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Effect of Warm Water Foot Bath on Fatigue in Patients Undergoing Hemodialysis

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Abstract : Fatigue is one of the most frequent complaints reported by the end stage renal disease patients who are undergoing hemodialysis. It limits patients' daily activities and independence. The aim of this study was to evaluate the effect of warm water foot bath on fatigue in patients undergoing hemodialysis. The present study was conducted at Kasr Al-Aini Center (Nephrology- Dialysis –Transplantation) at Cairo University hospital. A purposive sample consisted of 88 chronic renal failure patients (44 each in experimental and control group).Quasi experimental pre-post test non equivalent control group design was used. Data was collected using demographic sheet, Fatigue severity scale and bath thermometer. The study results revealed that in the experimental group a decrease of 8.46 points was indicated for the participants in the experimental group (time 1 is 53.73 ±3.22, time 3 after warm water footbath 45.27 ±5.98).Also a significant reduction was reported between the pre-test and post test score F = 42.447, P <0.0001. The current study concluded that most of the patients undergoing hemodialysis were suffering from fatigue. Warm water footbath is effective in reducing fatigue among patients who are undergoing hemodialysis. The study recommended that complimentary therapy such as warm water foot bath therapy should be added into hemodialysis complications treatment. The same study can be replicated in different settings on hemodialysis patients.

Keywords: Fatigue, warm water foot bath, hemodialysis and end stage renal disease

INTRODUCTION

Chronic renal failure (CRF) is a complex crippling condition influencing more than 70 million individuals around the world. In fact more than 100,000 individuals are determined to have chronic renal failure every year [1]**.** Chronic renal failure is an advanced and irreversible kidney failure that is often progressive, in which kidney damage or decreased glomerular filtration rate (GFR) persist for three months or longer, so eventually leads to end-stage renal disease (ESRD) [2]**.** End-stage renal disease is the fifth stage from chronic kidney disease, it is diagnosed when the estimated glomerular filtration rate (e GFR) falls below 15 mL/min [3].

The main causes of ESRD in Egypt, other than diabetic nephropathy, include hypertensive kidney disease, chronic glomerulonephritis, unknown etiology, and obstructive uropathy [4]. The most common treatment used in ESRD is hemodialysis . Haemodialysis is a procedure during which the patient's blood is circulated extra corporeally and filtered through a semi permeable membrane, thereby removing excess liquids and the waste products of metabolism; for example, urea, creatinine and electrolytes [5].

Haemodialysis is usually performed three times per week for three to four hours every session. Over half of patients with chronic renal failure undergoing hemodialysis complain of persistent fatigue before, during and after the dialysis [6].

Fatigue is defined as persistent and extreme tiredness that leads to mental or physical exhaustion or both. It is associated with lower quality of life and lower survival rates [7]. Some patients who suffer from post dialysis fatigue need more than three hours of rest after each session to recover. Hence, the management of fatigue is an important clinical priority for health care providers[8]. Fatigue in ESRD is associated with a range of factors including biochemical, hematological and treatment-related factors. Moreover, it has been shown to be related with greater levels of inflammation and poor nutrition [9].

Fatigue has a large repercussion on patient functioning and quality of life, further impairing patients' daily functioning, motivation, social engagement, contributing to decrease in sleep quality and increased body pain. There is evidence to suggest that fatigue may contribute directly to clinical outcomes, also increasing the risk of cardiac impairment and mortality [10]. Hence, the need to assess and evaluate fatigue level in patients undergoing dialysis is very important to patients wellbeing and quality of life [11].

Physical exercise, epoetin use, and L- carnitine infusion have all been used successfully to decrease fatigue level [11]. The use of complementary and alternative medicine has increased in conventional health care settings. There are many uses of complementary therapies to reduce fatigue and it is becoming a significant part of modern day health care with millions taking treatment each year. The most used

therapies are hydrotherapy, biofeedback, aromatherapy, relaxation technique, massage, and acupuncture [12].

Hydrotherapy is commonly used for relaxation and to maintain a patient's state of health [13].Hydrotherapy means the internal or external use of water in one of its form (water, ice, steam) for health promotion or treatment of different disease with various temperatures, pressure, duration, and site. It is one of the naturopathic treatment modality used widely in ancient cultures including India, Egypt and China [14].

