Effect of Progressive Muscle Relaxation Techniques on Physiological Parameters, Psychological Factors and Sleep Quality among Pregnant Women with Preeclampsia

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Abstract

Preeclampsia is a progressive disorder affecting multiple systems, which is distinguished by the sudden appearance of high blood pressure and protein in the urine or other significant end-organ dysfunction. Progressive muscle relaxation techniques is a useful technique to minimize stress, anxiety and blood pressure among pregnant women with preeclampsia. **The aim** of this research was to evaluate the effect of progressive muscle relaxation techniques on physiological parameters, psychological factors and sleep quality among pregnant women with preeclampsia. **Design**: A quasi experimental design (Two-Groups, Pre-test / Post-test). **Setting:** The research was conducted at obstetrics & gynecological outpatient clinic in Benha university hospital. **Sample**: A purposive sample of 60 pregnant women with mild preeclampsia. **Data collection tools:** Five tools were used: A structured interviewing questionnaire, Self-rating anxiety scale, Cohen perceived stress scale and Pittsburgh sleep quality index. **Results:** The total score of knowledge and sleep quality in the study group showed significant improvement post-intervention and two weeks post- intervention compared to pre intervention while in the control group, there was minimal improvement. Also, the physiological parameters, total level of anxiety and total level of stress were significantly decreased in the study group post-intervention and two weeks post- intervention compared to control group. **Conclusion**: The progressive muscle relaxation technique was effective and have a significant improvement of knowledge, physiological parameters and psychological factors and sleep quality among women with mild pregnancy induced hypertension. **Recommendation:** Pregnant women with hypertension should be provided with relaxation techniques in antenatal care to improve knowledge, physiological parameters and reduce blood pressure and stress level.

Keywords: physiological parameters, preeclampsia, progressive muscle relaxation techniques, psychological factors, sleep quality

Introduction

Pregnancy-related hypertension disorders are prevalent medical issues and a significant global cause of morbidity and mortality of mothers and infants. Preeclampsia is a complex medical condition affecting multiple body systems during pregnancy. Its cause is still unknown, but it is recognized as a complicated disorder. The condition is identified by the sudden occurrence of elevated blood pressure and the presence of protein in urine after the 20th week of pregnancy **(Demissie et al., 2022).** After hemorrhage, hypertensive disorder of pregnancy is the second most common cause of maternal death worldwide. These disorders also serve as a primary factor for preterm birth, stillbirth, and neonatal death. Preeclampsia is a prevalent issue during pregnancy, impacting approximately 3-8% of pregnancies and each year, more than 70,000 mothers and 500,000 fetuses die worldwide as a result of this **(Centers for Disease Control and Prevention, 2022).**

Preeclampsia is a "disease of theories" because multiple genetic, immunological, and environmental factors are thought to play a role in its development, but its exact cause is unknown. There are two phases to the pathogenetic mechanisms of this illness. The initial phase is marked by reduced blood flow to the placenta, likely caused by abnormal placental development with inadequate trophoblast incursion and insufficient renovating of the uterine spiral arteries. The second phase involves systemic symptoms in the mother, including which include thrombotic, metabolic, and inflammatory reactions that collectively

alter vascular function and may cause harm to several organs **(Lemoine et al., 2019.)**

In addition, Preeclampsia has the potential to affect the entire body of a woman, leading to additional complications during pregnancy such as HELLP syndrome. The likelihood of having a stroke, cardiovascular disease, and diabetes is raised by this condition. Preeclamptic pregnancies also increase the risk of preterm birth, perinatal mortality, delayed neurodevelopment, and cardiovascular and metabolic disorders in the offspring. Preeclampsia may develop into eclampsia if it is not treated for longer than twenty-four hours. An estimated 300 million women and children globally are more likely to experience long-term health problems as a result of having previously experienced preeclampsia. **(Sabry et al., 2021).**

Pregnant women who experience pregnancy complications, like preeclampsia, are prone to undergoing feelings of anxiety and stress throughout their pregnancies. Anxiety and stress during pregnancy increase the risk that expectant mothers will experience gestational hypertension and preeclampsia. The sympathetic nervous system is activated by the hypothalamus in response to stress, and this in turn causes the adrenal medulla to release adrenaline and norepinephrine. To cater to the demands of the heart, brain, bones, and muscles in order to handle the stress, owing to the actions of these hormones, there is an elevation in both blood pressure and blood sugar levels **(Pratiwi et al., 2021).**

Throughout pregnancy, childbirth and breastfeeding, exposed to psychological stress can result in negative consequences, such as termination of pregnancy, vomiting and diarrhea, preeclampsia, weight loss, premature birth, weakened immune system, and thus increasing the possibility of miscarriage. Moreover, it can also contribute to various degrees of postpartum psychological disorders. Research has shown a significant relationship between reduced quality of life and the factors mentioned above, including depression and general health issues (**Ding et al., 2021).**

Sleep disturbance is a prevalent issue for women experiencing preeclampsia, with approximately 79% of pregnant women globally encountering this problem. Sleep disorders have a connection to oxidative stress and dysfunction in the endothelial cells. Furthermore, they may increase the levels of cortisol and adrenal hormones, stimulate sympathetic nerves, and boost tumor necrosis factor-alpha, all of which contribute to an elevation in blood pressure **(Niazi et al., 2022)**.

Managing preeclampsia remains a difficult issue in obstetrics as the use of strong antihypertensive medication is usually avoided to prevent medically-induced low blood pressure. Also, there is a concern about the potential adverse impact of antihypertensive drugs on the developing fetus. Therefore, the most effective approach to management involves a combination of pharmaceutical and non-pharmaceutical methods. The latest data confirms that adopting a nutritious diet, losing weight, engaging in exercise, managing stress, and practicing relaxation techniques may help decrease the likelihood of developing preeclampsia **(Odigboegwu et al., 2020).**

Numerous relaxation methods have been demonstrated to help patients in a variety of ways. Jacobson's Progressive Muscle Relaxation Technique is one popular form of relaxation therapy. Dr. Edmund Jacobson created the Jacobson relaxation technique in 1930 with the intention of calming the nervous system and achieving profound muscle relaxation. The technique is based on the belief that when the muscles relax, the mind follows suit, ultimately eliminating any emotional distress. Jacobson maintained that this state of complete relaxation in the peripheral parts of the body could diminish arousal in both the central and autonomic nervous systems, leading to improved overall psychological and physical wellbeing **(Jacobson, 1938: Abdelhalim et al., 2023).**

Maternity nurses play a vital role in enhancing the well-being of expectant mothers, particularly those suffering from hypertension. A combination of lifestyle changes such as relaxation techniques and reducing stress, combined with medical treatment, can effectively and safely manage mild preeclampsia in pregnant women **(Ali et al., 2022).**

Justification of the research:

Pregnancy-related hypertension is the second most common cause of maternal death and remain a major health problem for women and the fetus in the world wide. Approximately 2-8% of pregnancies globally are impacted by preeclampsia, leading to the unfortunate loss of over 70,000 women's lives annually **(Hong et al. 2021)**. Around 6-8% of pregnancies in Egyptian women are affected by preeclampsia, and this

percentage increases to as much as 15% in tertiary care centers. Furthermore, preeclampsia remains the leading cause of maternal death, responsible for 27.7% of preventable maternal deaths. **(Ameen et al., 2023).**

Adverse consequences for both the fetus, newborn, and mother are linked with pregnancy induced hypertension. These complications include premature delivery, restricted growth in the uterus, perinatal mortality, acute hepatic or renal failure, antepartum hemorrhage, excessive bleeding after childbirth, and maternal mortality. **(Ekasari et al., 2021).**

Progressive muscle relaxation is an uncomplicated, secure, cost-effective, accessible, self-administered approach that can be easily implemented by the patient without the use of medications. Furthermore, it has emerged as an essential component in nursing care due to its methodical nature in alleviating stress, anxiety, depression, pain sensitivity, muscle tightness, and promoting restful sleep. In addition, it has been found that progressive muscle relaxation improves the body's immune system and overall feeling of contentment by triggering the release of endorphins. Additionally, it promotes parasympathetic activities which leads to a decrease in the cardiac index, blood pressure, heart rate, and breathing rate, while also improving physical performance. **(Bialas et al., 2020).** Therefore, this study was conducted to evaluate the effect of progressive muscle relaxation techniques on physiological parameters, psychological factors and sleep quality among pregnant women with preeclampsia.

Aim of the research:

This research aimed to evaluate the effect of progressive muscle relaxation techniques on physiological parameters, psychological factors and sleep quality among pregnant women with preeclampsia.

Research hypotheses:

H1: Women who will practice progressive muscle relaxation technique will show better physiological parameters than those who don't.

H2: Women who will practice progressive muscle relaxation technique will show less psychological factors (anxiety and stress) than those who don't.

H3: Women who will practice progressive muscle relaxation technique will show high sleep quality than those who don't.

