# Effect of Alternate Nostril Breathing Exercise on Reducing Anxiety and Blood Pressure among Pre-eclamptic Women

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## Abstract

The current study aimed to explore the effect of alternate nostril breathing exercise on reducing anxiety and blood pressure among pre-eclamptic women. **Materials and method:** A quasi-experimental pre-posttest design was used. The study was carried out at Obstetrics and Gynecology outpatient clinic, Mansoura University. A non-probability purposive sample of 63 pregnant women diagnosed with preeclampsia, had one viable fetus recruited to participate in the study. Data was collected through Structured interview Schedule, The Korean version of the State-Trait Anxiety Inventory, and Tool to quantify the dependent variables, such as HR and BP. **Results:** There was a significant difference between pre and post-test results in favor of post-intervention. However, following the intervention, there was a drop in heart rate, blood pressure, and anxiety levels. Also, there were highly statistically significant differences between different times of intervention (Pre, Immediate post, One week post and 4 weeks post) regarding SBP, DBP, Pulse rate and STAI ($p< 0.001$). There was a positive correlation between anxiety and SBP, DBP in addition to Pulse rate ($r= 0.292$ & $p= 0.020$), ($r= 0.377$ & $p= 0.002$) and ($r= 0.329$ & $p= 0.008$) respectively. **Conclusion:** The results of the present research demonstrated that practicing breathing through both nostrils exercise was beneficial in lowering anxiety, and blood pressure. It's a simple, socially acceptable, safe method that doesn't need any training or preparation. **Recommendations**: Alternate nostril breathing highly recommended to incorporate it into pre-eclamptic women's routine care.

**Keywords:** Alternate Nostril Breathing, Anxiety, Blood pressure, Pre-eclamptic women.

## Introduction

After twenty weeks of pregnancy, a previously normotensive woman may develop hypertension, which is indicative of a multi-systemic syndrome called pre-eclampsia, together with proteinuria (caused by kidney issues) or, in the absence of proteinuria, signs and symptoms suggestive of damage to a target organ. a disorder associated with elevated blood pressure that usually manifests after the 20$^{th}$ week of pregnancy. Preeclampsia can impact the mother's kidney, liver, and brain in addition to the placenta. Several organs, such as the pancreas, liver, kidneys, heart, lungs, and brain, are involved in the clinical symptoms **(Bartsch, Medcalf, Park, Ray, 2021)**.

Preeclampsia typically has no symptoms; however, it can occasionally

cause headaches, seizures, impaired vision, and stomach pain. Nulliparity, or the first pregnancy with a new partner, multiple pregnancies, body mass index greater than thirty, and maternal age greater than thirty-five are risk factors. Placental abruption necessitating a cesarean section birth is one of the sequelae. These issues could negatively impact the mother and the fetus. They could cause intrauterine growth restriction, hypoperfusion in the placenta, early disruption of the placenta, and, in the worst situations, pregnancy termination and the death of both the mother and the Fetus **(Stacey et al., 2020)**.

In women with pre-eclampsia, anxiety is a prevalent issue that is linked to a lower quality of life and return to work, as well as a higher risk of death. The National Health Examination Follow-Up Study's findings showed that people with depressive affect at baseline had a 50% higher risk of dying from heart disease at the 12-year follow-up point **(Kawachi, et al., 2020)**.

Circulation, breathing, and the function of essential organs are all directly impacted by hypertension. Complementary therapies also have a direct impact on mental and physical health, such as breathing exercises using different nostrils. As a result, alternating nostril breathing exercises promote prophylactic, preventative, and therapeutic actions while assisting in the maintenance of normal blood pressure. A useful component of the healthcare system is alternative therapy for nurses. Its primary foundations are the advancement, upkeep, defense, and recovery from illnesses. One of the methods that is non-pharmacological is breathing exercises. By activating the vagus nerve and the major nerve of the parasympathetic nervous system, alternate nostril breathing exercises assist to drop blood pressure, slow heart rate, relax the body, mind and lessen anxiety. **(Ttryambake., 2021)**.

**Significance of the study**

Higher rates of maternal, fetal, and newborn death as well as severe morbidity are linked to hypertensive disorders; this is particularly true in cases of hemolysis, severe pre-eclampsia, eclampsia, and low platelet levels (HELLP) syndrome. In prosperous countries, the incidence of eclampsia has remained rather steady, ranging from 1.6 to 10 instances per 10,000 deliveries. The incidence, however, varies greatly among poor nations, ranging from 6 to 157 cases per 10,000 deliveries. Thus, eclampsia continues to be a global issue even though its prevalence is decreasing in the developed world **(Emam & Saber, 2022)**.