One of the hydrotherapy forms is warm water foot bath. It means immersion of the feet in water temperature from 40°C to 43°C for 10 to 30 minutes .Warm water foot bath causes vasodilatation and induces heat dissipation [13]**.**It increases the foot vessel expansion so blood volume is increased and timely ought oxygen and nutrients to brain that need to relieve fatigue[15]**.**

Study by Isaac and Priya 2016 concluded that after administering warm water footbath at 40°C to 43°C for 10 to 30 minutes , it was found that there had been a significant level of reduction in fatigue and participants found themselves comfortable and also expressed high level of satisfaction towards administration of footbath.

Nurses are considered as one of the multidisciplinary team who play a significant role in reducing fatigue among patient undergoing haemodialysis by using new modality as warm water foot bath. Therefore the researcher will carry out this study to alert the nursing professionals working in haemodialysis units to the complications that may arise in patients and using alternative therapy to prevent and minimize the fatigue.

Nurses working in dialysis units have repeated frequent contact with patients who have CRF for periods of time. So, nurses should assess the fatigue and activity levels frequently to provide timely intervention [16]. Therefore, the aim of the current study is to evaluate the effect of warm water foot bath on fatigue level in patients undergoing haemodialysis.

In Egypt, the estimated annual incidence of ESRD is around 74 per million and the total prevalence of patients on haemodialysis is 264 per million [4]. Fatigue is the most common symptom among patients undergoing heamodialysis with a prevalence ranging from 60 to 97%[1].

A significant need exists for the management of fatigue in order to reduce its impact on the life of patients undergoing haemodialysis for example improving their quality of life, perform their daily activities, improve their abilities or desires to spend time with other people decreasing sleeping problems and depression . Nurses are in a strategic position to assess dialysis-related fatigue and help patients develop strategies to manage its effects.

Many studies were conducted aiming to evaluate the effectiveness of warm water foot bath on fatigue among patient undergoing haemodialysis . Warm water footbath is a cheap and simple method to relieve stress, fatigue, insomnia and anxiety [15]. Study by Soumya 2014 showed that when warm water footbath is applied at temperature from 40 ºC to 42 ºC to the body, the capillary vessels dilate, become flaccid and exhibit signs of loss of tension. In addition it causes relaxation since it induces significant increase in sympathetic activity.

Therefore this study will be build upon the science of complementary therapy that may be useful to nursing and other health care professionals for optimizing quality of care, decrease distress of fatigue as well as improving quality of care. In addition, this research could provide health care providers with an in depth understanding related to this category of patients with fatigue could be reflected positively on patients care, length of hospital stay and economic issues.

It is hoped that the findings of this study might establish evidence based data that can promote nursing practice research. Also it is hoped that this effort will generate attention and motivation for further researches in this area of alternative therapy. The main aim of the current study is to evaluate the effect of warm water foot bath on fatigue in patients undergoing hemodialysis.

RESEARCH HYPOTHESIS

H1. Patients on haemodialysis who receive the warm water foot bath will have lower fatigue level than those who will not.

Operational Definitions

The following operational definitions will be used in this study:

Warm water foot bath:

Soaking patient feet in warm water at 40ºC- 43ºC by utilizing bath thermometer for 30 minutes along seven consecutive sessions in the last hour of the haemodialysis session [13].

Fatigue*:*

It is defined as the patient's quantitative scores on fatigue severity scale (FSS) ranging between 36-63 [17]. The score is aggregated to three levels mild fatigue level (36 – 44) , moderate fatigue level(45 - 53) , sever fatigue level (54 - 63) .

Subject and Methods:

Research Design:

Quasi-experimental pre-post test non equivalent control group design was used in this study to estimate the causal impact of warm water foot bath (independent variable) on fatigue score (dependent variable) .This design lacks the element of random assignment but exercises certain controls of using some criterion other than random assignment such as eligibility cutoff point [18] .

The selected design helped to evaluate the effect of using warm water foot bath on fatigue level among patients undergoing hemodialysis.

Setting:

The study was conducted at Kasr Al-Aini Center (Nephrology- Dialysis – Transplantation) at Cairo University hospital .Total capacity in this center was 45 beds and 45 haemodialysis machines. The total number of patients divided in to two groups the first group come to the center on Saturday, Monday and Wednesday and the other group come on Sunday, Tuesday and Thursday. Duration of every session was three hours. Working system in the center distributed to three shifts per day.