Operational definitions:

Progressive muscle relaxation technique: It's a pattern of relaxation therapy that's adhered in nursing to minimize or improving physiological parameters, psychological factors and sleep quality among pregnant women with preeclampsia. This intervention entails pregnant women performing the contraction and relaxation movements of their muscles, in a peaceful environment. The duration of each session is 20 minutes, and the intervention takes place for a consecutive period of 15 days.

Physiological Parameters: It included assessment of blood pressure (systole and diastole), respiratory rate and pulse rate of pregnant women with preeclampsia.

Psychological Factors: It is a state of anxiety and stress expressed by the pregnant women with preeclampsia which were measured by anxiety scale as well as Cohen perceived stress scale.

Subjects and Method:

Research design:

A quasi experimental design (Two-Groups, Pre-test / Post-test quasi-experimental design) was applied in order to achieve the goal of this study. This design involves assessing an initial observation (pre-test) before implementing any intervention on individuals. The intervention is then introduced, followed by a second observation (post-test) conducted at a later time. By comparing the pre-test and post-test observations, the effectiveness of the intervention can be measured. **(Millsap and Olivares, 2009).**

Setting:

The research was carried out at the obstetrics and gynecological outpatient clinic located in Benha University Hospital. The clinic consists of a single room that is divided into separate areas for diagnosis and examination. Additionally, there is a waiting area specifically for women who were admitted and interviewed by the researchers. The clinic offers a range of services, including obstetrics and gynecological care, family planning counseling, and various outpatient procedures. The clinic's operating hours are from 9am to 12pm.

Sampling:

Sample type and size: A Purposive sample of 60 pregnant women. In 2022, the statistical center of Benha University Hospital reported that there were 601 pregnant women diagnosed with

preeclampsia by the end of that year. Ten percent of flow rate (60 pregnant women) were chosen, and two groups were randomly assigned: the control group, which consisted of 30 women who offered usual hospital care, and the study group, which consisted of 30 women who practiced progressive muscle relaxation technique in combination with usual hospital care. The selection of pregnant women followed **specific criteria**: women with a diagnosis of mild preeclampsia (having blood pressure readings between ≥140/90 and 160/110), gestational age 28 – 32 weeks, not suffering from any additional health problems, poised to take part in the research and available phone number to facilitate communication and follow up.

Tools of data collection:

Five tools were employed to gather data:

Tool (I): A structured interviewing questionnaire: It was composed of three parts:

Part one*:* Personnel characteristics of the pregnant women. It included four items (age, residence, education and occupation).

Part two*:* **Obstetrical history:** It included sex items (gestational age, gravidity, parity, previous abortions, preeclampsia in the previous pregnancy and family history regarding preeclampsia).

Part three*:* **knowledge related preeclampsia:** Researchers developed this part after reading relevant literature **(Al Ebrahimy et al., 2019; Agbeno et al., 2020)** to assess pregnant women' knowledge about preeclampsia. It included 9 items (definition, types, risk factors, signs, symptoms, complications, schedule of visits for preeclamptic women, criteria of HEELP syndrome and management).

Scoring system of knowledge: Every item received a score of (2) for correct answers and a score of (1) for incorrect answers. The sum of the scores for correct answers determined the total knowledge score. Higher scores indicate a greater understanding of preeclampsia. The overall knowledge score fell into the following categories:

- Inadequate knowledge: less than 60%
- Adequate knowledge: 60% to 100%

Tool (II): The Self-Rating Anxiety Scale: (SAS)

This tool was adapted from **Samakouri et al., (2012)** and encompassed 10 items to assess anxiety level. The Likert scale for each item has 5-point scale: (0)"never", (1)"sometime", (2)"half the time", (3)"frequently", and (4)"always". To determine the overall anxiety score for each individual, the answers' scores for every item were added together. Additionally, each subject's average anxiety scale was computed.

Total anxiety scoring system:

- Values ranging from 0 to 16 indicate a mild level of anxiety
- Values ranging from 17 to 24 indicate a moderate level of anxiety
- Values ranging from 25 to 40 indicate a severe level of anxiety

Tool (III): Cohen Perceived Stress Scale:

It was adopted from **Cohen et al., (1983),** to which women perceive lives as stressful. The subjects report how frequently in the past month they have found their lives unclear, unpredictable, and out of control. The scale was made up of "ten items," each of which was rated on a 5-point scale that went from (0) never, (1) almost never, (2) sometimes, (3) fairly often, and (4) very often. The questions "4, 5, 7, and 8" had reverse scores, meaning that the scores changed to 0=4, 1=3, 2=2, 3=1, and 4=0. The ratings were then added up for all ten items.

Total stress scoring system:

- Values ranging from 0 to 13 indicate a low level of stress.
- Values ranging from 14 to 26 indicate a moderate level of stress.
- Values ranging from 27 to 40 indicate a high level of stress.

Tool (IV): Physical assessment sheet: It was created and utilized by the researchers to gather information regarding physiological parameters such as blood pressure value (systole and diastole), pulse rate and respiratory rate.

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

It was adopted from **Carole, (2007)** to measure the sleep quality during previous month. It composed of "19 statements". PSQI covered "7 domains" related to sleep habits including: "Subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbance, use of sleeping medication and daytime dysfunction".

Scoring system: The sum of seven component scores, ranging from 0 (indicating no difficulty) to 3 (indicating severe difficulty), yielded a total score ranging from "0 to 21". A higher total score denotes poorer sleep quality.

The PSQI was interpreted into 4 levels of sleep quality.

- PSQI ≤ 5 indicates "good sleep quality".

- PSQI: 6 – 10 indicates "mild sleep quality disturbance".
- PSQI: 11 – 15 indicates "moderate sleep quality disturbance".
- PSQI ≥ 16 indicates "poor sleep quality".

Tools validity:

To check the content validity, a group of three nursing experts specializing in obstetrics and gynecology were provided with the data collection tools. Based on the feedback received from the panel, revisions were made to enhance the clarity of the statements and ensure the appropriateness of the content.

Tools reliability:

The tools were assessed for their reliability through the application of Cranach's alpha test. The results of this test indicated that the tools possess stable characteristics:

Tool	Cronbach's alpha value
Tool I- Part 3: Knowledge regarding preeclampsia	0.89
Tool II: The Self-Rating Anxiety Scale (SAS)	0.94
Tool III: Cohen Perceived Stress Scale	0.91
Tool IV: Physical assessment sheet	0.79
Tool V: Pittsburgh sleep quality index (PSQI):	0.91 and it rang from 0.85 to 0.93 the seven domains

Ethical Considerations:

Prior to commencing the research, the Benha University Faculty of Nursing's Scientific Research Ethical Committee approved the study. In order to carry out the research, a formal authorization has been granted by the chosen study environments. The purpose of the study and its benefits were communicated to all women start of the interview and around the research period. Every woman provided written consent prior to the start of the data collection. The women were reassured that the data would not be made public or used solely for research purposes. The women' autonomy and integrity were ensured. The women also had the freedom to stop participating in the study at any time without repercussions.

Pilot study:

Ten percent of the sample (six women) participated in the pilot study, which was conducted to assess the research tools' appropriateness and clearness as well as the amount of time required to complete them. The main sample comprised all of the women who participated in the pilot study because the instruments utilized remained unchanged.

Field work:

In order to achieve the objective of the research, the study implemented several phases. The initial phase involved preparations, followed by conducting interviews and assessments. Subsequently, a planning phase was undertaken, and then the progressive muscle relaxation techniques were put into practice. Finally, an evaluation phase was carried out. These phases occurred within a span of twelve months, starting in early November 2022 and ending in late October 2023. The researchers made regular visits to the aforementioned locations twice a week (on Sundays and Tuesdays) from 9 a.m. to 12 p.m.

Preparatory phase:

The initial phase of the research consisted of a comprehensive examination of both local and global literature pertaining to different aspects of the research issue. This enabled the researchers to acquire a more profound comprehension of the extent and seriousness of the problem under investigation and also provided guidance for developing the necessary tools for data collection. These tools were subsequently presented to three specialists in Obstetrics and Gynecological Nursing to assess their suitability, thoroughness, clearness, relevance, and applicability. Some items were excluded based on the recommendations of the experts.

Interviewing and assessment phase:

In this stage, the researchers conducted separate interviews with the control and study groups. At the beginning of each interview, the researchers greeted every woman and provided a detailed explanation of the interview's objective, duration, and research tasks. The researchers distributed the structured interviewing questionnaire (Tool I) to assess women' personal characteristics, obstetrical history and knowledge regarding preeclampsia. Then, the researchers distributed the self-rating anxiety scale (Tool II-pre-test) to assess women' level of anxiety, Cohen perceived stress scale (Tool III-pre-test) to assess women' level of stress, Physical assessment sheet (Tool IV-pre-test) to assess physiological parameters and finally Pittsburgh sleep quality index (Tool V-pre-test) to assess sleep quality. A baseline for further comparison to assess the effects of advanced muscle relaxation techniques has been

established by data obtained at this stage. On average, it took 30-45 minutes to finish all the tools.

