

Effect of Relaxation Breathing Exercise on Fatigue for Women with Gynecological Cancer Receiving Chemotherapy

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Abstract

Background: Preserving woman's health and energy level after chemotherapy is an important role for oncology nurses. Non-pharmacological Management of fatigue and other associated symptoms of chemotherapy is very necessary to decrease burden of medication used. **Aim:** Current study aimed to evaluate the effect of relaxation breathing exercises on fatigue for women with gynecological cancer receiving chemotherapy. **Design:** A randomized control trial was used. **Setting:** Current study was carried out at the gynecological ward at nuclear medicine in Mansoura university hospitals, Mansoura city, Egypt. **Subjects:** One hundred and eighty-three women with gynecological cancer were included. **Sample type:** Simple random sample was applied. **Data collection** included three tools which were structured interview questionnaire, piper fatigue scale and women's dairy notes. **Results:** There was a highly significant difference in fatigue scores between intervention and control. Also, there was a highly statistically significant reduction in fatigue scores between two times RBE and four time's group. As well as, there was a highly significance difference concerning four fatigue domains between intervention and control groups. Moreover, there was a significant difference of mean fatigue score concerning daily activities on the seventh day of the study among intervention (two times group), while, highly significance difference among four times groups and control group. **Conclusion:** Relaxation breathing exercise is cost effective; non-invasive, easy and safe practice to alleviate cancer related- fatigue especially when conducted four times daily. Moreover, relaxation breathing exercise has a positive effect in improving performance of daily activities and associated symptoms of chemotherapy. **Recommendations:** Relaxation breathing exercises should be used as the preferred standard procedures after chemotherapy administration.

Keywords: Chemotherapy, Fatigue, Gynecological cancer patients, Relaxation breathing exercises.

Introduction

Gynecological cancers are commonly widespread among female, especially in developing countries. Women with gynecological cancer receiving chemotherapy usually experienced many side effects such as nausea, vomiting, insomnia and fatigue, which is the most common symptoms (Cohen et al. 2020). Fatigue is a subjective symptom marked by feelings of tiredness, insufficiency energy, and frequent period of rest. Fatigue induces changes in the physical, psychological, social and cognitive aspects that influence the general quality of life of a woman after chemotherapy

(Thong et al. 2020). In fact, women who experienced fatigue also experience a range of symptoms including reduced energy, feelings of tiredness, forgetfulness, decreased focus, discomfort after exertion, and a decreased ability to perform activities that require minimal physical effort (Aybar et al. 2020).

Many variables can responsible for aggravating fatigue, including physiological factors as pain or anemia, and psychological factors as depression. Cancer related fatigue has a profound physical, mental, social and economic impact on the life of a person that can last for months or years after completion of chemotherapy treatment (Gebara et al. 2019).

Methods for controlling fatigue include both pharmacological and non-pharmacological (Georgia et al. 2019). Music therapy, massage therapy, energy therapy, relaxation, yoga, acupressure and hypnosis are non-pharmacological techniques. Muscle relaxation can be achieved through regulating the anterior and posterior hypothalamus which reduces the sympathetic nervous system activity, catecholamine secretion, regulates breathing, control muscle tension and spasm, also, and reduces heart rate, anxiety and fatigue (Song et al. 2018).

Because of the complexity of cancer-related fatigue syndrome, therapeutic programs that can be used to alleviate fatigue following chemotherapy use various techniques, including exercise, relaxation training, psychotherapy and cognitive behavioral therapy (Pouraboli et al. 2019). Relaxation Breathing Exercise (RBE) is a non-pharmacological techniques that is extremely effective in relieving cancer-related fatigue. RBE is a mindful action of slow deep breathing that maintains complete relaxation and accompanied by physical movements that women can individually perform with breathing exercises. RBE influences stress response mechanism and decreases energy consumption both provide relaxation to the mind and body. Also, RBE fosters the relaxation response by increasing transport of oxygen to the tissues and stimulating blood circulation. Breathing exercises are relatively time-consuming so, it could be performed three to four times daily, either during the day or before going to bed at night (Georgia et al. 2019).

In addition, a recent meta-analysis has shown that progressive relaxation training has beneficial effects on mental adjustment and treatment-related symptoms of gynecological cancer (Prakash et al. 2020). Breathing exercise is a different therapeutic approach that has a positive effect in improving cancer-related fatigue. In addition, advanced level of nursing practices such as' relaxation training 'provides symptom control and helps improve women's quality of life regarding undesired effects of chemotherapy protocols that currently being implemented (Thong et al. 2020).

