

The Effects of Home-Based Exercise Training on Physical Performance, Fatigue and Quality of Life in Breast Cancer Patient Receiving Chemotherapy: A Pilot Study

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Abstract—This study was to assess the effects of Home-Based Exercise Training (HBET) on physical performance, fatigue and quality of life on breast cancer patients receiving chemotherapy. One group pre-and post-test design. The setting of this study was in a daycare unit of Dr. Ramelan Navy Hospital Surabaya, Indonesia. 26 women with early stage of breast cancer receiving chemotherapy participated in this study. Participants completed baseline measures and waited a week after chemotherapy for exercise. Patients who were assigned to the HBET group performed 3 weeks of walking program. Test Timed Up and Go (TUG) was used to assess physical performance, while Brief Fatigue Inventory (BFI) was used to measure fatigue and The European Organization for Research and Treatment of Cancer Quality of Life Questionnaire-Core 30 (EORTC QLQ C-30) to assess the quality of life. The paired t-test showed a significant result $p < 0.0001$ for physical performance, fatigue and quality of life. Breast cancer patients who received HBET showed improvement in physical performance and quality of life and also reduction in fatigue. The result showed that HBET is effective in promoting and maintaining both physical performance and quality of life, as well as reducing fatigue by increasing emotional and physical wellbeing on breast cancer patients receiving chemotherapy.

Keywords--- Home-Based Exercise Training; Breast Cancer; Physical Performance; Fatigue; Quality of Life; Chemotherapy

I. INTRODUCTION

Women with breast cancer may experience both physical and psychological complications during their breast cancer therapy. Physical symptoms perceived by women with breast cancer may include physical activity, fatigue and quality of life deterioration [1]. Fatigue due to cancer has been reported to influence 70%-100% of people with cancer [2]. Furthermore, patients diagnosed with cancer also experience changes in emotional and social well-being [3]. The prevalence of breast cancer in East Java in 2013 is the second-largest case in Indonesia with an estimated 9.688 cases.

Several studies have been done to manage fatigue by physical training methods such as walking, aerobic gymnastic, and cycling [4]. Home-Based Exercise Training (HBET) is one method of physical exercise for the cancer population.

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This physical exercise could become a good complementary therapy to minimize or even recover from the physiological and psychological impact of cancer and the side effects of its therapy. In addition, home-based exercise has become an isolutive option to follow up on the benefit or side effects that might occur during the program [5]. Exercise can decrease the sympathetic nervous system and affect reactivation of the hypothalamus-pituitary-adrenal (HPA) axis, binding of β -endorphin; it is also good as a distraction from stressors and daily routines. It can potentially affect a person's emotional well-being which leads to increase pleasure and decreased anxiety [6].

A limitation of previous research was that there were few interventions theory-based. These are more likely to have a positive effect compared to theoretical interventions. One theory that has the potential to support home-based exercise training in women with breast cancer is Orem's theory. Self-care for patients with chronic disease is complex, and much needed for successful management and control of the chronic disease [7]. Orem's theory explains that if the self-care agency is not proportional to self-care demand, then there will be a self-care deficit. Thus, the interaction between nurses and clients is important and that nurses act as a nursing agency that serves to overcome the client's self-care deficit by optimizing the ability of the client to care for herself.

Exercise by walking is an important self-care activity and it can fight off several weakness effects due to illness, therapy or limited activity. Through Orem's nursing theory approach, the nursing system which is provided by nurses could improve the physical performance of breast cancer patients so that it would minimize their self-care deficit . This study aims to examine HBET to physical performance, fatigue and quality of life in breast cancer patients receiving chemotherapy.

AI. METHODS

Design and participants

The pilot study used one group pre-and post-test. The Independent variable in this study was Home-Based Exercise Training (HBET) while the dependent variable was physical performance, fatigue and quality of life. Sampling used was convenience. The sample size was 26 patients. The inclusion criteria were: age 35-55 years, early stages cancer (I-III), receiving chemotherapy, at least one series of chemotherapy, level of hemoglobin > 8 gr/dl. Exclusion criteria: documented bone metastases, diagnosed symptomatic cardiac disease.

Procedure

After approval was granted by Navy Hospital with ethical approval No. 17/EC/KERS, twenty-six patients with breast cancer who fulfilled inclusion criteria gave informed consent to enter the study.