Sample:

Purposive sample consisting of 88 patients (44 in the experimental and 44 in the control group) who received haemodialysis three times a week. The inclusion criteria included Patients who were having fatigue scored 36 to 63 according to objective validated fatigue severity scale [17]. Adult male and female patients between 18-60 years old who diagnosed to have chronic renal failure and they are doing hemodialysis since more than three months ago. The exclusion criteria included patients who were having disturbance on conscious level. And patients who had peripheral vascular diseases of the feet and legs. Also patients with sensory deficit and foot ulcer were excluded from the study.

Tools of data collection: Data was collected using the following tools:-

1. Structured Interview schedule: It was developed by the researcher. This tool was consists of two parts:
   - First part: included demographic data covering questions related to age, gender, level of education, occupation and marital status
   - Second part: was elicit data related to medical history such as duration of illness, duration of hospitalization and history of chronic diseases according patient medical record.
2. Fatigue severity scale (FSS): developed by Lauren B. Krupps and colleagues in the late 1980s [17]. FSS is a questionnaire containing nine statements that explore the severity of fatigue symptoms. The patients were asked to circle a number from 1 to 7, depending on how appropriate they felt the statement applied to them. As regard fatigue level a low value indicated strongly disagree and a high value indicated strongly agree .Adding all scores and get the final score. A score of 36 - 63 indicated the presence of fatigue. The score was aggregated by researcher to three levels mild fatigue level (36 – 44) , moderate fatigue level (45 - 53) , sever fatigue level (54 - 63) . Internal consistency of the FSS was excellent (Cronbach's $\alpha = 0.89$).
3. Bath thermometer (for measuring water temperature from 40 ºC - 43 ºC).

Validity & Reliability of the tools:

Content validity of the designed tool was reviewed by a panel of five experts in the field of medical surgical nursing and nephrology medicine. Also its internal consistency and reliability was statistically examined.

Pilot Study:

A pilot study was conducted on 10% of the sample; to ensure objectivity, clarity, feasibility and reliability of the study tool and determine the time required to fill the different data collection tools. Necessary modifications was done according to the modifications required, pilot study sample was included in the study .

Ethical Consideration:

Written approval was obtained from the Ethics and Research Committee of the Faculty of Nursing. Also an official permission was obtained from hospital administrators to conduct the study. The purpose and nature of the study as well as the importance were explained to the potential participants who met the inclusion criteria. Signed consent was obtained from the patients who choose to participate in the study. Also anonymity and confidentiality were assured through coding the data. Participants were assured that their participation is voluntary and they have the right to withdraw from the study at any time without any penalty.

Procedure:

The study was conducted through three phases. First phase was the assessment phase during it the study participant was recruited individually to explain the nature and purpose of the study. Demographic and medical data were gathered then the investigator obtained written consent from the participants who were agreed to participate in the study. The investigator was assessing patient's fatigue level through the fatigue severity scale (FSS) for both groups. Patient who had fatigue score ranged from 36 to 63 (mild, moderate and severe level) in both two groups (experimental group and control group) was included in the study. Second phase was implementing phase, in which intervention (warm water footbath) was administered to the experimental group during the last hour of dialysis session. Plastic basin was filled with warm water at temperature of 40 ºC - 43 ºC measured by water thermometer after that patient feet was soaked on it for 30 minutes, and then the feet was dried using towel .Also water temperature was maintained constant at 40ºC through adding warm water when needed. This intervention was done for seven consecutive sessions. In the last phase (evaluation phase) the level of fatigue was assessed after half an hour post intervention by the same scale on 4^{th} and 7^{th} day of intervention. Also at the same days the fatigue level of the control group was assessed.

Data Analysis:

Collected data was analyzed using statistical package for the social science (SPSS) program, version 20. The demographic variables such as (age, gender, level of education) were analyzed by using descriptive statistics (frequency and percentage). Fatigue level was analyzed by using descriptive statistics (mean, standard deviation). Effectiveness of warm water foot bath among both groups was analyzed by using inferential statistics (paired t test ,repeated measures of one way and two way ANOVA test). Association of demographic variables in both groups was assessed by chi square analysis. Level of significance was adopted at $p < 0.05$.