Pregnancy-related hypertensive diseases are a global public health concern. Preterm and small for gestational age deliveries, as well as higher rates of maternal death, perinatal mortality, and morbidity, were linked to preeclampsia and eclampsia, according to international research. Compared to women without hypertensive disorders of pregnancy, women with high diastolic blood pressure (HDP) had a five-fold increased risk of perinatal death. Ten percent of pregnancies are complicated by pregnancy-induced hypertension. An estimated 40,000 women, primarily from developing nations, pass away from

eclampsia or preeclampsia every year. In underdeveloped nations, preeclampsia is thought to be the only cause of between 40% and 60% of maternal mortality. A study carried out at a South African hospital revealed that HDP was responsible for 20.7% of maternal fatalities in the nation. Pregnancy-related hypertension issues are responsible for 19% of maternal mortality in Ethiopia **(Berhe, Kassa, Fekadu, & Muche, 2022)**.

It has been shown that the best technique for reducing anxiety and blood pressure in women with hypertension is alternate nostril breathing (ANB). Hypertension is treated with anti-hypertensive drugs and lifestyle modifications **(Amandeep, Preksha & Divya, 2019)**. Few studies have been done in Egypt thus far to examine how ANB exercise affects hypertension patients' blood pressure and pulse.

**Operational definition:**

**Alternate Nostril Breathing Exercise:** means to firmly close the mouth and pinch the nose. Breathe through the nose and slowly nod head while trying to hold breath as long as canning. Try to maintain a relaxed breathing pattern. Give it two minutes before doing the workout again.

**Aim of the study:**

This study aimed to explore the effect of alternate nostril breathing exercise on reducing anxiety and blood pressure among pre-eclamptic women.

**Hypothesis of the study:**

**H1.** When pre-eclamptic women do alternate nostril breathing exercises, their blood pressure measurements will significantly change.

**H2.** After doing Alternate Nostril Breathing techniques, pre-eclamptic women will experience a significant reduction in anxiety.

**Research design:**

Achieving the study's goal of determining the impact of the independent variable - nostril breathing exercise - on the dependent variables - anxiety and blood pressure among pre-eclamptic women - a quasi-experimental with a single group pre-post-test design technique was employed. These designs, which test arbitrary hypotheses, resemble experimental designs. Usually, It is used to assess how an ongoing program is affecting several output or result measures. It has two features: a pre- and post-test that compares findings at the same time **(Corbin & Strauss, 2009)**.

**Study Setting:**

The outpatient clinic for obstetrics and gynecology served as the source of the study sample, Mansoura University, Egypt from September, 2023 to February 2024, where the directions for nostril breathing exercise were given and the study sample was gathered from (outpatient clinics comprised three examination rooms for 4D ultrasound and ordinary assessment, a laboratory, a waiting space for patients, and reception) where the studied subjects were assessed for study outcomes. Pre-eclamptic women use

their services at a higher flow rate, which is the reason this setting was chosen.

**Sampling**

Over the course of five months, 63 pregnant women diagnosed with preeclampsia, had one viable fetus, and willing to be a part of the study were recruited to participate in the study as a non-probability purposive sample and excluded women with kidney and cardiac diseases.

**Sample size:**

With a power of study 80% and a level of significance of 5% based on data from the literature **(Pal et al., 2019)**, the sample size can be computed using a formula as follows.:

$$\mathbf{n} = \frac{(\mathbf{Z\alpha/2 + Z\beta})\text{^}\mathbf{2} \times \mathbf{2}(\mathbf{SD})\text{^}\mathbf{2}}{\boldsymbol{d}\text{^}\mathbf{2}}$$

Where, SD = standard deviation obtained from previous study; $Z_{\alpha/2}$, for 5% this is 1.96; $Z_{\beta}$, for 80% this is 0.84 and d, for the expected difference. Therefore,

$$\mathbf{n} = \frac{(\mathbf{1.96 + 0.84})\text{^}\mathbf{2} \times \mathbf{2}(\mathbf{6.38})\text{^}\mathbf{2}}{(\mathbf{3.2})\text{^}\mathbf{2}} = 62.3$$

The equation above indicates that 63 is the necessary sample size.

**Tools of data collection:**

Three instruments were employed in this study to accomplish its goal.

