FNJN

İSTANBUL UNIVERSITY CERRAHPAŞA

Florence Nightingale Journal of Nursing

DOI: 10.5152/FNJN.2025.24136

Research Article

Mindfulness-Based Breathing Exercise on Health Profile, Vital Signs, and Fetal Heart Rate in Pregnant Women Diagnosed With Pre-Eclampsia: A Randomized Control Trial

Ayşegül Kılıçlı[1], Simge Zeyneloğlu[2]

[1]Department of Obstetrics and Gynaecology Nursing, Muş Alparslan University, Faculty of Health Sciences, Muş, Türkiye
[2]Department of Obstetrics and Gynaecology Nursing, Gaziantep University, Faculty of Health Sciences, Gaziantep, Türkiye

Cite this article as: Kılıçlı, A., & Zeyneloğlu, S. (2025). Mindfulness-based breathing exercise on health profile, vital signs, and fetal heart rate in pregnant women diagnosed with pre-eclampsia: A randomized controlled trial. *Florence Nightingale Journal of Nursing*, *33*, 0136, doi: 10.5152/FNJN.2025.24136.

What is already known on this topic?

- *Pre-eclampsia is a pregnancy complication that causes maternal and fetal morbidity and mortality and adversely affects the health profile of mother and fetus.*
- *In the literature, it has been determined that nonpharmacological interventions are frequently used in addition to pharmacological treatment of pre-eclampsia. One of these is Mindfulness-Based Breathing Exercise (MBBE). However, the number of studies in this field is quite less.*

What this study adds on this topic?

- *MBBE has an impact on vital signs, basal fetal heart rate and number of fetal movements in pregnant women with pre-eclampsia, and positively affects the health profile of these pregnant women.*

Abstract

AIM: This study aimed to determine the effect of mindfulness-based breathing exercise on health profile, vital signs, and fetal heart rate in pregnant women diagnosed with pre-eclampsia.

METHOD: This is a randomized controlled trial. Data were collected between October 1, 2023, and May 19, 2024, with a sample of 66 pregnant women who were randomly assigned to the mindfulness-based breathing exercise (n = 33) or control (n = 33) groups. The experimental group received 20 minutes of mindfulness-based breathing exercise every 8 hours for 72 hours. The primary outcomes of the study were health profile, vital signs, and basal fetal heart rate. Secondary outcomes of the study are health profile sub-dimensions and fetal movement count.

RESULTS: Compared to the control group, a 59.2% positive increase over time in the health profile of the mindfulness-based breathing exercise group was observed. Additionally, there was a 10% decrease in pain, 11.4% decrease in emotional reactions, 80.7% increase in sleep quality, 13.3% decrease in social isolation, 38.8% increase in physical activity, and 87.1% increase in energy level, 9.8% decrease in mean pulse rate, 15.8% decrease in respiratory rate, 73.1% increase in oxygen saturation, 7% decrease in systolic blood pressure, and 6.4% decrease in diastolic blood pressure, 6.5% increase in mean fetal movement count was determined. At the fourth measurement, the experimental group had a higher mean basal fetal heart rate than the control group.

CONCLUSION: Mindfulness-based breathing exercise can be safely used as a care intervention to improve the health profile of pregnant women with pre-eclampsia.

Keywords: Breath awareness, health profile, meditation, mindful, pre-eclampsia

Introduction

Pre-eclampsia is a complication of pregnancy that causes maternal and fetal morbidity and mortality (Garovic et al., 2020). After 20 weeks of gestation, it is defined as a new onset of increased blood pressure (American College of Obstetricians and Gynecologists (ACOG), 2020). Symptoms include proteinuria or acute kidney damage, liver dysfunction, neurological symptoms, hemolysis, or thrombocytopenia, and fetal growth retardation. Although it is divided into groups as mild, moderate, and severe pre-eclampsia according to its symptoms, it has been determined that mild pre-eclampsia in pregnancy can turn into a severe form very quickly. For this reason, a new grouping system was created based on the 34th gestational age as early-onset (<34 weeks of gestation) and late-onset (≥34 weeks of gestation) pre-eclampsia. Early-onset pre-eclampsia has a much greater adverse effect on the pregnant woman and fetus than late-onset pre-eclampsia (ACOG, 2020). The prevalence is reported to be between 2% and

Received: June 10, 2024
Revision Requested: September 17, 2024
Last Revision Received: September 19, 2024
Accepted: December 4, 2024
Publication Date: March 10, 2025

Corresponding author: Ayşegül Kılıçlı,
E-mail: aysegul_ay_9@hotmail.com

8% in the world (ACOG, 2020), and between 4.65% and 7.6% in Türkiye (Ersoy et al., 2011). It ranks second among the causes of maternal mortality worldwide with a rate of 14% (Say et al., 2014), and third in Türkiye with a rate of 14.2% according to the Türkiye Maternal Mortality Report for 2015–2019 (Turkey Maternal Mortality Report (2015–2019), 2021).

When the complications of pre-eclampsia are examined, maternal effects include preterm labor, cardiovascular disease, cerebrovascular events, and various organ dysfunctions, while fetal complications include early and late-period complications such as prematurity, intrauterine growth retardation, and perinatal death (ACOG, 2020). Antihypertensive drugs and $MgSO_4$ treatment are used in pharmacological treatment to prevent complications of pre-eclampsia during pregnancy and delivery. Although these drugs are administered according to the severity of pre-eclampsia, $MgSO_4$ treatment prevents the development of eclampsia by reducing neuromuscular irritability. Pregnant women are closely monitored because of signs of toxicity such as decreased blood pressure and respiratory rate (< 14/min) and decreased fetal heart rate, especially with $MgSO_4$ administration (Committee on Obstetric Practice, 2017). There are also concerns about the use of antihypertensive drugs during pregnancy due to the lack of clear evidence of maternal benefits, similar uncertainties regarding fetal risks (Moser et al., 2012), and the reluctance of many pregnant women to take medication during pregnancy (Warriner et al., 2014). In addition, pre-eclampsia causes biopsychosocial problems such as pain, fatigue, insomnia, stress, fear of losing the baby, anxiety, and depression in pregnant women, leading to an increase in the current emotional, social, and physical health problems perceived by the pregnant woman about her body and a decrease in the daily functionality of the pregnant woman. All these factors adversely affect the overall health profile of pregnant women with pre-eclampsia and their fetuses (Garovic et al., 2020; Overton et al., 2022).

In the literature, it has been determined that nonpharmacological interventions are frequently used in addition to the pharmacological treatment of pre-eclampsia. The majority of these interventions are mind–body-based practices (such as yoga, body relaxation techniques, and breathing exercises), which are among the complementary and alternative therapies (Rakhshani et al., 2015; Qi et al., 2020; Valiani et al., 2023). Nonpharmacological methods are often preferred because they are simpler and cheaper than pharmacological methods, have no side effects, can be easily applied since they do not require a physician's order, and help the pregnant woman to relax and increase her satisfaction of the pregnant woman with the care (Warriner et al., 2014; Muthukrishnan et al., 2016). When the literature was examined, few clinical studies examining the effects of mindfulness-based breathing exercise (MBBE) on pregnant women and fetuses in pregnant women with pre-eclampsia were found. In the studies conducted, it was determined that the sample comprised healthy pregnant women, at-risk pregnant women, and/or pregnant women with gestational hypertension, and the interventions were deep breathing exercises, meditation practice, relaxation techniques, or body-based exercises (Rakhshani et al., 2015; Muthukrishnan et al., 2016; Felton et al., 2021). Mindfulness-based breathing exercise is one of the mind–body-based practices, and since it is noninvasive and easily applicable, it is thought to be useful for pregnant women with pre-eclampsia.

Mindfulness-based breathing exercise includes meditation and mindful breathing exercises with physical and mental involvement and involves paying attention to the breath in a way that is free from preconceptions (Babbar & Shyken, 2016; Schöne et al., 2018; Pozuelos et al., 2019; Qi et al., 2020; Felton et al., 2021; Christon et al., 2023). Additionally, mindful breathing is an approach that teaches individuals how to breathe deeply and slowly and how to exhale slowly (Babbar & Shyken, 2016). Furthermore, it can reduce stress hormones and pain intensity in the body, increase lung ventilation and oxygen saturation in the blood, provide relaxation in the body, reduce stress and fatigue often seen in pregnancy, and increase energy and sleep quality, thus improving the biopsychosocial health profile of pregnant women (Soni & Muniyandi, 2019). Studies have shown that breathing exercises improve autonomic function by changing sympathetic or parasympathetic activity; it is stated that it provides relaxation in the body by removing the autonomic nervous system from the compelling dominance of the sympathetic system and is effective in lowering blood pressure (Chaddha et al., 2019; Soni & Muniyandi, 2019; Felton et al., 2021). Considering all these mechanisms, mindfulness-based breathing exercise may be effective in reducing the current symptoms of pregnant women with pre-eclampsia. This study aimed to determine the effect of mindfulness-based breathing exercise on health profile, vital signs, and fetal heart rate in pregnant women diagnosed with pre-eclampsia.

