Effect of an Alternate Nostril Breathing Exercise On Fatigue and Quality of Sleep Pattern Among Pregnant Women in Third Trimester

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Abstract:

Background: Pregnancy-related problems encompass fatigue and sleep disturbances, which have adverse effects on quality of life as well as the growth and development of the fetus. Alternate nostril breathing (ANB) exercise derived from the discipline of yoga, is widely regarded as one of the most effective and straightforward methods for promoting overall well-being and physical vitality. This study **aimed** to determine the effect of an ANB exercise on fatigue and quality of sleep pattern among pregnant women in the third trimester. **Research design:** A quasi-experimental design was employed at Kafr El-Sheikh General Hospital, Kafr El-Sheikh Governorate, Egypt. **Subjects:** A convenient sample of 90 pregnant women was recruited based on certain criteria. Data was gathered using three **tools** namely, Basic data structured interview schedule, Pittsburgh Sleep Quality Index (PSQI) and Iowa Fatigue Scale (IFS). **Results:** There was improve of the sleep quality among participants after intervention where, the mean score of sleep quality in the study group was (8.6±2.5) compared to (15.22±2.62) in the control group. A significant decline in fatigue level among participants after intervention was observed where, the mean score of fatigue was (36.73±4.47) in the control group compared to (30.9±3.3) in the study group, ($p<0.000$). **Conclusion:** The findings concluded that ANB exercises improved sleep quality and decreased fatigue after 4 weeks of regular practice among pregnant woman in the third trimester. **Recommendations:** Integrating ANB exercise as a safe and non- pharmacological intervention for pregnant women that can improve sleep pattern and enhance level of fatigue, and included as part of antenatal care.

Keywords: Alternate nostril breathing exercise, fatigue, quality of sleep pattern, pregnant woman in third trimester.

Introduction

Pregnancy is considered to be one of the most significant periods in the life of woman. Physiological changes transpire during pregnancy to facilitate the fostering of the developing fetus and prime the mother for the process of labor and childbirth. These changes occur in reaction to various factors such as hormonal changes, an augmentation in the overall volume of blood, an increase in body weight, and an expansion in the size of the fetus as the pregnancy advances. All of these factors exert a physiological influence on the expectant mother (Soma-Pillay , Nelson-Piercy, Tolppanen & Mebazaa, 2016; Ricci, 2020).

The third trimester of pregnancy is often regarded as the most arduous phase, as a number of women experience heightened discomfort as their anticipated delivery date

approaches. With the fetus steadily expanding in size and encroaching upon the abdominal cavity, certain expectant mothers encounter backaches, heartburn, sleep apnea, daytime fatigue, difficulties in quality sleep, and various other unpleasant symptoms due to the transformative processes occurring within their bodies during this trimester (Guardino & Schetter, 2014; Mindell, Cook& Nikolovski, 2015; Ricci, 2020).

Pregnant women often complain of fatigue, whose severity increases during the first and third trimesters. The primary causes of fatigue during the first trimester are placenta development, metabolic and adaptation changes, increased blood flow, and hormonal changes, specifically the release of the placenta's progesterone. Further along, nocturia, Heart burn, weight gain, , sleep disturbances, increase fetal movements, leg cramps, Braxton's hicks contractions, , and the stress of giving birth are all linked to fatigue in the third trimester (Bossuah, 2017; National Institutes of Health [NIH], 2017; de Bellefonds, 2022;)

The hallmarks of fatigue are a strong, enduring sense of exhaustion and a diminished ability to perform both mental and physical tasks. Increased risk of problems during pregnancy can result from both more severe fatigue and poor sleep quality, including severe labor pain, preterm labor, prolonged labor, increased risk of cesarean section, low birth weight (LBW), fetal growth restriction, stillbirth, unbalanced neurological development and a weakened immune system of the baby, maternal morbidity, such as gestational diabetes, preeclampsia and cardiomyopathy, as well as maternal mortality, specifically, have been associated with suboptimal maternal mental well-being, particularly postpartum depressive symptoms, anxiety, and contemplation of self-harm (Nowakowski, Meers & Heimbach, 2013; Louis, Mogos, Salemi, Redline & Salihu, 2014; Kang et al., 2016; Wan, Qin, Wang, Sun & Liu, 2017; Osnes, Roaldset, Follestad & Eberhard-Gran 2019; Kalmbach et al., 2020; Porkka-Heiskane, Saaresranta& Polo-Kantola, 2021)).