The researchers performed a pre-test of physical performance by performing Timed Up and Go (TUG) tests, fatigue using the BFI questionnaire and quality of life using EORTC QLQ-C30 at the Hospital. Based on the results of this pre-test, the researchers provided education to patients and families then a guide diary for HBET to be done. HBET by walking was performed three times a week for three weeks, for 30 minutes in the morning. The intensity of the exercise was divided into 3 categories: low (0-3 times), moderate (4-6 times) and high (7-9 times) starting on the seventh day after chemotherapy. In accordance with safety precautions, pre-exercise screening was performed on the sixth day of post-chemotherapy. Hemoglobin level, blood pressure, temperature and heart rate were measured and recorded on the observation sheet a day before starting the intervention to ensure it was safe for the patients to participate in the HBET Program. The researchers conducted follow-up with the respondents once a week by calling to monitor the HBET process

and guidebook provided. The researchers also involved family members in the house with respondents to become the supervisor of the patient doing HBET.

After the patient performed HBET for 3 weeks, the researchers came to the respondent's house on the last day of the respondent doing HBET to do a post-test. The researchers performed a post-test of physical performance using TUG 30 minutes after the respondent took a rest from HBET then followed with a post-test of fatigue and quality of life.

Instruments

Physical performance was measured using Timed up and Go (TUG) tests, where TUG is a simple, fast, and inexpensive functional mobility test. Based on the International Classification of Functioning, Disability and Health (ICF), the TUG test measures the activity domain, altering and maintaining body position and walking (Eekhoof et al., 2001). The TUG test consists of the basic movements required for mobility in daily activities, i.e. standing up from a chair, walking as far as 3 meters, turning 180°, walking back towards the seat, and sitting back [8].

The instrument used to measure fatigue in cancer patients was the Brief Fatigue Inventory (BFI) questionnaire consisting of 9 questions [9]. The BFI questionnaire emphasizes the current level of fatigue (item no 1), the general fatigue rate felt during the last 24 hours (item no 2), the most severe level of fatigue during the last 24 hours (item no 3), the level of fatigue felt during the last 24 hours affecting 5 things, namely: general activity (item no 4), feeling (item no 5), walking ability (item no 6), job (item no 7), relationships with others (item no 8) and convenience of life (item no 9).

The instrument used to measure the quality of life in cancer patients was The European Organization for Research and Treatment of Cancer Quality of Life Questionnaire - Care 30 (EORTC-C30) consisting of 30 items. EORTC QLQ-30 has 5 functional scales (physical function, role function, cognitive function, emotional function and social function), 3 symptom scales (fatigue, pain and nausea vomiting), general health status, 1 item that examines actual symptoms frequently reported by cancer patients (shortness of breath, loss of appetite, insomnia, constipation and diarrhea) and feelings related to the impact of the illness on finances [10].

Data Analysis

The statistical test used a Paired t-test to measure the effect of the pre and post after the intervention and the ANOVA test to discover differences between three exercise intensity groups.

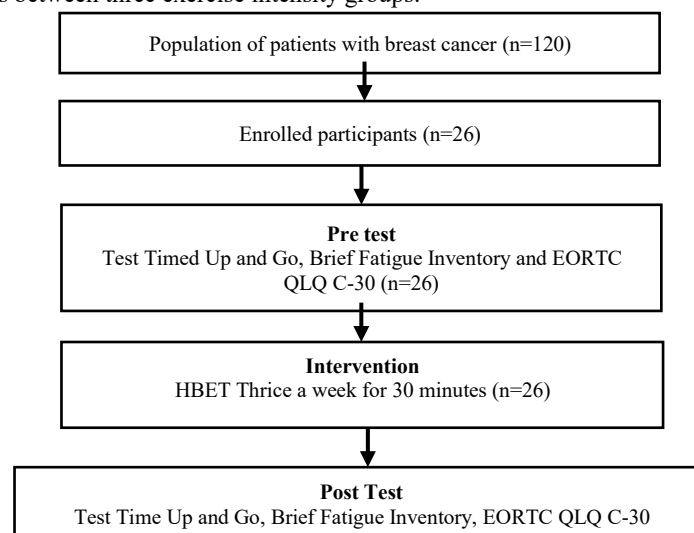


Figure 1 – Flow diagram of HBET study recruitment

BI. RESULTS

Sample demographics

A total of 26 women agreed to participate, the women's ages ranged from 26-55 years. The majority had II sessions of chemotherapy. Most patients had been diagnosed with breast cancer for less than a year. About half of the patients received a combination of epirubicin for chemotherapy as presented in Table 1.

