

Effect of Hot Water Foot Immersion Therapy on Level of Fatigue among Advance Stage Cancer Patients

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Abstract: ***Introduction:** Fatigue is a common symptom of advanced cancer, limiting one's activity and affecting the quality of life. It is a multidimensional symptom complex with subjective and objective components. **Aim** of the study was to assess the effect of Hot Water Foot immersion therapy on level of fatigue & to choose the action which is cost effective and cheap in reduction of fatigue among advanced stage cancer patients and to promote their quality of life. Objectives were to assess the level of fatigue of cancer patient before Hot Water Foot Immersion Therapy & to evaluate the effect of Hot Water Foot Immersion Therapy on fatigue among cancer patients. **Method:** This pre-experimental study with one group pretest post test design included a total 48 patients with advance stage (IIIrd & IVth) cancer of lung, oral cavity, cervix and ovary with the age group of 18 years and above who fulfilled the inclusion and exclusion criteria selected by Non purposive sampling technique. All the patients were assessed for severity of fatigue using Brief Fatigue Inventory (BFI) in Radiotherapy unit in the Regional cancer hospital in I.G.M.C. & Hospital, Shimla. Participants were guided to put their feet into the footbath device, which contained water at 41°C to 43°C to cover the feet up to 10 cm above the ankle. HWFIT administered twice a day for 1 day in the same group and post test was conducted on the 2nd day which provides level of fatigue from past 24 hours. This intervention was administered total 3 times and after each intervention 3 immediate post-test was taken. The soaking time was 15 minutes as measured by a timer. **Result:** It is revealed that mean \pm S.D. for pre-test was 53.63 ± 7.978 and for post-test mean \pm S.D. value was 43.27 ± 7.682 . The result showed that there is statistically significant decrease ($p < 0.05$) in the level of fatigue after the intervention. **Conclusion:** A hot water footbath is a local moist heat application. It is noninvasive and easy to apply at home. This study demonstrates its effectiveness in reducing fatigue among advance stage cancer patients. It can be a non-pharmaceutical method to help patients overcome fatigue and improve their quality of life.*

Keywords: Effect, Fatigue, Hot Water Foot Immersion Therapy & advanced stage cancer patients

1. Introduction

1.1 Background of the Study

Cancer is characterized by uncontrolled growth and spread of cancerous cells. It can be defined as a disease in which there is an uncontrolled growth of abnormal cells by disregarding the normal rules of cell division. Normal cells are constantly providing signals that dictate whether the cell should divide, differentiate into another cell, or die. Cancer cells develop a degree of autonomy from these signals, resulting in uncontrolled growth and proliferation. It can be fatal, if this proliferation is allowed to continue and spread. In fact, almost 90% of cancer related deaths are due to tumor spreading process known as metastasis. It can result in death, if the spread is not controlled.

In India, Cancer is emerged as a major public health concern. Around 2.8 million cases of cancer are prevalent and about 1.25 million new cases are diagnosed every year at any given point of time. According to the WHO, death from cancer in India is projected to rise to 13.1 million by the year 2030. Fatigue, pain, and sleep disturbance are among the most common symptoms experienced by people with cancer¹.

Fatigue is a common symptom of advanced cancer, limiting one's activity and affecting the quality of life. It is a multidimensional symptom complex with subjective and objective components. Fatigue has a high prevalence rate, and lasts longer in chronic diseases like cancer. Its association with treatment modalities like chemotherapy, radiotherapy alongside the primary disease process makes it seemingly ubiquitous in many cases. Systemic manifestation

of cancer causes excess demand on body resources on cell repair, uncontrolled growth with metabolite accumulation causing fatigue. Fatigue is recognized as a common state in palliative care and patients with advanced cancer experience it as the most distressing symptom affecting their quality of life. Patients characterize fatigue as a feeling of overwhelming exhaustion and lack of energy and enthusiasm. Problems with this symptom are experienced from many months to years following completion of the treatment.