Hypotheses

1. MBBE positively affects the health profile of pregnant women with pre-eclampsia.

2. MBBE is effective on vital signs of pregnant women diagnosed with pre-eclampsia.

3. MBBE is effective on basal fetal heart rate and fetal movement count in pregnant women with pre-eclampsia.

Method

Study Design

This was a randomized controlled trial. This research was registered in the NIH U.S. National Library of Medicine Clinical Trial Registry (ClinicalTrials.gov registration number: NCT06065709) on September 19, 2023. Consolidated Standards of Reporting Trials (CONSORT) guidelines were followed throughout the study protocol. The research process is shown with the CONSORT flow diagram (Figure 1) (Sunay et al., 2013)..

Sample

The study population consisted of hospitalized pregnant women diagnosed with pre-eclampsia during the study period between October 1, 2023 and May 19, 2024 ($N = 74$). Inclusion criteria: pregnant women diagnosed with pre-eclampsia, hospitalized in the ward for at least 72 hours, literate, being at 20 weeks of gestation or later, having a singleton pregnancy, have

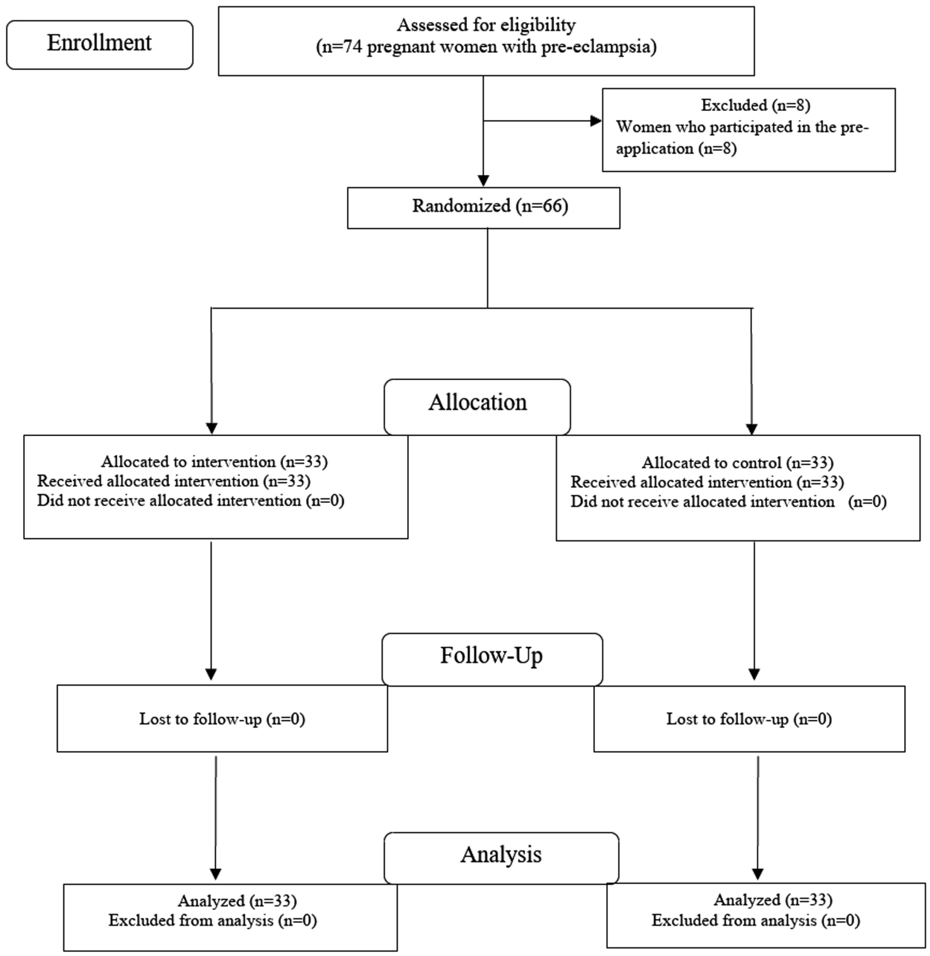

Figure 1.
CONSORT Flow Diagram for the Sample Selection Process for Pregnant Women With Pre-Eclampsia. Selection of Participants Through Each Trial Stage (Sunay et al., 2013; https://cdn-links.lww.com/permalink/phm/a/phm_00_00_2018_03_14_wu_ajpmr-d-17-00294_sdc1.pdf

not previously practiced MBBE or have no training or knowledge of this practice. Exclusion criteria: pregnant women with pregnancy-related diseases or other chronic diseases (e.g., diabetes mellitus, chronic hypertension) other than pre-eclampsia, after being included in the study, those who chose to leave the study voluntarily at any stage. No women voluntarily left the study or experienced any problems with themselves or their babies after participating in the study. No adverse side effects or complications of MBBE were observed in the participants.

The sample size was calculated using the G*power 3.1.9.2 program. For the sample calculation in the research, initially, no similar reference source was found in the literature. For this reason, it is stated that when there is no reference source related to the research in the literature, a sample calculation can be made with the result obtained by making a preliminary application (Cohen, 1992; Faul et al., 2007). Consequently, eight pregnant women diagnosed with pre-eclampsia (experimental = 4, control = 4) were reached in the preliminary implementation of the study, four pregnant women received MBBE, and four rested. Thus, the effect levels were determined separately for each measurement. In the pre-application, two independent groups were measured at four different times and mean scores were obtained, after which a two-way repeated measure ANOVA analysis was performed, and the minimum effect size $d = 0.25$ was determined. In the calculation of the minimum sample size using the two-way repeated measure test in the G*power program, the minimum effect size $d = 0.25$, type I error $\alpha = 0.05$, and the minimum sample size for pregnant women was 36 (experiment = 18, control = 18) with 95% power (Cohen, 1992; Faul et al., 2007). The minimum sample size was determined as 66 pregnant women in case of losses from the sample. In the research, 66 (MBBE group = 33, control group = 33) pregnant women diagnosed with pre-eclampsia were included in the sample. Individuals who participated in the pre-application were not included in the final sample of the study.

Randomization and Blinding

Before starting the study, pregnant women diagnosed with pre-eclampsia who met the inclusion criteria were identified. The objective and method of the study were explained in detail to the pregnant women. Written and verbal informed consent was obtained from the women who voluntarily participated in the study. Then, pregnant women diagnosed with pre-eclampsia were assigned to the groups by the randomization method. The Random.org website was used for assignment to groups. In the randomization method, there is a Random Integer Generator screen under the Numbers heading on the Random.org website. With the help of this screen, single-column groups between 1 and 66 were created. Taking into account the numbers 1 and 2 in the columns, the pregnant women were assigned to one of the numbers 1 and 2 in turn. The assignment of numbers to groups was determined with a coin. The part of the coin that was thrown into the air (1) constituted the experimental group, and the part that fell to the ground (2) constituted the control group (Figure 1). However, the study could not be single-blinded because the pregnant women learned which group they were in after the intervention started (Sunay et al., 2013). To prevent interaction between groups and participants, pregnant women participating in the study were hospitalized in different rooms in the Perinatology Service of the hospital. Mindfulness-based breathing exercise application, data collection, and analysis were conducted by researcher AK.

Setting and Relevant Context

This study was conducted in the Perinatology Service of Şanlıurfa Training and Research Hospital in Şanlıurfa, the province with the highest birth rate in Türkiye. The hospital is a tertiary hospital. Individuals from all age groups apply to the hospital, but the majority of the applicants are women and children. Women of all ages living in Şanlıurfa can receive care from this research hospital from pregnancy to 42 days after birth. The hospital has both the title of Mother Friendly Hospital and Baby Friendly Hospital. At least two perinatology specialists work in the Perinatology Unit of the hospital in addition to gynecologists. In the Perinatology Unit, five to six midwives/nurses work during the day and three nurses/midwives work at night. Patient rooms are for one and/or two persons. However, patients diagnosed with preeclampsia are followed up in one-patient rooms. Particular attention is paid to ensure that the rooms for patients with preeclampsia are quiet, calm, dimly lit, free of stimuli, hygienic, and restful for pregnant women.