Significance of the study

Fatigue is one of the most common complaints of cancer women undergoing chemotherapy. Hathiramani et al. (2020) reported that 80% to 100% of women with gynecological cancers complain of fatigue after chemotherapy. Nearly 56% of cancer patients reported that fatigue has affect their life quality as limits work ability (37%), inhibits life enjoyment (30%) and influences performance of daily activities (30%). They also found that fatigue in cancer women affect physical, psychosocial and economic status. Concerning physical condition (69% have difficulty trouble walking long distances, 56% have inability performing their work and 56% have difficulty climbing stairs). As regard psychosocial aspects 59 % said that it was difficult to interact with friends, 30 % had bad sexual relations, 71 % lost 1 or 2 days working every week, 31 % lost all working time and 28 % left work (Curt et al. 2000).

Since cancer related-fatigue is considered a part of the disease, it is seldom addressed by nursing staff. Meanwhile, some nurses still believe that cancer related-fatigue is a normal response that experienced by women after chemotherapy, so it does not require intervention (Sanada et al. 2017). Other than that, previous study showed that a combination of non-pharmacological and pharmacological therapy was very essential and effective technique to control fatigue (Hathiramani et al. 2020).

Furthermore, there is little studies that have been addressed the efficacy of RBE after chemotherapy and the required frequencies for effective fatigue relief result. For these reasons, researchers decided to conduct this research.

Aim of the study:

This study aimed to evaluate the effect of relaxation breathing exercise on fatigue for women with gynecological cancer receiving chemotherapy.

Study hypothesis:

(1): Women with gynecological cancer receiving chemotherapy who utilize relaxation breathing exercise will expect

to achieve lower fatigue scores than the control group.

- (2): Women with gynecological cancer receiving chemotherapy who utilize 4 times relaxation breathing exercise will expect to achieve better improvement of fatigue and other associated symptoms of chemotherapy than those who utilize 2 times.

Operational definitions

Relaxation Breathing Exercise (RBE): An exercise in which the woman lies comfortably and focuses attention on the lower abdomen; relaxing by inhaling a deep breaths and slowly exhaling them out, then ending the exercise by keeping her mind calm and stretching her arms and legs. Each time RBE performed for about 30 minutes.

Fatigue: Sensation of tiredness and powerless exhibited by the women after chemotherapy administration. It can be assessed through four domains; behavioral, cognitive, affective and sensory domains. A higher score indicates higher level of fatigue.

Subjects and Method

Study design: A randomized control trial was utilized.

Setting: This study was carried out at the gynecological ward at nuclear medicine in Mansoura university hospitals, Mansoura city, Egypt.

Sample type: Simple random sample was recruited to participate in this study.

Subjects: Subjects of this study included 183 women who fulfilled the following criteria:

Inclusion criteria:

- Woman who had gynecological cancer, receiving chemotherapy in the inpatient units.
- Woman who endured cancer-related fatigue
- Woman who had been absolutely alert.
- Woman who was writing and reading.

Exclusion criteria:

Women with chronic medical conditions as diabetes mellitus, heart disease and chronic

kidney disease were excluded from the study because fatigue experience can be affected by these conditions.

Sampling size calculation:

This randomized control trial proposed to evaluate the effect of relaxation breathing exercises for gynecological cancer women receiving chemotherapy. Based on data from literature of Afyanti et al. (2018), concerning level of significance of 5%, and power of study of 80%, the sample size can be calculated using the following formula:

$$n = [(Z\alpha/2 + Z\beta)^2 \times \{2(SD)^2\}] / (\text{mean difference between the three groups})^2$$

Where, SD = standard deviation

$Z\alpha/2$: This depends on level of significance, for 5% this is 1.96

$Z\beta$: This depends on power, for 80% this is 0.84

Therefore, $n = [(1.96 + 0.84)^2 \times \{2(0.49)^2\}] / (0.25)^2 = 60.2$

Based on the above formula, the sample size required per group is 61.