A significant proportion of disease free survivors report disruptive fatigue levels years after their treatment. Fatigue is reported rarely and treatment options or strategies of management are discussed infrequently. Many physicians consider fatigue a 'standard norm' of the treatment or disease, on which nothing can be done, and hence to be endured.

The prevalence of fatigue in palliative care setting is in the range of 48-78%. Consistently lower levels of fatigue were observed in healthy controls over cancer patients when standardized instruments were used. In patients who receive chemotherapy, the prevalence is between 75 and 90% and this has a linear increase with progression of treatment. In case of radiation therapy, it is 65% and it does not increase in most cases while on treatment. Long-term survivors of cancer (17-56%) experience fatigue lasting for months after cessation of their treatment with a resultant compromise in the quality of life. Fatigue is commonly associated with other chronic illnesses also. Among elderly people with chronic illnesses, the prevalence is estimated to be in the range of 47-99%. Multiple sclerosis, heart failure, chronic obstructive pulmonary diseases, HIV/AIDS, end stage renal

diseases, systemic lupus erythematosus, and rheumatoid arthritis are some of the major chronic illnesses in which fatigue is felt as a troublesome symptom. It should be noted that fatigue is only one dimension of cancer-related asthenia, which is characterized by easy tiring and reduced sustainability of performance, generalized weakness resulting in reduced ability to initiate movement, mental fatigue characterized by poor concentration, impaired memory, and emotional lability.

Age is considered a predictive factor for fatigue in cancer patients. Younger patients, less than 34 years do better than older patients. Similarly, men over 75 years of age were found to experience 11 times more fatigue than their younger counterparts. Among women with breast cancer, younger age group was more vulnerable to fatigue, probably due to the aggressiveness of their treatment. A pre-treatment fatigue level is an important factor. There is evidence that the patients experience fatigue even before their cancer diagnosis².

High cytokine content have been found in patients undergoing chemotherapy or radiation treatment. Levels are high in cancer survivors also³. Cytokine related primary fatigue has central and peripheral components. Changes in the hypo-thalamo pituitary-adrenal axis and neuronal system controlling arousal and fatigue constitute the central component, whereas altered muscular metabolism leading to energy imbalance and resultant fatigue is the peripheral component⁴.

It is found that the diurnal rhythm of cortisol secretion is upset in a subtle manner in breast cancer patients. Evening levels of cortisol was found to be comparatively low in these patients than normal population⁵. Hypothalamopituitary-adrenal axis was deregulated and this causes changes in circadian rhythm. This is another possible cause for excessive primary fatigue in cancer patients. Cancer, being a systemic disease, puts excessive demands on scarce body resources, for molecular and cellular repair, which is mirrored by an increased level of fatigue⁶. Another theory is that the systemic effects of cancer treatment causing accumulation of metabolites as a result of normal tissue damage give rise to fatigue⁷.

Fatigue is closely associated with anemia in cancer patients. Erythropoietin secretion is inhibited because of high levels of cytokines. Decrease in levels of fatigue was observed in patients treated with erythropoietin⁸. However, the association between hemoglobin and fatigue is weak and it is postulated that the impairment in the function of hemoglobin in cancer is the reason for fatigue⁹.

There are various interventions for fatigue, but pharmaceutical interventions may bring adverse effect to cancer patients hence non pharmaceutical methods have to be encouraged.

A warm foot bath warms the skin, which causes vessel dilation and induces heat dissipation. Foot bath is an effective method of relaxation, since it increases sympathetic activity. In addition, foot bath increases white blood cells and natural killer cells. When warm water foot bath therapy

is applied at a 40°C to 42°C temperature to the body, the capillary vessels dilate and become flaccid and exhibit signs of loss of tension. Untreated fatigue may impact greatly on quality of life, leading to increased dependence on others, weakness, increased physical and mental energy, social withdrawal and depression. A warm footbath therapy increases blood circulation, relaxes muscle tension, relieves congestion in the internal organs and brain and stimulate nerve ending of the soles thereby it exhibits a deep sense of relaxation¹⁰.

