USE OF STANDING FOOTS REFLECTION DEVICES TO REDUCE PAIN IN CANCER PATIENTS DURING CHEMOTHERAPY

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Abstract

Chemotherapy in cancer patients has many detrimental side effects, but this treatment remains a medical option. While chemotherapy is the primary treatment option for cancer, peripheral neuropathy, which refers to nerve damage that can develop as a result of chemotherapy, is often present. Non-pharmacological interventions are needed to ensure that cancer patients can lead a quality life without pain after chemotherapy. The Standing Foot Reflection Device (SFRD) is a device with acupressure points that is expected to be effective in reducing pain. The Standing Foot Reflection Device (SFRD) is effective in reducing moderate to imperceptible pain levels.The purpose of this study was to determine the effect of the use of the Standing Foot Reflection Device (SFRD) on pain during chemotherapy in cancer patients at the Indonesian Cancer Foundation. Using a quantitative method with a quasi-experiment, designed by involving a control group in addition to the intervention group that allows researchers to test the changes that occur through a pretest and posttest design with a control group. The results of the univariate analysis obtained were 51% pre-elderly, including women (68%), who worked (62%), with Diploma-III/S-1 education as much as 43%. The results of the bivariate analysis, the p-value chi square pretest of the intervention and control groups could not be calculated because many cells were empty. While the p-value of chi square posttest = 0.000 (<0.05) indicates a significant difference between the intervention and control groups. The p-value (sig.) of the Wilcoxon test for the difference in Hemoglobin (Hb) pre-post = 0.000 <0.05 so there is a significant effect. In conclusion, there is an effect in the use of SFRD on reducing chemotherapy pain. There are other symptoms, namely hemoglobin (Hb) less than normal which is a trigger for the sensation of pain, but the use of SFRD has an effect on increasing Hb so that it has an impact on reducing chemotherapy pain.

Keywords: Exercise, Chemotherapy, Hemoglobin, Pain

1. INTRODUCTION

Cancer is one of the non-communicable diseases that is the leading cause of death worldwide. Cancer is characterized by the uncontrolled growth of certain body cells, which can damage other cells and tissues, often resulting in death. Cancer's aggressive nature and uncontrolled growth can lead to death. All cells in the human body can be affected by cancer except hair, teeth, and nails (Azwar, 2021; Hassanpour, & Deghani, 2021).

The prevalence of prostate cancer in Indonesia in 2020 was 0.24‰, or an estimated 25,018 sufferers. The provinces with the highest prostate cancer prevalence were Yogyakarta Special Region, Bali, North Sulawesi, and South Sulawesi, at 0.5‰. Based on estimates, the highest number of prostate cancer sufferers was in East Java and Central Java. Cervical and breast cancer were the cancers with the highest prevalence in Indonesia in 2018, with cervical cancer at 0.8‰ and breast cancer at 0.5‰ (Hardjolukito, 2021). Riau Islands Province, North Maluku Province, and Yogyakarta Special Region have the highest prevalence of cervical cancer at 1.5‰, while the highest prevalence of breast cancer is found in Yogyakarta Special Region, at 2.4‰. Based on estimates, the highest number of cervical and breast cancer sufferers is found in East Java and Central Java Provinces.

Lung, colorectal, gastric, liver, and breast cancers are the most common types of cancer. Reports note that lung cancer is the deadliest cancer, accounting for 1.8 million deaths or 18.4 percent of total deaths in 2018. Breast cancer can be treated through early breast examinations and patient compliance with chemotherapy, as both of these factors can reduce morbidity and mortality in the long term. Adhering to the chemotherapy program can inhibit and kill cancer cells and reduce the risk of death (Marshall, et al. 2021; Huang, Wang, Chen, 2021; Samantha, 2020). Chemotherapy is used in the early stages to control cancer cells that may remain after surgery, as well as to reduce the risk of cancer coming back. In some cases, chemotherapy is given after surgery, this is called chemotherapy (adjuvean). There are also cases where chemotherapy is given before surgery with the aim of shrinking the cancer and this is usually called chemotherapy (non-adjuvean) (Azwar. 2021; Wu, et al. 2021).