Data Collection Tools

The data collection instruments used in the study included an Introductory Information Form to determine the sociodemographic and obstetric characteristics of the pregnant women, and the Nottingham Health Profile (NHP) to assess the health profile of pregnant women. Vital signs included a sphygmomanometer to measure systolic and diastolic blood pressure, an oximeter to measure oxygen saturation and pulse rate, and a non-touch thermometer to measure body temperature. All these devices were calibrated and disinfected before use in each patient. In addition, the respiratory rate of pregnant women was counted for one minute with a stopwatch. Basal fetal heart rate and fetal movement count were calculated using the non-stress test (NST) for 20 minutes.

Introductory Information Form

The form was created by the researchers following a literature review and included questions regarding the participant's sociodemographic characteristics such as age, marital status, family type, education, working status, income, and social security status, and obstetric characteristics such as gestational week, gravida, parity, living children number, abortion, pre-eclampsia degree, pre-eclampsia onset type, and $MgSO_4$ using status (Garovic et al., 2020; Qi et al., 2020; Overton et al., 2022; Valiani et al., 2023).

Nottingham Health Profile

It was developed by Hunt et al. (1985) to assess the health-related quality of life of individuals, and its Turkish validity and reliability were performed by Küçükdeveci et al. (2000). The scale consists of 38 questions and six sub-dimensions (eight questions on physical activity, eight questions on pain, five questions on sleep, three questions on energy level, nine questions on emotional reactions, and five questions on social isolation). Questions are answered as "yes" or "no" and item score calculations in each sub-dimension differ. A minimum score of 0 and a maximum score of 100 can be obtained from each sub-dimension. The minimum score that can be obtained from the whole scale is 0 and the maximum score is 600. As the scale and sub-dimension mean scores increase, it shows that the health profile is negatively affected. As the score decreases, the individual's quality of life or health profile improves (Hunt et al., 1985; Küçükdeveci et al., 2000). Cronbach's α value calculated in all domains of the scale ranged between 0.56 and 0.83 (Küçükdeveci et al., 2000). In this study, the Cronbach α values of NHP and sub-dimensions at the time of the last measurement were 0.906 for NHP total, 0.523 for NHP pain, 0.703 for NHP emotional reactions, 0.708 for NHP sleep, 0.524 for NHP social isolation, 0.520 for NHP physical mobility, and 0.853 for NHP energy.

Procedure

This study was conducted between October 1, 2023 and May 19, 2024. Before the start of the study, pregnant women who were admitted to the perinatology service with a diagnosis of pre-eclampsia and who met the inclusion criteria were interviewed. Pregnant women were first informed verbally about the aim, objectives, and method of the study, and the written informed consent of the women was then obtained.

All data of the study were collected by the researcher AK. The data were collected using the face-to-face interview method. Data collection took 25 minutes on average. To reduce bias in subjective data during the data collection process, attention was paid to the following: During the data collection process, the Introductory Information Form and NHP were completed by the pregnant women diagnosed with preeclampsia themselves. Vital signs were assessed using the instruments in the Perinatology Service. All of these instruments were calibrated. Vital signs included a sphygmomanometer to measure systolic and diastolic blood pressure, a non-touch thermometer to measure body temperature, and an oximeter to measure oxygen saturation and pulse rate. Fever was measured with the thermometer in the ward using disposable caps. An oxygen saturation probe was used for oxygen saturation and pulse rate. Nasal or mask oxygenation was not performed on pregnant women during Mindfulness-Based Breathing Exercise (MBBE) application in the experimental group, during resting in the control group, during vital signs measurement (especially during oxygen saturation measurement), and during NST application to avoid affecting the measurement results. Additionally, the respiratory rate of pregnant women was counted for one minute with a stopwatch. For respiratory rate, respiratory rate for 1 minute was calculated by the researcher AK. Systolic and diastolic blood pressure were measured with a sphygmomanometer by the researcher AK. Basal fetal heart rate and fetal movement count were calculated using the NST for 20 minutes. Fetal heart rate was assessed by NST for 20 minutes and baseline fetal heart rate was calculated. An increase in fetal heart rate during uterine contraction was defined as fetal movement. Therefore, the total number of these changes after 20 minutes of NST constituted the number of fetal movements. These counts were made by the researcher AK. Additionally, after the data were collected, the data were analyzed by the researcher AK. The time of application of the data collection forms and information about the application flow chart are given in Figure 3. During the intervention, care was taken to ensure that the room of the pregnant women in the experimental and control groups was quiet and calm. Routine care and follow-up of pregnant women diagnosed with pre-eclampsia were performed in a standardized manner. To prevent interaction between the participants in the study, they were kept in separate rooms. After the data were collected, the data collection forms were kept locked in researcher AK's locker at her workplace.

Mindfulness-Based Breathing Exercise Group

Pregnant women in the MBBE group received MBBE application a total of nine times. The MBBE was carried out only by researcher AK. Each application session lasted 20 minutes. Mindfulness-based breathing exercise was performed 3 × 1 times a day (every 8 hours) for 72 hours. Each application session lasted 20 minutes. The data were collected by researcher AK by face-to-face interview method.

The Introductory Information Form was completed by pregnant women before the first MBBE application. The NHP was completed by the pregnant women before the first MBBE application. Afterward, the NHP was filled in again every 24 hours at the same time every day by the pregnant women. The NHP was completed a total of four times (Figure 2).

Vital signs were measured by researcher AK before the first MBBE application. Afterward, vital signs were measured again every 24 hours at the same time every day by researcher AK . Vital signs were measured four times in total (Figure 2).

Non-stress test device was used for basal fetal heart rate and fetal movement count. Non-stress test was performed by researcher AK before the first MBBE application. Afterward, NST was performed every 24 hours at the same time every day by researcher AK to determine the basal fetal heart rate and fetal movement count. The NST was performed four times in total; thus, basal fetal heart rate and fetal movement count were evaluated four times in total (Figure 2). Mindfulness-based breathing exercise practice was carried out within the framework of the Mindfulness-Based Breathing Exercise practice protocol (Christon et al., 2023;Schöne et al., 2018; Qi et al., 2020; Pozuelos et al., 2019).

Mindfulness-Based Breathing Exercise Practice Protocol

The steps of the MBBE and the content of the application are given below in order in line with the literature (Babbar & Shyken, 2016; Christon et al., 2023; Pozuelos et al., 2019; Schöne et al., 2018; Qi et al., 2020).

Practice

Set your phone to ring every 5 minutes for 20 minutes of meditation, and get your body into a comfortable sitting position with a long spine.

Stage 1—Body Attunement: (Duration 5 Minutes)

Sit in a meditation pose in which you are comfortable, with your spine long and straight. Try to hold this pose throughout your meditation without moving if possible. Unless you are in excruciating pain, do not react immediately to the urge to fidget; try to invite your attention elsewhere.

With an inhalation, extend from the sitting bones to the crown of the head. Relax your shoulders with an exhalation.

Start scanning your body from head to toe, bottom to top. Your soles, feet, legs, buttocks, coccyx, abdomen, lower back, chest and back, arms and hands, neck, and around the head, face, and mouth should be relaxed. The inside of your mouth is soft, the mouth and eyes are softly closed, and the breath continues to flow through the nose if there are no obstructions. Invite your attention to the breath and continue to sit still, following your natural breathing rhythm and the sensations it creates, until the chime. One breath cycle should last about 6 seconds.

Stage 2—Count the Exhalations: (Duration 5 Minutes)

One breath cycle should last about 6 seconds.
Count from 1 to 10 after each exhalation.
When you reach 10, go back to 1.
If you get distracted, go back to 1.
Inhale, exhale 1, inhale, exhale 2, Inhale, exhale 3,.... Continue...

Stage 3—Count the Inhalations: (Duration 5 Minutes)

One breath cycle should last about 6 seconds.
Count from 1 to 10 before each breath.
When you reach 10, go back to 1.
If you get distracted, go back to 1.
1 Inhale, inhale, exhale; 2 inhale, exhale; 3 inhale, exhale; .... Continue...