2. Research Methodology

Tools

The BFI is used as screening tool for fatigue which measures severity of fatigue over the previous 24 hours (Alfa =0.82 to 0.97). The BFI has only nine items, with the items measured on 0-10 numeric rating scales (Annexure 1). Three items ask patients to rate the severity of their fatigue at its "worst," "usual," and "now" during normal waking hours, with 0 being "no fatigue" and 10 being "fatigue as bad as you can imagine." Six items assess the amount that fatigue has interfered with different aspects of the patient's life during the past 24 hours. The interference items include general activity, mood, walking ability, normal work (includes both work outside the home and housework), relations with other people, and enjoyment of life. The interference items are measured on a 0-10 scale, with 0 being "does not interfere" and 10 being "completely interferes. Fatigue was categorized using the BFI as either severe (score 7-10) or no severe (score 0-6), with the latter further subcategorized into moderate (score 4-6) and mild (score 0-3).

Procedure for Data Collection

After obtaining administrative permission from the I.G.M.C. & Hospital, Shimla, the subjects were identified according to the inclusion and exclusion criteria, by non- probability purposive sampling technique. The purpose of the study explained to the subjects. Assessed level of fatigue by using 1st domain of Brief Fatigue Inventory and selected those who were having moderate & severe level of fatigue. Informed consent was taken from the subjects. Investigator used an interview schedule to assess the demographic variables and clinical data. Fatigue level was assessed in the group by using Brief Fatigue Inventory before the intervention. Subjects were guided to put their feet into the footbath device, which contained water at 41°C to 43°C to cover the feet up to 10 cm above the ankle. The soaking time was 15 minutes as measured by a timer. Subjects were observed for any sweating, skin color change, and consciousness change. The intervention and post-test was conducted in following sequences:

On the first day, after conducting the pre-test, intervention was administered in the morning and 1st immediate post-test was conducted after 5 minutes of the intervention and next intervention was given in the evening and 2nd immediate post test was conducted after 5 minutes after the intervention.

On the 2nd day, post test was conducted in the morning to assess the level of fatigue from past 24 hours and after that

again intervention was administered and 3rd immediate post-test was taken.

HWFIT was given to the subjects for 3 times and 3 immediate post-test was conducted after each intervention to

assess the level of fatigue at present and one 24 hours post test conducted which provide information about level of fatigue from the past-24 hours.