Groups' Allocation

One hundred and eighty three women who receiving chemotherapy were assigned randomly into three equal groups (sixty one participants / group). Assignment of the groups was identified by selecting One closed envelope containing letters A, B, or C; where A refers to 2 times relaxation breathing exercise group, B refers to 4 times relaxation breathing exercise group, while C refers to control group. The assignment was carried out at 1:1:1 ratio, where 1/3 of the envelopes ($n=61$) contained letter "A", other 1/3 contained letter "B" and the remained 1/3 contained letter "C". Envelopes were opened after confirming eligibility for enrollment and taking informed written consents. Subjects' enrollment, exclusion, allocation, follow-up, and evaluation were presented in the study flowchart (see figure1).

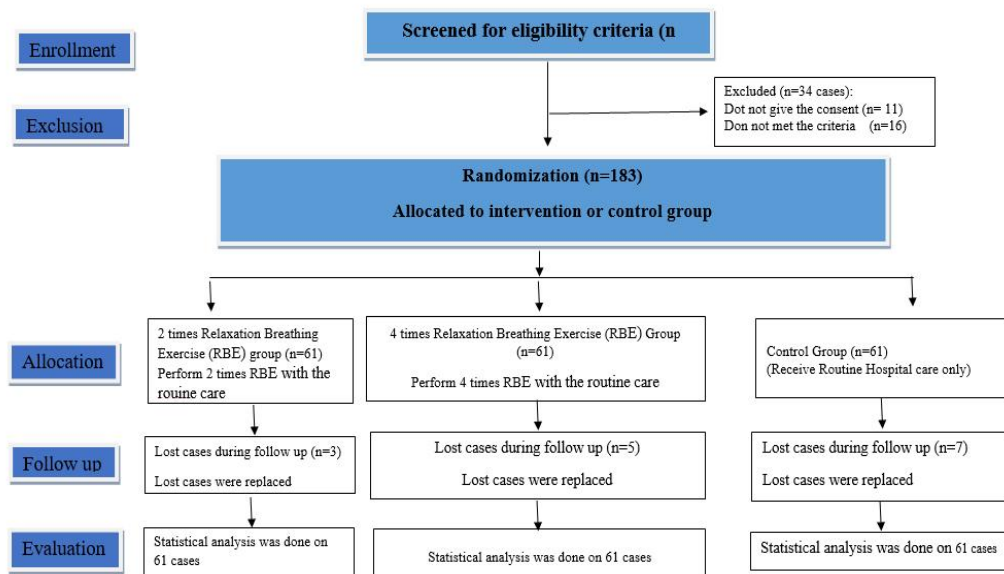


Figure 1. Flowchart of the study participants

Tools of Data Collection

Tool I: Assessment sheet: This sheet inquired about demographic characteristics of the study participants. It included age, phone number, as well as cancer type, cancer stage, cycle and regimen of chemotherapy.

Tool II: Piper Fatigue Scale: The Piper Fatigue Scale (PFS) is a self-administered questionnaire designed to assess the fatigue levels of cancer women and developed by Piper et al. (1998). It is a subjective indicator for fatigue and containing four domains, which are behavioral, cognitive, affective and sensory domains. It consists of 27 questions that divided in to 22 numerical scale questions with a range from 0 to 10 and 5 open ended questions. A higher score represents a high level of fatigue.

Tool III: Women's diary notes: Women's dairy notes were completed to determine the adherence to relaxation breathing exercise in which the participants in the intervention group record frequency and duration of the exercise. Also, the performed daily activities and chemotherapy associated symptoms were recorded.

Tools validity: Tools were reviewed by five jury experts in the nursing field to test the validity of the content; changes were considered, according to their comments.

Reliability of tool II: The reliability of the original tool was estimated using Chronbach's alpha test to measure the internal consistency the tools. It was found that the reliability for piper fatigue scale was ($r = 0.815$). Which indicates an excellent internal consistency.

Ethical Considerations:

An official acceptance from woman's health and midwifery nursing department was obtained to carry out this study. Approval from the Ethical Research Committee at Faculty of Nursing Mansoura University was obtained with a reference number (Ref. No.P.0212). An informed written consent was checked by each woman after full explanation of the aim and scope of the study. Women were notified about the confidentiality regarding the collected data. At any time, women were informed about their rights to not participate or withdraw from the trial without any influence on the provided care.