**Tool one: Structured interview Schedule**, after examining relevant literature, the researchers created the tool, which had two parts:

**Part 1: Demographic Data:** It is designed to evaluate the overall features of pregnant women, such as their age and educational level, residence, occupation, height, weight and body mass index.

**Part 2: Obstetric Data** such as gestational age, number of gravidity, number of parity, number of abortion ,number of children, pervious pregnancy preeclampsia and family history of hypertension.

**Tool two: The Korean version of the State-Trait Anxiety Inventory, Trait Version (KSTAIT, 1983)**

The components of this anxiety scale are very appropriate for psychometrics and internally consistent **(Spielberger, 1983)**. The tool has 20 Likert-scale items, each with a rating between 1 and 4. Higher scores on the thirteen items reflect greater anxiety, according to the way they are constructed. To lessen the impact of compliance, the remaining seven elements need to be inverted because they are negatively weighted.

Tests of the tool's reliability and item-level consistency showed that it had sufficient internal consistency, with a Cronbach alpha of 0.89 for the overall scale.

**Tool three:** A tool for quantifying dependent variables such as pulse rate and BP. The researchers created the tool. The stethoscope and the mercury Sphygmomanometer were used to take the patient's blood pressure. The auscultation approach involves placing

a stethoscope on the upper right limb's artery. The one-minute palpation technique used to measure the heartbeats in the right radial artery.

**Validity and reliability of tool:** A panel of three experts in the fields of obstetrics and maternity nursing verified the tool's content validity before it was given to pregnant women who were skilled in creating such instruments and made the appropriate modifications. The reliability of the tool is evaluated using Cronbach alpha and test-retest measures. Cronbach alpha (r.alpha) =.878 and ranged from r = 0.90 to r = 0.97.

**Pilot study:**

The applicability, clarity, and efficacy of the tools were assessed in a pilot study that was carried out on 10% (6 participants) of the total sample size in compliance with the selection criteria prior to the beginning of data collection. None of the respondents from the pilot research were included in the study sample.

**Ethical considerations:**

The University of Mansoura's Faculty of Nursing's Research Ethics Committee provided ethical consent with reference number (0538). After the study's purpose and methodology were made clear to all participants, written consent was acquired from everyone. Data confidentiality and privacy were safeguarded. Furthermore, the gathered information did not touch on the clients' moral or religious beliefs.

**Field work:**

The study will be carried out in three stages: preparation, implementation, and outcome evaluation.

**A. Preparatory phase:**

Revising the literature to determine whether alternate nostril breathing exercises can lower blood pressure and anxiety in pre-eclamptic women (using the books, periodicals, and online resources that are available) in order to familiarize oneself with the various facets of the research problem and to set up the instruments that will be needed for data collection. The purpose of the pilot research is then to evaluate the tools' usability and clarity.

**B. Implementation phase**

**The initial assessment:**

During this phase, a researcher conducted interviews with women to elucidate the purpose of the study, verify their eligibility, and obtain their consent for participation. Subsequently, the researcher finished gathering the interview schedule data. The body mass index (BMI) of the individuals was calculated by measuring their height and weight during three daily interviews in the research setting (Sunday, Tuesday, and Wednesday). Each interview with a subject lasted roughly 20 to 30 minutes, and blood pressure (BP) was measured using the automatic non-invasive BP monitor. Anxiety level was measured using the KSTAIT scale.

**Implementation phase:**

**Intervention:**

Each pregnant woman was told to adopt a sitting position and adhere to the guidelines listed below:

- Maintain a stable, easy posture with head, neck, and trunk upright and in a straight line while sitting in a peaceful, quiet, roomy area, and body should remain motionless.
- Raise the right hand to the nose and fold the middle and index fingers such that the ring finger closes the left nostril and the thumb closes the right (Vishnu Mudra).
- Close right nostril with the thumb, and then fully exhale out of left nostril. Exhaling should be deliberate, fluid, and free of force or jerkiness.
- When the exhale comes to a finish, cover left nostril with ring finger, open right nostril, and take a slow, deep breath in. The duration of the inhale and exhale should be the same, controlled, and smooth.
- Repeat this cycle of closing left nostril with ring finger while exhale entirely through left nostril and inhaling through right nostril.
- After exhaling, close right nostril and take a breath through left nostril, repeating the process twice more.
- In summarize, one exercise involved three repetitions of exhaling through the left nostril and inhaling through the right, then three repetitions of exhaling through the right nostril and inhaling through the left, and this was done for around fifteen minutes.
- The women are instructed to perform ANB therapy for four weeks, 2 times a day/ for 15 minutes in each therapy
- Women should follow doctor orders related to their prescribed drug and low salt diet with nostril breathing exercise.