Stage 4—Sit Still and Witness (Free Attention Called "Zazen"): (Duration 5 Minutes)

Stop counting. Allow attention to wander through the sensations in your body, breath, and mind. As the attention wanders, you just witness. Without trying to change it, without speaking, without correcting. Be a non-judgmental eye. If you feel that your attention is stuck and lingering on something, you can return to following the sensations created by your breath

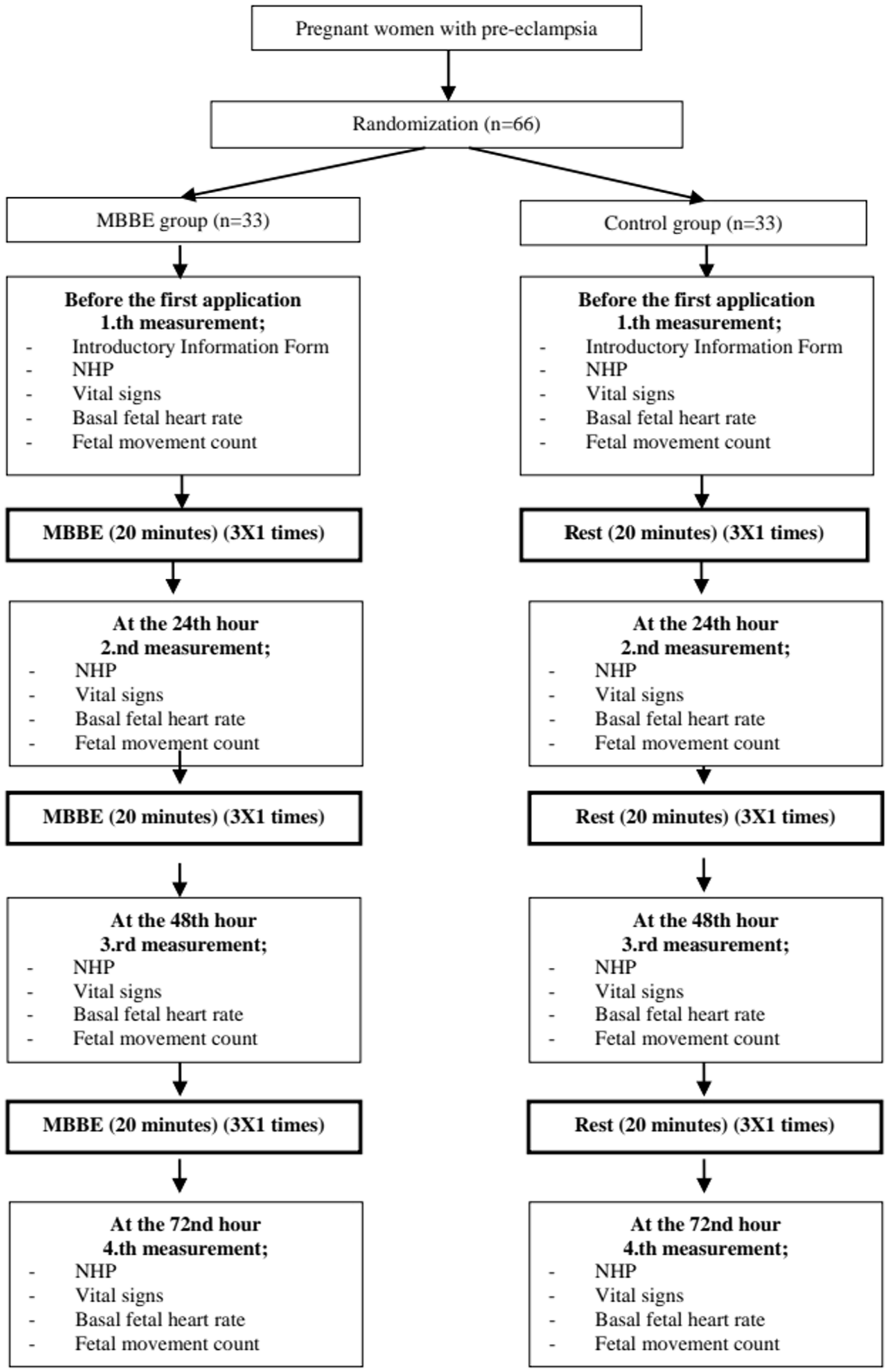

Figure 2.
Application Flowchart for Pregnant Women With Pre-Eclampsia. MBBE = Mindfulness-Based Breathing Exercise; NHP = Nottingham Health Profile.

to bring it back into the flow (Babbar & Shyken, 2016; Schöne et al., 2018; Pozuelos et al., 2019; Qi et al., 2020; Christon et al., 2023).

Control Group

Control group did not receive the MBBE application, but rested only in the sitting position for 20 minutes every 8 hours. The control group rested in the same sitting position for 20 minutes each time, for a total of nine times every 8 hours. The data were collected by researcher AK by face-to-face interview method. The Introductory Information Form and NHP were completed by the pregnant women. Vital signs were measured by researcher AK. Non-stress test for basal fetal heart rate and fetal movement count was performed by researcher AK. All measurements were evaluated in parallel with those in the MBBE group (Figure 2).

Data Analysis

All analyses were performed using IBM SPSS Statistics (Version 26). Initially, descriptive statistics, including frequencies, percentages, means, and SDs, were used to summarize the sociodemographic and obstetric characteristics of the participants. The Pearson chi-square test was used to analyze categorical variables according to the experimental and control groups. An independent-sample *t*-test was used to analyze differences between numeric variables according to the experimental and control groups. The effect size value (d^a) for the independent sample *t*-test is classified as small, medium, and large effects at 0.2, 0.5, and 0.8, respectively (Cohen, 1992; Faul et al., 2007). Differences in the mean NHP total and subdimensions, vital signs, basal fetal heart rate, and fetal movement count between the experimental and control groups over time were analyzed using a two-way repeated measures ANOVA for each measurement performed more than once. The measurement results over time according to the experimental and control groups were tested with Mauchly's test of Sphericity Assumed and Greenhouse–Geisser. It was determined that sphericity was achieved in all measurements. The *r* value represents the variance change between the groups as a percentage and is necessary to calculate the effect size. The effect size values (d^b) for two-way repeated measures ANOVA are 0.1, 0.25, and 0.4 for small, medium, and large effects, respectively (Cohen, 1992; Faul et al., 2007). Statistical significance was accepted at $p < .05$ and evaluated within a 95% CI.

Ethical Considerations

Ethics committee approval was obtained from the Muş Alparslan University Scientific Research and Publication Ethics Committee (Approval no: 7/43, Date: July 7, 2023). Institutional approval was obtained from the Şanlıurfa Provincial Health Directorate (Registration no: E-49781372-774.99-224414068) on September 13, 2023. Written and verbal informed consent was obtained from the participants.

Results

A total of 66 women, 33 in the Mindfulness-Based Breathing Exercise Group (MBBEG) and 33 in the Control Group (CG), were studied. It was determined that the women in MBBEG, and CG included in the study were similar in terms of average age, marital status, family type, educational status, working status, income status, social security, gestational week, gravida, parity, living children number, abortion, pre-eclampsia degree, pre-eclampsia onset type, and $MgSO_4$ using status ($p > .05$) (Table 1).

The changes in the mean NHP total and subdimension scores in MBBEG and CG are shown in Table 2 and Figure 3. As the NHP total and subdimension mean scores decrease, the health profile of the individual and the subdimensions of the health profile scale (pain, emotional reactions, sleep, social isolation, physical activity, and energy) are positively affected due to the usage feature of the scale.

Nottingham Health Profile total score in MBBEG decreased by 59.2% over time compared to CG (r^2 = 0.592, $p < .001$). Nottingham Health Profile pain score in MBBEG decreased by 10.0% over time compared to CG (r^2 = 0.100, p = .010). Nottingham Health Profile emotional reaction score in MBBEG decreased by 11.4% over time compared to CG (r^2 = 0.114, p = .006). Nottingham Health Profile sleep score in MBBEG decreased by 80.7% over time compared to CG (r^2 = 0.807, $p < .001$). Nottingham Health Profile social isolation score in MBBEG decreased by 13.3% over time compared to CG (r^2 = 0.133, p = .003). Nottingham Health Profile physical mobility score in MBBEG decreased by 38.8% over time compared to CG (r^2 = 0.388, $p < .001$). Nottingham Health Profile energy score in MBBEG decreased by 87.1% over time compared to CG (r^2 = 0.871, $p < .001$) (Table 2, Figure 3). Accordingly, compared to the control group, a 59.2% positive increase in the health profile of the mindfulness-based breathing exercise group was determined over time. In addition, a 10% decrease in pain, 11.4% decrease in emotional reactions, 80.7% increase in sleep quality, 13.3% decrease in social isolation, 38.8% increase in physical activity and 87.1% increase in energy level were determined.