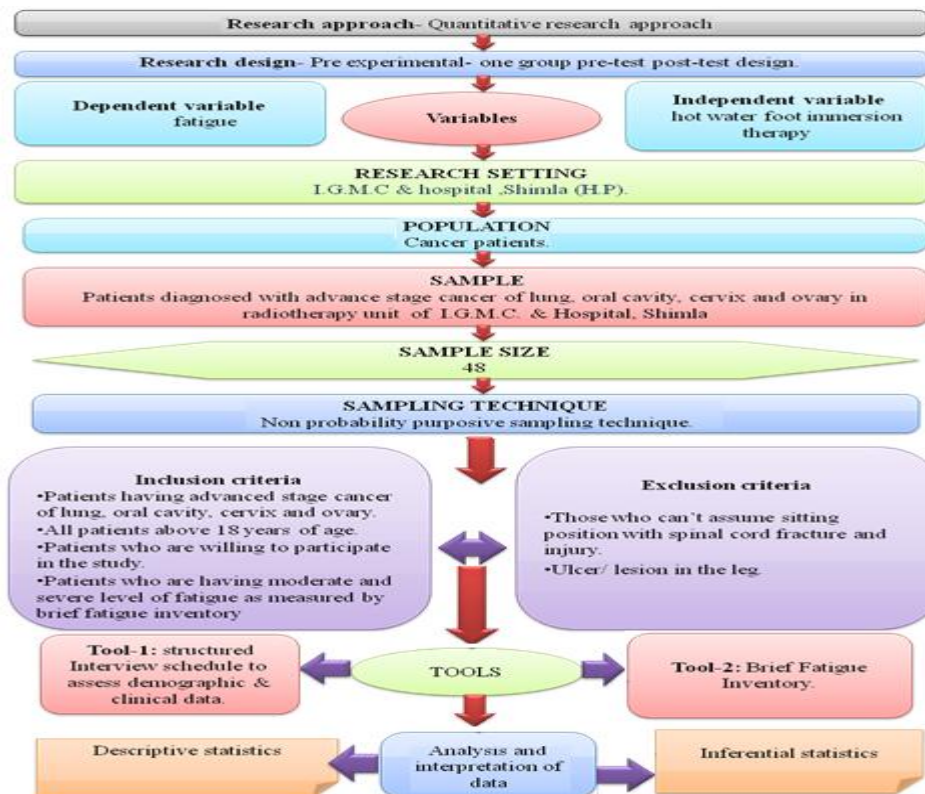


Figure 1: Schematic diagram of research methodology

3. Results

Table 1: Distribution of subjects based on Socio-demographic data, N=48

Variables	Category	Frequency (f)	Percentage (%)
Age in Years	18-39	2	4
	40-60	19	40
	Above 60	27	56
Religion	Hindu	48	100
Gender	Male	24	50
	Female	24	50
Residence	Rural	48	100
Education	No formal education	31	65
	Primary and secondary	9	19
	Higher Secondary & above	8	17
Diet	Vegetarian	1	2
	Non-vegetarian	47	98
Taken Any Food/Drinks	No	48	100
Smoking	No	48	100

Table No. 1 Depicts that more than half of the subjects 27 (56%) belongs to age category of above 60, all the subjects 48 (100%) belongs to Hindu religion, 48 (100%) belongs to rural area. Among all the subjects half of them that is 24 (50%) were female and other half 24 (50%) were male. Majority of the subjects 31 (65%) were having no formal education. Maximum of them 47 (98%) were non-vegetarian, 48 (100%) have not taken any food/drink within

30 minutes and all the subjects 48 (100%) have not done smoking within 30 minutes.

Table 2: Distribution of subjects based on Clinical data, N=48

Variables	Category	Frequency (f)	Percentage (%)
Diagnosis	Ca oral cavity	12	25
	Ca lung	12	25
	Ca cervix	12	25
	Ca ovary	12	25
Stages	Stage-III	37	77
	Stage-IV	11	23
Patient Undergoing Chemotherapy	Yes	9	19
	No	39	81
Patient Undergoing Radiotherapy	Yes	30	63
	No	18	38
Recent Hb	None >11	29	60
	Mild (9.5-10.9)	7	15
	Moderate (8-9.4)	11	23
	Severe (6.5-7.9)	1	2
Any Other Medical Condition	Yes	16	33
	No	32	67

Table No.2 depicts that 12 (25%) had cancer of oral cavity, 12 (25%) had cancer of lung, 12 (25%) had cancer of cervix, 12 (25%) had cancer of ovary. Most of the subjects 37 (77%) had stage-III of cancer. Majority of them 39 (81%) were not undergoing any chemotherapy and 30 (63%) were undergoing radiation therapy. More than half of the subjects

29 (60%) had Hb level more than 11 gm/dl according to WHO criteria and 32 (67%) had no any other medical condition.

Table 3: Distribution of subjects based on pre & post-test level of fatigue, N=48

Score Level	Pre-test	Post-test
Mild Fatigue (0-30)	0 (0%)	2 (4.2%)
Moderate Fatigue (31-60)	41 (85.4%)	43 (89.6%)
Severe Fatigue (61-90)	7 (14.6%)	3 (6.3%)
Maximum=90 Minimum =0		

Table No. 3. Explain that 41 (85.4%) had moderate level of fatigue and 7 (14.6%) had severe level of fatigue in the pre-test. After the intervention, 2 (4.2%) had mild level of fatigue, 43 (89.6%) had moderate level of fatigue and 3 (6.3%) had severe level of fatigue.