Table 1. Respondents' demographic characteristics(n=26)

Characteristic	n	%
Age		
26-35 years	3	11.5
36-45 years	11	42.3
46-55 years	12	46.2
Chemotherapy		
I	-	-
II	12	46.2
III	5	19.2
IV	6	23.1
V	2	7.7
VI	1	3.8
Regiment of chemotherapy		
Combination of carboplatin	9	34.6
Combination of epirubicin	12	46.2
Others	5	19.2
Diagnosed with cancer		
< 1 year	17	65.4
1-2 years	9	34.6
>3 years	-	-
Stage of cancer		
I	2	7.69
II	10	38.46
III	14	53.85

As presented in Table 2, the statistical result using the paired t-test showed $p < 0.0001$ in physical performance, fatigue and quality of life. This means that HBET has effects on improving physical performance and life quality also reducing fatigue for breast cancer patients receiving chemotherapy.

Table 2. Effects of home-based exercise training on physical performance, fatigue and quality of life in breast cancer patients receiving chemotherapy

Variable		Intervention group			T test
		N	Mean	SD	
Physical performance	Pre test	26	21.61	0.69	$p < 0.0001$
	Post test	26	16.60	2.46	
Fatigue	Pre test	26	4.59	0.78	$P < 0.0001$
	Post test	26	2.97	1.30	
Quality of life	Pre test	26	62.69	16.65	$P < 0.0001$
	Post test	26	81.11	16.14	

Table 3 showed the ANOVA test, which obtained $p = 0.000$ (physical performance), $p = 0.044$ (fatigue) and $p = 0.054$ (life quality). There was a significant difference in physical performance and fatigue based on the group who performed HBET with low, medium and high intensity. Exercise intensity groups showed that there was a self-care difference in

conducting HBET. The largest improvement in physical performance and fatigue was found in the high-intensity group. There was no quality of life differences in the three exercise intensity groups after conducting HBET.

Table 3 Effects of the intensity of home-based exercise training on physical performance, fatigue and quality of life

Variable	Exercise intensity						P
	low		moderate		high		
	Mean	SD	Mean	SD	Mean	SD	
Physical performance	3.24	0.49	3.85	1.40	7.46	1.26	0.000
Fatigue	1.29	0.66	1.49	0.66	2.25	0.91	0.044
Quality of life	6.00	12.86	19.83	11.07	23.55	13.30	0.054

IV. DISCUSSION

HBET and physical performance

The result of this study showed a significant effect of HBET on the physical performance of breast cancer patients receiving chemotherapy. HBET could improve physical performance. The result is similar to Waltman in the United States that showed the effectiveness of exercise in improving physical performance in patients with breast cancer undergoing adjuvant therapy; the exercise performed was well tolerated by breast cancer patients even after completion of a heavy adjuvant such as chemotherapy [11]. Overall HBET is also one type of exercise that can enhance properly and become an attractive physical activity for patients with breast cancer [12][13].

There is a positive effect exercising has on increased muscle flexibility and energy in breast cancer patients or at least stabilized physical performance [14]. The result of this study, conducted with breast cancer patients who performed HBET, will help them adapt to physical activity during chemotherapy. The physical activity through HBET in this study is expected to improve the ability of mobilization which will increase the functional ability of self-care in breast cancer patients. Nurses should provide information to perform a safe exercise during chemotherapy to improve physical performance and expect to improve the patient's health status.

The study showed there was a significant difference in fatigue based on the intensity of the exercise. The best improvement of physical performance is shown in the group who exercised with high intensity compared with low and moderate intensity. A consistent exercise with the right intensity can affect the level of perceived symptoms [15].

HBET and fatigue

The result of the present study showed there were significant decreases in fatigue before and after the intervention. A previous study also showed that exercise can decrease fatigue and help patients with breast cancer with fatigue management during and after therapy [16][17].

Anemia in cancer patients could affect fatigue, impair body function, decrease quality of life and limit activity to treatment [18]. Also, breast cancer patients who received chemotherapy had a higher incidence of anemia. Nurses should pay attention to the hemoglobin level in patients with breast cancer [19].