Planning phase:

After conducting interviews, assessments, and reviewing relevant literature, the researchers created printed colored guidelines booklets and videos on preeclampsia and progressive muscle relaxation techniques. These resources were developed to address the women's lack of knowledge and inadequate practices related to preeclampsia. The researchers also determined the instructional media, teaching methods, number of sessions and their content.

Implementation phase:

For control group: The women in the control group received routine hospital care (such as; measuring blood pressure for hypertension, urine analysis for proteinuria, body weight for oedema, instruction about rest and sleep, minimal salt intake, sedative, antihypertensive) without intervention.

For study group: In addition to the routine hospital care, the researchers conducted the intervention by organizing three instructional sessions, with 30 to 45 minutes dedicated to each session. In the reception area of the obstetrics and gynecological outpatient clinic, these sessions were replicated for each subgroup of 1-3 women per session. To ensure understanding, a simplified Arabic language was used. A variety of instructional techniques and resources were used, including video films, power point presentations, role-playing and demonstration with a model, modified lectures, group discussions, and a specially created booklet. After each session, any questions from the women were addressed to clarify any misunderstandings. Feedback from the previous session was given at the start of the next one and an introduction to the new session's objectives. The instructional booklets were given to all study group's women. The researchers monitored the adherence of these women to the progressive muscle relaxation techniques through telephone communication.

(1) The first session. **(Theoretical)**

The session covered knowledge regarding preeclampsia, including its definition, types, risk factors, signs, symptoms, complications, schedule of visits for high-risk pregnant women, symptoms of HEELP syndrome and management.

(2) The second and third sessions (**Practical)**

The practical sessions included demonstration and re-demonstration of progressive muscle relaxation techniques. The researchers trained the women how to apply the progressive muscle relaxation techniques adopted from **Chandran, (2018)**. As the following:

The woman was instructed to sit in a quiet place, relax, empty her bladder, and remove any restrictive clothing. Following that, she was instructed to take a deep breath in through her nose, expanding her abdomen, and then exhale slowly through her mouth. "Inhale deeply for another "3-5 rounds".

1. Fist

Place your hand on the armrest of the chair and close your fingers tightly into a fist, applying pressure to the palm. Maintain this position for 8 seconds, ensuring that the muscles in your hand are contracted. Afterward, gradually release the tension by repeating the word "relax" for 16 seconds while monitoring the warmth generated in that specific muscle group. Take a slow and deep breath for 30 seconds. Repeat these instructions twice, ensuring that each step is performed twice. Therefore, proceed to repeat the entire process once more.

2. Hands on the shoulder

Place your hand on your shoulders and exert pressure to contract the muscles for 8 seconds. Subsequently, relieve the tension gradually for 16 seconds with the verbalization of "relax... relax... relax..." and perceive the warmth originating from the targeted muscle group. Inhale deeply for a duration of 30 seconds. Finally, replicate this process once again.

3. Stretch hands downward

To tense the muscles in your hands and back, maintain a straight position and stretch your hands downward for a duration of 8 seconds. Subsequently, gradually release the tension by repeating the word "relax" privately for 16 seconds, allowing for the warmth to build up in those specific muscle groups. Take a thirty-second deep breath before proceeding to repeat the entire process once more.

4. Eyes

Tightly close the eyelids for a duration of 8 seconds in order to tighten the muscles surrounding the eyes. Subsequently, gradually release the tension over a period of 16 seconds while repeating the word "relax... relax... relax..." silently to oneself, and notice the

sensation of warmth produced in that specific group of muscles. Inhale deeply and hold for 30 seconds. Finally, repeat the aforementioned process once more.

5. Jaws

To tense the muscles in the jaw, close your lips, tilt your head, and form a smile for 8 seconds. Afterwards, ease the tension gradually for 16 seconds while repeating the word "relax... relax… relax…". You should feel a warmth in the targeted muscle group. After taking a deep breath for thirty seconds, repeat the procedure once more.

6. Head

To tense the muscles in the head, place the head firmly against the back of the chair for a duration of 8 seconds. Afterwards, gradually ease the tension for "16 seconds" while repeating the word "relax" to yourself. Pay attention to the warm sensation in that specific muscle group. Inhale deeply and hold the breath for 30 seconds. Finally, repeat the entire process once more.

7. Chest

To engage the muscles in chest, inhale deeply and maintain the breath for eight seconds. Subsequently, alleviate the pressure by exhaling gradually for 16 seconds while repeating the phrase " relax... relax… relax….." Moreover, pay attention to the sensation of warmth generated within the targeted muscle group. After inhaling deeply for thirty seconds, replicate these steps once again.

8. Stomach

Pull stomach in and contract abdominal muscles, maintaining this position for 8 seconds. Afterwards, slowly release the tightness over a period of 16 seconds while silently repeating the word "relax... relax... relax..." to yourself. Pay attention to the warmth that develops in that particular muscle group. Take a deep breath for 30 seconds. Perform this sequence again one more time.

9. Legs

In order to sustain tension in the leg muscles, it is crucial to ensure that the feet remain firmly grounded and apply force on the floor for 8 seconds. Then, slowly alleviate this tension over a period of 16 seconds by continuously repeating the soothing phrase "relax... relax... relax..." to oneself, enabling the sensation of warmth to emerge in the specific muscle group. Following this, take a deep breath for 30 seconds, and subsequently repeat the entire procedure again.

10. All the steps together

Contract your hand, eye, jaw, chest, abdomen, and leg muscles simultaneously and maintain the tension for a duration of 8 seconds. Subsequently, gradually relax all these muscle groups simultaneously for a duration of 16 seconds while uttering the word "relax... relax... relax..." to yourself. Notice the warmth generated within those specific muscle areas. Inhale deeply for 30 seconds, and then proceed to repeat this process once more.

Complete relaxation for 3 minutes.

In the end, take three minutes to be in a calm state without any body movements and appreciate the feeling of relaxation. Concentrate on the state of relaxation in your body. If women become distracted, take a deep breath to relax and return focus to the relaxed state of the body. After the three minutes of deep relaxation have passed, begin to slowly and gently move your body parts before gradually standing up.

After completing the practical session, an educational video was presented, illustrating the various steps involved in progressive muscle relaxation techniques. The pregnant women will be encouraged to engage in this intervention for a duration of 20 minutes once a day for a period of 15 days.

Evaluation phase:

Women were evaluated before the intervention, immediately after the intervention (2 weeks after baseline) and 2 weeks after the intervention (4 weeks after baseline). The women' knowledge regarding preeclampsia, anxiety level, stress level, physiological parameters and sleep quality were evaluated used Pre-posttest tools (Tool I – Part 3, II, III, IV and V).

Statistical analysis:

The Statistical Package for Social Sciences was used to code, organize, computerize, and analyze the data (SPSS version 22). The use of descriptive statistics (e.g. g. mean, percentages, frequencies, and standard deviations). Chi-square tests, independent t-tests, and Pearson correlation coefficients were used. Every statistical test that was conducted yielded a p-value: > 0.05 meant no statistically significant difference, <0.05 meant that there was, and ≤ 0.001 meant a highly significant difference.

Limitations

A limited number of studies have assessed how progressive muscle relaxation techniques affect physiological parameters, psychological factors, and the quality of sleep in preeclamptic pregnant women.

Results

Table (1): Clarifies that (53.3% & 46.7%) of both study and control groups respectively were in the age group of (≥ 35) with a mean age of 33.81±3.81 and 32.72 5.20 years old respectively. Pertaining to residence, (66.7% & 60.0%) of both study and control groups respectively from rural area. In terms of education, it was clear that the study group had secondary education at 46.7% and the control group had secondary education at 60.0%. Concerning occupation (73.3% & 60.0%) of both study and control groups were housewives. Furthermore, there was no significant variance noted in the individual attributes, implying a resemblance between the two cohorts.

Table (2): provides information on the gestational age of the study and control groups, stating that the mean gestational age was 29.43±0.89 in the study group and 29.40±1.40 in the control group. In terms of primigravida, 60.0% of the study group and 66.7% of the control group were primigravida. Furthermore, in the previous pregnancy, 90.0% of the study group and 83.3% of the control group did not have preeclampsia, and in terms of family history, 93.3% of the study group and 96.7% of the control group had no family history of preeclampsia.

Table (3): Reveals that, there was no statistical significant difference between the two groups at pre intervention phase regarding the knowledge about preeclampsia ($p > 0.05$). Nevertheless, immediate post intervention and two weeks after the intervention, a statistically significant contrast was observed between the two groups' knowledge about preeclampsia ($P \leq 0.05$).