Chemotherapy is unavoidable for cancer patients if it is the doctor's choice of treatment. This study is an extension of a previous study entitled "The Effect of Walker Foot Reflection (WFR) on Minimizing Chemotherapy Side Effects in Breast Cancer Patients at the Indonesian Cancer Foundation." The study, conducted by Jenita DT Donsu & Team in 2023, found that using WFR once during chemotherapy can reduce low to moderate pain sensations. The difference with the WFR device is that it does not have complete acupressure points compared to the Standing Foot Reflection Device (SFRD), so the use of SFRD is expected to have an impact on reducing pain in all types of cancer during chemotherapy.

Feasibility studies have shown that patients generally accept foot reflexology to help manage cancer-related pain. Furthermore, foot reflexology has been reported to be effective and have a significant effect on reducing cancer-related pain. The results also suggest that the selection of pain assessment tools should consider the specific clinical context and assessment goals. Furthermore, there are some differences in the foot reflexology procedures followed by different researchers; nevertheless, the effectiveness of foot reflexology has been demonstrated in all studies. Foot reflexology is appropriate and can be integrated to complement pain management plans for cancer patients (Cai, Chen, Lo. 2022; Alassaf, et al. 2025).

2. METHODOLOGY

Using a quantitative method with a quasi experiment, designed and involving 100 respondents (total sample) divided into a control group of 50 respondents and an intervention group of 50 respondents, which allows researchers to test the changes that occur through a pretest and posttest design with a control group. The inclusion criteria are cancer patients undergoing chemotherapy and staying at the Indonesian Cancer Foundation halfway house, and the exclusion criteria if they have wounds on the soles of their feet to the point of being unable to walk. Pain measurement uses the Numeric Rating Scale (NRS), with the duration of giving leg exercises using SFRD 3 x a week for 10 minutes. Ethical eligibility is recorded in the KEPK Poltekkes Kemenkes Yogyakarta: No.DP.04.03/e-KEPK.1/1047/2025.

3. RESULTS

3.1 Characteristics

The characteristics of the respondents in this study consisted of: Age, Gender, Occupation, and Education. Univariate analysis used statistical formulas for mean, standard deviation, frequency, and percentage. The following are the results of univariate tests on the characteristic factors:

Table 1. *Frequency Distribution of Age, Gender, Occupation and Education Factors(n=100)*

Subvariable	Category	Group		Total
		Intervention	Control	(%)
Age/Years	≤40	3 (42,9)	4 (57,1)	7 (100)
	41-50	20(57,1)	15(42,9)	35(100)
	51-60	21(41,2)	30(58,8)	51(100)
	61-70	2 (28,6)	5 (71,4)	7 (100)

Gender	Man	16(51,6)	15(48,4)	31(100)
	Woman	34(49,3)	35(50,7)	69(100)
Work	Housewives	16(51,6)	15(48,4)	31(100)
	Pension	5 (71,4)	2 (28,6)	7 (100)
	Work	29(46,8)	33(53,2)	62(100)
Education	ES	2 (50,0)	2 (50,0)	4 (100)
	JHS	4 (44,4)	5 (55,6)	9 (100)
	SHS	18(45,0)	22(55,0)	40(100)
	Diploma[3]/Bachelor	24(55,8)	19(44,2)	43(100)
	Magister	2 (50,0)	2 (50,0)	4 (100)

Table 1 shows that the majority of those in the 51-60 age group (51%) are considered pre-elderly. The majority of the gender is female (68%). The most common occupations are civil servants, self-employed, private sector workers, farmers, and laborers (62%). The majority of educational attainment is Diploma III/Bachelor.(43%).

***Table 2**. Frequency Distribution of Education, Other Diseases, Pre-Posttest Symptoms (n=100)*

Subvariable	Category	Group		Total
		Intervention	Control	(%)
Education	Tidak	25(39,7)	38(60,3)	63(100)
	Pernah	25(67,6)	12(32,4)	37(100)
Other diseases	Tidak	37(46,3)	43(53,8)	80(100)
	Ada	13(65,0)	7 (35,0)	20(100)
Symptoms pretes	Tidak	0 (0,0)	0 (0,0)	0 (0)
(moderate pain)	Ada	50(100)	50(100)	100(100)
Symptom post-test	Tidak	50(82,0)	11(18,0)	61(100)
	Ada	0 (0,0)	39(100)	39(100)

Table 2 shows that the highest percentage of respondents in the education subvariable was in the category of never having received education about the effects of chemotherapy that cause pain (63%). In the other disease subvariable, the highest percentage was in the category of not suffering from other diseases (80%). Regarding the subvariable of experiencing disease symptoms during the pretest (moderate pain), all respondents experienced moderate pain (100%). At the posttest, the highest percentage had no symptoms (61%), and those with symptoms (39%) were in the control group.

