Effect of paced breathing technique on hot flashes and quality of daily life activities among surgically menopaused women

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Abstract

Background: Surgical menopause is associated with a sudden and rapid onset of symptoms, as opposed to the natural menopausal transition. Hot flashes often begin immediately after surgery due to the abrupt and complete absence of all ovarian steroids, they are severe enough to alter sleep, social activities, and the overall quality of women's life. Paced breathing is a behavioral relaxation technique that may be effective in the reduction of the severity and frequency of menopausal hot flashes**. Objectives**: This study was done to determine the effect of paced breathing technique on the frequency and severity of hot flashes and their interference with daily life activities among surgically menopaused women. **Study design**: A quasi-experimental research design was utilized in this study. **Methods**: A convenient sample of 80 women undergone surgical menopause were recruited. Three tools for data collection were used: (1) Basic data structured interview schedule (2) Daily hot flash diary (3) Hot flash related daily interference scale **Results**: Significant differences were found between the two groups in the second week (p = 0.038) and third week (p = 0.001) after applying intervention in relation to hot flashes frequency also, significant differences were found between the two groups in the second and third weeks (p = 0.001) in relation to hot flashes severity. Additionally, the differences between the two groups were statistically significant after applying interventions in relation to the quality of daily life activities, where p=<0.001 in week 3. **Conclusion**: paced breathing technique is an effective non-pharmacological intervention in decreasing the severity and frequency of hot flashes among surgically menopaused women.

Keywords: *Paced breathing, Hot flashes, surgical menopause, and quality of daily life activities.*

Introduction

Menopause is a significant feminine stage that marks the transition from one stage of life to the next. It has a negative impact on a woman's body image, sexual identity, and overall quality of life. It represents the permanent cessation of menstruation and the loss of fertility due to the decline in ovarian function. It can occur naturally or induced surgically after bilateral oophorectomy **(McBride, 2019; Secoşan et al., 2019)**.

The abrupt cessation of ovarian function via oophorectomy is associated with a rapid and frequently dramatic onset of menopausal symptoms. The most prevalent symptom is hot flashes (HFs), which are characterized by generalized heat, sweating, and flushing, occurring most frequently around the head, neck, chest, and upper back and quickly

spreading throughout the body. The heat sensation lasts for a few minutes or even up to an hour, and it is accompanied by profuse sweating, chills, and shivering **(El-Bandrawy et al., 2018; Wong et al., 2018)**.

More than 75% of women with natural menopause and 90% of surgically menopaused women suffer from hot flashes, with 10-20 percent of them reporting severe symptoms. Hot flashes usually disappear within a few years. However; one-third of postmenopausal women will have symptoms for up to fifteen years. Flashes vary in severity, frequency, and duration from woman to woman; some experience hot flashes every day, some as frequently as every hour, while others have episodes every week or month **(Mallhi et al., 2018; Bansal & Aggarwal, 2019)**.

The brain's reaction to lower estrogen levels is thought to cause hot flashes. Hormonal changes that occur as a result of surgical removal of ovaries may cause the thermoregulation mechanisms that govern temperature equilibrium in the hypothalamus to become unstable. In the presence of low serum estrogen, the central nervous system, which has a high concentration of estrogen receptors (ERα and ERβ), may produce irregular pulses of norepinephrine, which may in turn elevate sympathetic activity, and result in vasomotor instability experienced as a hot flash with or without sweats. Norepinephrine is thought to be the primary neurotransmitter responsible for decreasing the thermoregulation set point and activating the heat loss mechanisms associated with hot flashes **(Genazzani et al., 2007; Freedman, 2014)**.

Hot flashes, especially when they occur frequently during the day, can be uncomfortable, physically demanding, and have a detrimental influence on women's activities and social contacts. In addition, when they disrupt sleep on a regular basis, it can lead to fatigue, poor concentration, anxiety, and depression. Consequently, hot flashes could have a negative effect on women's daily life activities and the overall quality of life **(Cunningham et al., 2018; El-Bandrawy et al., 2018)**.