Changes in the mean vital signs in MBBEG and CG during follow-up are shown in Table 3. Average body temperature did not differ significantly over time in MBBEG compared to CG (r^2 = 0.003, p = .690). The average pulse rate in MBBEG decreased by 9.8% over time compared to CG (r^2 = 0.098, p = .011). The average respiration rate in MBBEG decreased by 15.8% over time compared to CG (r^2 = 0.158, p = .001). Average oxygen saturation in MBBEG increased by 73.1% over time compared to CG (r^2 = 0.731, $p < .001$). Average systolic blood pressure in MBBEG decreased by 7.0% over time compared to CG (r^2 = 0.070, p = .032). Average diastolic blood pressure in MBBEG decreased by 6.4% over time compared to CG (r^2 = 0.064, p = .040) (Table 3, Figure 4). Accordingly, compared to the control group, the mindfulness-based breathing exercise group had a 9.8% decrease in mean pulse rate, 15.8% decrease in mean respiratory rate, 73.1% increase in mean oxygen saturation, 7% decrease in mean systolic blood pressure and 6.4% decrease in mean diastolic blood pressure over time.

Changes in the mean basal fetal heart rate and fetal movement count in MBBEG and CG during follow-up are shown in Table 3. Average basal fetal heart rate did not differ significantly over time in MBBEG compared to CG (r^2 = 0.018, p = .289). However, at the fourth measurement, the mean fetal heart rate of women in MBBEG was significantly higher than in CG (t = 3.156, p = .002). In addition, there were no significant differences between the groups at the first, second, and third measurements. The average fetal movement count in MBBEG increased by 6.5% over time compared to CG (r^2 = 0.065, p = .038) (Table 3, Figure 4). Accordingly, compared to the control group, the average fetal movement rate in the mindfulness-based breathing exercise group increased by 6.5%. However, when the basal fetal heart rate of the participants was analysed, it was determined that the mean basal fetal heart rate of the mindfulness-based breathing exercise group was significantly higher than the control group only in the fourth measurement.

Table 1.
Comparison of Women in Mindfulness-Based Breathing Exercise (MBBE), and Control Groups According to Their Sociodemographic, and Obstetric Characteristics (n=66)

Sociodemographic Characteristics	MBBE Group (*n* = 33)	Control Group (*n* = 33)	Test	*p*
Age, mean (SD)	27.90 (7.25)	29.0 (6.41)	$t = -0.647$	.520
Marital status, n (%)			[a]	
Married	33 (100)	33 (100)		
Family type, n (%)			$X^2 = 0.862$	.353
Nuclear	28 (84.8)	25 (75.8)		
Extended	5 (15.2)	8 (24.2)		
Educational status, n (%)			$X^2 = 1.761$	.624
Literate	9 (27.3)	7 (21.2)		
Primary school	15 (45.5)	19 (57.6)		
Middle school	8 (24.2)	5 (15.2)		
High school	1 (3.0)	2 (6.1)		
Working status, n (%)				
Not working	33 (100)	33 (100)	[a]	
Income status, n (%)			$X^2 = 0.746$	.388
Income lower than expenditure	29 (87.9)	31 (93.9)		
Income equals or exceeds expenditure	4 (12.1)	2 (6.1)		
Social security status, n (%)				
Yes	33 (100)	33 (100)	[a]	
Gestational week, mean (SD)	29.42 (3.01)	29.72 (3.00)	$t = -0.409$	.684
Gravida, mean (SD)	3.15 (2.03)	3.60 (1.76)	$t = -0.970$	.336
Parity, mean (SD)	2.0 (1.76)	2.21 (1.55)	$t = -0.517$	.607
Living children number, mean (SD)	1.96 (1.77)	2.18 (1.57)	$t = -0.514$	.609
Abortion, mean (SD)	.18 (.39)	.39 (.70)	$t = -1.512$	.137
Pre-eclampsia degree, n (%)				
Mild pre-eclampsia	19 (57.6)	17 (51.5)	$X^2 = 0.653$	.722
Moderate pre-eclampsia	9 (27.3)	12 (36.4)		
Severe pre-eclampsia	5 (15.2)	4 (12.1)		
Pre-clampsia onset type, n (%)				
Early onset (<34th week of pregnancy)	29 (87.9)	28 (84.8)	$X^2 = 0.129$	.720
Late onset (≥34th week of pregnancy)	4 (12.1)	5 (15.2)		
$MgSO_4$ using status, n (%)				
Yes	4 (12.1)	3 (9.1)	$X^2 = 0.653$	.722
No	29 (87.9)	30 (90.9)		

Note: MBBE = Mindfulness-Based Breathing Exercise; $MgSO_4$ = Magnesium Sulfate; *p* = Statistical significance level < .05; SD = Standard Deviation; *t* = Independent Sample *t*-test; χ^2 = Pearson chi-square test.
[a]No statistics are computed because variable is a constant.

Discussion

When the primary results of this study, which was conducted to examine the effect of MBBE on health profile, vital signs, and fetal heart rate in pregnant women with pre-eclampsia, were examined, it was determined that MBBE practice positively affected the health profile and had an effect on vital signs and basal fetal heart rate. The secondary outcomes of the study were health profile subscale mean scores and the number of fetal movements. Mindfulness-based breathing exercise was also found to be effective on these.

Abnormal changes in vital signs of pregnant women with pre-eclampsia have a significant adverse effect on maternal and fetal health. In this study, it was determined that MBBE application decreased the pain level of pregnant women, decreased the levels of emotional reaction and social isolation, increased the sleep quality, physical activity, and energy levels of pregnant

Table 2.
Comparison of Nottingham Health Profile (NHP) and Sub-Dimensions Mean Scores of Women in Mindfulness-Based Breathing Exercise (MBBE) and Control Groups According to Measurement Times

Scale and Measurements	MBBE Group (n = 33) Mean (SD)	Control Group (n = 33) Mean (SD)	Mean Difference [95% CI]	Test	p	da	Effect Size Level
NHP total							
First measurement	416.08 (52.28)	397.51 (49.13)	18.56 [−6.38, 43.52]	t = 1.487	.142	–	–
Second measurement	367.57 (47.6)	382.86 (49.64)	−15.29 [−39.23, 8.64]	t = −1.276	.206	–	–
Third measurement	191.77 (46.09)	337.62 (40.34)	−145.85 [−167.15, −124.54]	t = −13.679	<.001	3.367	Large
Fourth measurement	69.56 (32.61)	293.93 (50.24)	−224.36 [−245.26, −203.46]	t = −21.516	<.001	5.297	Large
Statistical analysis F = 492.930, df = 1, p < .001, r^2 = 0.592, d^b = 1.204 (large effect)							
Sphericity test for NHP total, Mauchly's (W) test of sphericity for time W = 0.752, p = .003, time*group Greenhouse–Geisser F = 241.084, p < .001							
NHP pain							
First measurement	56.89 (14.93)	49.38 (18.88)	7.50 [−0.86, 15.87]	t = 1.790	.078	–	–
Second measurement	46.52 (14.68)	45.03 (13.07)	1.49 [−5.34, 8.32]	t = 0.435	.665	–	–
Third measurement	21.93 (10.46)	35.14 (6.74)	−13.20 [−17.54, −8.86]	t = −6.094	<.001	1.501	Large
Fourth measurement	8.76 (6.22)	28.86 (8.21)	−20.09 [−23.68, −16.50]	t = −11.205	<.001	2.759	Large
Statistical analysis F = 7.121, df = 1, p = .010, r^2 = 0.100, d^b = 0.333 (medium effect)							
Sphericity test for NHP pain, Mauchly's (W) test of sphericity for time W = 0.468, p < .001, time*group Greenhouse–Geisser F = 29.729, p < .001							
NHP emotional reactions							
First measurement	59.70 (29.42)	58.33 (25.70)	1.36 [−12.21, 14.95]	t = 0.201	.841	–	–
Second measurement	44.63 (19.87)	53.95 (25.17)	−9.32 [−20.48, 1.82]	t = −1.671	.100	–	–
Third measurement	24.94 (14.14)	38.86 (16.49)	−13.92 [−21.47, −6.36]	t = −3.680	<.001	0.906	Large
Fourth measurement	7.24 (7.97)	33.99 (15.22)	−26.75 [−32.77, −20.73]	t = −8.941	<.001	2.201	Large
Statistical analysis F = 8.217, df = 1, p = .006, r^2 = 0.114, d^b = 0.358 (medium effect)							
Sphericity test for NHP emotional reactions, Mauchly's (W) test of sphericity for time W = 0.315, p < .001, time*group Greenhouse–Geisser F = 14.166, p < .001							
NHP sleep							
First measurement	77.14 (2.80)	77.63 (0)	−0.48 [−1.48, 0.50]	t = −1.00	.325	–	–
Second measurement	74.04 (8.47)	77.64 (0.05)	−3.59 [−6.60, −0.58]	t = −2.436	.021	0.601	Medium
Third measurement	39.73 (15.28)	73.23 (7.28)	−33.50 [−39.43, −27.56]	t = −11.367	<.001	2.799	Large
Fourth measurement	10.22 (12.74)	61.65 (13.10)	−51.42 [−57.78, −45.07]	t = −16.165	<.001	3.980	Large
Statistical analysis F = 268.414, df = 1, p < .001, r^2 = 0.807, d^b = 2.044 (large effect)							
Sphericity test for NHP sleep, Mauchly's (W) test of sphericity for time W = 0.413, p < .001, time*group Greenhouse–Geisser F = 129.974, p < .001							