Figure (1): Shows that 20.0% of study group and 23.3% of control group had adequate knowledge about preeclampsia before intervention. Meanwhile, immediately post-intervention and two weeks post- intervention, 70.0% and 76.7% in the study group compared to 26.7% and 33.3% of women in the control group respectively had adequate knowledge about preeclampsia.

Table (4): Shows that, prior to the intervention, there was no statistically significant difference in the average scores of the physiological parameters between the women in the two groups. The study group's average physiological parameter scores were, however, lower than those of the control group following the intervention. There was a significant difference in both respiratory rate and diastolic blood pressure ($p \leq 0.05$) as well as a highly significant difference in systolic blood pressure ($p \leq 0.001$). Furthermore, two weeks after the intervention, the average scores of the physiological parameters in the study group were still lower than those in the control group, with a highly significant difference in systolic and diastolic blood pressure ($p \leq 0.001$) and a significant difference in respiratory rate ($p \leq 0.05$).

Table (5): Reveals that, at the pre-intervention phase, there was no statistically significant difference in the mean anxiety score between the two groups ($P \leq 0.05$). Nonetheless, the study group's mean anxiety score was lower than the control group's at the two-week and immediately post-intervention phases, with a highly statistically significant difference between the two groups ($P \leq 0.001$). Additionally, in the study group, the overall score of anxiety per intervention was 31.36 ± 6.24 which decreased to 20.70 ± 6.39 and 17.06 ± 4.96 immediately post-intervention and two weeks post- intervention phases respectively. While in the control group, the overall score of anxiety pre intervention was 31.50 ± 5.72 which decreased to 28.53 ± 7.18 and 26.33 ± 7.87 immediately post-intervention and two weeks post- intervention phases respectively.

Figure (2): Shows that 80.0% and 76.6% of women in both study and control groups respectively had severe anxiety before intervention. Meanwhile, immediately post-intervention and two weeks post- intervention, only 30.0% and 16.7% in the study group compared to 70.0% and 66.7% of women in the control group respectively had severe anxiety.

Table (6): Demonstrates that, at the pre-intervention phase, there was no statistically significant difference ($P \leq 0.05$) in the mean stress score between the two groups. Nonetheless, the study group's mean anxiety score was lower than the control group's at the two-week and immediately post-intervention phases, with a statistically significant difference between the two groups ($P \leq 0.05$). Additionally, in the study group, the overall score of stress pre intervention was 33.70 ± 4.94 which decreased to 24.60 ± 4.21 and 22.63 ± 3.55 immediately post-intervention and two weeks post-intervention phases respectively while in the

control group, the overall score of anxiety per intervention was 33.36 ± 4.83which decreased to 30.76 ± 4.45 and 29.26 ± 6.15 immediately post-intervention and two weeks post-intervention phases respectively with highly statistical significant difference between two groups ($P \leq 0.001$).

Figure (3): displays that prior to the intervention, a significant percentage of women in both the study and control groups (73.3% and 76.6% respectively) experienced high levels of stress. However, following the intervention, the percentage of women in the study group with high stress decreased to 33.3% immediately post-intervention and 16.7% two weeks post-intervention. In comparison, the control group maintained higher levels of stress, with 73.3% reporting high stress immediately post-intervention and 70.0% reporting high stress two weeks post-intervention.

Table (7): Demonstrates that, there was no statistical significant difference in the mean score of sleep between the two groups at pre intervention phase ($p > 0.05$). However, immediately post-intervention and two weeks post- intervention phases, the mean difference score of sleep in the study group were lower than the scores in the control group with highly statistical significant difference between two groups ($P \leq 0.001$).

Figure (4): Shows that 3.3% and 0 % of women in both study and control groups respectively had good sleep quality before intervention. Meanwhile, immediately post-intervention and two weeks post- intervention, 26.7% and 36.7% in the study group compared to 0% of women in the control group respectively had good sleep quality.

Table (8) Shows that, there was a highly statistically significant positive correlation between total stress score and total anxiety score in both groups at pre intervention, post intervention and follow up phases ($P \leq 0.001$). On the other hand, there was a highly statistically significant negative correlation between total stress score and total sleep quality score in both groups at pre intervention, post intervention and follow up phases ($P \leq 0.001$).

Table (1): Distribution of the studied women in both groups according to personal characteristics (n=60)

personal characteristics	Study group n= 30		Control group n=30		FET/X2 p-value
	No	%	No	%	
Age (years)					
< 25	1	3.3	2	6.7	2.34€ 0.53
25- < 30	5	16.7	9	30.0	
30- < 35	8	26.7	5	16.7	
≥ 35	16	53.3	14	46.7	
Mean ± SD	33.81±3.81		32.72± 5.20		
Residence					
Rural	20	66.7	18	60.0	0.28
Urban	10	33.3	12	40.0	0.59
Education					
Not read nor write	1	3.3	0	0.0	2.08€ 0.81
Read and write	4	13.3	3	10.0	
Primary education	5	16.7	5	16.7	
Secondary education	14	46.7	18	60.0	
University education	6	20.0	4	13.3	
Job					
House wife	22	73.3	18	60.0	1.20
Employee	8	26.7	12	40.0	0.27

Chi-square test (x^2); € Fisher Exact Test; Non statistical significant $p > 0.05$

Table (2): Distribution of the studied women in both groups according to their obstetrical history (n=60).

Obstetrical history	Study group n= 30		Control group n=30		FET/X2	P value
	No	%	No	%		
Gestational age (Weeks)						
Mean ± SD	29.43±0.89		29.40±1.40		t=0.110	0.913
Gravidity						
Primigravida	18	60.0	20	66.7	0.28	0.59
Multigravida	12	40.0	10	33.3		
Parity						
Nullipara	18	60.0	20	66.7	0.93€	0.68
Primipara	10	33.3	9	30.0		
Multipara	2	6.7	1	3.3		
Previous abortion						
No	30	100.0	30	100.0	—	—
Preeclampsia in the previous pregnancy						
Yes	3	10.0	5	16.7	0.57	0.44
No	27	90.0	25	83.3		
Family history of preeclampsia						
Yes	2	6.7	1	3.3	0.35	0.55
No	28	93.3	29	96.7		

Chi-square test (x^2); € Fisher Exact Test; t= independent t test; Non statistical significant $p > 0.05$

Table (3): Distribution of the studied women in both groups according to their knowledge regarding preeclampsia thorough the program phases (n=60).

Items \ Groups		Before intervention	Immediate post intervention	Two weeks post intervention	X_1^2 P value	X_2^2 P value	X_3^2 P value
		Correct answer No. (%)	Correct answer No. (%)	Correct answer No. (%)			
Meaning of preeclampsia	**Study group (n= 30)**	9 (30.0)	21 (70.0)	23 (76.7)	0.30	4.34	5.71
	Control group (n= 30)	11 (36.7)	13 (43.3)	14 (46.7)	0.58^{ns}	0.03*	0.01*
Types of preeclampsia	**Study group (n= 30)**	7 (23.3)	19 (63.3)	21 (70.0)	0.34	5.40	5.45
	Control group (n= 30)	9 (30.0)	10 (33.3)	12 (40.0)	0.55^{ns}	0.02*	0.02*
Risk factors of preeclampsia	**Study group (n= 30)**	11 (36.7)	22 (73.3)	24 (80.0)	0.30	8.14	8.53
	Control group (n= 30)	9 (30.0)	11 (36.7)	13 (43.3)	0.58^{ns}	0.004*	0.003*
Signs of preeclampsia	**Study group (n= 30)**	6 (20.0)	18 (60.0)	22 (73.3)	0.80	4.28	8.14
	Control group (n= 30)	9 (30..0)	10 (33.3)	11 (36.7)	0.37^{ns}	0.03*	0.004*
Symptoms of preeclampsia	**Study group (n= 30)**	7 (23.3)	20 (66.7)	21 (70.0)	0.73	5.40	6.69
	Control group (n= 30)	10 (33.3)	11 (36.7)	11 (36.7)	0.39^{ns}	0.02*	0.01*
Complications of preeclampsia	**Study group (n= 30)**	9 (30.0)	22 (73.3)	23 (76.7)	0.08	9.64	9.77
	Control group (n= 30)	8 (26.7)	10 (33.3)	11 (36.7)	0.77^{ns}	0.002*	0.002*
Schedules of visits	**Study group (n= 30)**	5 (16.7)	20 (66.7)	22 (73.3)	0.11	9.64	9.64
	Control group (n= 30)	6 (20.0)	8 (26.7)	10 (33.3)	0.73^{ns}	0.004*	0.002*
Criteria of HEELP syndrome	**Study group (n= 30)**	2 (6.7)	15 (50.0)	18 (60.0)	0.35	9.32	10.00
	Control group (n= 30)	1 (3.3)	4 (13.3)	6 (20.0)	0.55^{ns}	0.002*	0.002*
Management of preeclampsia	**Study group (n= 30)**	6 (20.0)	20 (66.7)	22 (73.3)	2.20	4.28	4.44
	Control group (n= 30)	10 (33.3)	12 (40.0)	14 (46.7)	0.33^{ns}	0.03*	0.03*

^{ns} no statistical significant difference (p > 0.05) * A statistically significance (P ≤0.05).