The study showed significant differences in fatigue based on the intensity of exercise. Statistical tests also showed that groups with a low intensity of exercise did not experience a significant difference in the level of fatigue compared to

the moderate-intensity group. This study proved that patients in the high-intensity group (7-9x exercise) had more decrease in fatigue than patients in low or moderate-intensity groups. Fatigue significantly decreased in patients who performed a complete session of exercise. Different intensities performed by patients related self-care to require health management.

HBET and quality of life

This study showed significant effects of HBET on quality of life in breast cancer patients receiving chemotherapy. Quality of life represents a both a physical and psychological condition with also social aspects [20]. Some previous studies showed that exercise can improve physical condition and quality of life in breast cancer patients [21]. Demographic, clinical and also psychological factors can influence Quality of life [22]. According to the study conducted by Segal home-based walking exercise training is an effective, low cost and safe way to improve quality of life in breast cancer patients [23].

In this study, most of the patients (65.4%) were diagnosed with breast cancer for less than a year and all patients were in the early stages of breast cancer (stage I-III). According to a study conducted by Huang, quality of life in breast cancer patients who were diagnosed and received treatment quickly improved [24]. A previous study also proved that exercise during adjuvant cancer therapy improved quality of life [25]. In this study, HBET can be used to prevent the deterioration of health conditions in the early stage of breast cancer patients. This is expected to improve the quality of life during therapy. Improvement of quality of life also appears on the patient's ability to perform daily activities.

V. CONCLUSION

Home-Based Exercise Training would affect mobility improvement, exercise tolerance and muscle flexibility thus it could improve physical performance. HBET could also improve skeletal muscle activity thus it could reduce fatigue and affect physical and psychological aspects which would improve emotional and physical well-being and eventually improve quality of life. HBET can be used as supportive therapy in minimizing or even restoring, physiologically and psychologically, the conditions of cancer side effects and cancer therapy. Future studies are needed to check the procedure for similarity, also possible placebo effects of HBET including physiology (i.e., cancer treatment, chemotherapy session) and psychology factors (i.e., stress, belief and expectations).

CONFLICT OF INTEREST

The authors report no conflicts of interest.

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REFERENCES

- [1] C. Chung, S. Lee, S. Hwang, and E. Park, "Systematic Review of Exercise Effects on Health Outcomes in Women with Breast Cancer," *Asian Nurs. Res. (Korean. Soc. Nurs. Sci.)*, vol. 7, no. 3, pp. 149–159, 2013.
- [2] H.-P. Huang et al., "The effect of a 12-week home-based walking program on reducing fatigue in women with breast cancer undergoing chemotherapy: A randomized controlled study," *Int. J. Nurs. Stud.*, vol. 99, no. 259, p. 103376, 2019.

