Korea
Tel: 011-82-51-890-6835 Fax: 011-82-896-9840 E-mail: nurhrk@ijnc.inje.ac.kr
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give up their job or school, and they may have to depend on others for everyday activities. Many patients find they cannot bear the fatigue and want to know why they experience it. Though they ask for help in reducing fatigue, health professionals say that, for patients on hemodialysis, fatigue is inevitably produced by their irreversible disease and therefore is not treatable (Srivastava, 1986). Because fatigue is considered to be a problem that cannot be solved, it has received little attention from health professionals (McCann & Boore, 2000).

Traditionally, patients on hemodialysis have been told their fatigue is largely caused by anemia, uremia, and water and electrolyte imbalances due to disease. However, biochemical markers, including hemoglobin, hematocrit, ferritin, urea, creatinine, albumin, calcium, and phosphorus, have not shown a relationship to fatigue (Barret et al., 1990; Cardenas & Kutner, 1982; Kim, 2000; McCann & Boore, 2000). Only interdialytic weight gain, which is due to water retention, has been found to be related to fatigue (Barret et al., 1990). Many studies have examined the relationships between fatigue and other factors such as psychological factors (e.g., depression or anxiety), and social factors (e.g., social support or positive and negative social life events), however, results of these studies have not been consistent. Despite the increased numbers of patients on hemodialysis who complain of fatigue, little is known about the characteristics and correlates of fatigue.

The purpose of this study was to identify the characteristics of fatigue and to examine the relationships between fatigue and physiological, psychological and social factors in Korean patients on hemodialysis. Three research questions were identified: (1) What are the characteristics of fatigue in Korean patients on hemodialysis; (2) what is the relationship between fatigue and its correlates (physiological, psychological and social factors); and (3) what is the predictive relationship between fatigue and its correlates, while controlling for patients' demographic factors (age, gender, and education).

METHODS

Sampling

Using the annual report of the Korean Society of Nephrology, patients living in the community who were on hemodialyis and hemodialysis clinics in Korea were identified. Hemodialysis patients and hemodialysis units were concentrated in the capital city of Seoul, Korea with 40% of the population on hemodialysis and 32% of the hemodialysis clinics being located in that city. Except for patients with acute disease, such as those who had recently undergone atrio-ventricular fistula (A-V fistula) repair, or patients with serious complications, hospitals in Seoul tend to transfer most chronic hemodialysis patients to local clinics. As a result, the majority of patients without complications on hemodialysis were registered and treated regularly at 11 local hemodialysis clinics in Seoul, Korea rather than in general care hospitals.

While all 11 of these clinics were contacted for permission to include their patients in the study, only seven agreed to participate. There were no differences between participating and non-participating clinics in size, structure of treatment rooms, and procedure of treatment. Four non-participating clinics refused to be involved in the study because the administrators did not want to take responsibility for any complaints related to the study. Of the seven participating clinics, one was used to collect data for a pilot study. Data from the other six clinic sites were used for the main study reported here. Of a possible 147 patients who met the inclusion criteria for the study, 104 (70.7%) subjects completed the survey. Reasons given for non-participation included the need to rest during dialysis (n = 20), and the belief that there was no benefit from the survey (n = 16). The remaining 7 eligible participants did not give any specific reason for refusal.

To be included in the study, patients needed to meet the following criteria: 1) undergone hemodialysis for a minimum of 3 months or a maximum of 4 years; 2) received hemodialysis regularly 2 - 3 times a week; 3) experienced no complications or disabilities; 4) were able to complete the questionnaires by themselves; 5) were between 30 - 60 years of age; and 6) agreed to participate in the study. The duration of subjects' hemodialysis was set at 3 months to 4 years because patients with A-V fistula repair are affected by this operation for up to 3 months, while patients who have received dialysis for more than 4years tend to report levels of fatigue that are significantly lower than those with less than 4 years of dialysis (Cardenas & Kutner, 1982). Dialysis time, complications, and disabilities were limited because these factors can affect the subject's experience of fatigue.

Design and Procedure

This cross-sectional, correlational study was developed to examine the relationships between fatigue and physiological, psychological and social factors. Data collection was conducted concurrently in six hemodialysis clinics to control for external environmental factors such as temperature, political, and economic catastrophes that may affect the public at large. Six registered nurses were recruited to collect data and were trained until results of multiple interviews with the same patients were highly correlated.