During pregnancy, maternal sleep quality declines, getting worse in the third trimester. The three main sleep disturbances that pregnant women experience are restless legs syndrome (RLS), sleep disordered breathing (SDB), and primary insomnia. Sleep disturbances result in sleep fragmentation and the breakdown of sleep architecture, which causes sleep loss as well as daytime exhaustion, fatigue, cognitive difficulties, and a heightened risk of accidents (Aukia et al., 2020; Porkka-Heiskane et al., 2021).

Primary insomnia encompasses two types: initiation insomnia, which manifests as trouble falling asleep, and maintenance insomnia, which manifests as frequent nighttime awakenings and excessively early morning awakenings (inability to get back asleep). Primary insomnia throughout the third trimester is brought on by physical changes as the fetus continues to grow (Porkka-Heiskane et al., 2021;Bastian & Brown, 2022; Lockwood& Magriples, 2022; Aggarwal, 2023).

Nurses have a pivotal role in managing pregnancy-related fatigue and sleep disturbances by educating women about non-pharmacological interventions such as aromatherapy, music therapy, aerobic exercise, massage, behavioral intervention, acupuncture, acupressure, relaxation techniques, yoga, mindfulness and breathing exercises (Klein, O'Neal, Scifres, Waters& Waters 2016; Hung & Chiang, 2017; Wayne, 2023).

Alternate nostril breathing (ANB) is a yoga breathing exercise and entails breathing

slowly and gently through one nostril while holding the other nostril with hand. Then switch nostrils and repeat the technique. It assists pregnant women in focusing on their breathing, which is typically an instinctive action that promotes calmness and relaxation. This exercise can be performed at least twice a day (Brennan, 2021; Crumpler & Barrell, 2022).

The process of ANB is known to stimulate the autonomic nervous system, sympathetic and parasympathetic, via the right and left nostrils respectively. This activation occurs by means of a neural pathway that involves connections between the nasal meatus and various hypothalamic nuclei. Furthermore, alternate-nostril breathing has been observed to enhance the natural rhythm of the body, which is commonly referred to as the nasal cycle. An immediate improvement in performance across different tasks was noted in participants following the practice of alternate-nostril breathing (Niazi et al., 2022).

Alternate nostril breathing, when practiced regularly, has many benefits such as improved lung function and voluntary regulation of breathing to calm the mind and make respiration rhythmic; restoration of autonomic nervous system balance; metabolism refinement; reduction of stress and anxiety; increased relaxation; increased energy and vitality; improvement of cardiac function, including lowering blood pressure and heart rate; improvement of brain functions, including improved cognitive and motor function; reduction of fatigue; optimization of sleep quality and enhancement of general health and well-being (Dhanvijay, Bagade & Kumar, 2020; Crumpler & Barrell, 2022; Crumpler, 2023).

Significance of the study

Fatigue and sleep problems have a detrimental influence on pregnancy outcome. Among the 605 expectant mothers, a noteworthy of 94.2% experienced fatigue throughout their pregnancy. Prevalence of insomnia during pregnancy was found to be 38.2%; third trimester prevalence of insomnia symptoms was greater at 39.7% than in first (25.3%) and second (27.2%) trimesters (Weng, Lee & Chien, 2020; Effati-Daryani, Mohammad-Alizadeh-Charandabi, Mohammadi, Zarei & Mirghafourvand, 2021; Sedov, Anderson, Dhillon & Tomfohr-Madsen,2021; Kendle, Salemi, Jackson, Buysse, & Louis, 2022). Pregnant and postpartum women may experience major physical, psychological, and social effects from these conditions. Therefore, this study was conducted to determine the effect of an alternate nostril breathing exercise on fatigue and quality of sleep pattern among women in third trimester. Also, it is anticipated that The study's findings will enrich knowledge about non pharmacological nursing interventions for fatigue and sleep disturbance. This will in turn provide evidence-based practices to obstetrics and gynecological nurses to lessen fatigue, improve sleep quality and decrease risk of problems during pregnancy can result from both more severe fatigue and poor sleep quality, without the side effects of pharmacological measures.

Aim of the study

The study aimed to determine the effect of an alternate nostril breathing exercise on fatigue and quality of sleep pattern among pregnant women in third trimester.

Research hypothesis

Pregnant women who practice alternate nostril breathing exercise during third trimester exhibit less fatigue and higher sleep quality than those who don't practice it.

Subjects and methods

Research design and setting:

A quasi-experimental design was employed in the antenatal clinic at Kafr El-Sheikh General Hospital, Kafr El-Sheikh Governorate, Egypt. This setting was selected because it serves as the primary educational medical facility within the Kafr El-Sheikh Governorate. Also, this hospital is responsible for providing comprehensive obstetrics and gynecology services alongside a substantial pregnant women turnover.