$X1^2$ Comparison between two groups at pre-intervention.

$X2^2$ Comparison between two groups immediately post intervention.

$X3^2$ Comparison between two groups 2 weeks post- intervention

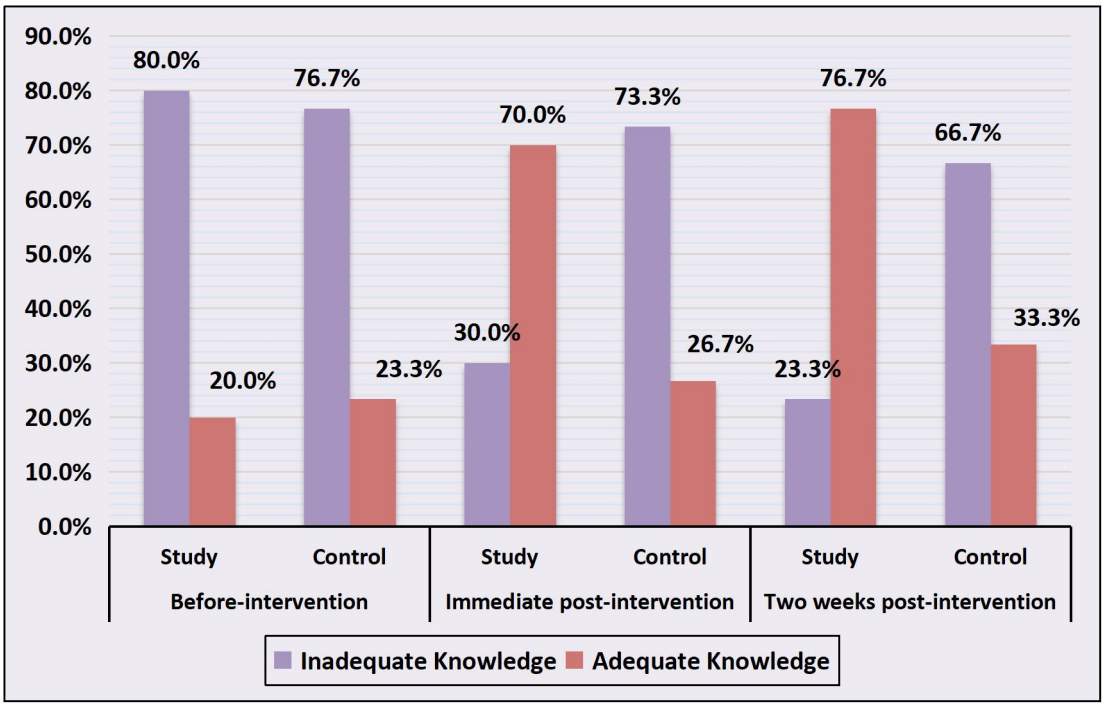

Figure 1. Distribution of studied women in both groups regarding their total knowledge about preeclampsia thorough the program phases (n=60).

Table (4): Comparison of the mean scores of physiological parameters among studied women in both groups thorough the program phases (n=60).

Items \ Groups		Before intervention	Immediate post intervention	Two weeks post intervention
		Mean ± SD	Mean ± SD	Mean ± SD
Systolic blood pressure (mmHg)	Study group (n= 30)	146.40 ± 2.74	143.16 ± 1.96	141.63 ± 2.74
	Control group (n= 30)	147.53 ± 3.51	146.66 ± 3.66	145.73 ± 5.54
Test of significance		t= 1.39 p = 0.16 ns	t= 4.61 p= 0.000**	t= 3.62 p= 0.000**
Diastolic blood pressure (mmHg)	Study group (n= 30)	97.83 ± 5.00	93.03 ± 2.28	91.26 ± 1.96
	Control group(n= 30)	96.26 ± 3.84	95.90 ± 4.20	94.73 ± 4.19
Test of significance		t= 1.36 p = 0.17 ns	t= 3.28 p= 0.002*	t= 4.10 p= 0.000**
Pulse rate (b/m)	Study group (n= 30)	78.56 ± 8.38	69.86 ± 8.08	68.01 ± 8.37
	Control group (n= 30)	76.10 ± 5.86	74.40 ± 5.28	73.13 ± 5.41
Test of significance		t= 1.32 p = 0.19 ns	t= 2.57 p= 0.01*	t= 2.78 p= 0.007*
Respiratory rate (c/m)	Study group (n= 30)	17.86 ± 1.22	17.40 ± 1.16	16.80 ± 1.24
	Control group(n= 30)	17.33 ± 1.29	17.46 ± 1.27	17.10 ± 1.06
Test of significance		t= 1.63 p = 0.10 ns	t= 0.21 p= 0.83 ns	t= 1.00 p= 0.31 ns

t= independent t-test ns no statistical significant difference (p > 0.05)

*A statistical significant difference (P ≤ 0.05); **A high statistical significant difference (P ≤ 0.001)

Table (5): Comparison of the mean scores of anxiety among studied women in both groups thorough the program phases (n=60).

Items \ Groups		Range of Possible Scores	Before intervention	Immediate post intervention	Two weeks post intervention	t-test 1 P-value	t-test 2 P-value	t-test 3 P-value
			Mean ± SD	Mean ± SD	Mean ± SD			
I feel restless, nervous, tense, or agitated	Study group	0-4	3.16 ± 0.69	2.13 ± 0.86	1.63 ± 0.61	0.89	3.46	3.66
	Control group		3.00 ± 0.74	2.80 ± 0.61	2.40 ± 0.96	0.37 ns	0.000**	0.000**
Experiencing fear without any cause	Study group	0-4	3.06 ± 0.63	2.06 ± 0.82	1.66 ± 0.66	0.39	4.53	3.84
	Control group		3.13 ± 0.68	2.93 ± 0.63	2.53 ± 1.04	0.69 ns	0.000**	0.000**
I worry about negative events that might happen to me	Study group	0-4	3.26 ± 0.73	2.10 ± 0.71	1.73 ± 0.63	0.18	6.42	4.19
	Control group		3.23 ± 0.62	3.20 ± 0.61	2.70 ± 1.08	0.85 ns	0.000**	0.000**
I struggle to fall asleep, remain asleep or waking up early	Study group	0-4	3.00 ± 0.74	2.26 ± 0.78	1.68 ± 0.71	0.66	4.01	3.47
	Control group		3.13 ± 0.81	2.86 ± 0.73	2.56 ± 1.04	0.51 ns	0.000**	0.000**
I face difficulty eating too much or too little	Study group	0-4	3.13 ± 0.77	2.10 ± 0.71	1.63 ± 0.71	0.51	4.69	3.80
	Control group		3.03 ± 0.71	2.96 ± 0.72	2.56 ± 1.13	0.60 ns	0.000**	0.000**
I wish I knew a way to enhance my relaxation	Study group	0-4	2.96 ± 0.66	2.16 ± 0.74	1.96 ± 0.80	0.46	5.47	3.54
	Control group		3.03 ± 0.41	3.00 ± 0.37	2.70 ± 0.79	0.64 ns	0.000**	0.000**
I have difficulty with my concentration	Study group	0-4	3.23 ± 0.67	2.20 ± 0.76	1.73 ± 0.78	0.55	5.29	4.18
	Control group		3.33 ± 0.71	3.16 ± 0.64	2.73 ± 1.04	0.58 ns	0.000**	0.000**
Experience feelings of anxiety most of time	Study group	0-4	3.30 ± 0.74	2.16 ± 0.74	1.76 ± 0.77	0.69	4.84	3.61
	Control group		3.16 ± 0.74	3.06 ± 0.69	2.66 ± 1.12	0.49 ns	0.000**	0.000**
Occasionally, I have cold hands or feet, dry mouth, sweating, and trouble breathing.	Study group	0-4	3.30 ± 0.59	2.23 ± 0.72	1.73 ± 0.73	0.19	5.70	4.10
	Control group		3.26 ± 0.73	3.23 ± 0.62	2.76 ± 1.16	0.84 ns	0.000**	0.000**
I wish I could be as relaxed with myself as others seem to be	Study group	0-4	2.93 ± 0.73	2.26 ± 0.73	1.80 ± 0.80	1.25	4.59	3.49
	Control group		3.16 ± 0.69	3.10 ± 0.66	2.66 ± 1.09	0.21 ns	0.000**	0.000**
Overall score	Study group	0-40	31.36 ± 6.24	20.70 ± 6.39	17.06 ± 4.96	0.08	4.07	5.45
	Control group		31.50 ± 5.72	28.53 ± 7.18	26.33 ± 7.87	0.93 ns	0.000**	0.000**

t= independent t-test; ns no statistical significant difference (p > 0.05); **A high statistical significant difference (P ≤ 0.001)