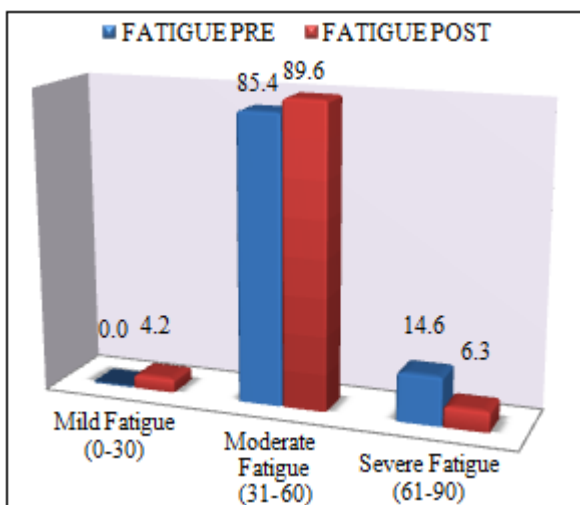


Figure 2: Comparison between pre and post-test level of fatigue (N=48)

Table 4: Comparison of post test level of fatigue based on immediate observations after the intervention, N=48

Score Level (N=48)	1st Observation	2nd Observation	3rd Observation
Mild (0-3)	10 (20.8%)	12 (25%)	42 (87.5%)
Moderate (4-6)	35 (72.9%)	33 (68.8%)	6 (12.5%)
Severe (7-10)	3 (6.3%)	3 (6.3%)	0 (0%)
Maximum=10, Minimum =0			

Table No. 4 Level of fatigue after the intervention was analyzed by using 1st domain of Brief Fatigue Inventory which is a 10 point (0-10) rating scale. This table depicts that in the 1st observation after the intervention, majority of the subjects 35 (72.9%) was having moderate level of fatigue, whereas 10 (20.8%) of the subjects were having mild level of fatigue and 3 (6.3%) were having mild level of fatigue as measured by Brief Fatigue Inventory. In the 2nd observation 33 (68.8%) of the subjects was having moderate level of fatigue, less than half of the subjects 12 (25%) were having mild level of fatigue and minimum of the participants 3 (6.3%) were having severe level of fatigue. In the 3rd observation maximum of the subjects 42 (87.5%) were having mild level of fatigue, 6 (12.5%) were having moderate level of fatigue and no subjects was having any fatigue. This Table shows that the level of fatigue was reduced in the 3rd observation.

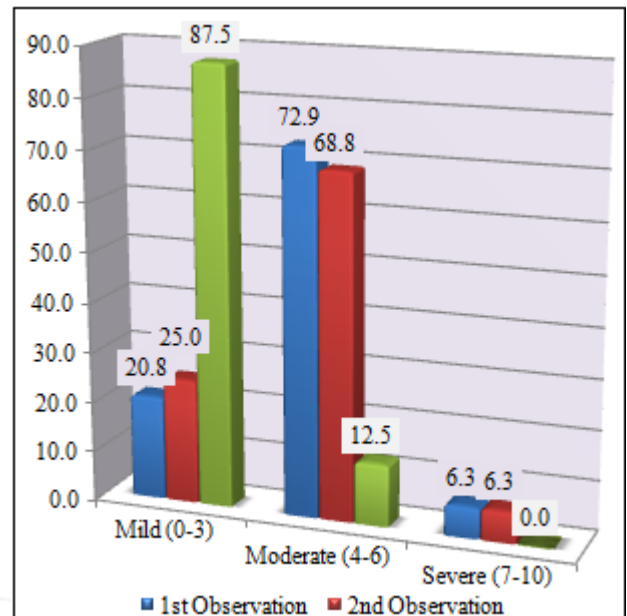


Figure 3: Comparison of post test level of fatigue based on immediate observations