**Outcome evaluation**

As consequently, all woman was undergo three recordings at varying times: the first recording was occurred right after the intervention, the second recording was occur after one week, and the third recording was occurred after four weeks. The woman has been advised to record her anxiety level and blood pressure on the provided sheet and to preserve it until her next visit.

**Statistical analysis**

The SPSS software, version 20.0, was used to analyze all of the data on Windows. The continuous data variables displayed a normal distribution and were expressed as the arithmetic mean ± standard deviation (SD). Variables holding categorical data were described using percentages and frequencies. Student's t test for independent variables was used to compare means. The Chi-square test was used to compare the frequencies. A statistically significant P value is less than 0.05.

**Results:**

Table (1) shows that 28.6% of the studied women aged from 18 to 23 years with a mean (32.3 ±10.3). The results clarified that 50.8% of them had a university degree and 76.2% of them lived in rural areas. Regarding physical characteristics, the weight of 47.6% of the studied women ranged from 70 to 90 K.G. while the height of 79.4% of them ranged from 150 to 170 CM and their body mass index was normal.

Table (2) clears that 54% of the studied women gave the last birth between 37 to 40 weeks gestation with no history of abortion. The results portrayed that 42.9% of them were gravida 2 while 31.7% of them were para 2 and 41.3% of them had two lived children. Moreover, 23.8% and 55.6% of studied women had previous pregnancy preeclampsia and family history of hypertension respectively.

Table (3) reveals that there were highly statistically significant differences between different times of intervention (Pre, Immediate post, One week post and 4 weeks post) regarding SBP, DBP, Pulse rate and STAI ($p< 0.001$).

Table (4) finds that there was a positive correlation between anxiety and SBP, DBP in addition to Pulse rate ($r= 0.292$ & $p= 0.020$), ($r= 0.377$ & $p= 0.002$) and ($r= 0.329$ & $p= 0.008$) respectively.

Table (5) presents that there was a statistically significant association between occupation of studied women and their DBP ($P=0.017$*).

Table (6) explains that there was a statistically significant association between number of parity and Family history of hypertension with Pulse rate ($P=0.018$).

**Table 1.** Distribution of studied women according to their demographic data.

| | N= 63 | % |
|---|---|---|
| **Age (Years)** | | |
| 18 – >23 | 18 | 28.6 |
| 23 – > 30 | 14 | 22.2 |
| 30 – >35 | 16 | 25.4 |
| 35 – 46 | 15 | 23.8 |
| **Mean ±SD** | 32.3 ±10.3 | |
| **Educational Level** | | |
| Illiterate | 10 | 15.9 |
| Secondary education | 16 | 25.4 |
| University | 32 | 50.8 |
| Postgraduate | 5 | 7.9 |
| **Occupation** | | |
| Working | 23 | 36.5 |
| Housewife | 40 | 63.5 |
| **Residence** | | |
| Rural | 48 | 76.2 |
| Urban | 15 | 23.8 |
| **Weight (K.G.)** | | |
| < 70 | 9 | 14.3 |
| 70 – 90 | 30 | 47.6 |
| > 90 | 24 | 38.1 |
| **Height (CM)** | | |
| < 150 | 11 | 17.5 |
| 150 – 170 | 50 | 79.4 |
| > 170 | 2 | 3.2 |
| **BMI** | | |
| Underweight | 10 | 15.9 |
| Normal | 50 | 79.4 |
| Overweight | 3 | 4.7 |

BMI = Body Mass Index

**Table 2.** Distribution of studied women regarding to their obstetric history.

| | N=63 | % |
|---|---|---|
| **Gestational age (Weeks)** | | |
| < 37 | 18 | 28.6 |
| 37 – 40 | 34 | 54.0 |
| > 40 | 11 | 17.5 |
| **Number of gravidity** | | |
| One | 4 | 6.3 |
| Two | 27 | 42.9 |
| Three | 12 | 19.0 |
| More than three | 20 | 31.7 |
| **Number of parity** | | |
| One | 20 | 31.7 |
| Two | 20 | 31.7 |
| Three | 13 | 20.6 |
| More than three | 10 | 15.9 |
| **Number of abortions** | | |
| None | 34 | 54.0 |
| One | 8 | 12.7 |
| Two | 8 | 12.7 |
| Three | 7 | 11.1 |
| More than three | 6 | 9.5 |
| **Number of children** | | |
| None | 3 | 4.8 |
| One | 20 | 31.7 |
| Two | 26 | 41.3 |
| Three | 9 | 14.3 |
| More than three | 5 | 7.9 |
| **Previous pregnancy pre-eclampsia** | | |
| No | 48 | 76.2 |
| Yes | 15 | 23.8 |
| **Family history of hypertension** | | |
| No | 28 | 44.4 |
| Yes | 35 | 55.6 |