***Table 3**. Average Hemoglobin (Hb) Values Pretest, Posttest and Hb Difference (n=100)*

Subvariable	Group		Total
	Intervention	Control	
Hb pre-test	12,96±0,81	12,9±0,52	12,93±0,68
Hb post-test	12,83±0,78	11,07±0,85	11,95±1,2
Difference Hb	-0,13±0,36	-1,84±0,75	-0,98±1,04

The data above shows that the pretest Hb subvariable has a mean value that is approximately the same between the intervention group (12.96) and the control group (12.9) with a total mean value of (12.93) but in the standard deviation (SD) value there is a slight difference in the intervention group (0.81) and the control group (0.52) with a total mean (0.68). While in the post-test Hb subvariable, the mean value of the intervention group (12.83) and the control group (11.07). Likewise, the post-test Hb standard deviation (SD) value of the intervention group (0.78) is lower than the control group (0.85) with a total standard deviation value (1.2). In the subvariable, the mean value of the difference in Hb of the intervention group (-0.13) and the intervention group (-1.84), while the standard deviation value of the difference in Hb of the intervention group (0.36) and the control group (0.75) with a total standard deviation value of the difference in Hb (1.04).

3.2 Supporting Data for Research Objectives

In order to minimize the side effects of chemotherapy after SFRD training in cancer patients at the Indonesian Cancer Foundation, the data were analyzed bivariately using the chi square statistical formula, as follows:

***Table 4**. Bivariate Analysis of Other Diseases in the Intervention and Control Groups (n=100)*

Group	Other Diseases		Total	p-value
	No	There is		
Intervention	37(74,0)	13(26,0)	50 (100)	0,134
Control	43(86,0)	7(14,0)	50 (100)	

Based on the bivariate analysis results in Table 4, the chi-square p-value was 0.134 > 0.05. This indicates no significant difference in the incidence of other diseases between the intervention and control groups.

***Table 5.** Bivariate Analysis of Symptoms Appearing During WFR Use (n=100)*

		Symptom		Total	p-value
		No	There is		
Pretest	Intervention	50 (100)	0(0)	50 (100)	-
	Control	0 (0)	0(0)	0 (0)	
Posttest	Intervention	50 (100)	0(0)	50 (100)	0,000
	Control	11(22,0)	39(78,0)	50 (100)	

Table 5 shows the results of the bivariate analysis, showing that the chi-square p-value for the pretest of the intervention and control groups could not be calculated because many cells had blank values. Meanwhile, the chi-square p-value for the posttest was 0.000 (<0.05). This indicates a significant difference in the symptoms that appeared after SFRD administration at posttest between the intervention and control groups.

***Table 6**. Hemoglobin Normality Test Pre-Posttest Intervention Group (n=50)*

Tests of Normality						
	Kolmogorov-Smirnova			Shapiro-Wilk		
	Stat	df	Sig.	Stat	df	Sig.

Hb_pretest	,162	50	,002	,890	50	,000
Hb_postest	,196	50	,000	,873	50	,000

Table 6 shows the p-value for the normality test, namely the Kolmogorov-Shapiro test, is 0.000 <0.05. The data is not normally distributed, so the next hypothesis is tested using a non-parametric test, namely the Wilcoxon statistical test, as follows:

Tabel 7*. Difference in Hemoglobin Pre-Posttest Intervention Group (n=50)*

		N	Mean Rank	Sum of Ranks	p
Hb_postes - Hb_pretes	Negative Ranks	13a	7,77	101,00	0,019
	Positive Ranks	2b	9,50	19,00	
	Ties	35c			
	Total	50			

Based on table 7, the p value of the Wilcoxon test = 0.019 <0.05, so there is a significant difference in Hb pre and posttest in the intervention group.