Pilot Study

Pilot study was conducted on 10 percent of the pre-determined sample (18 women). It was aimed to pick up a general idea on the

feasibility of performing relaxation breathing exercises, occurrence of any associated ailments, and to check the clarity of the study measures. Results of the piloting indicated that relaxation breathing exercise was tolerable without any associated ailments. Also, the pilot revealed that the clarity of the study tools. Thus, no modification was done. Women involved in the pilot study, were not included in the total sample.

Method

- The current clinical trial was carried out in the above mentioned center from October 2019 to March 2020. The study was implemented in three phases. Phase 1 and 2 were preparation and implementation of the intervention, while the 3rd phase included outcome evaluation process.
- **Preparatory phase:** The researchers checked the study-relevant literature, and then prepared data collection methods. Official approval received from the director of nuclear medicine at Mansoura University Hospitals to conduct this study.
- **Implementation phase:**
 - The researchers visited the nuclear center three days weekly from 9:00 am to 5:00 pm. During chemotherapy administration, the researchers began by introducing themselves to every woman, welcoming, making them to feel secure. Recruitment of the participants was done by explaining the aim and approach of the current study to the study participants who attended the study setting during the study period. Thereafter, screening for eligible cases with cancer-related fatigue was initiated.
 - After recruitment of the participant women, the researcher assign each participant to one of three groups, and instruct each one about the intervention related to the assigned group. Subjects of the control group received the routine hospital care with chemotherapy. Meanwhile, subjects of the intervention group were instructed how to perform relaxation breathing exercises (either 2 times or four times) along with the routine hospital care.
 - Once the diagnosis of the cancer-related fatigue was confirmed, informed written

consents were obtained from eligible ones. Demographic characteristics and information about chemotherapy protocol were completed, then, the participants were assigned randomly into the three study groups (control group, 2 times relaxation breathing exercise group, or 4 times relaxation breathing exercise group). The intervention was performed according to the following sequences:

- (a) **Care of the control group:** This group received the routine hospital instructions on how to cope and manage the side effects after chemotherapy. Including, 1) eating soft well balanced, 2) frequent drinking water, milk and fresh juice, 3) maintaining enough period of rest and sleep, and 4) frequent mouth care. Simultaneously, participants were advised to perform their daily activities gradually according to their ability.
- (b) **Care of the 2 times Relaxation Breathing Exercise group:** Besides the previous mentioned routine care, subjects of the two times relaxation breathing exercise group were taught how to perform a 3-steps relaxation breathing exercise. The studied women were taught to perform the exercise daily for a complete of 7 days; starting from the day of enrolment until 7 days thereafter according to the following steps:
 - Step 1. Preliminary exercise:** In which women sit on the bed in a comfortable position and focus their attention on the lower abdomen.
 - Step 2. Relaxation breathing:** This step focus on performing relaxation breathing exercise through which the women relax and inhaling a deep breaths and exhaling them out slowly.
 - Step 3. Ending Exercise:** This step considered the final step to end the exercise in which the women was instructed to extend both arms and legs and keep their minds clear. Each participant was instructed to make the 3-steps relaxation breathing exercise twice daily; once in the morning/8 am and the other in the afternoon /8 pm

for 30 minutes each time for seven days.

Care of 4 times Relaxation Breathing Exercise group

Four times relaxation breathing exercise group received the same care as 2 times group except that they instructed to perform RBE four times daily instead of twice. This group were instructed how to perform a 3-steps relaxation breathing exercises 4 times daily for 30 minutes each time, at this times; (morning/8 am, midday/12 pm, afternoon/4 pm and night/8 pm) for seven days.

The number of sessions done were reported in a daily diary notes by all participants. Compliance with the intervention was attained by recording the frequency and duration of the exercise during the period of follow-up.

[3] Outcomes evaluation phase

- At the end of the recommended times of RBE of each group, the researcher measured fatigue level using PFS daily in the afternoon at the same time.
- The researchers also, recorded the woman's performance of daily activities and associated symptoms such as nausea, vomiting, insomnia and dizziness every day until the end of intervention period. At the end of the study period, adherence to the interventions was determined; by reviewing the daily recording diaries for both 2 times and 4 times groups.

Results

Table (1) shows that 59% of two times group aged between 50:60 years old, 47% & 44.3% of four times group and control group aged between 50:60 years old. 59 % of each group had uterine cancer, slightly less than 50% of each group had stage two cancer. Morethan 50 % of two & four time's group follows 21 day chemotherapy cycle, while 41% of control group follow one month chemotherapy cycle. Most of the studied groups had platinum regimen. Finally, there

isn't significant variance between three groups regarding sociodemographic characteristics.