While estrogen therapy reduces hot flashes, it is associated with an increased risk of endometrial cancer, and if taken with progestin to prevent endometrial hyperplasia, it raises the risk of cardiovascular, cerebrovascular, and thromboembolic events in the long run. Other pharmacologic therapies, such as antidepressants, have some effect on hot flashes but have undesirable side effects. As a result, there has been a lot of focus on finding non-pharmacologic treatments that are not only effective but also safe and well-tolerated. Non-pharmacologic treatments for hot flashes include, but are not limited to, herbal remedies, mind, and body practices (e.g., yoga), acupuncture relaxation, and slow-paced breathing **(Goldstein et al., 2016; Fait, 2019)**.

Paced breathing is a behavioral relaxation technique that involves slowing the respiratory rate and prolonging expiration, by filling the lungs to full capacity when inhaling and then pushing out as much air as possible when exhaling. In clinical research, regular practice of paced breathing has been proven to decrease sympathetic nervous system activity and facilitate the relaxation response which may reduce the perceived effect of hot flashes. Additionally; paced breathing has been suggested as a potential hot flash intervention because irregular adrenergic neurotransmission has also been linked to the pathogenesis of hot flashes **(Fait, 2019)**.

Significance of the study

It is critical for women to have a healthy menopausal time. Many women

who do not receive adequate health care at this time acquire chronic disorders, and their failure to deal with menopausal symptoms has a detrimental impact on their quality of life. Therefore, hot flashes can't be ignored. Pharmacological therapies are not always effective in eliminating hot flashes without the occurrence of side effects, so, utilization of non-pharmacological interventions like paced respiration may safely assist in the management of hot flashes. However, there is a lack of evidence to support their effectiveness in managing hot flashes. **So this study aimed** to determine the effect of paced breathing technique on the frequency and severity of hot flashes and daily life activities among surgically menopaused women.

Research hypothesis:

- Menopausal women who practice paced breathing technique exhibit less severity and frequency of hot flashes than those who do not practice it.
- Menopausal women who practice paced breathing technique exhibit high quality of daily life activities than those who do not practice it

Materials and method

Materials

Research design: A quasi experimental research design was utilized in this study

Setting: This study was conducted at the gynecologic outpatient clinic of Damanhour medical institute, Egypt. This hospital was particularly selected because it has an appropriate turnover for the study and the patients attending this hospital have a similar socio-demographic profile which maintains the homogeneity of the study sample.

Subjects: A convenient sample of (80) women who were available at the time of data collection were recruited from the above-mentioned setting according to the following criteria:

- Women who recently undergone bilateral oophorectomy (surgical menopause)
- Woman who reported at least 4 moderate or severe hot flashes per day.
- Not currently taking hormonal replacement therapy, a psychoactive medication, and not using complementary therapy for menopausal symptoms.
- Educated or can read and write.

Epi info 7 program was used to estimate the sample size using the following parameters:

Population size = 300 over 4 months.

Expected frequency 50%

Acceptable error 10%

Confidence coefficient 95%

Minimal sample size =73

The selected subjects were equally assigned to either study or control group.

Tools:

To achieve the aim of the study three tools were used.

Tool- I : Basic data structured interview schedule:

This tool was developed and used by the researcher to elicit basic information about subjects that included Socio-demographic characteristics such as age, level of education, occupation, residence.

The time of onset of hot flashes after operation and menopausal woman reaction

toward her condition were also added to this tool.

Tool- II

Daily Hot Flash Diary: It is a self-report dairy developed by **(Sloan et al., 2001)** (Sloan et al., 2001), in which participants recorded how many hot flashes they experienced on a daily basis as well as the severity of each hot flash on a scale of 1-3 (1 being mild, 2 moderate, and 3 severe). Hot flashes throughout a 7-day period were added to produce a weekly hot flash frequency score. While the number of hot flashes reported in each severity level was used to calculate the daily severity score, the total number of daily severity scores over the course of seven days was used to determine the hot flash severity index

Tool III: Hot flash related daily interference scale (HFRDIS)