(*Continued*)

Table 2.
Comparison of Nottingham Health Profile (NHP) and Sub-Dimensions Mean Scores of Women in Mindfulness-Based Breathing Exercise (MBBE) and Control Groups According to Measurement Times (Continued)

Scale and Measurements	MBBE Group (n = 33) Mean (SD)	Control Group (n = 33) Mean (SD)	Mean Difference [95% CI]	Test	p	da	Effect Size Level
NHP social isolation							
First measurement	50.95 (18.16)	43.57 (20.56)	7.37 [−2.16, 16.91]	t = 1.54	.127	–	–
Second measurement	34.77 (18.76)	40.41 (21.37)	−5.64 [15.53, 4.24]	t = −1.139	.259	–	–
Third measurement	7.44 (12.05)	29.84 (20.78)	−22.40 [−30.79, −14.00]	t = −5.355	<.001	1.318	Large
Fourth measurement	0 (0)	24.54 (19.90)	−24.54 [−31.60, −17.49]	t = −7.086	<.001	1.743	Large
Statistical analysis F = 9.806, df = 1, p = .003, r^2 = 0.133, d^b = 0.391 (medium effect)							
Sphericity test for NHP social isolation, Mauchly's (W) test of sphericity for time W = 0.847, p = .065; time*group sphericity assumed F = 27.506, p < .001							
NHP physical mobility							
First measurement	71.39 (6.36)	68.58 (7.90)	2.80 [−0.72, 6.33]	t = 1.588	.117	–	–
Second measurement	67.59 (6.04)	65.63 (4.98)	1.96 [−0.76, 4.68]	t = 1.438	.155	–	–
Third measurement	46.67 (9.99)	62.70 (7.61)	−16.03 [−20.40, −11.66]	t = −7.331	<.001	1.805	Large
Fourth measurement	35.23 (4.68)	54.97 (8.32)	−19.74 [−23.08, −16.40]	t = −11.873	<.001	2.924	Large
Statistical analysis F = 40.599, df = 1, p < .001, r^2 = 0.388, d^b = 0.796 (large effect)							
Sphericity test for NHP physical mobility, Mauchly's (W) test of sphericity for time W = 0.714, p = .001, time*group Greenhouse–Geisser F = 63.295, p < .001							
NHP energy							
First measurement	100.00 (0)	100.00 (0)	–	–	–	–	–
Second measurement	100.00 (0)	100.18 (.58)	−0.18 [−0.38, 0.02]	t = −1.789	.083	–	–
Third measurement	51.03 (19.63)	97.81 (7.00)	−46.78 [−54.12, −39.45]	t = −12.891	<.001	3.174	Large
Fourth measurement	8.09 (15.85)	89.89 (19.41)	−81.79 [−90.51, −73.07]	t = −18.742	<.001	4.616	Large
Statistical analysis F = 431.053, df = 1, p < .001, r^2 = 0.871, d^b = 2.598 (large effect)							
Sphericity test for NHP energy, Mauchly's (W) test of sphericity for time W = 0.001, p < .001, time*group Greenhouse–Geisser F = 209.363, p < .001							

Note: The decrease in NHP total and sub-dimension mean scores indicates that the health profile of the individual is positively affected.
df = degrees of freedom; F = two-way repeated measures ANOVA (group–time interaction analysis); MBBE = Mindfulness-Based Breathing Exercise; NHP = Nottingham Health Profile; p = statistical significance level < .05; r^2 = partial eta square; t = Independent sample t-test.
d^a: Impact value of each application according to assessment time, interpretation of effect sizes in t-tests, the effect sizes in t-tests: 0.2 for small effects, 0.5 for medium effects, and 0.8 for large effects.
d^b: Impact value for two-way repeated measures ANOVA, the effect size in two-way repeated measures ANOVA: 0.1 for small effects, 0.25 for medium effects, and 0.4 for large effects.

Table 3.
Comparison of Mean Values for Vital Signs, Basal Fetal Heart Rate and Number of Fetal Movements of Women in Mindfulness-Based Breathing Exercise (MBBE) and Control Groups According to Measurement Times

Variable and Measurements	MBAM Group (n = 33) Mean (SD)	Control Group (n = 33) Mean (SD)	Mean Difference [95% CI]	Test	p	da	Effect Size Level
Body temperature							
First measurement	36.64 (0.16)	36.67 (0.11)	.−0.03 [−0.09, −0.38]	t = −0.876	.385	–	–
Second measurement	36.65 (0.13)	36.67 (0.10)	−0.01 [−0.07, 0.04]	t = −0.616	.541	–	–
Third measurement	36.67 (0.13)	36.67 (0.09)	0.003 [0.053, 0.059]	t = 0.108	.915	–	–
Fourth measurement	36.70 (0.12)	36.70 (0.11)	0.006 [−0.05, 0.06]	t = 0.203	.840	–	–
Statistical analysis F = 0.161, df = 1, p = .690, r^2 = 0.003, d^b = 0.054 (no effect)							
Sphericity test for body temperature, Mauchly's (W) test of sphericity for time W = 0.796, p = .014, time*group Greenhouse–Geisser F = .678, p = .545							
Pulse							
First measurement	70.90 (4.73)	70.63 (2.89)	0.27 [−1.65, 2.20]	t = 0.282	.778	–	–
Second measurement	75.15 (5.06)	76.81 (3.02)	−1.66 [−3.72, 0.39]	t = −1.622	.111	–	–
Third measurement	76.51 (4.97)	79.87 (3.78)	−3.36 [−5.53, −1.18]	t = −3.092	.003	0.760	Medium
Fourth measurement	77.48 (5.44)	82.66 (4.13)	−5.18 [−7.56, −2.80]	t = −4.354	<.001	1.072	Large
Statistical analysis F = 6.945, df = 1, p = .011, r^2 = 0.098, d^b = 0.329 (medium effect)							
Sphericity test for pulse, Mauchly's (W) test of sphericity for time W = 0.246, p < .001, time*group Greenhouse–Geisser F = 15.820, p < .001							
Respiration							
First measurement	25.27 (1.35)	24.15 (1.82)	1.12 [0.33, 1.91]	t = 2.838	.006	.698	Medium
Second measurement	19.57 (1.27)	20.72 (1.80)	−1.15 [−1.92, −0.38]	t = −2.990	.004	.738	Medium
Third measurement	17.63 (1.38)	19.30 (1.77)	−1.66 [−2.45, −0.88]	t = −4.247	<.001	1.052	Large
Fourth measurement	15.51 (1.46)	18.33 (1.74)	−2.81 [−3.60, −2.02]	t = −7.117	<.001	1.755	Large
Statistical analysis F = 12.052, df = 1, p = .001, r^2 = 0.158, d^b = 0.433 (large effect)							
Sphericity test for respiration, Mauchly's (W) test of sphericity for time W = 0.394, p < .001, time*group Greenhouse–Geisser F = 42.686, p < .001							
Oxygen saturation							
First measurement	96.51 (1.00)	95.84 (0.71)	0.66 [0.23, 1.09]	t = 3.111	.003	0.772	Medium
Second measurement	98.81 (0.39)	97.03 (0.58)	1.78 [1.54, 2.03]	t = 14.580	<.001	3.601	Large
Third measurement	99.0 (0)	97.30 (0.58)	1.69 [1.48, 1.90]	t = 16.650	<.001	4.145	Large
Fourth measurement	99.0 (0)	97.78 (0.54)	1.21 [1.01, 1.40]	t = 12.769	<.001	3.195	Large
Statistical analysis F = 174.292, df = 1, p < .001, r^2 = 0.731, d^b = 1.648 (large effect)							
Sphericity test for oxygen, Mauchly's (W) test of sphericity for time W = 0.344, p < .001, time*group Greenhouse–Geisser F = 20.411, p < .001							