Data collection was conducted in the clinics while subjects were receiving hemodialysis treatment. Length of dialysis with no special treatment was approximately 4 hours. Environmental factors such as clinic size, the number of staff on duty, hemodialysis procedures, light, and sound were similar between the seven participating clinics. Because outside visitors were prohibited, the clinics were quiet during dialysis.

Utilizing a list of all patients registered at the six participating clinics, study personnel approached patients at the time of dialysis to obtain consent for participation. Interviews and medical record reviews were conducted only after the study was thoroughly explained to each potential participant and consent was obtained. Subjects were interviewed as they sat or were lying down in bed during dialysis. The interviews took a total of 40 minutes. Each treatment bed had a screen door and enough space between beds to allow for private conversation.

In addition to semi-structured interviews, subjects' medical records were also reviewed to collect physiological data. Interviews were conducted at the same time physiological tests were done. Because fatigue is so changeable, physiological, psychological and social variables were measured simultaneously in order to identify the relationships between fatigue and its related factors.

Instruments

The severity of fatigue was measured by the Visual Analogue Scale-Fatigue (VAS-F) (Lee, Hicks, & Nino-Murcia, 1991), which is a self-rating scale and provides a quantifiable score of perceived subjective fatigue level. This scale, translated into Korean by Lee (1993), consists of a fatigue subscale (13 items) and an energy subscale (5 items). The VAS-F has visual analogue lines 100 mm in length with bipolar anchors of related descriptors. Subjects were asked to place a mark along each line to indicate their current feelings. The mean length from the left end to the point where subjects indicated their fatigue/energy was used as the measure of severity of fatigue/energy. Concurrent validity was established between the VAS-F and both the Stanford Sleepiness Scale and the Profile of Mood States ($r > 0.3$, $p<0.00$) (Lee, Hicks, & Nino-Murcia, 1991). Internal consistency reliabilities (alpha = .94 to .96) have been reported for healthy subjects and sleep disorder patients (Lee et al., 1991). The coefficient alpha for this study was .94.

The existence of fatigue was measured with a yes/no question. Duration of fatigue was measured by hours, and frequency of fatigue was rated using a 5-point Likert scale ranging from 1 (rare) to 5 (always). The coefficient alpha of frequency of fatigue in this study was .73.

Physiological data were collected from the patients' medical records during their regular monthly check ups at the clinics. Physiological data were categorized into three indicators: anemia (hematocrit-HCT), uremia (BUN and creatinine), and water retention (interdialytic weight). Interdialytic weight gain was calculated by subtracting "after dialysis weight" from "before dialysis weight" and then divided by "dried body weight," all multiplied by one hundred. A higher weight gain represented a higher water accumulation in the body.

The psychological factor was represented by depression and was measured by the Self-Rating Depression Scale (SDS) (Zung, 1965). This self-rating depression scale was devised as an attempt to quantify the symptoms of depression, using the diagnostic criteria of the presence of a pervasive depressed affect, and its physiological and psychological concomitants. It is reported that mean indices achieved on the scale for patients diagnosed with depressive disorders before and after treatment were 0.74 and 0.39, respectively (Zung, 1965.) This scale consists of 20 items; 10 positive items which are rated on a 4 point scale from 1 (most of the time) to 4 (a little of the time) and 10 negative items which are given a reversed score of 1 (a little of the time) to 4 (most of the time). Total scores for this scale ranged from 20 to 80, with higher scores representing higher levels of depression. Using this scale, Kim (1989) has reported a reliability coefficient of .83 in Korean military patients with low back pain. The reliability coefficient alpha in this study was .73.

Social factors measured for this study included two variables: perceived social support and social network. The Norbeck Social Support Questionnaire (NSSQ) (Norbeck, Lindsey, & Carrieri, 1981) was used to mea-