Subjects:

A sample of 90 pregnant women was conveniently recruited based on the specific inclusion criteria: (1) PSQI ≥13 (women with sleep disruption) and IFS ≥ 30; (2) with a normal course of pregnancy; (3) gestational age of 27 - 33 weeks; (4) receive regular antenatal visits; (5) single fetus; (6) with low- risk pregnancy; (7) free from medical and obstetrical diseases. Exclude the women who have night shift work, refuse to continue in the study; not comply with breathing exercise as scheduled; experience sleep disturbance as restless, legs syndrome (RLS) and obstructive sleep apnea or chronic diseases. The researchers interviewed 146 pregnant women to determine who matched the inclusion criteria. Epi-info-7 statistical program was employed to derive an estimate for the sample size utilizing the subsequent parameters: population size of 115, expected frequency of 50%, acceptable error of 5%, and confidence coefficient of 95%. The minimum sample size was 89. Subsequently, the chosen participants were evenly allocated to either the control or study group.

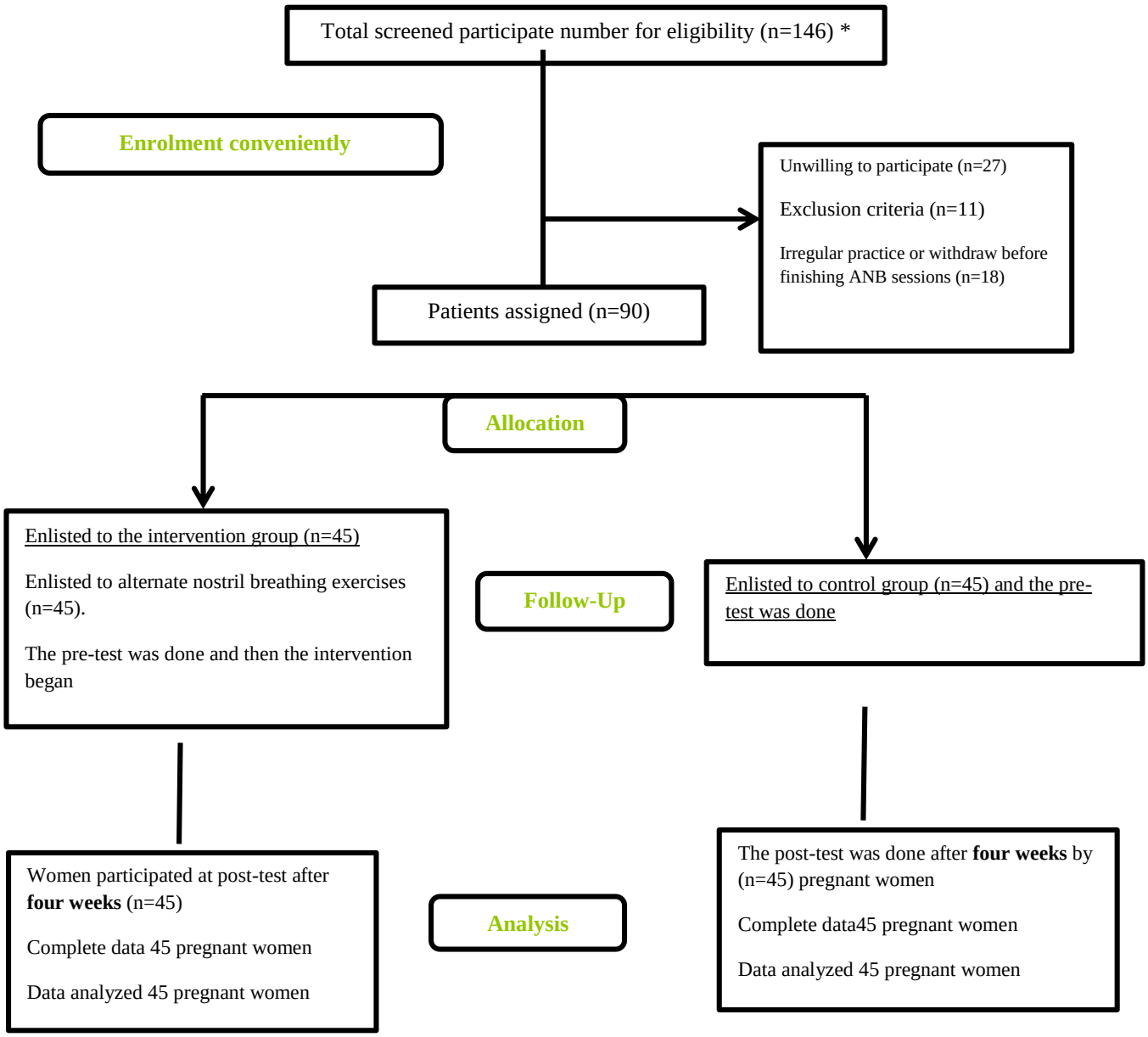

Figure (1): Flow Chart of Participants' Recruitment Process.