**Table 3.** Comparison of blood pressure readings, pulse rate and anxiety through Pre, Immediate post, One week post and 4 weeks post intervention N=63

| | **Pre – intervention** | **Immediate post intervention** | **One week post intervention** | **4 weeks post intervention** | **Oneway ANOVA** | |
|---|---|---|---|---|---|---|
| | **Mean ±SD** | **Mean ±SD** | **Mean ±SD** | **Mean ±SD** | **F** | **P** |
| SBP | 149.2 ±22.3 | 137.3 ±17.8 | 131.4 ±16.2 | 125.4 ±14.9 | 20.009 | <0.001** |
| DBP | 97.5 ±27.7 | 89.7 ±18.2 | 85.7 ±12.1 | 81.8 ±8.6 | 8.601 | <0.001** |
| Pulse rate | 82.5 ±16.5 | 78.1 ±12.9 | 75.8 ±10.9 | 73.6 ±9.2 | 5.685 | <0.001** |
| STAI | 60.9 ±11.0 | 51.6 ±10.3 | 46.9 ±9.8 | 42.2 ±9.1 | 39.560 | <0.001** |

SBP=Systolic Blood Pressure DBP=Diastolic Blood Pressure STAI= State-Trait Anxiety Inventory

P < 0.05* statistically significant P<0.001** highly statistically significant

**Table 4.** Correlation between Anxiety with blood pressure readings and pulse rate N=63

| | **Anxiety** | |
|---|---|---|
| | **r** | **p** |
| SBP | 0.292 | 0.020* |
| DBP | 0.377 | 0.002* |
| Pulse rate | 0.329 | 0.008* |

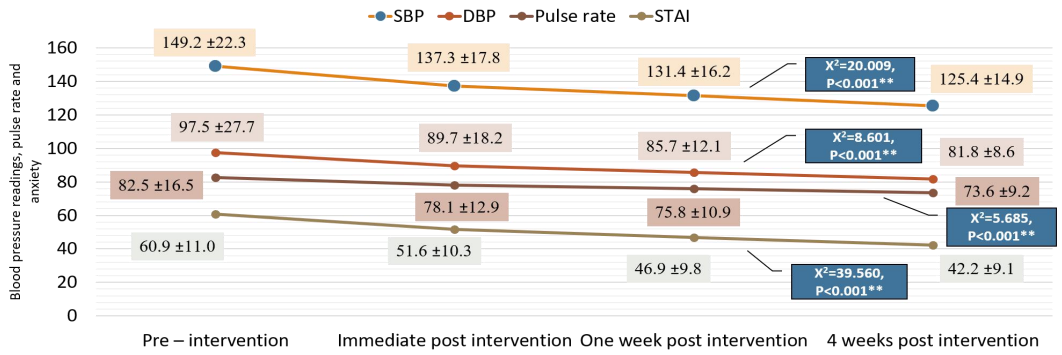


**Figure 1.** Comparison of blood pressure readings, pulse rate and anxiety

**Table 5.** Association between demographic characteristics of studied women and blood pressure readings, pulse rate and anxiety N=63