(*Continued*)

Table 3.
Comparison of Mean Values for Vital Signs, Basal Fetal Heart Rate and Number of Fetal Movements of Women in Mindfulness-Based Breathing Exercise (MBBE) and Control Groups According to Measurement Times (Continued)

Systolic blood pressure							
First measurement	147.66 (9.05)	148.60 (8.96)	−0.93 [−5.37, 3.49]	$t = -0.423$	.673	–	–
Second measurement	113.09 (7.81)	112.90 (5.82)	0.18 [−3.20, 3.57]	$t = 0.107$	.915	–	–
Third measurement	108.45 (6.26)	109.84 (4.47)	−1.39 [−4.07, 1.28]	$t = -1.040$	.302	–	–
Fourth measurement	105.03 (5.76)	111.9 (4.29)	−6.90 [−9.41, −4.40]	$t = -5.523$	<.001	1.352	Large
Statistical analysis $F = 4.803$, $df = 1$, $p = .032$, $r^2 = 0.070$, $d^b = 0.274$ (medium effect)							
Sphericity test for systolic blood pressure, Mauchly's (*W*) test of sphericity for time $W = 0.154$, $p < .001$, time*group Greenhouse–Geisser $F = 4.362$, $p = .026$							
Diastolic blood pressure							
First measurement	96.21 (7.77)	96.51 (6.01)	−0.30 [−3.72, 3.11]	$t = -0.177$	.860	–	–
Second measurement	75.45 (5.97)	75.63 (5.33)	−0.18 [−2.96, 2.60]	$t = -0.130$	.897	–	–
Third measurement	70.09 (4.26)	72.51 (4.27)	−2.42 [−4.52, −0.32]	$t = -2.308$	.024	0.567	Medium
Fourth measurement	67.0 (3.63)	71.06 (3.83)	−4.06 [−5.89, −2.22]	$t = -4.418$	<.001	1.088	Large
Statistical analysis $F = 4.407$, $df = 1$, $p = .040$, $r^2 = 0.064$, $d^b = 0.261$ (medium effect)							
Sphericity test for diastolic blood pressure, Mauchly's (*W*) test of sphericity for time $W = 0.173$, $p < .001$, time*group Greenhouse–Geisser $F = 2.545$, $p = .098$							
Basal fetal heart rate							
First measurement	151.33 (2.64)	150.72 (4.48)	0.60 [−1.21, 2.42]	$t = 0.669$	.506	–	–
Second measurement	146.81 (2.05)	147.39 (3.83)	−0.57 [−2.09, 0.94]	$t = -0.761$	.450	–	–
Third measurement	147.66 (2.27)	146.78 (3.68)	0.87 [−.62, 2.38]	$t = 1.165$	.248	–	–
Fourth measurement	148.63 (2.45)	146.24 (3.59)	2.39 [0.87, 3.90]	$t = 3.156$	.002	0.777	Large
Statistical analysis $F = 1.142$, $df = 1$, $p = .289$, $r^2 = 0.018$, $d^b = 0.135$ (there is no effect because $p = .289$)							
Sphericity test for basal fetal heart rate, Mauchly's (*W*) test of sphericity for time $W = 0.638$, $p < .001$, time*group Greenhouse–Geisser $F = 29.791$, $p < .001$							
Fetal movement count							
First measurement	2.18 (0.72)	2.03 (0.63)	0.15 [−0.18, 0.48]	$t = 0.901$	.371	–	–
Second measurement	3.06 (0.65)	2.90 (0.52)	0.15 [−0.14, 0.44]	$t = 1.036$	.305	–	–
Third measurement	3.81 (0.52)	3.54 (0.66)	0.27 [−0.02, 0.56]	$t = 1.844$	.070	–	–
Fourth measurement	4.60 (0.74)	4.0 (0.66)	0.60 [0.25, 0.95]	$t = 3.488$	.001	0.855	Large
Statistical analysis $F = 4.475$, $df = 1$, $p = .038$, $r^2 = 0.065$, $d^b = 0.263$ (medium effect)							
Sphericity test for fetal movement number, Mauchly's (*W*) test of sphericity for time $W = 0.979$, $p = .931$, time*group sphericity assumed $F = 5.833$, $p = .001$							

Note: df = degrees of freedom; F = two-way repeated measures ANOVA (group–time interaction analysis); MBBE = Mindfulness-Based Breathing Exercise; NHP = Nottingham Health Profile; p = statistical significance level < .05; r^2 = partial eta square; t = independent sample t-test.
d^a: Impact value of each application according to assessment time, interpretation of effect sizes in t-tests, the effect sizes in t-tests: 0.2 for small effects, 0.5 for medium effects, and 0.8 for large effects.
d^b: Impact value for two-way repeated measures ANOVA, the effect size in two-way repeated measures ANOVA: 0.1 for small effects, 0.25 for medium effects, and 0.4 for large effects.

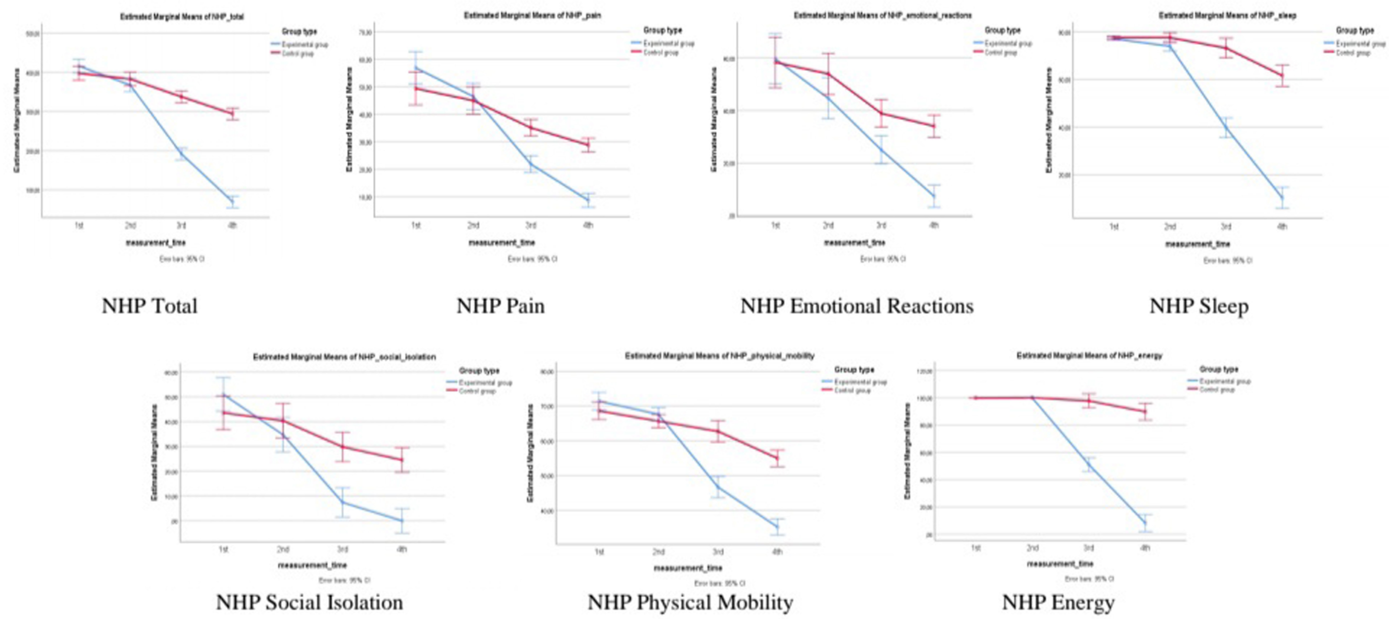

Figure 3.
Graph of Change in Average NHP and Sub-Dimension Scores of Pregnant Women With Pre-Eclampsia in Experimental and Control Groups Over Time.