Table 5: Distribution of subjects based on pre and post-test level of fatigue from past 24 hours in Brief Fatigue Inventory, N=48

Variables	Category	Pre-test level of fatigue		Post- test level of fatigue	
		(f)	(%)	(f)	(%)
Fatigue right now	Mild	0	0	26	54
	Moderate	18	38	20	42
	Severe	30	63	2	4
Usual level of fatigue (24 hrs)	Mild	0	0	9	19
	Moderate	18	38	36	75
	Severe	30	63	3	6
Worst level of fatigue (24 hrs)	Mild	0	0	9	19
	Moderate	16	33	36	75
	Severe	32	67	3	6
General activity (24hrs)	Mild	0	0	2	4
	Moderate	40	83	40	83
	Severe	8	17	6	13
Mood (24hrs)	Mild	10	21	25	52
	Moderate	32	67	19	40
	Severe	6	13	4	8
Walking ability (24 hrs)	Mild	0	0	0	0
	Moderate	36	75	38	79
	Severe	12	25	10	21
Normal work (24 hrs)	Mild	1	2	1	2
	Moderate	39	81	40	83
	Severe	8	17	7	15
Relations with other people (24hrs)	Mild	14	29	14	29
	Moderate	32	67	32	67
	Severe	2	4	2	4
Enjoyment of life (24hrs)	Mild	0	0	0	0
	Moderate	32	67	32	67
	Severe	16	33	16	33

Table No.5. Depicts that in the pre-test maximum of the subjects 30 (63%) had severe level of fatigue at right now whereas in the post-test, level of fatigue was reduced to 26 (54%). Majority of the subjects 30 (63%) had severe, usual level of fatigue from past 24 hours in the pre-test and in the post-test, 36 (75%) had moderate, usual level of fatigue from past 24 hours. More than half of the subjects 32 (67%) had severe, worst level of fatigue from 24 hours in the pre-test

and maximum of the subjects 36 (75%) had moderate, worst level of fatigue in the post-test. Maximum of the subjects 40 (83%) had moderately affected their general activity from 24 hours in the pre-test and post-test also. Majority of the subjects 32 (67%) had moderately affected mood from 24 hours in the pre-test whereas in the post test 25 (52%) subjects had mild affect on the mood from past 24 hours. Maximum of them 36 (75%) had moderately affected their walking ability from past 24 hours in the pre-test and in the post-test 38 (79%) had moderate effect on the walking ability. 39 (81%) subjects had moderate effect on the normal work in the pre-test whereas in the post-test 40 (83%) had moderate effect on the normal work. More than half of the subjects 32 (67%) had moderately affected their relationship with the other people both in the pre-test and post-test. Maximum of them 32 (76%) had moderate effect on their enjoyment of life from 24 hours in the pre-test and post-test also.

This table shows that there is statistically reduction in the level of fatigue in the post-test and also there was statistically difference in the other domain of Brief Fatigue Inventory such as Mood from 24 hours, walking ability from 24 hours, normal work from 24 hours in the post-test, whereas there is no statistically difference in general activity from 24 hours, relations with other people from 24 hours and enjoyment of life from 24 hours

Table 6: Effectiveness of Hot Water Foot Immersion Therapy on level of fatigue of subjects based on multiple observations,

N=48

Multiple observations	Pre-test	Post-test-1	Post-test-2	Post-24hrs	Post test -3
Mean	6.73	4.54	4.44	3.46	2.33
S.D.	1.364	1.237	1.428	1.383	0.953
Number	48	48	48	48	48
Maximum	10	7	8	7	4
Minimum	4	2	2	1	1
Range	6	5	6	6	3
Df1	4				
Df2	188				
F Test	243.48				
P value	<0.001				
Table Value at 0.05	2.42				
Result	Significant				