Table (2): shows that there is no statistically significant difference in fatigue scores between intervention (two times and four times group) and control group on the first and second day from intervention, while, there is a highly significant difference in fatigue scores between intervention (two times and four times group) and control group from the third day till the seventh day of the intervention. Also, there is a highly statistically significant reduction in fatigue scores among two times % four time's group.

Table (3) illustrates that there is a highly significance difference between intervention and control groups concerning four fatigue domains. Also, there is a significant reduction of fatigue score of four fatigue domains on the seventh day compared to the first day of the study within each group.

Tables (4) shows that there is a highly significance difference among three different groups regarding daily activity on the seventh day of the study compared to the first day. Also, there is a highly significance difference among three different groups regarding nausea, vomiting, dizziness and insomnia on the seventh day of the study compared to the first day.

Table (5) presents that there isn't a significant reduction of mean fatigue score concerning daily activities among intervention and control groups on the first day of the intervention. While there is a significant reduction of mean fatigue score concerning daily activities on the seventh day of the study among two times group, and highly significance difference among four times groups.

Figure (2) shows that there is a statistically significant reduction in fatigue scores among intervention (two times and four times groups) and control group on the seventh day compared to first day of intervention. Also, there is highly significant difference between three groups started on third day till the seventh day of the study.

Table 1. Socio demographic characteristics of the studied groups (N=183)

Items	2 times group (n=61)		4 times group (n=61)		Control group		Significance
	No	%	No	%	No	%	
Age							
▪ 30:39 yrs	2	3.3	4	6.6	6	9.8	X ² =7.073 p=0.314
▪ 40 :49 yrs	22	36.1	26	42.6	23	37.7	
▪ 50 : 60 yrs	36	59.0	29	47.5	27	44.3	
▪ + 60 yrs	1	1.6	2	3.3	5	8.2	
Mean ± SD	50.59 ± 5.91		47.96 ± 6.21		46.131 ± 5.207		F=9.130 p=0.685
Cancer type							
▪ Cervical	5	8.2	8	13.1	8	13.1	X ² =4.175 p=0.653
▪ Uterine	36	59.0	36	59.0	37	60.7	
▪ Ovarian	18	29.5	14	23	16	26.2	
▪ Vaginal	2	3.3	3	4.9	0	0	
Cancer stage							X ² =2.234 p=0.693
▪ 1st stage	18	29.5	14	23.0	18	29.5	
▪ 2nd stage	29	47.5	27	44.3	29	47.5	
▪ 3rd stage	14	23.0	20	32.8	14	23	
Chemotherapy cycle							
▪ 2 weeks	13	21.3	7	11.5	13	21.3	X ² =5.967 p=0.202
▪ 21day	31	50.8	34	55.7	23	37.7	
▪ Month	17	27.9	20	32.8	25	41	
Regimen							
▪ Platinum	42	68.9	49	80.3	44	72.1	X ² =2.209 p=0.332
▪ Non platinum	19	31.1	12	19.7	17	27.9	

Table 2. Fatigue mean difference scores between intervention and control groups from first to seven day of implementation of relaxation breathing exercises.

Days	Intervention Group I (2times group) Mean ± SD	Intervention GroupII (4times group) Mean ± SD	Control group Mean ± SD	Significance test
Day 1	223.065 ± 26.112	224.524±4.357	224.311± 5.405	F=0.285 p= 0.918
Day 2	223.196±26.102	222.819±25.683	224.426± 4.978	F=0.138 p= 0.871
Day 3	208.245±26.093	199.344 ±24.566	223.032±26.335	F=13.246 p= 0.000**
Day 4	200.786 ± 24.824	187.360 ±20.420	210.852±29.832	F= 13.218 p= 0.000**
Day 5	189.049±24.528	181.016 ±17.773	208.196±34.824	F=16.750 p= 0.000**
Day 6	178.147±21.720	168.032±12.410	201.295±30.394	F= 31.600 p=0.000**
Day 7	168.901±10.793	158.524 ±10.143	200.819±30.137	F=81.149 p=0.000**
Significance	F=237.461 p= 0.000**	F=376.561 p= 0.000**	F=6.169 p= 0.357	

Table 3: Mean differences of fatigue domains between studied groups from day 1 to day 7.