| | SBP | DBP | Pulse rate | STAI |
|---|---|---|---|---|
| | Mean ±SD | Mean ±SD | Mean ±SD | Mean ±SD |
| **Age (Years)** | | | | |
| 18 – 23 | 128.1 ±14.6 | 80.2 ±8.8 | 75.5 ±8.3 | 45.2 ±8.8 |
| 24 – 29 | 124.1 ±15.7 | 84.1 ±6.0 | 73.2 ±7.6 | 38.5 ±7.6 |
| 30 – 35 | 121.6 ±13.0 | 82.6 ±9.1 | 69.0 ±9.2 | 42.9 ±11.6 |
| 36 – 46 | 127.4 ±16.8 | 80.6 ±9.9 | 76.1 ±10.2 | 41.3 ±6.9 |
| One way ANOVA | F=0.647, P=0.588 | F=0.703, P=0.554 | F=2.117, P=0.108 | F=1.536, P=0.215 |
| **Educational Level** | | | | |
| Illiterate | 125.9 ±14.9 | 83.9 ±9.0 | 69.3 ±9.9 | 37.6 ±8.0 |
| Secondary education | 127.2 ±14.9 | 81.8 ±9.0 | 74.3 ±9.8 | 43.4 ±9.4 |
| University | 121.5 ±14.5 | 79.9 ±8.2 | 74.4 ±8.1 | 41.6 ±8.2 |
| Postgraduate | 125.2 ±18.2 | 83.4 ±6.8 | 74.2 ±5.5 | 45.2 ±10.7 |
| One way ANOVA | F=0.518, P=0.672 | F=0.514, P=0.674 | F=0.831, P=0.482 | F=1.278, P=0.290 |
| **Occupation** | | | | |
| Working | 126.1 ±17.1 | 85.1 ±7.6 | 72.1 ±9.6 | 42.2 ±8.6 |
| Housewife | 125.0 ±13.7 | 79.9 ±8.6 | 74.3 ±8.8 | 42.2 ±9.4 |
| Student's T – Test | T=0.277, P=0.783 | T=2.445, P=0.017* | T=0.897, P=0.373 | T=0.028, P=0.978 |
| **Residence** | | | | |
| Rural | 126.6 ±14.9 | 81.1 ±8.8 | 74.0 ±9.0 | 41.8 ±8.8 |
| Urban | 121.7 ±14.5 | 83.9 ±7.7 | 71.7 ±9.7 | 43.4 ±10.1 |
| Student's T – Test | T=1.115, P=0.269 | T=1.117, P=0.268 | T=0.854, P=0.397 | T=0.596, P=0.554 |
| **Weight (K.G.)** | | | | |
| < 70 | 126.8 ±16.3 | 81.0 ±11.7 | 71.6 ±10.5 | 38.9 ±7.4 |
| 70 – 90 | 125.1 ±15.1 | 81.3 ±7.4 | 72.2 ±9.7 | 43.2 ±9.0 |
| > 90 | 125.2 ±14.7 | 82.7 ±9.0 | 75.8 ±7.6 | 42.1 ±9.8 |
| One way ANOVA | F=0.044, P=0.957 | F=0.226, P=0.799 | F=1.307, P=0.278 | F=0.789, P=0.459 |
| **Height (CM)** | | | | |
| < 150 | 115.9 ±8.8 | 81.5 ±8.5 | 74.8 ±10.0 | 42.8 ±10.3 |
| 150 – 170 | 127.5 ±15.5 | 81.7 ±8.8 | 73.2 ±9.1 | 42.3 ±8.9 |
| > 170 | 124.5 ±3.5 | 85.0 ±0.1 | 73.5 ±4.9 | 36.0 ±8.5 |
| One way ANOVA | F=2.920, P=0.062 | F=0.143, P=0.867 | F=0.138, P=0.871 | F=0.485, P=0.618 |
| **BMI** | | | | |
| Underweight | 126.2 ±15.5 | 80.7 ±11.0 | 72.2 ±10.1 | 38.9 ±6.9 |
| Normal | 125.3 ±15.3 | 81.8 ±8.3 | 73.9 ±9.2 | 42.7 ±9.2 |
| Overweight | 124.3 ±2.5 | 85.3 ±0.6 | 71.7 ±4.7 | 43.7 ±14.6 |
| One way ANOVA | F=0.023, P=0.978 | F=0.329, P=0.721 | F=0.196, P=0.823 | F=0.782, P=0.462 |

**Table 6.** Association between the obstetric history of studied women and blood pressure readings, pulse rate and anxiety N=63