	PRE-TEST			
POST-1	2.19 Sig	POST-1		
POST-2	2.3 Sig	0.1 Sig	POST-2	
POST-3	4.4 Sig	2.21 Sig	2.1 Sig	POST-3
POST-24	3.28 Sig	1.08 Sig	0.98 Sig	1.13 Sig

***significant at <0.001

Table No.6 Level of fatigue after the intervention was analyzed by using 1st domain of Brief Fatigue Inventory which is a 10 point (0-10) rating scale. This table depicts that Mean \pm SD value was decreased in the 3rd immediate post test which was 2.33 ± 0.953 and post-test done after 24 hours, the Mean \pm S.D. Value was 3.46 ± 1.383 which was statistically significant ($p < 0.05$). It means immediate effect was more as compared to delayed effect. The mean differences of multiple observations were found to be statistically significant at $p < 0.05$ level of significance.

Table 7: Comparison of pre and post-test level of fatigue from past 24 hours, N=48

Table 7: Comparison of pre and post test level of fatigue from past 24 hours, N=40									
Paired T Test		Mean	S.D.	Mean %	Mean Difference	Paired T Test	P value	Table Value at 0.05	Result
Fatigue	Pretest	52.63	7.978	58.47	9.354	31.033	0.0000	2.01	Significant
	Posttest	43.27	7.682	48.08					
		Maximum= 90 Minimum= 0							

Table No.7. Depicts that mean \pm S.D. for pre-test was 53.63 ± 7.978 and for post-test mean \pm S.D. value was 43.27 ± 7.682 . The result showed that there is statistically

significant decrease ($p < 0.05$) in the level of fatigue after the intervention. Hence research hypothesis accepted.

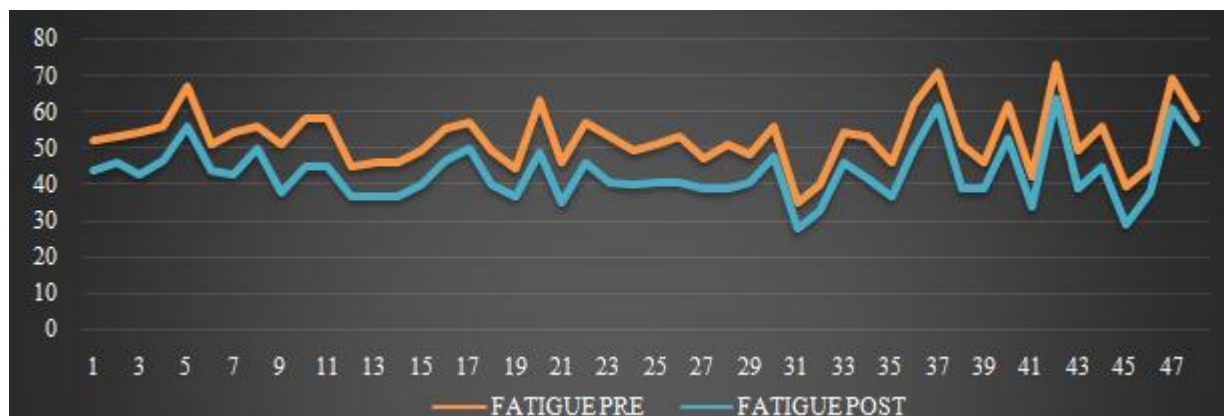


Figure 4: Comparison of pre and post-test level of individual scores of fatigue from 24 hours. (N=48)

4. Discussion

4.1 Objectives of the study

1) To assess the level of fatigue of cancer patients before Hot Water Foot Immersion Therapy.

Study analysis reveals that 41 (85.4%) subjects had moderate level of fatigue and 7 (14.6%) had severe level of fatigue in the pre-test.