- [3] K. P. Loh et al., "Effects of a Home-based Exercise Program on Anxiety and Mood Disturbances in Older Adults with Cancer Receiving Chemotherapy," *J. Am. Geriatr. Soc.*, vol. 67, no. 5, pp. 1005–1011, May 2019.
- [4] E. A. Coleman et al., "Effects of exercise on fatigue, sleep, and performance: A randomized trial," *Oncol. Nurs. Forum*, vol. 39, no. 5, pp. 468–477, 2012.
- [5] A. Soriano-Maldonado et al., "Effects of a 12-week resistance and aerobic exercise program on muscular strength and quality of life in breast cancer survivors: Study protocol for the EFICAN randomized controlled trial," *Medicine (Baltimore)*, vol. 98, no. 44, p. e17625, Nov. 2019.
- [6] Y. jing Chen et al., "Exercise Training for Improving Patient-Reported Outcomes in Patients With Advanced-Stage Cancer: A Systematic Review and Meta-Analysis," *Journal of Pain and Symptom Management*, vol. 59, no. 3. Elsevier Inc., p. 734–749.e10, 01-Mar-2020.
- [7] P. D. Larsen and I. M. Lubkin, *Chronic illness : impact and intervention*. Jones and Bartlett Publishers, 2009.
- [8] E. Nordin, E. Rosendahl, and L. Lundin-Olsson, "Timed 'Up & Go' Test: Reliability in Older People Dependent in Activities of Daily Living— Focus on Cognitive State," *Phys. Ther.*, vol. 86, no. 5, pp. 646–655, May 2006.
- [9] T. R. Mendoza et al., "The rapid assessment of fatigue severity in cancer patients," *Cancer*, vol. 85, no. 5, pp. 1186–1196, Mar. 1999.
- [10] P. Fayers, N. K. Aaronson, K. Bjordal, M. Groenvold, D. Curran, and A. Bottomley, *EORTC QLQ-C30 Scoring Manual*. European Organisation for Research and Treatment of Cancer, 2001.
- [11] N. L. Waltman et al., "Testing an intervention for preventing osteoporosis in postmenopausal breast cancer survivors," *J. Nurs. Scholarsh.*, vol. 35, no. 4, pp. 333–338, 2003.
- [12] S. S. Lowe, B. Danielson, C. Beaumont, S. M. Watanabe, and K. S. Courneya, "Physical activity interests and preferences of cancer patients with brain metastases: A cross-sectional survey," *BMC Palliat. Care*, vol. 15, no. 1, pp. 1–7, 2016.
- [13] R. Nikander, H. Sievänen, K. Ojala, T. Oivanen, P. L. Kellokumpu-Lehtinen, and T. Saarto, "Effect of a vigorous aerobic regimen on physical performance in breast cancer patients - A randomized controlled pilot trial," *Acta Oncol. (Madr.)*, vol. 46, no. 2, pp. 181–186, 2007.
- [14] F. T. Baumann et al., "Physical activity in breast cancer patients during medical treatment and in the aftercare - A review," *Breast Care*, vol. 8, no. 5, pp. 330–334, 2013.
- [15] A. . . Schwartz, M. Mori, R. Gao, L. Nail, and M. . King, "Exercise reduces daily fatigue in women with breast cancer receiving chemotherapy," *Med. Sci. Sports Exerc.*, vol. 33, no. 5, pp. 718–723, 2001.
- [16] L. Adamsen, J. Midtgaard, C. Andersen, M. Quist, T. Moeller, and M. Roerth, "Transforming the nature of fatigue through exercise: Qualitative findings from a multidimensional exercise programme in cancer patients undergoing chemotherapy," *Eur. J. Cancer Care (Engl.)*, vol. 13, no. 4, pp. 362–370, 2004.
- [17] C. T. Stricker, D. Drake, K.-A. Hoyer, and V. Mock, "Evidence-Based Practice for Fatigue Management in Adults With Cancer: Exercise as an Intervention," *Oncol. Nurs. Forum*, vol. 31, no. 5, pp. 963–76, 2004.
- [18] D. J. Straus et al., "Quality-of-life and health benefits of early treatment of mild anemia," *Cancer*, vol. 107, no. 8, pp. 1909–1917, 2006.
- [19] H. Ludwig et al., "The European Cancer Anaemia Survey (ECAS): A large, multinational, prospective survey defining the prevalence, incidence, and treatment of anaemia in cancer patients," *Eur. J. Cancer*, vol. 40, no. 15, pp. 2293–2306, 2004.
- [20] H. Thu and T. Sukartini, "The Effectiveness of a Pain Management Program on Intensify of Pain and Quality of Life Among Cancer Patients in Myanmar," *J. Ners*, vol. 12, no. 2, p. 205, Oct. 2017.
- [21] M. Quist et al., "High-intensity resistance and cardiovascular training improve physical capacity in cancer patients undergoing chemotherapy," in *Scandinavian Journal of Medicine and Science in Sports*, 2006, vol. 16, no. 5, pp. 349–357.
- [22] J. Kalter et al., "Moderators of the effects of group-based physical exercise on cancer survivors' quality of life," *Support. Care Cancer*, vol. 23, no. 9, pp. 2623–2631, Oct. 2015.
- [23] R. Segal et al., "Structured Exercise Improves Physical Functioning in Women With Stages I and II Breast Cancer: Results of a Randomized Controlled Trial," *J. Clin. Oncol.*, vol. 19, pp. 657–665, 2001.
- [24] R. Huang, Y. Huang, P. Tao, H. Li, Q. Wang, and J. Li, "Evaluation of the quality of life in patients with breast cancer at different TNM stages after standardized treatment," *Chinese J. Oncol.*, vol. 35, no. 1, pp. 71–7, 2013.
- [25] L. W. Lund, G. Ammitzbøll, D. G. Hansen, E. A. W. Andersen, and S. O. Dalton, "Adherence to a long-term progressive resistance training program, combining supervised and home-based exercise for breast

cancer patients during adjuvant treatment,” *Acta Oncol. (Madr)*, vol. 58, no. 5, pp. 650–657, May 2019.