It is a 10-item scale developed by **Carpenter, (2001)** to assess the degree to which hot flashes interfere with women's daily life activities. The first nine items assess the quality of daily life activities including work, social activities, leisure activities, sleep, mood, concentration, relationships with others, sexuality, and enjoyment of life and the tenth item assesses the overall quality of life. On a scale of 0 (do not interfere) to 10 (totally interfere), Women rate the extent to which hot flashes interfered with each item throughout the previous week. A total score is calculated by summing items. Higher scores reflect more interference from hot flashes and a greater impact on quality of life. The total score ranges from 0-100. This score was interpreted to the corresponding daily interference as follows:

- Mild interference 0-33
- Moderate interference 34-67
- Severe interference 68-100

Method: The study was implemented through the following steps:

1. Approvals

- Approval of the Research Ethics Committee, Faculty of Nursing, Damanhour University was obtained.
- An Official letter from the Faculty of Nursing, Damanhour University was submitted to the responsible authorities of the study setting to take their permission for data collection after explanation of the study purpose.

2. Tools development

- Tool I was developed by the researcher after extensive review of recent and related literature.
- Tool II and III were adapted and translated into Arabic language to suit the Egyptian culture.
- Tools content validity was tested by a jury of five experts in the field of obstetric and gynecologic nursing and the recommended modifications were done.
- Tools II& III reliability was tested by Cronbach Alpha test to measure internal consistency and the result was satisfactory (0.84, 0.76 respectively).

3. Pilot study

A pilot study was carried out on 8 women to ascertain clarity and applicability of the tools, determine any obstacles that may be encountered and to estimate the time needed for data collection. The result revealed that the tools were clear, relevant, and applicable and no changes were made. Women participating in the pilot study were excluded from the main study sample.

4. Collection of data

Initially, the researchers interviewed the women of both groups during the postoperative follow-up visits in gynecologic outpatient clinic in order to collect the basic data and choose the eligible subjects. Then, hot flashes frequency and severity as well as hot flashes interference with the quality of daily life activities were evaluated using tool II& III for all eligible women before intervention (baseline measurement)

The subjects were assigned to one of 2 groups as follows:

The study group comprised 40 women who practiced paced respiration for 3 weeks. The researcher explained to women how to perform paced respiration and provided a demonstration of each step to each woman individually followed by re-demonstrations by the women from 3- 4 times until she can master all the steps.

The researcher instructed women to:

- Sit in a straight-back chair with both feet on the ground.
- Place hands on the abdomen.
- Slowly count to four while inhaling through the nose and feel the abdomen rise.
- Hold breathe for a second.
- After that, while slowly counting to four and exhaling through lips, let the abdomen gradually fall.

At the end of the session, women were instructed to repeat this exercise 6 to 8 times per minute for 15 minutes twice a day and at the beginning of each hot flash episode for 3 weeks and the researchers gave each woman instructions about the significance of adhering to the intervention.

The control group included 40 women who practiced the routine care for hot flashes such as wearing cotton night clothes, sipping ice water at the start of a hot flash, etc...

- To calculate hot flashes score/week, participants were instructed to record the number of hot flashes they experience on a daily basis for 3 week as well as the severity of each hot flash on a scale of 1-3 (1 being mild, 2 moderate, 3 severe) using tool II. The researcher explained the characteristics of each level of severity to women as follows:

- **Mild**

The hot flash lasts less than 5 minutes, sensation of warm and red face without sweating, the episode is tolerable and no action is needed**.**

- **Moderate**

The hot flash lasts up to 15 minutes with a sensation of warmth in the head, neck, ears, and sometimes all over the body with some sweating and dry mouth, also the woman feels irritated, agitated, and tired. Usually, the woman uses a fan, takes off layers of clothes, or uncovers if sleeping and opens windows even if the weather is cold to overcome the hot flash episode.

- **Severe**

The hot flash episode lasts up to 20 minutes or more with a sensation of intense warmth, headache, severe sweating, increase in the heart rate, waking up frequently at night, feeling faint, and sometimes feeling of having a panic attack. The woman needs to take a cold shower or apply ice to her skin in addition to performing the same steps as in a moderate episode to get through the episode**.**

- The researcher contacted each woman daily to ascertain that they performed the intervention and recorded the frequency and severity of hot flashes

accurately.