sure perceived social support, and was translated into Korean (Oh, 1984). The NSSQ has three major subscales: Total Functional, Total Network, and Total Loss. For this study, only the Total Functional and Total Network scales were used. The Functional Scale consists of three subscales: (a) affect - the expression of liking, admiration, respect, or love of one person toward another; (b) affirmation - the expression of agreement, acknowledgment, or endorsement of another person's behavior or statement; and (c) aid - the provider of direct aid or assistance, such as money, information, or time to another. Subjects were first asked to identify significant people who provided personal support to them and then to rate the amount of affect, affirmation, and aid received from each individual listed. Each of the three subscale items contained two questions asking subjects to rate network members on a 5 point Likert - type scale from "not at all" to "a great deal." The Total Functional score was obtained by summing the ratings of the three subscales. The maximum number of support for this scale is 24. The maximum Total Functional score is 720 while Total Network is 264. Kim et al. (1999) reported the norm of social support using 332 Korean nursing students and 294 Korean nurses. The mean of the Total Functional score was 285.17 (SD = 140.29), ranging from 29 to 630. The mean of the Total Network score was 12.95 (SD = 7.9), ranging from 1 to 21. Norbeck et al. (1981) established test -retest reliability for the subscales on a sample of 67 nursing students. In this current study, an alpha coefficient of .95 was obtained for the Total Functional Scale. Total Network consisted of the number in network, duration of relationship, and frequency of contact. Total Network score was calculated by summing the ratings of duration of relationship and frequency of contact.

Table 1. Characteristics of Fatigue (N = 104)

Experience of Fatigue	N (%)	
Yes	81 (77.9)	
No	21 (22.1)	
Frequency of Fatigue	**N (%)**	
Always	3 (2.9)	
Very often	5 (4.8)	
Frequently	22 (21.2)	
Sometimes	45 (43.3)	
Rare	6 (5.8)	
	M (SD)	Range
Severity of Fatigue	36.5 (17.5)	2-81
Duration of Fatigue	3.8 (5.3)	0-30

Data Analysis

Data were managed and analyzed using the SPSS software program version 9.0 for Windows. Statistical analysis included hierarchical multiple regression, which examined the amount of variance of fatigue and provided a means for comparing the effects of subjects' demographics, physiological, psychological and social factors on ratings of fatigue.

FINDINGS

The mean age of study subjects was 43 years. Most subjects were male (65%) and were high school graduates (52%). Subjects' mean income was $1,271 a month, ranging from $57-$7,136 a month.

Research question 1. What are the characteristics of fatigue in Korean patients on hemodialysis? Descriptive data analysis was used to identify the characteristics of fatigue. Table 1 shows a summary of the characteristics of fatigue. Eighty-one (77.9%) subjects reported they felt fatigue at the time of the interview. On average, the duration of fatigue was 3.8 hours (SD = 5.3, range 0 - 30). Forty-five (43.3%) subjects reported feeling fatigue sometimes, while 22 (22.1%) subjects reported that they

Table 2. Description of Physiological, Psychological, and Social Variables of Fatigue (N = 104)

Factors	Variables	M (SD)	Range	Normal Range
Physiological	HCT (%)	24.5 (4.6)	13.0-36.0	37-53
	BUN (mg/dl)	81.8 (22.8)	10.9-137.5	5-20
	Creatinine (mg/dl)	11.6 (3.4)	1.7-19.4	0.7-1.5
	Weight (%)	4.7 (2.0)	0-9.6	4.0 or less
Psychological	Depression	45.5 (10.8)	24-86	
Social	Perceived SS	174.9 (138.8)	17-706	
	SS Network	73.8 (55.3)	9-235	
	# of supporters	7.8 (6.4)	1-24	

Note: HCT = Hematocrit, SS = Social support

experienced fatigue frequently. The mean score on the VAS - F measuring severity of fatigue was 36.5 (SD = 17.5, range 2-81).

Research question 2. What is the relationship between fatigue and its related factors (physiological, psychological and social factors)? Pearson correlations were used to examine the relationship between fatigue and its related factors. Table 2 shows the description of fatigue related factors. All variables showed a normal distribution. The mean HCT (%) was lower than that of normal range, and the means of BUN, creatinine, and weight were higher than those of normal ranges. The mean depression score was 45.5, ranging from 24 to 86. The mean of perceived social support and social support network were 174.9 (SD = 138.8) and 73.8 (SD = 55.3), respectively. The mean number of social support was 7.8 (SD = 6.4), ranging from 1 to 24.

Table 3 is a correlation matrix that shows relationships among all study variables, which ranged between .00 and .93. Depression was strongly correlated with severity of fatigue ($r = .47$, $p<.01$) as was interdialytic weight gain ($r = .21$, $p<.05$). Education was negatively correlated with severity of fatigue ($r = -.21$, $p<.05$). Three physiological factors (HCT, BUN, and creatinine), and two social factors (perceived social support and social support network) were not significantly correlated with the severity of fatigue in patients in this study.