Domain	Days	2 times group Mean ± SD	4 times group Mean ± SD	Control group Mean ± SD	Significant test
Behavioral	Day 1	70.296 ± 0.445	69.90 ± 0.396	67.868 ± 5.512	F=5.871 p=0.356
	Day 7	29.032 ± 2.50	13.641 ± 1.438	51.967 ± 4.693	F=2.241 p=0.000**
Significance		t=25.324 p=0.043*	t=140.129 p=0.000**	t=14.856 p=0.681	
Affective	Day 1	50.349 ± 0.212	49.95 ± 0.218	50.981 ± 0.391	F=3.103 p=0.421
	Day 7	20.73 ± 1.787	10.065 ± 1.66	37.459 ± 3.608	F=1.832 p=0.000**
Significance		t=131.501 p=0.036*	t= 182.824 p=0.000**	t=27.146 p=0.542	
Sensory	Day 1	50.864± 0.345	49.95 ± 0.218	50.0 ± 0.961	F=3.103 p=0.477
	Day 7	20.73 ± 1.787	10.245 ± 4.076	37.163 ± 4.160	F= 9.074 p=0.000**
Significance		t= 127.827 p=0.031*	t= 76.010 p=0.000**	t= 24.099 p=0.433	
Cognitive	Day 1	60.649 ± 0.625	61.442 ± 0.567	60.964 ± 0.694	F= 7.332 p=0.112
	Day 7	24.688 ± 1.708	12.606 ± 1.037	49.508 ± 5.545	F= 1.277 p=0.000**
Significance		t= 161.449 p=0.0112*	t=356.850 p=0.000**	t=23.226 p=0.441	

Table 4. Distribution of the studied groups according to daily activities and other associated symptoms of chemotherapy from day 1 to day 7 from performing Relaxation Breathing Exercises.

Items	Day 1						Day 7					
	2 times group		4 times group		Control group		2 times group		4 times group		Control group	
	No	%	No	%	No	%	No	%	No	%	No	%
Daily activity												
▪ Done	0	0	0	0	0	0	31	50.8	43	70.5	0	0
▪ Partially done	7	11.5	14	23.0	11	18	30	49.2	18	29.5	41	67.2
▪ Not done	54	88.5	47	77.0	50	82	0	0	0	0	20	32.8
Significance	X ² = 2.803			p=0.246			X ² =88.840			p=0.000**		
Associated symptoms												
Nausea												
▪ Present	61	100	61	100	61	100	21	34.4	8	13.1	43	70.5
▪ Absent	0	0.00	0	0.00	0	0.00	40	65.6	53	86.9	18	29.5
Significance	X ² =---			p=---			X ² = 43.325			p=0.000**		
Vomiting												
▪ Present	61	100	61	100	61	100	23	37.7	12	19.7	46	75.4
▪ Absent	0	0.00	0	0.00	0	0.00	38	62.3	49	80.3	15	24.6
Significance	X ² = ---			p= ---			X ² = 40.221			p= 0.000**		
-Dizziness												
▪ Present	61	100	35	57.4	61	100	7	11.5	1	1.6	45	73.8
▪ Absent	0	0.00	26	42.6	0	0	54	88.5	60	98.4	16	26.2
Significance	X ² = 60.611			p= 0.000**			X ² = 90.730			p= 0.000**		
Insomnia												
▪ Present	37	60.7	34	55.7	1	1.6	17	27.9	8	13.1	45	73.8
▪ Absent	24	39.3	27	44.3	60	98.4	44	72.1	53	86.9	16	26.2
Significance	X ² = 54.818			p= 0.000**			X ² = 51.684			p= 0.000**		

Table 5: Mean differences between fatigue scores and daily activity & associated symptoms of chemotherapy from day 1 to day 7.