- The daily life interference of hot flashes was evaluated before the intervention then at the end of each week for three consecutive weeks using tool III, the researcher contacted each woman through a telephone calls at the end of the first and second weeks and asked them to rate each item in the hot flash related daily interference scale from 0 - 10 after reading the items carefully to them.
- Women were instructed to attend the clinic after 3 weeks for follow-up and to reassess the daily life interference for the third week and to receive the daily hot flashes diaries of severity and frequency throughout the three weeks.
- The effect of paced respiration technique on hot flashes frequency, severity and quality of daily life activities was determined by comparing the results of the two groups before and after the intervention.
- Collection of data starting from mid of May to the end of September 2019.
- The Statistical Package for Social Sciences (SPSS) version 20.0 was utilized for data analysis. Descriptive statistics included numbers, percentages, means, and standard deviation to describe socio-demographic, clinical characteristics, hot flashes frequency, severity, and daily interference of hot flashes. Kolmogorov-Smirnov test was used to check the normality of the study variables, and it showed that they were not normally distributed. Comparison between the menopausal women in the two study groups regarding their mean age, hot flashes frequency, severity and daily interference of hot flashes were done using Fisher Exact, Mann-Whitney (Z), Student t and Friedman tests. All of the statistical analyses were considered significant at $P < 0.05$.

Ethical considerations

A written informed consent was obtained from the study participants after an explanation of the study's aim, the researchers emphasized women's free decision to voluntarily participate in the study and stressed women's right to refuse the participation or withdraw from the study at any time. Privacy and anonymity were maintained, and confidentiality of the obtained data was also assured.

Results

Table (1) Represents that the mean age in the study and control groups was almost the same (38.18 ± 3.10 and 38.13 ± 3.40) years respectively. A sizeable proportion (75 % & 72.5%) and (80 % & 72.5%) of participants were married and housewives respectively. In addition, 42.5 % & 45 % of them respectively had completed their secondary education. The table also shows that (65 % & 75 %) of both groups were urban dwellers.

Moreover, a sizable proportion (70 % & 82.5%) of women in both groups respectively have experienced hot flashes onset one week after the operation, it is also noticed that (80 % & 75%) of them respectively not accepted their present condition after surgery. There were no statistically significant differences between the two groups in relation to the socio-demographic characteristics.

Table (2) shows that the mean scores of hot flashes frequency ***before applying the interventions*** were 104.83±19.68 and 110.75±10.22 in the study and control groups respectively with no statistically significant difference ($p = 0.868$). ***After the intervention***, there was an obvious decline in the mean hot flashes frequency in the favor of the study group where, it was (51.80 ± 37.14) in the study group compared to (89.08 ± 9.24) in the control group by the fourth week. Significant differences were found between the two groups in the second week ($p = 0.038$) and the third week ($p = 0.001$).

The same table illustrates that the

mean scores of hot flashes severity index were 242.55 ± 34.39 and 243.43 ± 33.79 in both groups respectively before applying intervention, with no statistically significant difference (p = 0.931). ***After the intervention***, there was a slight decline in the mean severity of hot flashes in the first and second weeks in the favor of the study group while, a noticeable reduction in the mean severity of hot flashes was observed in the study group by the third week where it declined to (80.85 ± 60.86) compared to (196.18 ± 42.55) in the control group. Significant differences were found between the two groups in the second and third weeks (p = 0.001).

Table (3) represents the number and percent distribution of the study and control groups according to the severity of hot flashes. In relation to the study group before intervention, most (90 %) of women had severe hot flashes and only10% of them had moderate hot flashes. After applying intervention, the study group showed an obvious decline in their hot flashes severity all over the three periods of the study where 87.5% & 12.5%, had severe and moderate hot flashes respectively after 1st week of intervention. On the other hand, (47.5 % & 25%) and (67.5% & 17.5%) of them had mild to moderate hot flashes in 2nd and 3rd weeks after intervention respectively. No statistically significant difference was found before intervention and the 1st week after (P= 0.931). On the other hand, A statistically significant difference was detected between the 1st and 2nd weeks after intervention (P = 0.001), and the 1st week and 3rd weeks after intervention (P = 0.001).