2) To evaluate the effect of Hot Water Foot Immersion Therapy on fatigue among cancer patients.

After the intervention, 2 (4.2%) had mild level of fatigue, 43 (89.6%) had moderate level of fatigue and 3 (6.3%) had severe level of fatigue. Study analysis reveals that Mean \pm SD value was decreased in the 3rd immediate post test which was 2.33 ± 0.953 and post-test done after 24 hours, the Mean \pm S.D. Value was 3.46 ± 1.383 which was statistically significant ($p < 0.05$). It means immediate effect was more as compared to delayed effect.

Hypothesis

H₁- There will be a significant difference in the level of fatigue among cancer patients before and after the Hot Water Foot Immersion Therapy at $p < 0.05$ level of significance.

Result shows that mean \pm S.D. for pre-test was 53.63 ± 7.978 and for post-test mean \pm S.D. value was 43.27 ± 7.682 . Result showed that there is significant reduction in the level of fatigue immediately as well as after 24 hours at $p < 0.0000$. Hence research hypothesis accepted.

In the similar study which was conducted by Huei-Lin Yang in Taiwan, Nov, 2010. Title of the study was "The Effects of Warm-Water Footbath on Relieving Fatigue and Insomnia of the Gynecologic Cancer Patients on Chemotherapy", study result showed that Participants in the experimental group reported a significant reduction in fatigue and improvement in sleep quality from the second session of chemotherapy and continued to improve during the study period.

In another similar study, conducted by S. Jose Amala Anilda, P. Thenmozhi Chennai 2013, "Effectiveness of Hot Water Foot Bath on Level of Fatigue among Elderly Patient", result showed that in experimental group Pre test mean = 7.3 SD = 1.1 post-test mean = 4.1 SD = 1.4. The paired-t test reveals that there is effectiveness of hot water footbath on reducing the level of fatigue among elderly patients at the level of $P < 0.05$.

5. Recommendation for Future Research

Based on the findings of the study, followings recommendations are offered:

- The current study can be replicated on large sample for generalization of the findings.
- Hot Water Foot Immersion Therapy can be used in both hospitals as well as in community settings.
- Hot Water Foot Immersion Therapy can be used in fatigue due to other illnesses, because fatigue is not restricted to cancer only.

- More studies should be done to assess the effect of Hot Water Foot Immersion Therapy on other physiological symptoms such as pain and sleep disturbances.
- More comparative studies should be done to identify difference in the level of fatigue in male and female.

6. Conclusion

A Hot-water footbath is a local moist heat application. It is noninvasive and easy to apply at home. This study demonstrates its effectiveness in reducing fatigue among advance stage cancer patients. It can be a non-pharmaceutical method to help patients overcome fatigue and improve their quality of life.

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APPENDIX-K

CERTIFICATE OF THESIS RECOMMENDATION BY
ETERNAL UNIVERSITY, BARU SAHIB, H.P.

We have critically examined the thesis for the entitled 'A pre-experimental study to assess the effect of Hot Water Foot Immersion Therapy on level of fatigue among advance stage cancer patients admitted in I.G.M.C. & Hospital, Shimla.' submitted by Tamanna Chauhan, BS-16-MHNS-018 for the degree of science in Medical surgical Nursing, Akal College of Nursing, Eternal university, Baru sahib, Himachal Pradesh under the supervision of Ms. Rose Mary George Associate Professor, MSN, Akal college of Nursing. It is certified that the research problem is original, program of work is properly planned, and is of good practical significance.

1. Rmg
03/09/18 (Guide)

Ms. Rose Mary George,
Asso. Professor, ACN

2. Dr. Lekha Vasanth
03/09/2018
Dr. Lekha Vasanth
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4. Dr. Nisha Thakur
4/09/2018
Dr. Nisha Thakur
As Prof. Eternal Univ.
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Approved/ ~~Not approved~~

Saravjit
09/09/2018
Dean, Post Graduate Studies
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