Table 8. *Hemoglobin Normality Test Pre-Post Test in the Control Group (n=50)*

	Kolmogorov-Smirnova			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Hb_pretes	,172	50	,001	,933	50	,007
Hb_postes	,129	50	,037	,949	50	,031

Table 8 shows the results of the Hb normality test for the pretest and posttest. The p-value for the Kolmogorov-Shapiro test is 0.000 <0.05. The data are not normally distributed, so the next hypothesis is tested using the non-parametric Wilcoxon statistical test, as follows:

Table 9. *Difference in Hb Pre_Posttest Control Group (n=50)*

		N	Mean Rank	Sum of Ranks	p-value
Hb_postes - Hb_pretes	Negative Ranks	50a	25,50	1275,00	0,000
	Positive Ranks	0b	,00	,00	
	Ties	0c			

Table 9 p value of Wilcoxon test = 0.000 <0.05 so there is a significant difference between Hb pre and post test in the control group.

Table 10 *Normality Test of the Difference in Hb Between the Intervention and Control Groups (n=100)*

	Kel	Kolmogorov-Smirnova			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.

Hb_pretest	Intervention	,162	50	,002	,890	50	,000
	Control	,172	50	,001	,933	50	,007
Hb_postest	Intervention	,196	50	,000	,873	50	,000
	Control	,129	50	,037	,949	50	,031
Difference	Intervention	,378	50	,000	,683	50	,000
	Control	,115	50	,098	,971	50	,261

Based on the results of the normality test for the difference in Hb pretest and posttest in the intervention and control groups, the p-value in the normality test, namely the Kolmogorov-Shapiro test, was 0.000 <0.05 except for the control group, the difference in Hb p = 0.971 > 0.05 which was normally distributed. For data that is not normally distributed, the hypothesis is then tested using non-parametric statistical tests, namely the Mann-Whitney and Wilcoxon tests, as follows:

***Table 11**. Difference in Hb Pre_Posttest Intervention and Control Groups(n=100)*

	Group	WMean Rank	Sum of Ranks	Whitney	Wilcoxon	p-value
Hb_pretest	Intervention	50,56	2528,00	1247,000	2522,000	,983
	Control	50,44	2522,00			
Hb_postest	Intervention	72,60	3630,00			,000
	Control	28,40	1420,00	145,000	1420,000	

Table 11 p-value (Sig.) in the Wilcoxon pre-test Hb test = 0.983 > 0.05 so there is no significant difference in pre-test Hb of the control and intervention groups. However, the p-value (Sig.) of the Wilcoxon post-test Hb test = 0.000 < 0.05 indicates that there is a significant difference in post-test Hb between the control and intervention groups.

***Table 12**. Difference in Hb Pre-Posttest in the Intervention and Control Groups (n=100)*

	Group	Mean Rank	Sum of Ranks	Whitney	Wilcoxon	p-value
Difference Hb	Intervention	74,76	3738,00	37,000	1312,000	0,000
	Kontrol	26,24	1312,00			

Table 12 p-value (Sig.) Wilcoxon test for difference in Hb (posttest-pretest) = 0.000 <0.05 so there is a significant difference in the difference in Hb between posttest and pretest.

4. DISCUSSION

The characteristics of the respondents in this study included age, occupation, education, previous education, current illnesses, and current symptoms. Univariate and bivariate analyses were conducted using statistical formulas for mean, standard deviation (SD), frequency, and percentage. Univariate analysis of the characteristic factors for the age variable showed that the highest prevalence was in the 51-60 year old age group (51%), which is classified as pre-elderly, and the highest prevalence was in women (69%). According to Hagedorn (2021), there is no statistically significant relationship between

age and cancer incidence. Similarly, Skandarajah (2021) explains that anemia in pre-elderly individuals can occur due to bone marrow failure syndrome, decreased erythropoietin production in the kidneys, nutritional deficiencies, and inflammatory processes, not cancer. The older a woman is, the greater the risk of developing breast cancer. The same applies to gender. The highest incidence of cancer in Yogyakarta is breast and cervical cancer, so this study targeted women. According to Roncolato (2021) and Montagnese (2021), women of reproductive age physiologically menstruate every month. However, if a woman doesn't ovulate, the progesterone produced is unable to counteract estrogen, which triggers breast cancer. Based on the research findings above, it's highly possible that age, especially in women who haven't given birth, increases the risk of developing hormone-related breast cancer.