T-test 1 Comparison of mean scores between two groups before intervention

T-test 2 Comparison of mean scores between two groups immediate post intervention

T-test 3 Comparison of mean scores between two groups at two weeks post intervention

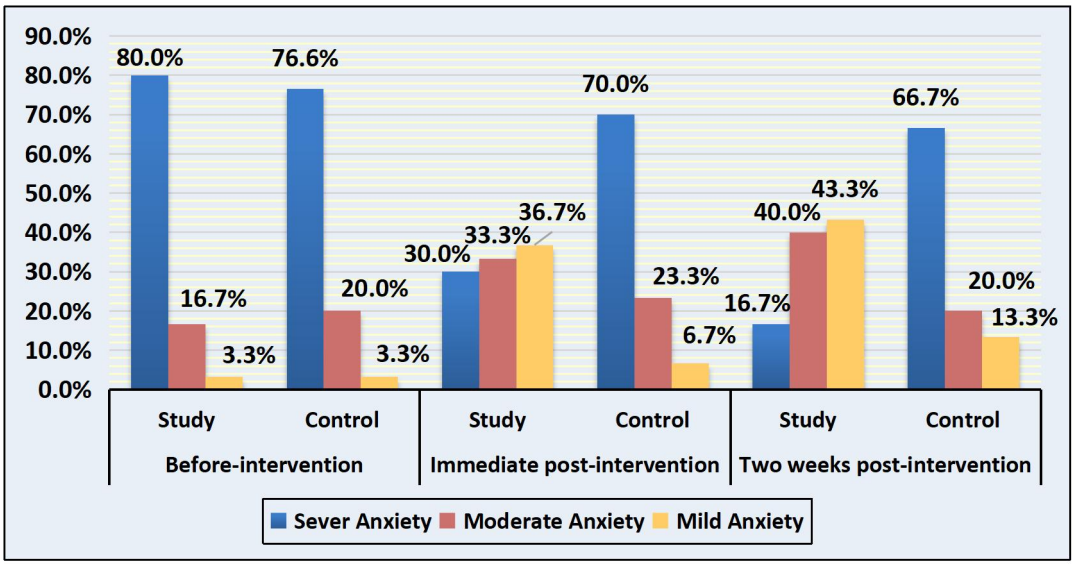

Figure (2): Distribution of total anxiety score among studied women in both groups thorough the program phases (n=60).

Table (6): Comparison of the mean scores of stress among studied women in both groups thorough the program phases (n=60).

Items \ Groups		Range of Possible Scores	Before intervention	Immediate post intervention	Two weeks post intervention	t-test 1 P-value	t-test 2 P-value	t-test 3 P-value
			Mean ± SD	Mean ± SD	Mean ± SD			
Been upset because of unexpected thing	**Study group**	**0-4**	3.40 ± 0.62	2.30 ± 0.70	2.10 ± 0.48	1.11	2.08	2.69
	Control group		3.20 ± 0.76	2.66 ± 0.66	2.56 ± 0.81	0.27 ns	0.04*	0.009*
Lack of control over aspects of life.	**Study group**	**0-4**	3.23 ± 0.67	2.23 ± 0.72	2.13 ± 0.62	0.36	3.25	2.87
	Control group		3.30 ± 0.74	2.83 ± 0.69	2.70 ± 0.87	0.71 ns	0.002*	0.006*
Felt nervous and stressed	**Study group**	**0-4**	3.50 ± 0.62	2.60 ± 0.81	2.36 ± 0.76	0.59	2.39	2.43
	Control group		3.40 ± 0.67	3.06 ± 0.69	2.90 ± 0.92	0.55 ns	0.02*	0.01*
Feeling confident in your ability to deal with personal issues	**Study group**	**0-4**	3.23 ± 0.72	2.40 ± 0.72	2.33 ± 0.80	0.32	3.07	3.24
	Control group		3.30 ± 0.87	3.00 ± 0.78	3.00 ± 0.78	0.75 ns	0.003*	0.002*
Felt that things were going your way	**Study group**	**0-4**	3.40 ± 0.72	2.43 ± 0.67	2.26 ± 0.69	1.19	3.19	2.89
	Control group		3.16 ± 0.79	3.00 ± 0.69	2.86 ± 0.89	0.23 ns	0.002*	0.005*
Found you couldn't handle everything you had to do	**Study group**	**0-4**	3.26 ± 0.63	2.56 ± 0.72	2.33 ± 0.60	0.43	3.05	2.95
	Control group		3.20 ± 0.55	3.03 ± 0.41	2.83 ± 0.69	0.66 ns	0.003*	0.004*
Been able to control irritations in life	**Study group**	**0-4**	3.40 ± 0.67	2.73 ± 0.78	2.53 ± 0.73	0.79	2.48	2.31
	Control group		3.53 ± 0.62	3.20 ± 0.66	3.03 ± 0.92	0.43 ns	0.01*	0.02*
Felt you were on top of things	**Study group**	**0-4**	3.56 ± 0.62	2.83 ± 0.79	2.63 ± 0.92	0.99	2.58	2.52
	Control group		3.40 ± 0.67	3.36 ± 0.80	3.26 ± 1.01	0.32 ns	0.01*	0.01*
Feeling upset due to uncontrollable circumstances	**Study group**	**0-4**	3.50 ± 0.50	2.93 ± 0.73	2.66 ± 0.95	0.19	2.82	2.41
	Control group		3.43 ± 0.72	3.43 ± 0.62	3.23 ± 0.85	0.68 ns	0.006*	0.01*
Difficulties felt overwhelming and insurmountable.	**Study group**	**0-4**	3.20 ± 0.76	2.56 ± 0.77	2.26 ± 0.69	1.25	3.05	2.57
	Control group		3.43 ± 0.62	3.16 ± 0.74	2.86 ± 1.07	0.20 ns	0.003*	0.01*
Overall score	**Study group**	**0-40**	33.70 ± 4.94	24.60 ± 4.21	22.63 ± 3.55	0.26	4.61	4.33
	Control group		33.36 ± 4.83	30.76 ± 4.45	29.26 ± 6.15	0.79 ns	0.000**	0.000**

T-test 1 Comparison of mean scores between two groups before intervention
T-test 2 Comparison of mean scores between two groups immediate post intervention
T-test 3 Comparison of mean scores between two groups at two weeks post intervention

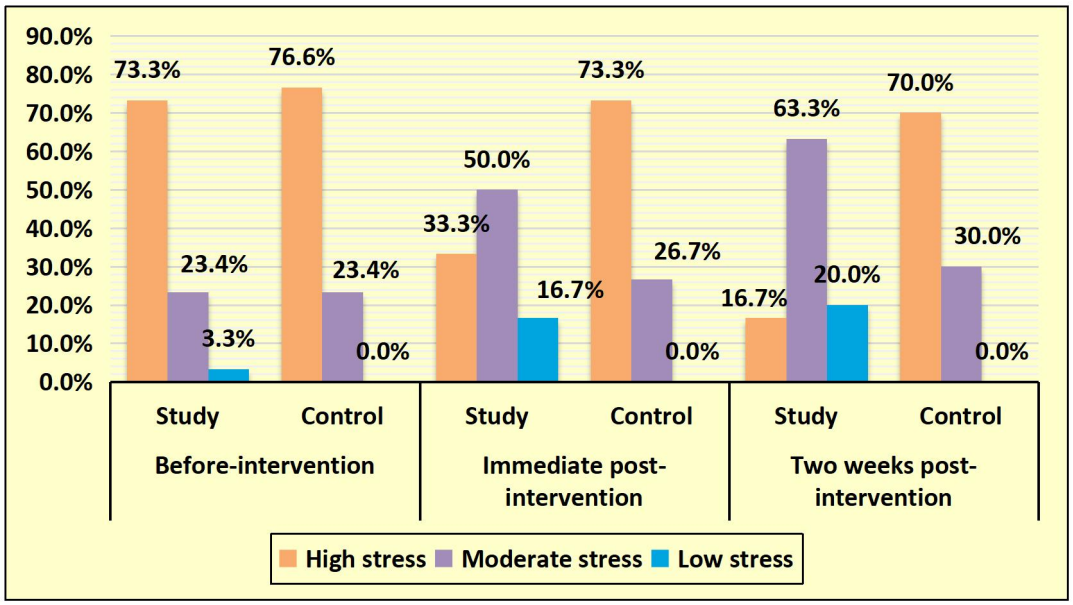

Figure (3): Distribution of total stress score among studied women in both groups thorough the program phases (n=60).

Table (7): Comparison of the mean scores of sleep among studied women in both groups thorough the program phases (n=60).