Tools:

The researchers employed three tools to collect data.

Tool (I): Basic data Structured interview schedule:

The researchers employed this tool to amass the subsequent data:

- Socio-demographic data encompassing: age, occupation, educational level, marital status, residence, telephone number with WhatsApp.
- Reproductive history encompassing: gravidity, parity, number of abortions, complications prior pregnancies as well as the current pregnancy profile as weeks of gestation, number of antenatal visits.

Tool (II): Pittsburgh Sleep Quality Index (PSQI)

It was developed by Buysse et al. (1989) to assess the quality and adult sleep patterns. The researchers modified this index to fit the Egyptian culture. Nineteen statements about the nature of sleep throughout the last month were comprised in this tool. These statements were categorized to seven dimensions: sleep quality (3); sleep latency (1); sleep duration (1); habitual sleep efficiency (10); sleep disturbance (1); use of sleeping medication (1); lack of sleep as daytime dysfunction (2).

Each item had a 3-point Likert format as follows: Zero indicates none, (1) indicates occurrence once or twice weekly, and (2) indicates three or more instances per week.

The total score ranged between 0-38, which was ranked as follows: (0-12) stands for no sleep difficulty; (13-25) stands for mild sleep difficulty and (26-38) stands for sleep severe difficulty.

Tool (III): Iowa Fatigue Scale (IFS)

This tool was adopted by the researchers (Hartz et al., 2003). It included eleven items employed to evaluate the fatigue level among pregnant women. This tool had a 5- point, Likert scale that ranged from a minimum score of 1, indicating no fatigue, to a maximum score of 5, indicating extreme fatigue.

Total score was ranged from 11 to 55. Subjects' pattern of responses was ranked as followed: non fatigue (11-29), mild fatigue (30 – 39) and severe fatigue (40-55).

METHOD

The following steps were followed to complete the study:

-The researchers participated in a three-day training program (consisting of 18 hours) centered on the practice of breathing exercises. This program took place at The Arab African Union, a highly regarded institution that specializes in Complementary Medicine. The Union is affiliated with the Ministry of Culture and Investment, and it is located in Alexandria governorate. As a result of their participation, the researchers were able to obtain an official certificate of accreditation.

-An approval from the Scientific Research Ethics Council, Kafr El-Shaikh University was acquired. An official letter from the vice dean of graduate studies and research at Kafr El-Shaikh University's Faculty of Nursing was submitted to the responsible authorities to obtain their consent for gathering data.

-The Arabic translation of the tools was done and used for data collection. The required modifications were made after they underwent a content validity test conducted by a jury comprised of 5 experts in obstetrics and gynecologic nursing field. Internal consistency (Cronbach's Alpha test) was used to evaluate the reliability of tools II and III; the results revealed that r = 0.87 and r = 0.88, correspondingly. A pilot study was undertaken on 10% of the study sample (9 pregnant women). The findings of the pilot study were omitted from the final sample.

Ethical consideration:

Women gave their written informed consent before any data collection and after being informed of the study's objectives, their right

to privacy, the confidentiality of the data gathered, and the voluntary nature of participation, with the option to withdraw at any point.

Procedure:

- The researchers interviewed with each pregnant woman individually, introduced themselves, the study's title and its aim to fill tool I.
- Then, 90 pregnant women were chosen to participate in the research based on predefined inclusion criteria, after which they were evenly and randomly divided into two groups; group I: the study group comprised of 45 pregnant women who were instructed to practice alternate nostril breathing exercise, as well as group II: the control group comprised of 45 pregnant women who receive routine hospital care (Sleep Hygiene and Education) as night dim lights and comfortable night environment, a warm bath).
- The control group was started and completed then ANB group. The researcher evaluated fatigue and quality of sleep pattern for both groups before practicing ANB exercise in study group and the routine care in control group using tool (II) &(III).
- For study group:
- The researchers ensured that environment is clean, well ventilated, and free from any distractions.
- Every woman was met individually and instructed to evacuate her bladder, lose any tight clothes, and assume a comfortable position, such as sitting on a chair, and relax her body.
- The researchers started to explain and demonstrate how to do alternate nostril breathing exercise using a PowerPoint presentation & video and demonstration of exercise.
- The researchers firstly ask the woman to close her eyes and pay attention to her breathing.
- Steps of alternate nostril breathing exercise: (a) Participants were instructed to occlude the left nostril using the index finger of the left hand and perform inhalation through the right nostril for duration of 6 seconds. (b) Subsequently, they were directed to close the right nostril with the index finger and retain the breath for 6 seconds. (c) Following this, a slow exhalation through the left nostril for 6 seconds was performed. (d) Next, inhalation through the left nostril while keeping the right nostril closed for 6 seconds was carried out. (e) The participants were then required to hold their breath, occluding both nostrils, for a period of 6 seconds. (f) Finally, exhalation through the right nostril while keeping the left nostril closed for 6 seconds was conducted (Jahan et al., 2021; Crumpler, 2023).
- After the completion of the explanation, each woman was asked to do it until the researchers ensured that she had mastered it. Also, they were instructed to practice the breathing exercise for 5 minutes three times a day for four weeks.
- The researchers followed up with the women by phone or WhatsApp to see if they had any problems during the follow-up.