In general, they work as civil servants, self-employed, private sector workers, farmers, and laborers (62%). According to Dhawan et al. (2022), the quality of life of cancer patients is influenced by one factor, namely employment. A better job provides peace of mind for cancer patients because it is associated with higher income. According to the Indonesian Employment Report, work systems, especially in the health, transportation, police, military, nursing, medical, and other sectors that require 24-hour service. Shift work is a significant issue related to the intensive and extensive exploitation of production systems. Night shifts can have negative impacts on workers, such as workplace accidents and a tendency towards chronic diseases, including cardiovascular and metabolic disorders, and cancer. Shift work has a negative impact on workers' bodies, especially those with irregular working hours (Munawaroh, 2022).

The education backgrounds of those with a Diploma III/S1 degree (43%) are highly varied. Likewise, the higher the level of education, the easier it is to understand health education. Table 4.2 shows that the highest education subvariable falls under the category of never having received education about the side effects of chemotherapy. The education received does not focus much on the side effects of chemotherapy. Providing health education related to cancer has a significant impact on the community, increasing their health confidence, thus encouraging them to undergo screening because they realize that everyone is at risk of cancer (Khademolhosseini, Noroozi, Tahmasebi, 2021).

In the other diseases subvariable, the majority were in the "none" category (80%). This means that cancer patients generally only focus on the cancer undergoing chemotherapy. Respondents for the intervention and control groups were limited based on inclusion criteria, including not having other diseases, especially those experiencing foot disorders related to the use of the Standing Foot Reflection Device (SFRD). In the disease symptoms subvariable, such as nausea, vomiting, fever, and dizziness, no symptoms were present during the pretest. However, respondents generally had moderate pain sensations (100%) because they were already included in the inclusion criteria. At the posttest, most respondents had no symptoms (61%) in the intervention group. Meanwhile, symptoms of pain sensations were still present (39%). Several factors that influence pain sensations vary from person to person. According to Abd-Elsayed, Gyorfi, Hughes, (2021), pain sensations can be influenced, among other things, by anxiety about the disease.

Hemoglobin (Hb) in this study was not a specific goal, but increasing Hb can reduce pain sensations. Based on the analysis results, Hb values are important to evaluate because the lower a person's Hb value impacts the sensation of pain that is felt. This is related to the symptoms of cancer itself, which bleeds, so a person is in the range of Hb deficiency. Anemia is a condition where the amount of hemoglobin in the blood is insufficient, so it cannot carry out its function of distributing oxygen to the tissues. Oxygen deficiency in cancer patients receiving chemotherapy disrupts the process of eradicating cancer cells, making it ineffective. The ability of radiotherapy to eradicate cancer cells is highly dependent on the level of oxygen molecules in the tumor. According to Harrison & Andrew in Hidayati, & Arifah, (2022), oxygen is an important radiosensitizer in destroying cancer cell DNA. Radiotherapy forms free radicals from oxygen molecules and penetrates the DNA of cancer cells, causing cancer cells to die. Likewise, anemia in cancer patients can cause fatigue and a decreased quality of life, increasing mortality by up to 65%.

The benefits of SFRD can improve gastric function, thus causing post-chemotherapy patients to increase nutritional intake, thereby improving Hb levels. According to Harrison & Andrew in Hidayati & Arifah, (2022), statistically, the total radiation dose received by patients is related to the incidence of anemia in cancer patients receiving radiotherapy and/or chemotherapy. This indicates the occurrence of anemia in patients receiving radiotherapy, resulting in a decrease in the number of erythrocytes and hematocrit caused by impaired erythrocyte production in the bone marrow.

5. CONCLUSIONS

5,1 The characteristics of post-chemotherapy cancer patients are generally pre-elderly women with diploma and bachelor's degrees who work..

5,2 The pain scale felt by cancer patients after chemotherapy is generally a moderate pain scale which is then followed by an increase in Hb, resulting in a reduction in the sensation of pain after administering SFRD.

5,3 The use of SFRD is effective in reducing chemotherapy pain in post-chemotherapy patients at the Indonesian Cancer Foundation.

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