Items \ Groups		Range of Possible Scores	Before intervention Mean ± SD	Immediate post intervention Mean ± SD	Two weeks post intervention Mean ± SD	t-test 1 P-value	t-test 2 P-value	t-test 3 P-value
Total Subjective sleep quality	Study group	0-3	2.23 ± 0.97	1.36 ± 0.80	1.20 ± 0.84	0.26	3.39	3.55
	Control group		2.16 ± 0.94	2.13 ± 0.93	2.03 ± 0.96	0.78 ns	0.000**	0.000**
Total Sleep latency	Study group	0-3	2.06 ± 0.90	1.23 ± 0.62	1.10 ± 0.54	0.27	3.36	3.98
	Control group		2.00 ± 0.94	1.90 ± 0.88	1.86 ± 0.89	0.78 ns	0.000**	0.000**
Total Sleep duration	Study group	0-3	2.26 ± 0.98	1.23 ± 0.93	1.10 ± 0.66	0.39	3.54	4.06
	Control group		2.16 ± 0.98	2.10 ± 0.95	2.00 ± 1.01	0.69 ns	0.000**	0.000**
Total Sleep efficiency	Study group	0-3	2.10 ± 0.95	1.23 ± 0.72	1.06 ± 0.69	0.39	3.43	4.05
	Control group		2.00 ± 1.01	2.00 ± 0.98	1.93 ± 0.94	0.69 ns	0.000**	0.000**
Total Sleep disturbance	Study group	0-3	2.20 ± 0.88	1.23 ± 0.62	1.10 ± 0.60	0.43	3.58	3.76
	Control group		2.30 ± 0.91	1.96 ± 0.92	1.86 ± 0.93	0.66 ns	0.000**	0.000**
Total Use of sleep medication	Study group	0-3	2.13 ± 1.00	1.13 ± 0.73	1.10 ± 0.71	0.25	3.79	3.50
	Control group		2.06 ± 1.01	2.00 ± 1.01	1.90 ± 1.02	0.79 ns	0.000**	0.000**
Total Daytime dysfunction	Study group	0-3	2.20 ± 0.92	1.23 ± 0.72	1.10 ± 0.80	0.13	3.51	3.68
	Control group		2.16 ± 0.94	2.00 ± 0.94	1.93 ± 0.94	0.89 ns	0.000**	0.000**
Overall score	Study group	0-21	15.20 ± 6.44	8.66 ± 3.87	7.76 ± 3.77	0.20	4.15	4.56
	Control group		14.86 ± 6.39	14.10 ± 6.02	13.53 ± 5.79	0.84 ns	0.000**	0.000**

t= independent t-test; ns no statistical significant difference ($p > 0.05$); **A highly statistical significant difference ($P \leq 0.001$)

T-test 1 Comparison of mean scores between two groups before intervention

T-test 2 Comparison of mean scores between two groups immediate post intervention

T-test 3 Comparison of mean scores between two groups at two weeks post intervention

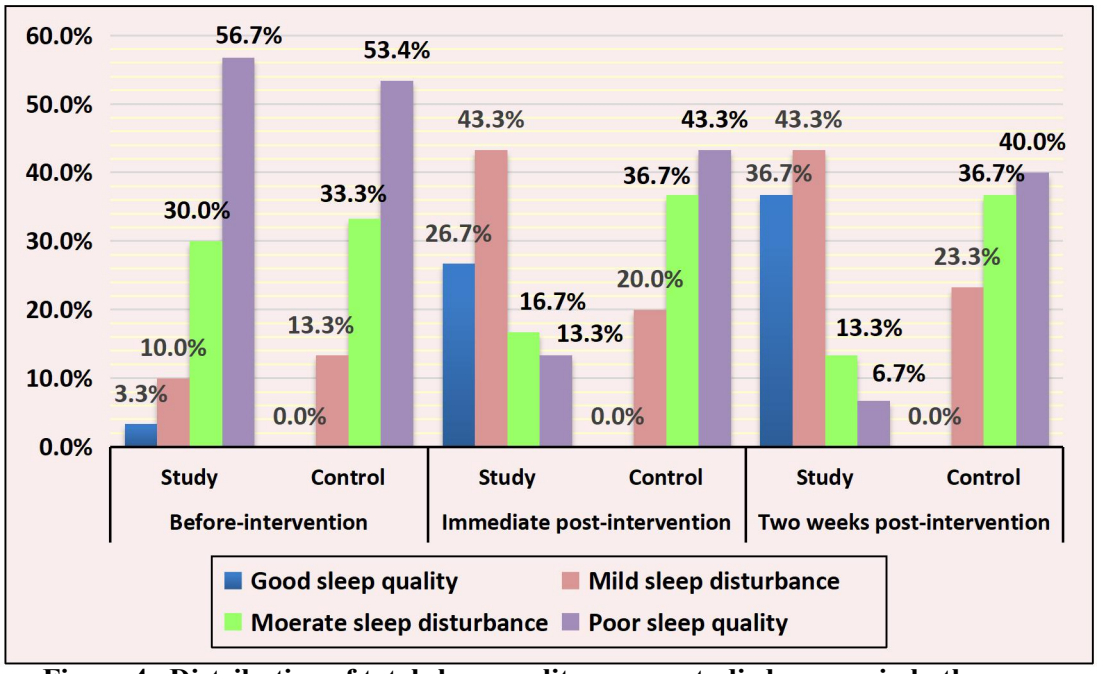

Figure 4. Distribution of total sleep quality among studied women in both groups thorough the program phases (n=60).

Table (8): Correlation between total stress score, total anxiety and total sleep quality thorough the program phases (n=60).

Variables	Total stress score											
	Study group n= 30						Control group n= 30					
	Pre-intervention		Immediately post-intervention		Two weeks post-intervention		Pre-intervention		Immediately post-intervention		Two weeks post-intervention	
	r	P value	r	P value	r	P value	r	P value	r	P value	r	P value
Total anxiety	.392	.000**	.412	.000**	.438	.000**	.450	.000**	.517	0.000**	.489	.000**
Total sleep quality	-.475-	.000**	-0.456-	.000**	-.518-	.000**	-.541-	.000**	-.571-	0.000**	-.602-	.000**

****A high statistical significant difference (P ≤ 0.001)**

Discussion:

Preeclampsia is an uncommon and potentially life-threatening pregnancy condition that is the leading cause of illness and death for both mothers and their babies. Shorter lifespans are observed in pre-eclamptic women and babies have higher risks of preterm birth, perinatal mortality, neurocognitive impairment, and metabolic and cardiovascular diseases in later life **(Pittara et al., 2021).** Thus, the need for cutting-edge and unusual treatments for hypertension during pregnancy is critical; non-pharmacological therapies in particular are needed. It is believed that relaxation techniques are a useful treatment for these kinds of disorders. While there are many various relaxation methods, some of the most well-liked ones are progressive relaxation (**Kamel et al., 2020).**

The current research aimed to evaluate the effect of progressive muscle relaxation techniques on physiological parameters, psychological factors and sleep quality among pregnant women with preeclampsia.

Regarding personal characteristics, the findings of current research found that over half of the participants in the study group and more than two fifths of the participants in the control group were aged thirty-five or older, with an

average age of 33.81±3.81 and 32.72±5.20 years old respectively. In terms of residency, approximately two-thirds of both the study and control groups resided in rural areas. In regards to educational level, it was evident that more than two fifths of the study group and nearly two thirds of the control group had completed secondary education. When it came to occupation, approximately two thirds of the control group and less than three quarters of the study group were housewives. Furthermore, there was no significant variance noted in the individual attributes, implying a resemblance between the two cohorts.

The results associated with the conclusions of **Hassan et al. (2023),** who found that a similar percentage (two thirds) of individuals in both groups were in their thirties. Furthermore, the study group consisted mostly of housewives, whereas a significant portion (75%) of the control group also consisted of housewives. Additionally, approximately 50% of the study group and 65% of the control group were rural residents. It is noteworthy that the two groups' personal characteristics did not significantly differ from one another. In contrast, **El Shahat et al., (2023)** stated that the majority of people in both groups could only read and write and were illiterate. This differences may related to differences in culture and sample.

Regarding the obstetric history, the findings of the present study indicated that the average gestational age was (29.43±0.89 and 29.40±1.40) in the study and control groups, respectively. Moreover, approximately two-thirds of the participants in both groups were experiencing their first pregnancy. Furthermore, a large proportion of the study group and more than three-quarters of the control group did not have a history of preeclampsia in their previous pregnancy. Additionally, the majority of participants in both groups did not have a family history of preeclampsia.

Similarly, **Vanita, (2019)** demonstrated that the largest portion of both groups didn't have previous preeclampsia and didn't have family history of preeclampsia. While the results of **Hassan, et al., (2023)** reported dissimilar findings to current study results in which less than one third of the study and control groups were primigravida and compared to one-third of the control group, slightly half of the study group had a history of preeclampsia in a previous pregnancy.

From the perspective of the researcher, practically all of the sociodemographic traits and obstetric history of the study and control groups matched. Overall, the study participants' consistent profile served to reduce unrelated factors that might compromise the intended intervention's effectiveness.