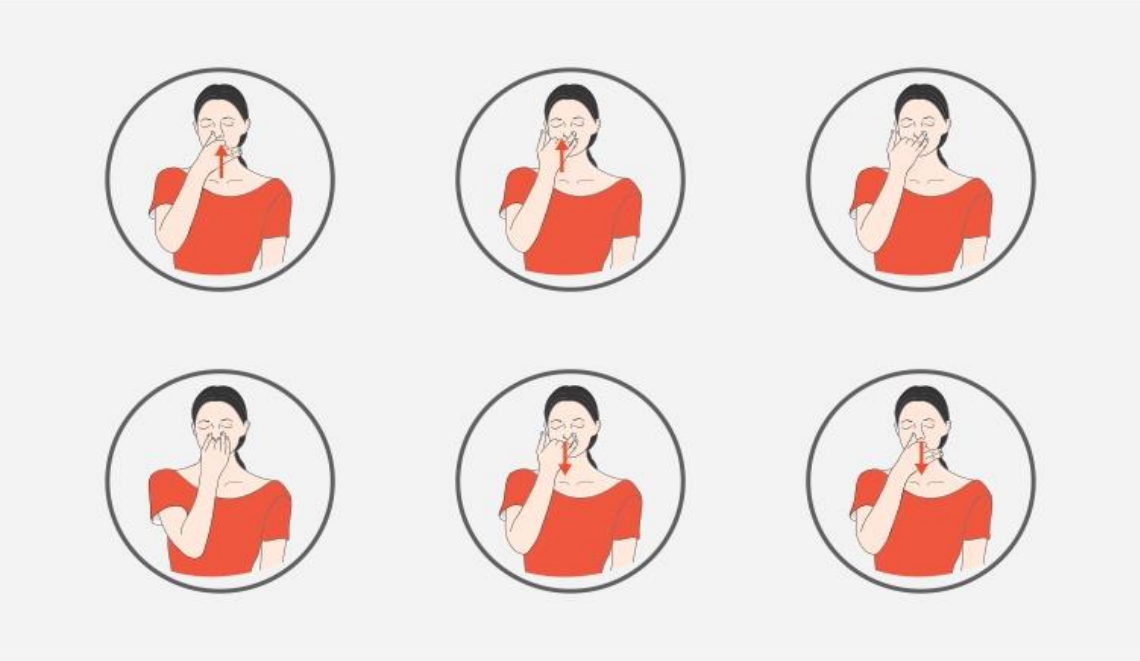

Figure (2): Steps of ANB

Source: https://www.medanta.org/patient-education-blog/breathing-exercises-to-be-performed-during-covid-19

Evaluation:

- The researcher re-evaluated fatigue level and quality of sleep pattern for both groups after four weeks by using tool (II) and (III). The effect of an Alternate Nostril Breathing Exercise on fatigue and quality of sleep pattern was determined by comparing the mean score of fatigue and quality of sleep pattern scale between the two groups before and after the intervention.
- The duration of the data collection spanned a total of six months, commencing in the early days of June and concluding at the termination of November in the year 2023.

Statistical analysis:

Data were inputted into the computer, and the analysis was conducted using version 23.0 of the IBM SPSS software package. The examination of the variable distribution for normality was conducted using the Shapiro-Wilk test, and group comparisons for categorical variables were evaluated through the Chi-square test (Monte Carlo). In cases of regularly distributed quantitative variables, comparisons between the two groups were made utilizing the student t-test. The Test for Marginal Homogeneity is employed to investigate the significance of alterations in ordinal data between two points in time: before and after, and for normally distributed quantitative variables, the significance of changes in each group's before and after was examined using the paired t test. The acquired results were deemed significant at the 5 level.