women, and thus positively affected the health profiles of pregnant women. When the literature was analyzed, no study similar to our research findings was found. However, it was determined that the studies conducted were mind–body-based applications on different samples. Qi et al. (2020) found that breathing exercise was effective in maintaining energy levels; Pozuelos et al. (2019) found that 3 weeks of mindfulness breathing positively affected metacognitive processes; Aybar et al. (2020) reported that respiratory exercise in patients with breast cancer had a positive effect on the functional status of patients. When the mechanism of action of MBBE application is examined, it is effective in increasing oxygenation in the body with mindful breathing exercises, providing relaxation and parasympathetic nerve activation in the body with controlled breathing and meditation, decreasing cardiovascular activity, increasing vasodilation, and increasing vascular endothelial growth factor that stimulates angiogenesis for fetal and placental development. The SFlt-1/PGF ratio is thought to lower blood pressure by reducing the level of SFlt-1 in plasma, which is used in clinical routine to predict adverse outcomes associated

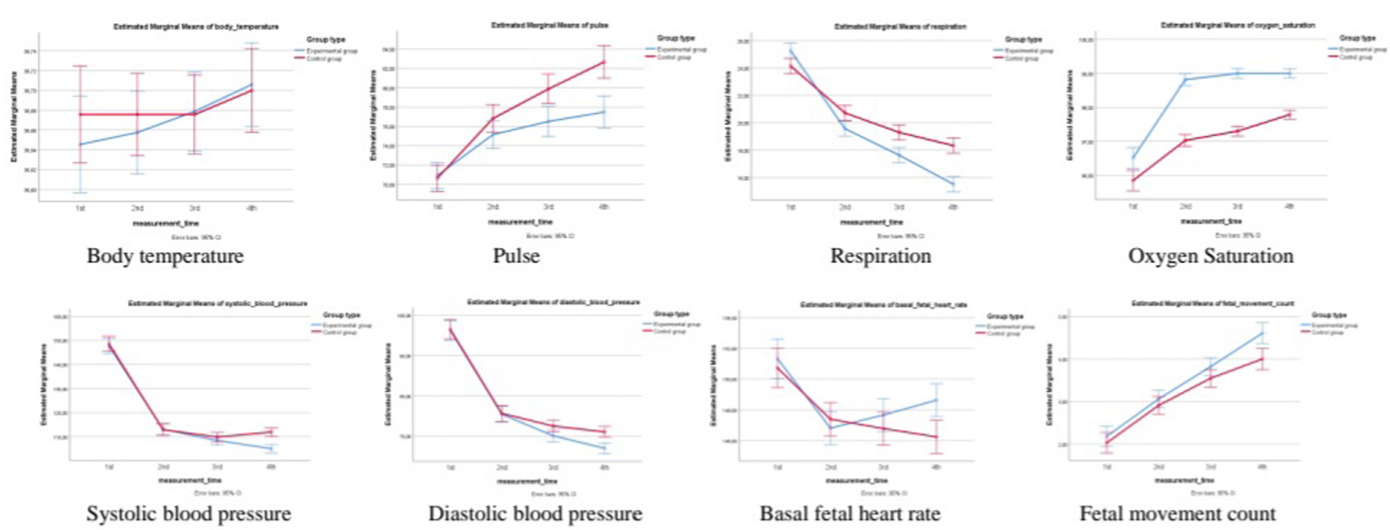

Figure 4.
Graph of Change in Average Vital Signs, Basal Fetal Heart Rate, and Fetal Movement Count of Pregnant Women With Pre-Eclampsia in Experimental and Control Groups Over Time.

with pre-eclampsia, thereby improving the overall health profile of pregnant women (Paccione et al., 2022). Our study finding is consistent with the literature and shows that MBBE has a positive effect on the health profile.

In this study, it was determined that MBBE application applied in a sitting position (zazen) for 20 minutes every 8 hours for 72 hours was effective on vital signs in pregnant women with pre-eclampsia. It was found that MBBE administration decreased systolic and diastolic blood pressure, increased oxygen saturation, and decreased pulse rate and respiratory rate. When the literature was examined, no study examining the effect of MBBE application on vital signs in pregnant women with pre-eclampsia was found. However, there are studies in the literature examining the effectiveness of mind–body-based intervention methods on different samples. Muthukrishnan et al. (2016) reported that mindfulness meditation training applied for two sessions per week for five weeks decreased respiratory rate, cold pressure systolic and diastolic blood pressure response, and mental arithmetic systolic blood pressure response and increased heart rate variability per minute in pregnant women. They also reported that all of these decreased the perceived stress in pregnant women as a result of improvement in parasympathetic functions. Bernardi et al. (2017) reported that slow breathing increased overall arterial and cerebral oxygen saturation, decreased blood pressure, and decreased basal respiratory rate. Conscious, slow, and deep breaths stimulate the parasympathetic nervous system by stretching the lung tissue and the vagal nerve (Babbar & Shyken, 2016). Activation of the parasympathetic system leads to a decrease in heart rate, blood pressure, metabolic rate, and oxygen consumption (Jerath et al., 2006). Deep breaths also enhance neuroplasticity, which is defined as the reorganization of neural pathways such as adaptive responses. Therefore, the increased parasympathetic activity during meditation makes it possible to limit the natural adaptations that occur during pregnancy, such as heart rate, plasma volume, cardiac output, etc. (Babbar & Shyken, 2016). Our study finding is consistent with the literature and shows that MBAM has a positive effect on vital signs.

In this study, it was determined that MBBE increased basal fetal heart rate and number of fetal movements. No study similar to this finding was found in the literature. However, Fink et al. (2011) investigated fetal response to relaxation techniques and reported that fetal heart rate was higher and had longer variations in the experimental group, especially during relaxation and 10 minutes after relaxation. Rakhshani et al. (2015) reported that 1-hour yoga practice three times a week in high-risk pregnant women increased utero-placental blood flow and was effective in improving fetal health. Providing relaxation in the body with conscious breathing exercises and meditation, an increase in oxygenation, and an increase in parasympathetic nerve activation accelerates utero-placental blood flow by providing improvement in the vital signs of the pregnant woman over time. This also leads to a positive effect on fetal health over time, with an increase in the basal fetal heart rate and fetal movement count in the fetus whose health profile improves (Babbar & Shyken, 2016; Jerath et al., 2006). Our study finding is consistent with the literature and shows that MBBE has a positive effect on fetal health profile.

Study Limitations

The limitations of this study are that it included only pregnant women with pre-eclampsia who were followed up in the hospital, was conducted in a single center, and had a single-blind design. There may have been an increase in the interest of the pregnant women in the experimental group in the MBBE practice during the practices and follow-ups. In addition, the pregnant women completed the NHP by themselves. However, vital signs were assessed using standard vital signs devices, and basal fetal heart rate and fetal movement rate were assessed by the researcher using an NST device. Therefore, since the data on the NHP and its sub-dimensions are based on subjective data, there may be detection bias in the study. In addition, there may be detection and performance bias in the study because pregnant women completed the NHP measurement tool a total of four times at the same time every day, and the pregnant women got used to the questions in the measurement tools over time. All these situations constitute the limitations of the study. Despite all these limitations, the fact that the study was conducted in a region where fertility is the highest in the country and the socioeconomic status of women is low constitutes the strength of the study.

Conclusion and Recommendations

Mindfulness-based breathing exercise positively affects the health profile, vital signs, fetal heart rate, and fetal movement count of pregnant women. Therefore, it may be recommended that pregnant women with pre-eclampsia should be informed about the practice and their awareness should be increased. Nurses should be informed and authorized about Mindfulness-based breathing exercise, and this method should be included in prenatal care practices.

Availability of Data and Materials: The data that support the findings of this study are available upon request from the corresponding author.

Ethics Committee Approval: Ethics committee approval was obtained from the Muş Alparslan University Scientific Research Ethics Committee (Approval no: 7/43, Date: July 7, 2023). Institutional approval was obtained from the Şanlıurfa Provincial Health Directorate (Registration no.: E-49781372-774.99-224414068) on September 13, 2023.

Informed Consent: Written and verbal informed consent was obtained from the participants.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept – A.K.; Design – A.K.; Supervision – A.K., S.Z.; Resource – A.K.; Materials – A.K.; Data Collection and/or Processing – A.K.; Analysis and/or Interpretation – A.K., S.Z.; Writing – A.K., S.Z.; Critical Review – S.Z.

Acknowledgment: The authors thank the pregnant women who participated in the study and the Şanlıurfa Training and Research Hospital Perinatology Service health professionals.

Declaration of Interests: The authors have no conflict of interest to declare.

Funding: The authors declared that this study has received no financial support.

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