The same table reveals that, the vast majority (92.5%) of the control had severe hot flashes and 7.5% of them had moderate hot flashes before intervention. After intervention, control group had poor improvement all over the three periods of the study, where 92.5%, 87.5% & 82.5% had severe hot flashes and 7.5%, 12.5% & 17.5% had moderate hot flashes in the 1st, 2nd and 3rd weeks after intervention respectively. No statistically significant difference was found before intervention and the 1st week after intervention (P= 0.1000), between the 1st week and 2nd weeks after intervention (P = 0.729), and the 1st and 3rd weeks after intervention (P = 0.488).

Figure (1) Shows that the change in hot flashes frequency after applying the intervention was satisfactory in the study group where, it was 1.23 in the first week, 23.98 in the second week, and 53.03 in the third week, while in the control group, there was a fewer change in hot flashes frequency, it was 1.38 in the first week, 12.58 in the second week, and 21.67 in the third week.

Table (4) displays that all 85% of women in both the study and control groups suffered from severe interference of hot flashes with their daily life activities following surgery, the mean scores were (74.50±9.59 and 74.50±9.86) respectively ***before applying the interventions with*** no statistically significant difference (p=0.959). ***After the intervention***, there was an apparent decline in daily interference in the favor of study group to become mild in 65% of the study participants. The means of daily interference of hot flashes were (61.50± 14.06 and 74.50± 9.86) in the first week, (41.50± 10.01and 64.00± 8.41) in the second week and (30.50± 14.49 and 61.75± 16.47) in the third week after intervention in the study and control groups respectively. Significant differences were found between the two groups in the first, second and third weeks (p=0.001) respectively.

Table (1): Comparison between the two studied groups according to socio-demographic and clinical characteristics

Socio-demographic & clinical characteristics	Study group (n = 40)		Control group (n =40)		F/ χ^2 (P)
	No.	%	No.	%	
Age (years)					
<35	6	15.0	5	12.5	0.881 (0.644)
35 – <40	10	25.0	12	30.00	
≥ 40	24	60.0	23	57.5	
Mean ± SD.	38.18 ± 3.10		38.13 ± 3.40		t= 0.069 (0.945)
Median	39.0		39.0		
Marital status					
Single	2	5.0	3	7.5	1.357 (0.778)
Married	30	75.0	29	72.5	
Divorced	4	10.0	6	15.0	
Widowed	4	10.0	2	5.0	
Level of education					
Read & write	0	0.0	1	2.5	1.153 (0.961)
Primary/ preparatory education	15	37.5	14	35.0	
Secondary education	17	42.5	18	45.0	
University education or higher	8	20.0	7	17.5	
Occupation					
Housewife	32	80.0	29	72.5	1.836 (0.422)
Employee	3	7.5	7	17.5	
Worker	5	12.5	4	10.0	
Original residence					
Rural	14	35.0	10	25.0	0.952 (0.329)
Urban	26	65.0	30	75.0	
Time of onset of hot flashes after surgery					
Immediately after operation	12	30.0	7	17.5	1.726 (0.189)
One week after the operation	28	70.0	33	82.5	
Woman's reaction toward the present condition					
Accepted	8	20.0	10	25.0	0.287 (0.592)
Not accepted	32	80.0	30	75.0	

χ^2: **Chi square test** FE**: Fisher Exact** **t: Student t-test**
p: p value for comparing between the studied groups

Table (2): Comparison between the study and control groups according to the total hot flashes frequency and severity index

Hot flashes/week	Study group (n = 40)	Control group (n =40)	U/ (p)
	Mean ± SD.	Mean ± SD.	
Frequency			
Before intervention (Baseline)	104.83±19.68	110.75±10.22	784.00 (0.868)
1st week after intervention	103.6 ± 12.40	109.38 ± 15.26	611.50 (0.065)
2nd week after intervention	80.85 ± 29.91	98.18 ± 12.73	588.0* (0.038*)
3rd week after intervention	51.80 ± 37.14	89.08 ± 9.24	360.0* (<0.001*)
Severity index			
Before intervention (Baseline)	242.55 ± 34.39	243.43 ± 33.79	791.00 (0.931)
1st week after intervention	210.70 ± 19.91	222.78 ± 33.96	651.0 (0.137)
2nd week after intervention	127.58 ± 57.71	211.05 ± 19.64	255.50*(<0.001*)
3rd week after intervention	80.85 ± 60.86	196.18 ± 42.55	188.50* (<0.001*)