Results:

Table (1) shows that 53.3% of the control group was under 25 years old compared to 31.1% of the study group was 25 to less than 30 years old, with a mean age of 25.0±2.6 years in the control group and 25.7±2.55 years in the study group. Moreover, 53.3% & 68.9% of the latter and the former groups correspondingly were housewife. Concerning level of education, 44.4% & 40% of both groups had secondary and university education respectively. The table also showed that 68.9% & 75.6% of the last and the follow groups respectively lived in an urban area. No statistically significant differences were found between the two groups' socio-demographic characteristics.

Table (2) displays the distribution of the study participants according to reproductive history. It was observed that majority of the participants in both groups had 1- 3 pregnancies and deliveries; about 77.8% of the control group had no abortion compared to 82.2% of the study group. In addition, 68.9% of the both groups had no previous pregnancies complications.

Table (3) clarifies the distribution of the two groups according to present pregnancy profile. Concerning gestational age, 68.9% & 71.1% of both control and study groups were between 27-30 weeks respectively, with mean weeks of gestation for the latter and former groups were 29.1±2.2& 29.4±1.6 respectively. Moreover, 55.6% of the control group assumed 4-5 antenatal follow up visits compared to 44.4% of the ANB group, with mean follow-up visits was 3.77±1.06 and 3.80±1.34 for the last and follow groups respectively. Finally, there no statistically significant differences were found between the two groups according to present pregnancy profile.

Table (4) demonstrates comparison of the study and control groups according to the sleep quality. It was observed that the majority (91.1%) of the ANB group had no difficulty with sleep quality after intervention, compared to none (0%) of the control group. The mean score of sleep quality was 15.22±2.62 in the control group compared to 8.6±2.5 in the ANB group after the intervention. The relationship was found to be highly statistically significant among the ANB group before and after intervention ($p<0.001$). In addition, there was a highly statistically significant difference between the study and the control groups after intervention ($p<0.001$).

Table (5) It was clarified that more than half (55.6%) of the ANB group had mild fatigue compared to 75.6% of the control group. The mean level of fatigue in the control group before was 36.0±3.2 and after was 36.73±4.47 compared to 34.8±3.9 for participants before intervention in the study group and after was 30.9±3.3. That is, highly statistically significant was revealed among the ANB group before and after intervention ($p<0.001$). Finally, there was a highly statistically significant difference between the two groups after intervention ($p<0.001$).

Table (1): Distribution of the study groups according to their socio-demographic data

Socio-demographic data	Control group (n=45)		Study group (n=45)		Test of sig.	p
	No.	%	No.	%		
Age (years)						
<25	24	53.3%	14	31.1%	χ^2= 4.555	0.103
25 - <30	17	37.8%	25	55.6%		
30≤	4	8.9%	6	13.3%		
Mean ± SD	25.0±2.6		25.7±2.55		t = 1.356	0.178
Occupation						
Housewife	24	53.3%	31	68.9%	χ^2= 2.669	^{MC}p = 0.254
A working	21	46.7%	14	31.1%		
Educational level						
No read and write	0	0.0%	0	0.0%	χ^2= 0.211	0.900
Preparatory education	7	15.6%	7	15.6%		
Secondary education	20	44.4%	18	40.0%		
University education	18	40.0%	20	44.4%		
Marital status						
Married	45	100%	45	100%	-	-
Residence						
Urban	31	68.9%	34	75.6%	χ^2= 0.498	0.480
Rural	14	31.1%	11	24.4%		

χ^2: Chi square test MC: Monte Carlo t: Student test
SD: Standard deviation p:p value for the comparison between the two group

Table (2): Distribution of the study and control groups according reproductive history

Reproductive history	Control group (n=45)		Study group (n=45)		Test of sig.	p
	No.	%	No.	%		
Number of pregnancies						
Once	15	33.3%	16	35.6%		
Twice	15	33.3%	15	33.3%	□□=	MCp =
Three times	14	31.1%	13	28.9%	0.354	1.000
Four times or more	1	2.2%	1	2.2%		
Number of abortions						
None	35	77.8%	37	82.2%		
Once	10	22.2%	8	17.8%	□□=	0.598
Twice	0	0.0%	0	0.0%	0.279	
Three times or more	0	0.0%	0	0.0%		
Parity	(n=35)		(n=37)			
Once	12	34.3%	14	37.8%		
Twice	13	37.1%	13	35.1%	□□=	0.977
Three times	10	28.6%	9	24.3%	1.138	
Four times or more	0	0.0%	1	2.7%		
Occurrence of previous pregnancies complications						
No	31	68.9%	31	68.9%	□□= 0.0	1.000
Yes	14	31.1%	14	31.1%		

χ^2: Chi square test MC: Monte Carlo p: p value for the comparison between the two groups.