| | SBP | DBP | Pulse rate | STAI |
|---|---|---|---|---|
| | **Mean ±SD** | **Mean ±SD** | **Mean ±SD** | **Mean ±SD** |
| **Gestational age (Weeks)** | | | | |
| < 37 | 124.9 ±14.7 | 79.6 ±9.0 | 69.3 ±11.1 | 42.7 ±10.5 |
| 37 – 40 | 125.8 ±15.0 | 82.4 ±8.4 | 75.2 ±7.6 | 41.3 ±7.8 |
| > 40 | 125.1 ±16.2 | 83.6 ±8.5 | 75.0 ±8.5 | 43.9 ±10.8 |
| Oneway ANOVA | F=0.022, P=0.978 | F=0.937, P=0.397 | F=2.771, P=0.071 | F=0.375, P=0.689 |
| **Number of gravidity** | | | | |
| One | 124.0 ±8.6 | 82.5 ±10.0 | 72.8 ±12.8 | 44.8 ±13.9 |
| Two | 126.1 ±16.1 | 79.5 ±9.7 | 74.0 ±8.9 | 41.4 ±8.8 |
| Three | 131.3 ±16.2 | 83.2 ±6.3 | 72.2 ±10.3 | 44.0 ±8.3 |
| More than three | 121.3 ±12.8 | 83.9 ±7.6 | 73.7 ±8.6 | 41.7 ±9.3 |
| Oneway ANOVA | F=1.178, P=0.326 | F=1.178, P=0.326 | F=0.123, P=0.946 | F=0.350, P=0.789 |
| **Number of parity** | | | | |
| One | 122.6 ±13.5 | 79.9 ±9.9 | 73.3 ±9.9 | 39.6 ±9.8 |
| Two | 130.0 ±17.0 | 80.3 ±7.9 | 74.8 ±8.2 | 45.2 ±8.2 |
| Three | 126.2 ±14.7 | 84.7 ±6.9 | 67.5 ±8.5 | 43.8 ±8.7 |
| More than three | 120.8 ±12.5 | 84.7 ±8.4 | 79.0 ±6.0 | 39.3 ±8.6 |
| Oneway ANOVA | F=1.204, P=0.316 | F=1.434, P=0.242 | F=3.606, P=0.018* | F=1.823, P=0.153 |
| **Number of abortions** | | | | |
| None | 123.2 ±14.0 | 80.5 ±9.4 | 73.8 ±8.8 | 41.5 ±9.3 |
| One | 130.9 ±15.4 | 81.3 ±9.3 | 74.4 ±7.8 | 45.3 ±7.7 |
| Two | 127.2 ±19.6 | 80.0 ±7.8 | 76.2 ±10.8 | 44.0 ±6.5 |
| Three | 124.8 ±14.6 | 84.5 ±6.1 | 69.0 ±8.5 | 43.6 ±9.6 |
| More than three | 128.9 ±16.5 | 87.1 ±4.3 | 74.0 ±11.9 | 38.9 ±11.4 |
| Oneway ANOVA | F=0.554, P=0.697 | F=1.168, P=0.334 | F=0.630, P=0.643 | F=0.610, P=0.657 |
| **Number of children** | | | | |
| None | 117.7 ±21.9 | 73.7 ±0.6 | 72.7 ±4.0 | 36.7 ±12.5 |
| One | 128.6 ±14.4 | 81.6 ±8.1 | 75.2 ±8.7 | 42.0 ±8.3 |
| Two | 125.5 ±15.9 | 80.5 ±9.5 | 72.4 ±9.4 | 43.5 ±8.4 |
| Three | 120.3 ±12.5 | 86.2 ±6.7 | 76.3 ±10.1 | 43.1 ±9.5 |
| More than three | 125.8 ±12.5 | 86.0 ±7.0 | 67.6 ±9.1 | 37.8 ±13.9 |
| Oneway ANOVA | F=0.675, P=0.612 | F=1.806, P=0.140 | F=1.011, P=0.409 | F=0.718, P=0.583 |
| **Previous pregnancy pre-eclampsia** | | | | |
| No | 126.2 ±15.3 | 81.8 ±8.6 | 73.9 ±9.3 | 42.3 ±8.6 |
| Yes | 122.9 ±13.5 | 81.7 ±8.7 | 72.1 ±8.6 | 41.9 ±10.7 |
| Student's T – Test | T=0.732, P=0.467 | T=0.023, P=0.982 | T=0.690, P=0.493 | T=0.149, P=0.882 |
| **Family history of hypertension** | | | | |
| No | 122.4 ±13.7 | 80.9 ±9.4 | 70.7 ±7.6 | 40.0 ±10.5 |
| Yes | 127.8 ±15.5 | 82.5 ±8.0 | 75.7 ±9.7 | 43.9 ±7.5 |
| Student's T – Test | T=1.428, P=0.158 | T=0.700, P=0.487 | T=2.261, P=0.027* | T=1.727, P=0.089 |

## Discussion

Pre-eclampsia is a pregnancy-related illness characterized by high blood pressure and signs of organ damage, usually to the liver and kidneys. It is characteristically associated with increased anxiety and stress levels. Managing anxiety and blood pressure is crucial for the well-being of pre-eclamptic women and their unborn babies **(Karrar & Hong, 2023)**.