U: Mann Whitney test χ^2: **Chi square test**
p: p value for comparing between the studied groups *: Statistically significant at $p \leq 0.05$

Table (3): Percent distribution of the study and control groups according to the severity of hot flashes before and after the intervention

Severity of hot flashes	Study group (n = 40)								Control group (n =40)							
	Before intervention		1st Week after intervention		2nd week after intervention		3rd week after intervention		Before intervention		1st Week after intervention		2nd week after intervention		3rd week after intervention	
	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%
Mild	0	0.0	0	0.0	19	47.5	27	67.5	0	0.0	0	0.0	0	0.0	0	0.0
Moderate	4	10.0	5	12.5	10	25.0	7	17.5	3	7.5	3	7.5	5	12.5	7	17.5
Severe	36	90.0	35	87.5	11	27.5	6	15.0	37	92.5	37	92.5	35	87.5	33	82.5
Fr (p)	85.982*(<0.001*)								9.424* (0.024*)							
p_1	0.931								1.000							
p_2	<0.001*								0.729							
p_3	<0.001*								0.488							

Fr: **Friedman test**, Sig. bet. Periods were done using **Post Hoc Test (Dunn's)**
P1: Significance between before intervention and 1st week after.
P2: Significance between 1st week and 2nd week after.
P3: Significance between 1st week and 3rd week after