Table (3): Distribution of the study participants according to present pregnancy profile

Present pregnancy profile	Control group (n=45)		Study group (n=45)		Test of sig.	p
	No.	%	No.	%		
Weeks of gestation						
27-30 weeks	31	68.9%	32	71.1%	χ^2= 0.053	0.818
31-33 weeks	14	31.1%	13	28.9%		
Mean ± SD	29.1±2.2		29.4±1.6		t =0.717	0.475
Antenatal visits						
2 – 3	16	35.6%	18	40.0%	χ^2= 1.491	0.471
4 – 5	25	55.6%	20	44.4%		
6+	4	8.9%	7	15.6%		
Mean ± SD	3.77±1.06		3.80±1.34		t = 0.086	0.932

χ^2: Chi square test MC: Monte Carlo t: Student t-test SD: Standard deviation
p: p value for the comparison between the two group

Table (4): Comparison of the study and control groups according to sleep quality

Sleep Quality	Control group (n=45)				Study group (n=45)				Test of sig. study vs control	
	Pre		Post		Pre		Post			
	No.	%	No.	%	No.	%	No.	%	Before	After
No difficulty (0-13)	0	0.0%	0	0.0%	0	0.0%	41	91.1%		
Mild difficulty (13-25)	35	77.8%	38	84.4%	34	75.6%	4	8.9%	χ^2=0.062, p= 0.803	χ^2=51.607*, p<0.001*
Sever difficulty (26-38)	10	22.2%	7	15.6%	11	24.4%	0	0.0%		
MH	0.317				<0.001*					
Mean ± SD	15.0±3.2		15.22±2.62		14.6±3.0		8.6±2.5		t = 0.537, p =0.593	t = 12.241*, p<0.001*
p_0	0.612				<0.001*					

χ^2: Chi square test for comparing the two groups
t: Student t-test for comparing the two groups
MH: Marginal Homogeneity Test for comparing between pre and post in each group
P_0: p value for Paired t test for comparing between pre and post in each group
* Statistically significant p-value at ≤0.05

Table (5): Comparison of the study and control groups according to level of fatigue

Level of Fatigue	Control group (n=45)				Study group (n=45)				Test of sig. study vs control	
	Pre		Post		Pre		Post			
	No.	%	No.	%	No.	%	No.	%	Before	After
No fatigue (11-29)	2	4.4%	2	4.4%	0	0.0%	20	44.4%		
Mild fatigue (30 – 39)	36	80.0%	34	75.6%	37	82.2%	25	55.6%	χ^2= 1.499, ^{MC}p= 0.508	χ^2=25.100*, ^{MC}p<0.001*
Sever fatigue (40-55)	7	15.6%	9	20.0%	8	17.8%	0	0.0%		
MH	0.414				<0.001*					
Mean ± SD	36.0±3.2		36.73±4.47		34.8±3.9		30.9±3.3		t = 1.590, p = 0.116	t = 7.054*, p<0.001*
p_0	0.156				<0.001*					

χ^2: **Chi square test** for comparing the two groups **Monte Carlo**

t: Student t-test for comparing the two groups

MH: Marginal Homogeneity Test for comparing between pre and post in each group

P_0: p value for Paired t test for comparing between pre and post in each group

* Statistically significant p-value at ≤0.05

Discussion

Alternate nostril breathing, a common yogic technique, entails breathing through one nostril while manually closing the other, offering various benefits such as improved cardiac function and stress relief **(Ghiya, S., 2017).** This exercise is both cost-effective and beneficial for overall health and fitness, without requiring special equipment or significant time investment. It aids in purifying both the body and the mind, enhancing cognitive acumen, and attenuating the effects of aging (**Ghiya, S., 2017**).

ANB is one of the best and easiest breathing exercises. The efficacy of alternate-nostril breathing is supported by research showing improvements in attention, blood pressure, as well as reductions in fatigue, anxiety, and stress

(Crumpler et al., 2023; Crumpler & Barrell, 2022). So the present study investigated the effect of an alternate nostril breathing exercise on fatigue and quality of sleep pattern among pregnant women in the third trimester.