RESULTS

Table1: Characteristics of participants in both groups

Variables	Values	Study group		Control group		X^2	P value
		No.	%	No.	%		
Age	21-30	3	6.8	6	13.6		
	31-40	13	29.5	12	27.3		
	41-50	18	40.9	16	36.4		
	51-60	10	22.7	10	22.7		
	Mean	43.6 ± 8.2		42.5 ± 9.5		1.1	0.7
Gender	Male	21	47.7	21	47.7		
	Female	23	52.3	23	52.3	0	1
Marital status	Married	33	75.0	28	63.6		
	Widow	3	6.8	7	15.9		
	Single	2	4.5	9	20.5	4.6	0.2
Education	cannot read and write	2	4.5	4	9.1		
	read and write	20	45.5	17	38.6		
	basic education	10	22.7	12	27.3		
	Diploma	11	25.0	7	15.9		
	higher education	1	2.3	4	9.1	3.7	0.4
Occupation	Employee	3	6.8	2	4.5		
	Housewife	16	36.4	14	31.8		
	Unemployed	22	50.0	23	52.3		
	free work	3	6.8	5	11.4	0.85	0.83
Residence	Rural	10	22.7	14	31.8		
	Urban	34	77.3	30	68.2	0.9	0.3

*significant at $P < 0.05$

Table 1 showed that the mean age of the study participants in the control group was 42.5 ± 9.5years, whereas that of participants in the experimental group was 43.6 ± 8.2years; however there was no statistically significant difference between both groups (X^2 =1. 1; P = 0.7). The above table also revealed that there was no statistically meaningful difference between gender, level of education, occupation and residence in both groups (P >0.05*)*.The same table illustrated that in each group the higher percentage of the study participants were married and around half of them are unemployed.

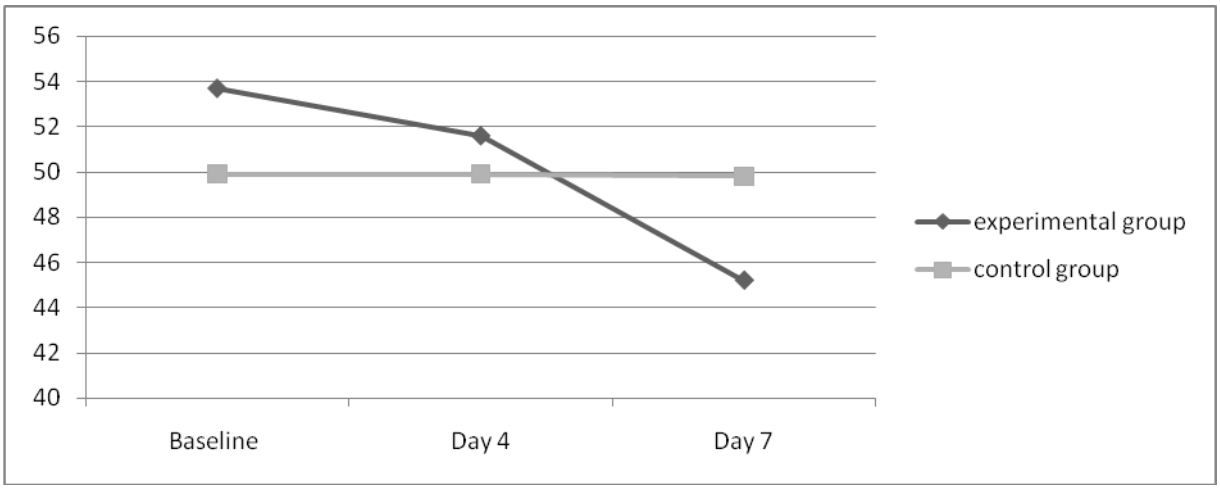

Figure 1 Difference between fatigue levels in both groups at each time

Figure 1 showed a meaningful reduction in the fatigue level in experimental group from baseline assessment of fatigue level to day 7 (F=42.447; $P\leq$ .0001). Also statistically significant association was found between both groups as regards fatigue level on baseline and day 7(F=81.2 ; $P\leq$0.0001).

Table 2 Medical data of experimental and control groups

Variables	Values	Experimental group		Control group		X^2	*P* value
		No.	%	No.	%		
Onset of haemodialysis	1-3	15	34.1	11	25.0		
	4-6	13	29.5	17	38.6		
	7-9	10	22.7	7	15.9		
	10-12	2	4.5	5	11.4		
	>12	4	9.1	4	9.1	2.9	0.5
	Mean	5.7		6.2			
Number of hemodialysis sessions in a week	3	44	100.0	44	100.0		
Duration of session	4	44	100.0	44	100.0		
Chronic illness	DM	5	11.4	2	4.5		
	HTN	11	25.0	13	29.5		
	HCV+ve	2	4.5	4	9.1		
	HCV+ve andHTN	2	4.5	2	4.5		
	HCV+ve and DM	4	9.1	3	6.8		
	no chronic illness	20	45.5	20	45.5	9.6	0.1
Hemoglobin level	5-<9	12	27.3	13	29.5		
	9-10	23	52.3	21	45.8	0.2	0.8
	10.5-11.5	9	20.5	10	22.7		
	Mean	9.5		9.3			