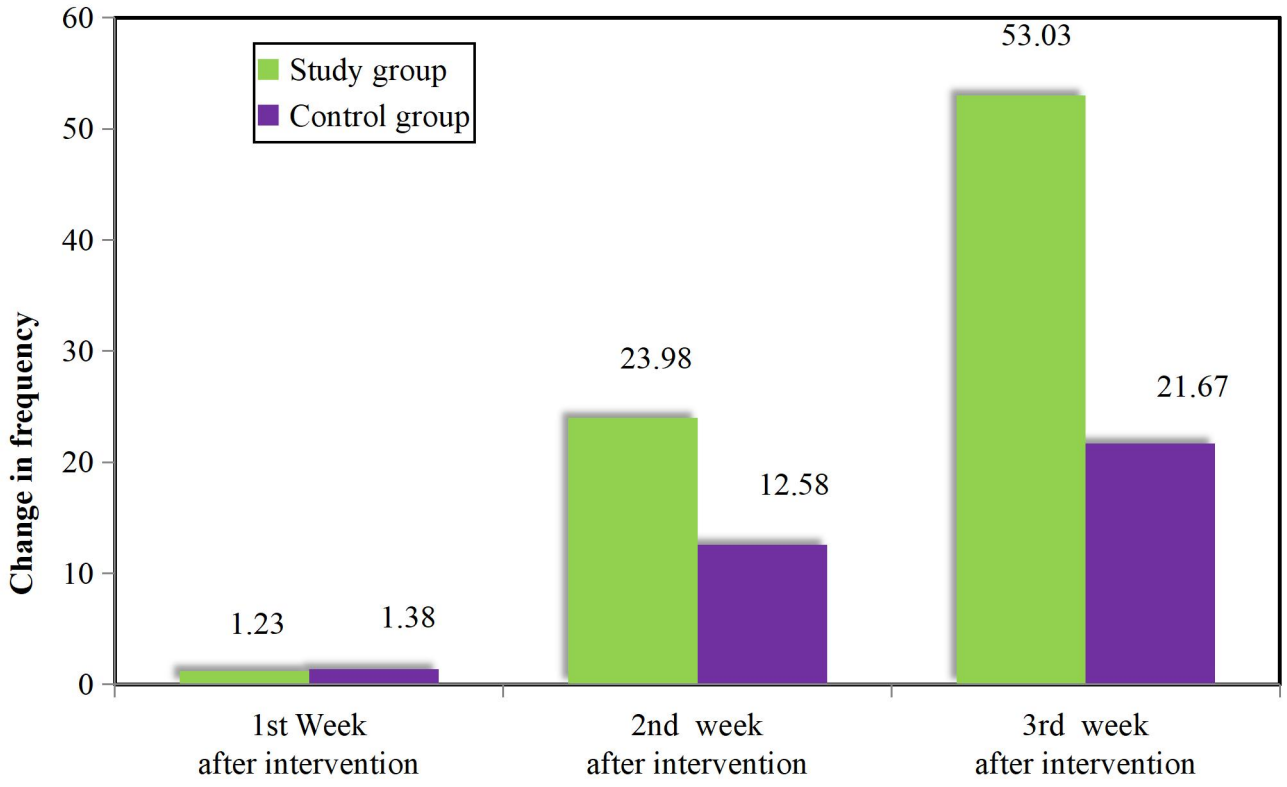

Figure (1): Comparison between the two studied groups according to the change in total hot flashes frequency before and after intervention

Table (4): Comparison between the study and control groups according to the total daily interference of hot flashes

Total daily interference of hot flashes	Before intervention				1st week after intervention				2nd week after intervention				3rd week after intervention			
	Study group		Control group		Study group		Control group		Study group		Control group		Study group		Control group	
	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%
Mild interference (0-33)	0	0.0	0	0.0	4	10.0	0	0.0	17	42.5	0	0.0	26	65.0	5	12.5
Moderate interference (34-67)	6	15.0	6	15.0	10	25.0	6	15.0	23	57.5	18	45.0	14	35.0	8	20.0
severe interference (68-100)	34	85.0	34	85.0	26	65.0	34	85.0	0	0.0	22	55.0	0	0.0	27	67.5
Mean ± SD	74.50±9.59		74.50±9.86		61.50± 14.06		74.50± 9.86		41.50± 10.01		64.00± 8.41		30.50± 14.49		61.75± 16.47	
U/ (p)	U=795.00 (p=0.959)				U=408.0* (p<0.001*)				U=69.0* (p=<0.001*)				U=135.0* (p=<0.001*)			

U: Mann Whitney test
p: p value for comparing between the studied groups
*: Statistically significant at p ≤ 0.05

Discussion

Surgical menopause is the removal of both ovaries before the natural age of menopause. Ovaries can be surgically removed during a hysterectomy or other pelvic surgery for a variety of reasons, including underlying ovarian diseases, or as a prophylactic measure **(Rodriguez & Shoupe, 2015)**. The ovarian sex steroid production decreases abruptly rather than gradually after surgical menopause. In contrast to the intact postmenopausal ovary, which generally retains a limited production of steroids, particularly testosterone, surgical removal of the ovaries likewise, leads to a complete deficiency of steroids. Surgical menopause is associated with a sudden and rapid onset of symptoms. Hot flashes often begin immediately after surgery due to the abrupt and complete absence of all ovarian steroids, which are often more intense than in women going through natural menopause. Other menopausal symptoms often emerge earlier and are severe enough to alter sleep, social activities, and the overall quality of women's life **(Cho et al., 2019)**.

While using hormonal replacement therapy is effective in the management of menopausal hot flashes, it may be associated with an increased risk of endometrial cancer and is to some extent contraindicated in women who have undergone surgical bilateral oophorectomy after gynecologic malignancies or metastasis **(Edey et al., 2018)**. Some pharmacological medications as antidepressants have a relative effect on hot flashes, but their side effects usually surpass the benefits which in turn limit their acceptability **(Rodriguez & Shoupe, 2015)**. Consequently, there has been widespread interest in using safe and effective non-pharmacologic measures **(Rada et al., 2010)**. Paced breathing is recommended by the North American Menopause Society as a behavioral relaxation technique for the management of menopausal hot flashes **(North American Menopause Society, 2015)**.

The findings of the current study revealed a significant decline in the frequency and severity of hot flashes in the study group at the end of the third week where, the frequency decreased by 50.5% and the severity decreased by 66.6% while

in the control group only 19.6% reduction in the frequency of hot flashes and 19.4% reduction in the severity were detected. In line with the current result, **Sood et al., (2013)** in their study about the effect of paced breathing compared with usual breathing for hot flashes reported 52% reduction in hot flashes during the nine weeks of practicing paced breathing twice a day.