Items	Day 1			Day 7						
	2 times group	4 times group	Control group	2 times group	4 times group	Control group				
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD				
Daily activity										
▪ Done	226.516 ± 516	221.069 ± 30.454	222.168 ± 29.368	169.935 ± 12.606	160.651 ± 9.748	201.364 ± 30.542				
▪ Partially done	222.033 ± 6.071	227.014 ± 3.235	221.292 ± 31.751	147.8.333 ± 8.618	113.444 ± 9.463	205.097 ± 31.751				
Significance	t= 3.535 p=0.356	t=-0.820 p=0.269	t=0.664 p=0.614	t= 0.758 p=0.004*	t=2.655 p=0.000**	t= 3.267 p=0.894				
Associated symptoms	4.393 ± 0.492	4.868 ± 0.846	4.983 ± 0.128	6.885 ± 1.226	7.524 ± 0.721	5.065 ± 1.711				
Significance	F= 18.380			p=0.613			F=60.149	p=0.000**		

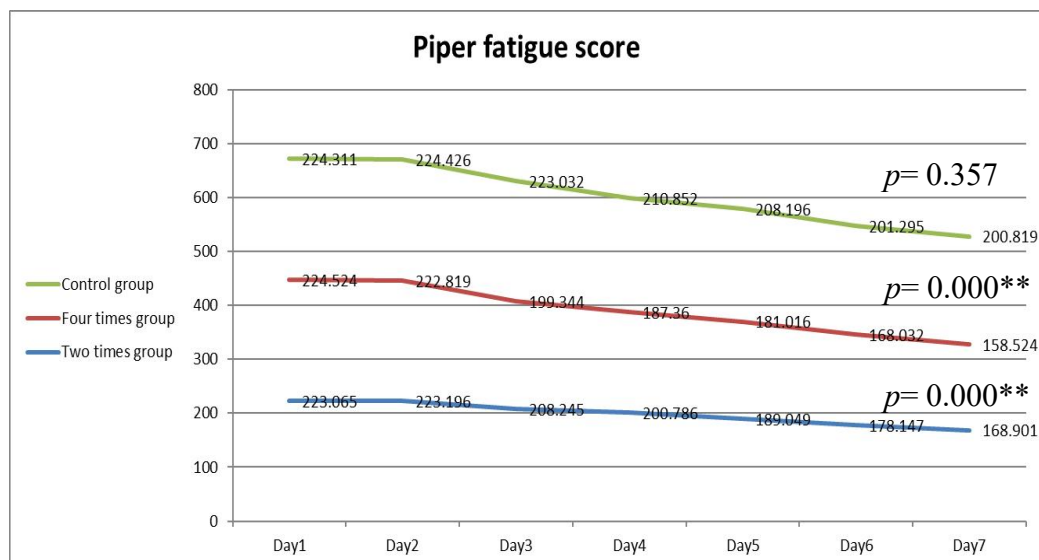


Figure (2): a statistically significant reduction in fatigue scores among intervention

Discussion

The current study aimed to evaluate the effect of relaxation breathing exercise on fatigue for women with gynecological cancer receiving chemotherapy. The results of the study supported the study hypothesis that women who utilized relaxing breathing exercise experienced lower fatigue scores than who do not. Moreover, women who utilized 4 times relaxation breathing exercise daily achieved less fatigue scores than those who utilized relaxation breathing exercise twice daily.

Concerning the average score of fatigue, the present study results revealed that there was a significant reduction in fatigue scores among intervention and control groups. Also, there was a significant mean difference according to fatigue score among the two intervention groups as there was more reduction regarding fatigue score among four times relaxation breathing exercises group compared to two times group. These results were in line with **Afiyanti et al. (2018)** who conducted a study to evaluate the effectiveness of RBE on fatigue for women receiving chemotherapy for gynecological cancer and found an ongoing reduction in the in fatigue scores between four times RBE group and the and the twice RBE group during the seven-day follow-up. In addition, the results of the study coincided with

the results of **Devi & Saharia, (2016)** stated that deep breathing exercises were an effective intervention to reduce fatigue among cancer women and can be used effectively by oncology nurses to enhance the quality of life.

The results of the study were also supported by **Taso et al. (2014)** who studied the yoga relaxation exercises effect on fatigue in women undergoing chemotherapy and reported that there was a significant reduction in fatigue scores in the intervention group compared to the control group. Moreover, the results of the current study coincided with a study by **Demiralp et al. (2010)** in Turkey and found a significant improvement in the level of fatigue after performing breathing exercises than it was before the intervention.

The agreement between the study's results can be explained by practicing breathing techniques can improve ventilation efficiency, reduce breathing work, increase diaphragm excursion, improve gas and oxygen exchange, reduce muscle tension and maintain an energy level that leads to relief fatigue and the maintenance of normal body activities.