Alternate nostril breathing has been shown to have calming effects on the autonomic nervous system, leading to reduced stress and anxiety in various populations **(Abd El Kader, Ibrahim & Mohamed, 2023)**. So, this study aimed to assess the effect of alternate nostril breathing exercise on reducing anxiety and blood pressure among preeclamptic women.

A total of 63 preeclamptic pregnant women were involved in the research study. According to the study's demographics, the majority of the participants 48 (76.2%) were in the age group of 18-35 years with mean age (32.3 ±10.3), which is corroborated by second research carried out by **Sindhu (2022)** studying the feto-maternal outcome in severe preeclampsia and eclampsia which revealed that 81% of women are in the age group of 21-35 years. The mean age is 26years, the age ranges from 18years- 40years.

A systematic review and meta-analysis study conducted by **Motedayen, Rafiei, Rezaei Tavirani, Sayehmiri & Dousti (2019)** demonstrated that the risk of preeclampsia and body mass index are significantly correlated, which contrasted with our study that cleared majority of pre-eclamptic women have normal body mass index.

The existing research results state 61.9% of pre-eclamptic women are multigravida (pregnant two or more times), which come along with those of **Rafida, Mochtar, Artiningtyas & Anas (2020)** who concluded that preeclamptic women mostly (52.9%) are multigravida (pregnant two or more times).

The current study shown that, following a continuous 4-week intervention, there was a significant difference in the average values of systolic blood pressure, diastolic blood pressure, pulse rate, and anxiety level before and after 4-week assessments. This is consistent with research by **Soliman (2020)** on the impact of alternate nostril breathing exercise (ANB) on Egyptian hypertensive patients' heart rate, blood pressure, and anxiety. That study found that the average systolic and diastolic blood pressure values, heart rate, and anxiety level differed significantly before and after a 4-week continuous intervention.

Regarding the influence of ANB on the pulse, the current research discovered statistically significant differences in heart rate measurements before and after seven days as well as after the conclusion of four weeks, where $P<0.001$**. Samiksha, Kirti, Tejal, and Anshu (2020), who investigated the impact of breathing exercises on the blood pressure, pulse, and oxygen saturation of hypertension patients, confirmed the findings of the

current study. The results of the study demonstrated a substantial drop-in heart rate and blood pressure after exercise.

Our findings are corroborated by a different study by **Priya Kumari et al. (2020)**, which demonstrated a significant reduction in blood pressure and pulse after engaging in breathing exercises. These findings are supported by **Ghiya and Lee's (2012)** additional investigation. The aim of the research is to ascertain the impact of ANB on the pulse. The findings demonstrated that there were statistically significant ($p < 0.05$*) variations between the pre- and post-heart rate values.

In individuals with essential hypertension under medication management, **Telles et al. (2013)** discovered that breathing through alternate nostrils for eighteen minutes lowers heart rate, blood pressure, and SBP. The above-mentioned results in reducing HR and BP were remarkable, as noted by Mullur Lata et al. (2019). So, hypothesis one was approved" there is an important change in blood pressure readings after performing alternate nostril breathing exercise between pre-eclamptic women ".

About how well ANB reduces anxiety. According to the results of the current study, anxiety levels following alternative nostril breathing practice were highly statistically significant at pre-, day 7 and 4-week end, with $p < 0.001$**. Deep breathing exercises' effects on anxiety, heart rate, blood pressure, and depression were studied previously, and **D'Silva et al. (2014)** supported these findings. The findings demonstrated the advantageous impact of doing deep breathing exercises on lowering diastolic blood pressure and anxiety.

According to **Birch (2015),** breathing exercises are frequently employed as training techniques to lower anxiety levels. Our ANB exercise is a straightforward yet powerful strategy for lowering anxiety. Therefore, hypothesis two was accepted, " After engaging in Alternate Nostril Breathing exercises, pre-eclamptic women experience a significant reduction in anxiety".

The results of the current study do, in fact, show that simplified ANB exercise is beneficial for lowering blood pressure, pulse, and anxiety levels in pre-eclamptic women.

## Conclusion and Recommendations

The study concluded that, using alternate nostril breathing have been shown to lower blood pressure and anxiety in pre-eclamptic women. Applying the breathing exercise to women doesn't require specific supplies or equipment, nor does it require extensive training for the staff nurses. These straightforward breathing exercises can be routinely performed to lower the medication dosage and lessen the likelihood of developing long-term issues from pre-eclampsia.

The study recommended that, Alternate nostril breathing should incorporate into pre-eclamptic women's routine care.

### Conflict of interest

According to the authors, there wasn't any conflict of interest.

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