*significant at $P < 0.05$

DM=Diabetes Melletus; HTN=Hypertension; HCV+ve= Hepatitis C positive

Table 2 illustrated that there was no statistically significant differences between both groups as regards onset of hemodialysis, chronic illnesses and hemoglobin level (*P* >0.05*)*

Table 3: Comparison of fatigue level over time, Mean ± SD of participants in control and experimental groups

Follow up time	Experimental group		Control group		F-value	p-value
	Mean	±SD	Mean	±SD		
Baseline fatigue level	53.73	3.22	49.98	5.90	13.717	.0001*
Day 4 (session 4)	51.66	3.78	49.91	5.80	2.811	.097
Day 7(session7)	45.27	5.98	49.80	6.16	12.224	.001*
F-value	42.447		0.105			
p-value	.0001*		0.901			

*$P \leq .05$; F= Variance analysis of repeated measurements, one way and two way ANOVA test

When participants complained about fatigue (Baseline means assessment of fatigue level in the control group and again on day 4 and day 7, in sync with experimental group baseline means immediately before starting the warm water foot bath when participants complained about fatigue.

Table 3 indicated that there was a statistically significant difference between fatigue level on baseline assessment among both groups *(P* <0.05).The same table showed reduction in fatigue level from baseline to day 4 (session 4 of administering warm water footbath) by 2.07 points(53.73± 3.22,day 4 51.66 ± 3.78) in the experimental group and 0.07 points(baseline 49.98± 5.90; day 4, 49.91± 5.80) in the control group .Also a decrease of 8.46 points was indicated for the participants in the experimental group (baseline is 53.73 ±3.22 ; day 7(last session) 45.27 ±5.98 respectively) after warm water footbath.

DISCUSSION

The main aim of the current study was to evaluate the effect of warm water foot bath on fatigue level in patients undergoing hemodialysis. The findings of the present study revealed that among the experimental group a significant reduction in the mean level of fatigue was 45.27 after administering warm water footbath with standard deviation 5.98 .In contrasts, the control group the mean level of fatigue was 49.80 with standard deviation of 6.16. The obtained 'F' value 42.447 was significant at p<0.05 level. This finding support the effectiveness of using warm water footbath to reduce level of fatigue among hemodialysis participants. This finding is consistent with a previous study conducted by [13] to evaluate the effectiveness of footbath therapy on fatigue among chronic renal failure patients which highlighted a significant difference between fatigue level in the experimental group before and after administering water foot bath. Another study carried out in India by [1] who reported that warm footbath therapy among participants with chronic renal failure undergoing hemodialysis is effective in reducing fatigue .The same authors also found that among experimental group, the mean level of fatigue before administering footbath was 49 with 5.6 Standard Deviation was higher than the post intervention level of 32±6.2 which is similar to the our findings. In addition the findings of the current study are supported by other study conducted in Chennai by [15] to determine the effectiveness of warm water footbath on the fatigue level in elderly patients and reported a significant reduction in the

level of fatigue among elderly patients receiving warm water footbath. Another study carried out by [19] on gynecologic cancer patients during chemotherapy found that warm-water footbath intervention resulted in reduced fatigue and insomnia symptoms. Other researcher have published data in Taiwan to explore the effect of warm-water footbath on fatigue, sleep and quality of life in hospitalized post-stroke patients and highlighted that warm water footbath is a safe and effective modality for post-stroke hospitalized patients, especially in improving the patient's fatigue and quality of life [20].

The authors of the current study **concluded** that most of the participants undergoing hemodialysis were suffering from fatigue. With using warm water footbath a significant reduction in the level of fatigue was observed. Participants appreciated the authors and reported comfortable feeling and satisfaction towards using warm water footbath. Thus using the concerned technique is an effective and simple method to reduce fatigue among patients undergoing hemodialysis. Also it is easy to be applied by nonprofessional caregiver or patients themselves. Thus without pharmacological intervention patients can use cheap and simple technique to relive fatigue by improving the foot vessel expansion which reflected on significant increase in sympathetic activity to relive the fatigue.

CONCLUSION AND RECOMMENDATION

Further researches are needed on larger scale to support the generalization of this finding.

- Complementary therapy such as warm water foot bath therapy could be added into hemodialysis complications treatment.

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