Although the current study revealed that the fatigue scores started to be decreased from the third day after intervention. This is in agreement with **de Jong et al. (2006)** who evaluated the course of fatigue between two cycles of chemotherapy and found that the

mean fatigue scores started to improve on the second day to the third day preceding the following chemotherapy session. This can be explained by the effect of chemotherapy tends to be great following cycle administration as well as the effectiveness of breathing exercise can be maximized.

Regarding fatigue domains, the present study represented that there was a highly significant difference in all score of fatigue domains between intervention and control groups. These results coincided with **Jong et al. (2018)** who found that there was a significant improvement in all areas of fatigue after the intervention. In addition, this result was consistent with **Afiyanti et al. (2018)** who reported significant improvement in all fatigue domains following the relaxation and breathing exercises intervention, especially in the group 4 times group. Also, this result was identical to the study by **Danismaya, (2009)** who reported a positive improvement in areas of fatigue after performing the breathing and yoga relaxation exercises. This can be explained by breathing exercises reduce the degree of fatigue, so women can feel more energetic to carry out their daily activities effectively.

Regarding daily activities, the present study illustrated that there was a significant difference between the intervention and control groups concerning daily activities. There was also an improvement in the performance of daily activities, especially among four times group. The findings were supported by **Taso et al. (2014)**, who reported that there was a positive impact of yoga breathing exercise and improvement of daily life activities among breast cancer women undergoing chemotherapy. Moreover, this is an agreement with **Mishra et al. (2012)** who concluded that breathing exercises were more effective among breast cancer women and improved physical performance and daily activities.

Considering associated symptoms, the study reported that there was a significant improvement in chemotherapy associated symptoms (nausea; vomiting; insomnia and dizziness after performing RBE especially in 4 times group than control group. The results of the study joined with **Mishra et al. (2012)** who found that breathing exercises were more

effective in reducing depression, sleep disturbances, and fatigue among cancer women. In addition, **Hua-Song et al. (2013)** who found that respiratory exercises achieved progressive improvement of anxiety and other associated symptoms of chemotherapy.

The study results were also parallel to **Cheng and Lee, (2011)** who concluded that relaxation exercises have a positive effect on reducing anxiety and insomnia in women with breast, colon and rectal cancer. **Charalambous, (2016)** also produced the same results that relaxation exercises were effective in reducing anxiety, dizziness, and insomnia in both breast and prostate cancer. This result can be interpreted as the regular performance of breathing techniques, which can reduce muscle tension and maintain an energy level that leads to relief of tension and insomnia and the maintenance of normal body activities.

Finally, it was evident that regular performance of relaxation breathing exercises had a positive effect in alleviating cancer related fatigue especially when it repeated 4 times daily. As a result of decreasing fatigue scores, daily activities can be better performed and other associated symptoms of chemotherapy was improved. Performance of relaxation breathing exercise is a non-pharmacologic intervention that should be encouraged by oncology nurses to improve overall quality of care of cancer patients.

Strength and limitations of the study

Adequate sample size, and relatively low number of lost cases during follow-up increase the weight of this clinical trial and maintain the possibility of generalizing the study results. On the other hand, few cases of the study participants cannot be observed directly by the researcher during RBE implementation because discharged home after four days of chemotherapy administration. To overcome this limitation, researchers provide patient with guidelines of RBE and taught women and their family members how to implement RBE at home. Moreover, the RBE implementation was evaluated at home by checking women's diary notes through telephone interviews.

Conclusion

Relaxation Breathing Exercise is a cost effective, non-invasive and safe practice to alleviate fatigue in women with gynecological cancer receiving chemotherapy. Frequency of breathing exercise implementation was also affect fatigue experience as four times group experienced less fatigue than two times group. Moreover relaxation breathing exercise had a positive effect in improving performance of daily activities and associated symptoms of chemotherapy.

Recommendations

- Relaxation breathing exercises can be used as a preferred standard procedure after chemotherapy.
- Designing & distributing a guideline that clearly describes proper implementation of relaxation breathing exercises for gynecological cancer women.
- Implementation education sessions to increase awareness of cancer women regarding the positive effect of relaxation breathing exercises in improving cancer related fatigue.
- Further researches should be performed to evaluate the long-term effects of relaxation breathing exercises.

Conflict of Interest Disclosure

Researchers declared no conflict of interest.

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