The current study finding is also consistent with that of **Bhuvaneswari, (2012)** who concluded that paced breathing exercise was effective in reducing the frequency and severity of hot flashes among menopausal women. Additionally, a similar result (50% reduction in hot flash frequency) also reported by **Freedman, (2005)** in a comparison of paced breathing against α-wave EEG biofeedback and muscle relaxation exercises.

Another relatively supporting two randomized controlled trials one of them was done by **El-Bandrawy et al., (2018)** revealed that paced respiration was effective in decreasing blood cortisol levels and vasomotor symptoms of menopause however, they concluded that the effect was much better when combining paced breathing with foot reflexology. The other relatively supporting result was obtained from **Huang et al., (2015)** who concluded that women who practiced device-guided slow-paced respiration reported some improvement in the frequency and severity of their hot flashes, but the paced breathing intervention was less effective than a music-listening intervention in decreasing the frequency and severity of these symptoms.

Paced breathing has been suggested to improve hot flashes by decreasing the elevated sympathetic autonomic tone since, the elevation in the central sympathetic activation, mediated through α_2-adrenergic receptors, is one of the responsible factors for narrowing the thermoregulatory zone **(Freedman, 2014)**. The favorable effects of paced breathing may be mediated by other mechanisms including the sense of increased relaxation, which may decrease the perceived burden of hot flashes **(Raupach et al., 2008)**.

Moreover, in a trial to assess the effect of paced breathing on hot flashes, **Freedman and Woodward, (1992)** found that paced breathing is effective in reducing the severity and frequency of menopausal hot flashes, they suggested that menopausal hot flashes are triggered by increased central sympathetic activation. They hypothesized that the slow, deep breathing exercises act in some way to modulate this activation and thereby reduce the frequency of hot flashes. On replicating their study to test the biochemical and thermoregulatory effects of behavioral treatment for menopausal hot flashes, **Freedman et al., (1995)** reported that paced respiration did not result in sympathetic activation changes but they found an alteration in the 2 hours skin conductance level suggesting the possibility of an alteration in the circadian rhythm of heat loss.

Since the daily performance of paced respiration technique for three weeks decreased the severity and frequency of hot flashes, the results of the present study revealed an improvement in their quality of daily life activities as well. This result was in agreement with **Huang et al., (2015)** who detect a satisfactory reduction in the daily interference of hot flashes.

Becoming flushed and profusely sweating in a social or work situation may lead to anxiety and social isolation, other psychological disturbances may also arise from sleep deprivation, mood swings, and unpredictable hot flashes which have an extreme negative effect on the quality of daily life activities. Accordingly, any improvement in the severity and frequency of hot flashes will be accompanied by a

reduction in the interference with women's daily life activities and could positively affect the quality of their life.

The result of the current study is incongruent with the results reported by **Carpenter et al., (2013)** in their study about the effect of Paced respiration on vasomotor and other menopausal symptoms, they concluded that most study subjects did not achieve a 50% reduction in vasomotor symptoms and the interference of hot flashes with the quality of daily life activities despite the proven ability to practice paced respiration correctly and daily. They also observed small statistically significant differences in the secondary measurements at 8 and 16 weeks. This discrepancy may be related to the differences in inclusion criteria and methodological approaches of the two studies.

Conclusion:

Based on the findings of the present study, it can be concluded that paced breathing technique is an effective non-pharmacological intervention in decreasing the severity and frequency of hot flashes among women undergone surgical menopause. In addition to a satisfactory improvement in the quality of daily living activities.

Recommendations

- Based on the findings of the present study, the following recommendations are suggested:

1- Integrating paced breathing technique in the nursing care of menopausal women with hot flashes is a safe, cost-effective, and simple non-pharmacological nursing measure.

2- The curricula of basic obstetrics and gynecologic nursing education could be enriched with significant evidence-based non-pharmacological practices for menopausal hot flashes.

3- In-service training programs for nurses in gynecologic units about non-pharmacological approaches.

4- Further research is also recommended about the effect of other non-pharmacological modalities on menopausal hot flashes.

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