Research question 3. What is the relationship between fatigue and its related factors, while controlling for patient's demographic factors (age, gender, and education)? Hierarchical multiple regression modeling was used to determine how much variance in severity of fatigue was explained by the predictors of fatigue. In the first step, subjects' demographics, such as age, gender and education, were entered in the regression equation. Next, physiological, psychological and social factors were added into the equation.

Table 4 shows the relationship between the set of correlates (demographics, physiological, psychological, and social factors) and severity of fatigue. Age, gender and education did not have a statistical effect on severity of fatigue (F value = 2.67, $p>.05$). However, when physiological, psychological, and social factors were entered into the equation, the total percent of explained variance significantly increased showing 20% incremental partitioning of variance (F value = 4.36, $p<.00$). Among the set of correlates, controlling for demographics, depression was the most significant correlate for severity of fa-

Table 4. Summary of Hierachical Regression Analysis for Variables Predicting Fatigue (N = 104)

	Severity of Fatigue	
	Step1	Step 2
Step Predictor	Beta	
1. Demographics		
Age	.19	.17
Gender	.03	-.10
Education	-.18	-.04
2. Physiological		
HCT		-.03
BUN		-.15
Creatinine		.12
Weight		.25*
3. Psychological		
Depression		.43**
4. Social		
Perceived Social Support		.25
SS Network		-.24
R^2 Change	.05	.20
Adjusted R^2	.05	.25
F for change	2.67	4.36**

Note: HCT = Hematocrit, SS = Social Support
*p<.05 **p<.001

Table 3. Zero-Order Correlation among Study Variables (N = 104)

	1	2	3	4	5	6	7	8	9
1. Age									
2. Education	-.03								
3. HCT	-.02	.10							
4. BUN	-.04	.03	.00						
5. Cr.	-.02	.22*	.23*	.36*					
6. Weight	-.09	-.11	.03	-.00	.07				
7. Depression	.06	-.32**	-.05	-.04	-.10	.06			
8. Perceived SS	.03	.25*	.26**	.11	.19	.08	-.70**		
9. SS Network	.07	.29**	.27**	.14	.22	.08	-.19	.93**	
10. S Fatigue	.17	-.21*	-.11	-.11	-.06	.21*	.47**	-.12	-.13

Note: HCT = Hematocrit, Cr = Creatinine, SS = Social Support, S Fatigue = Severity of Fatigue
*p<.05 **p<.01

tigue (beta = .43, p<.00). Interdialytic weight gain was the second most significant correlate (beta = .25, p<.05).

DISCUSSION

Overall, the findings of this study indicate that fatigue is common among Koean patients on hemodialysis. In this study, 78% of subjects complained of fatigue. This finding is almost the same number of 79% of subjects that experienced fatigue in a study from United States (Parfrey et al., 1988), while 100% of subjects complained of fatigue in a study from the Republic of Ireland (McCann & Boore, 2000). As measured by the same instrument, the severity of fatigue for patients in this sample was slightly lower than that of myocardial infarction (MI) patients one week after the acute incident, but higher than that of MI patients 2-3 week after infarct (Lee, 1993). In addition, severity of fatigue for patients in this study was shown to be higher than that of patients with sleep disturbances (Lee et al., 1991). The existence of fatigue for patients in this study was higher than those observed in healthy subjects (51%), but lower than in lung and breast cancer patients (99%) and multiple sclerosis patients (87.5%) (Blesch et al, 1991; Krupp, Alvarez, La Rocca & Scheinberg, 1988). This indicates that fatigue in Korean hemodialysis patients is different from other chronic diseases such as myocardial infarction, sleep disturbances, lung and breast cancer and multiple sclerosis in existence and severity.

Among the physiological factors studied, interdialytic weight gain was the only significant factor for fatigue in this study, which is consistent with the findings from Parfrey et al. (1989). Because patients on hemodialysis have difficulty eliminating water from their bodies without dialysis, interdialytic weight gain depends on the amount of water supply in the body from one dialysis session to the next. Therefore, the significant relationship between interdialytic weight gain and fatigue indicates that control of water levels in the body may help reduce fatigue experienced by patients on hemodialyis. In this study, the mean interdialytic weight gain was 4.7% of dried body weight, which is higher than the 4.0% maximum considered to be normal interdialytic weight gain.

The clinics that participated in this study routinely used a guidebook to give information to patients regarding water and diet restrictions for reduction of interdialytic body weight. At each clinic visit, variables related to interdialytic weight gain were measured and recorded. Patients were then advised of their conditions and given information on how to control it (Kim, 1986). Chon (1985) reported that hemodialysis patients complained of difficulties with water and diet restrictions for reducing interdialytic body weight. Subjects in this study reported this to be the most stressful regulation for them when dealing with the complications of dialysis.