The results of the present study clarify that more than two-thirds of the study groups were housewives and less than half of them had university education. The findings of the current study are consistent with those of **Jannah & Rahmawati (2023)** who reported that the respondents' most dominant education was university level and in terms of profession, the most dominant was housewife. This study is in line with research ndicating that improper body movements during work and limited time for self-empowerment activities contribute to discomfort during pregnancy and labor preparation **Bjelica A (2018).**

Furthermore, most participants in the study had 1-3 pregnancies and deliveries, similar to the results reported by **Setiawati1 et al. (2020)** showing that a majority of the intervention group were multigravida. However, this finding contrasts with the study by **Azward et al. (2022),** which found

that less than half of the intervention group was multipara.

The findings of the current investigation revealed that the majority of participants in the study group exhibited no difficulties with sleep quality following the intervention. These outcomes are consistent with **Azward et al., (2022),** who noted a significant correlation between prenatal yoga practice and sleep quality improvement in third-trimester pregnant women pre and post-intervention. Most pregnant women experienced enhanced sleep quality after engaging in yoga sessions four times every two weeks (lasting 60–90 minutes per session). Researchers attribute the enhancement of sleep quality in third-trimester pregnant women to the profound sense of relaxation, decreased bodily and mental tension, and increased comfort and confidence in labor preparation.

The current study indicated a highly significant disparity ($p<0.001$) concerning the Pittsburgh Sleep Quality Index (PSQI) between the intervention and control groups post-intervention. Corroborating these findings, previous research suggests that yoga activities raise vagal tone, leading to reduced sympathetic activity and catecholamine levels, thereby mitigating sleep disturbances post yoga breathing exercises. Additionally, the practice of alternate nostril breathing facilitates voluntary regulation of breathing, promoting rhythmic respiration and mental tranquility. This practice alleviates stress, enhances relaxation, boosts vitality, and augments overall health and well-being **(Dhanvijay, Bagade, & Kumar, 2020).** These results align with the findings of **Beddoe et al., (2010),** supporting yoga as a promising therapeutic avenue for enhancing maternal sleep quality and ameliorating potential sleep disruptions during pregnancy.

Moreover, these findings are congruent with the results delineated by **Kaur & Mitra (2018),** indicating a significant discrepancy between pre-test and post-test mean PSQI scores, suggesting a notable association between breathing exercises and sleep quality. Consequently, breathing exercises emerge as efficacious non-pharmacological interventions for enhancing sleep quality during pregnancy.

It was noted that a considerable proportion of participants in the study group experienced mild fatigue post-intervention. This discovery mirrors the findings of Dhungel (2013), highlighting that the practice of alternate nostril breathing diverts attention from worldly concerns, fostering reduced stress levels. This diversion may lead to decreased adrenaline secretion, consequently lowering sympathetic activity and resulting in diminished heart rate, respiratory rate, blood pressure, and ultimately fatigue. **Jahan et al., (2021)** further support these results by demonstrating that alternate nostril breathing bolsters cardiorespiratory and autonomic functions, thereby aiding in mitigating anxiety, stress, and fatigue.

According to the current investigation, there was a highly significant difference ($p<0.001$) in the Iowa Fatigue Scale (IFS) following intervention between the study and control groups. The present study's results align with those of **Mamta Amola et al. (2019),** who reported that following an intervention for four weeks, a comparison between groups revealed significant differences ($p<0.05$) in fatigue and concluded that the inspiratory muscle training (IMT) group had significantly improved compared to the diaphragmatic group. **Alokayli, Alkhaldi, and Bin Shehan (2018)**, corroborated these recent findings by reporting a statistically significant improvement in the post-intervention fatigue score in the inspiratory muscle training (IMT) group when compared

to the deep breathing exercises (DBE) group. They also recommended incorporating IMT into the rehabilitation protocol during this stage of pregnancy.

Conclusion

Based on the findings of the aforementioned research, it has been established and proposed that the use of alternate nostril breathing exercises during the third trimester of pregnancy can effectively improve sleep quality and reduce fatigue in pregnant women, based on the findings of the abovementioned studies. It has proved to be both simple and cost effective, making it an ideal choice to implement. By doing so, individuals are able to restore their physical and mental condition in order to foster wellbeing and healthy physical fitness.

Recommendations:

Based on the findings of the current study, the following recommendation was derived and suggested:

- As part of prenatal care, it is recommended that pregnant women incorporate alternate nostril breathing exercises as a safe, non-pharmacological strategy that can improve sleep patterns and increase levels of weariness.
- It is crucial to increase the awareness of pregnant women about the benefits of practicing an alternate nostril breathing exercise.
- It is essential that nursing staff members obtain the necessary training to perform an alternate nostril breathing exercise and incorporate it into prenatal care.
- More researchs is needed to determine whether breathing exercises with alternative nostrils can help pregnant women in the first and third trimesters of their pregnancy feel less fatigued and have better sleep patterns.

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