In this study, mean scores of physiological factors such as HCT (M: 24.5%, normal range: 37-53%), BUN (M: 81.8mg/dl, normal range: 5-20mg/dl), creatinine (M: 11.6mg/dl, normal range: 0.7-1.5mg/dl), and interdialytic weight gain (M: 4.7%, normal range: 4.0 or less%) deviated from the normal ranges. However, these variables were not significantly related to fatigue, which is consistent with findings from previous studies (Cardenas & Kutner, 1982; McCann & Boore, 2000).

Consistent with previous studies of patients on hemodialysis (Cardenas & Kutner,1982; McCann & Boore, 2000), the psychological factor of depression explained a significant amount of the fatigue in this study. A few studies have reported that depression was not significantly related to fatigue in patients with chronic disease such as cancer (Pickard - Holley, 1991) and rheumatoid arthritis (Belza, Henke, Yelin, Epstein & Gillis, 1993). Belza et al. (1993) reported that none of the three psychological variables including depression, helplessness, and social support contributed to a significant amount of the variance in fatigue in a sample of 133 older adults with rheumatoid arthritis. However, studies of MI patients (Lee, 1993) and patients with rheumatoid arthritis (Tack, 1991) as well as in patients on hemodialysis as observed by Cardenas & Kutner (1982) and McCann & Boore (2000), support the finding of a relationship between depression and fatigue in patients in this study. Thus it appears that depression is associated with fatigue in patients with many types of chronic disease.

In this study, perceived social support and social network were not significantly related to fatigue. This is consistent with a study of 133 older American adults with rheumatoid arthritis (Tack, 1991), and a study of 656 healthy women (Lee, Lentz, Taylor, Mitchell, & Woods, 1994). However, results of this study were inconsistent with those of Kim (2000), which reported a significant negative correlation between social support and post-dialytic fatigue in 96 Korean patients on hemodialysis (r = -.21, p<.00). Further study is needed to explore the relationship between these variables. In this study, there was a high correlation between perceived

social support and social support network, which resulted in multicollinearity (r = .93). In future studies, it would be interesting to examine the regression model including only one of these factors.

Demographic variables such as age, gender, and education did not explain the variance in severity of fatigue in the hierarchical regression model in this study. Only education showed any type of correlation, demonstrating a negative correlation with severity of fatigue (r = -.21, p<.05) and fatigue related psychological factors such as depression (r = -.32, p<.001), and a positive correlation with social factors such as perceived social support (r = .25, p<.05) and social support network (r = .29, p<.01). While Tack (1991) reported that age, gender, and education were not significant fatigue related variables, all of them had a significant relationship with fatigue-related factors such as muscle strength, helplessness, depression and overall mood in patients with rheumatoid arthritis. Findings from this study indicate that demographic factors should be examined further to identify both direct and indirect relationships with fatigue.

This study suggests that depression and interdialytic weight gain are significant factors in explaining the severity of fatigue in Korean patients on hemodialysis. It can be predicted that higher levels of depression and greater interdialytic weight gain will increase fatigue in patients on hemodialysis, but further study will be needed to identify the causal relationship between them.

IMPLICATIONS

Fatigue which is experienced frequently and for long periods of time (Kim, 1986), causes much distress for patients on hemodialysis and makes it difficult for many of them to maintain sufficient quality of life (Bang, 1988; Chon, 1985). Health professionals need to acknowledge this serious problem and recognize the effect and impact of this symptom on their patients. Traditionally, when patients complain of fatigue, most health professionals check for abnormal physiological factors such as hemoglobin (Hgb), HCT, BUN, or creatinine. When offered, treatments for fatigue are focused primarily on medications for improving Hgb or HCT, limitation of high-sodium content foods, and choice of dialysis machine or dialyzer to sustain as normal a physiological status as possible. However, health professionals have not given as much attention to the psychological factor of depression (Bang, 1988). Findings from this study suggest that depression was the most important factor in understanding patients' fatigue related to hemodialysis. Thus, patients should be frequently assessed for psychological factors as well as physiological factors to understand fatigue. Although further study is needed to develop effective interventions to relieve fatigue in patients on hemodialysis, findings from this study can give a direction for nursing care and developing effective interventions for Korean patients on hemodialysis who experience fatigue.

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