In terms of knowledge, the findings of the current study showed no significant difference between the two groups in terms of their knowledge about preeclampsia before the intervention ($p>0.05$). However, after three and six months of intervention, there was a significant difference between the two groups in terms of their knowledge about preeclampsia ($p\leq0.05$). Moreover, before the intervention, only one fifth of women in both the study and control groups had sufficient knowledge about preeclampsia. However, immediately after the intervention, more than two thirds of the study group had adequate knowledge about preeclampsia, compared to just over one quarter of the control group. Furthermore, two weeks after the intervention, more than three quarters of the study group had sufficient knowledge about preeclampsia, while only one third of the control group did. This might be related to a decline in prenatal visits and follow-up appointments, a lack of adequate educational resources in rural areas, and maternal negligence or unawareness about the primary issues associated with pregnancy.

These outcomes concurred with **Ahmed et al., (2022)** who observed that the majority of participants' knowledge of preeclampsia was inadequate. Furthermore, compared to pre-intervention, the majority of the study group possessed adequate level of knowledge regarding the post-educational guidelines for preeclampsia. Similarly, **Alnuaimi et al., (2020)** found that antenatal moms' baseline understanding of pre-eclampsia management was insufficient. During the pretest, it was discovered that a small percentage of them had never heard of pre-eclampsia management, and that the knowledge they did have was insufficient. It was evident that the pre-eclampsia management concept was understood by them after the teaching program was implemented, as evidenced by the significant increase in post-test knowledge scores.

Concerning physiological indicators, the findings of the present study revealed that there was no significant discrepancy in the mean scores of these indicators among the women in

the two groups prior to the intervention. Nonetheless, after the intervention, the average scores of the study group were lower than those of the control group. Notably, there was a significant disparity in both respiratory rate and diastolic blood pressure ($p \leq 0.05$), and a highly significant difference in systolic blood pressure ($p \leq 0.001$).

Furthermore, at two weeks following the intervention, the study group's mean scores for every physiological parameter were lower than those of the control group. There was a statistically significant difference between the two groups for both respiratory rate ($P \leq 0.05$) and systolic and diastolic blood pressure ($P \leq 0.001$).It may due to that progressive muscle relaxation technique stimulates parasympathetic activity that lowers blood pressure, heart rate, breathing rate and cause a profound state of relaxation

The present results congruent with **El Shahat et al., (2023)** who reported that, following two weeks of relaxation techniques, the study group's mean systolic blood pressure score dropped to 126.50 ± 4.883, and after four weeks, it dropped to 122.52±4.183, with a significant difference between them ($F= 239.38$, $P \leq .000$). While in the control group, the systolic blood pressure mean score was 149.40±10.01 in the in initial assessment and dropped to 146.46±9.100 and 140.80±11.08 after two and four weeks respectively, with a significant difference between them ($F= 5.624$, $P \leq .000$).

The results of **Rajeswari and Reddy's (2020)** study align with the findings of our research, indicating that the intervention group showed an improvement in blood pressure after six weeks of progressive muscle relaxation compared to the control group. These results also support the conclusion made by **Ghorbannejad et al. (2022),** who determined that PMRT is an effective non-pharmacologic approach for reducing blood pressure in expectant mothers with mild preeclampsia. Similarly, **Puspitasari et al. (2022)** found a significant decrease in blood pressure after three and seven days, respectively, further highlighting the positive effects of PMRT ($P \leq .001$, $P= .008$, $P \leq .000$).

The results listed above substantiated the first study hypothesis, which assumed that women who will practice progressive muscle relaxation technique will show better physiological parameters than those who don't.

Anxiety and stress are potential side effects of preeclampsia, and women with preeclampsia (severe or non-severe) have higher anxiety and stress scores. Therefore, by lowering pregnant mothers' stress or anxiety, relaxation techniques can improve the symptoms of hypertension as well as other maternal and fetal outcomes **(Pratiwi et al., 2021).**

The mean score for anxiety was examined in the current study. Results showed that prior to the intervention, there was no significant difference in the mean anxiety score between the two groups ($P \leq 0.05$). However, the study group had a lower mean anxiety score compared to the control group at the two-week and immediately post-intervention stages, with a highly significant difference between the two groups ($P \leq 0.001$). Furthermore, in the study group, the overall anxiety score per intervention decreased from 31.36 ± 6.24 to 20.70 ± 6.39 and 17.06 ± 4.96 immediately and two weeks after the intervention, respectively. On the other hand, in the control group, the overall anxiety score before the intervention was 31.50 ± 5.72, which decreased to 28.53 ± 7.18 and 26.33 ± 7.87 immediately and two weeks after the intervention, respectively.

This might be because of PMR trigger the parasympathetic nervous system. The parasympathetic nervous system's triggers the release of endorphins, which have a calming and comfortable effect. This, in turn, suppresses the release of cortisol and adrenocorticotropin, which results in a decrease in anxiety scores. Additionally, achieving such a state could restore or enhance psychological and physiological wellbeing by lowering arousal in both the central and autonomic nervous systems.

The above-mentioned results concurred with **Chaudhuri et al., (2020)** who observed that progressive muscles relaxation techniques were helpful to decrease anxiety and depression in patients who had coronary heart disease and also was effective in lowering the high blood pressure among them. Additionally, **Atef et al., (2022)** clarified that progressive muscle relaxation therapy is helpful in management of patients with hypertension as well as tension, stress, anxiety and depression associated with such chronic disease.

Relaxation techniques are widely mentioned as a crucial part of physical and psychological therapies to manage stress and lessen depression because they are a low-risk, free, self-applied, and safe technique. The

definition of relaxation techniques is "a collection of methods to enhance the body's reaction to stress." Utilizing relaxation to reduce stress or anxiety is the fundamental therapeutic objective of all relaxation techniques **(Toussaint et al., 2021).**

The current study's findings showed that, at the pre-intervention phase, there was no statistically significant difference in the mean stress score between the two groups ($p > 0.05$). Nonetheless, the study group's mean anxiety score was lower than the control group's at the two-week and immediately post-intervention phases, with a statistically significant difference between the two groups ($P \leq 0.05$). Additionally, in the study group, the overall score of stress pre intervention was 33.70 ± 4.94 which decreased to 24.60 ± 4.21 and 22.63 ± 3.55 immediately post-intervention and two weeks post-intervention phases respectively while in the control group, the overall score of anxiety per intervention was 33.36 ± 4.83which decreased to 30.76 ± 4.45 and 29.26 ± 6.15 immediately post-intervention and two weeks post- intervention phases respectively with highly statistical significant difference between two groups ($P \leq 0.001$).

This could be clarified by the reality that problems pertaining to the disease's existence and chronic nature and its detrimental effects on the patient's mental, physical, and social wellbeing, all have an impact on the quality of life and psychological state for those who suffer from hypertension.

Additionally, **El Shahat et al., (2023)** demonstrated that, following four weeks of applying progressive muscle relaxation techniques, none of the study group's patients exhibited high levels of stress, compared to less than 75% of patients at the time of the initial assessment. Additionally, **Pradhan et al. (2020)** discovered that PMR helped cancer patients feel less depressed and anxious.

Furthermore, the results of this study found that, around three quarters of women in both study and control groups had high stress prior to intervention. In contrast to almost three quarters of the women in the control group, only two thirds and less than one fifth of the study group's participants experienced elevated stress levels immediately after the intervention and two weeks later.

Similarly, **Valiani et al., (2023)** demonstrated that following the BRT, the intervention group's PES frequency distribution significantly shrank. Furthermore, following the BRT, the high-risk pregnant mothers' mean stress score in the intervention group dramatically dropped. In contrast, there was no discernible difference in the control group's mean stress score before and after the intervention.

The second study hypothesis, which said that, women who will practice progressive muscle relaxation technique will show less psychological factors (anxiety and stress) than those who don't was supported by the results mentioned above.

The present study's findings showed that, at the pre-intervention phase, there was no statistically significant difference in the mean sleep score between the two groups ($p > 0.05$). However, there was a statistically significant difference ($P \leq 0.05$) between the study group's mean sleep scores at the two-week and immediately post-intervention phases compared to the control group. Additionally, minimal percentage of study group and any one in the control group had good sleep quality before intervention. Meanwhile, immediately post-intervention and two weeks post- intervention, more than one quarter and more than one third of the study group respectively had good sleep quality compared to no one in the control group. This may be due to that performing Jacobson's progressive muscle relaxation technique stimulate releasing endorphins, that boosts immunity and causes a complete state of relaxation which in turn encourage women to have better sleep quality.

The results mentioned above were consistent with the findings of **Yuksel and Oran (2023),** who observed a significant difference between the study group and control group in terms of each component score of the Pittsburgh Sleep Quality Index. In the study group, each component score showed a decrease compared to the control group. Furthermore, **Akbas and Sozbir (2023)** discovered that the average posttest scores for sleep quality in the study group of women were significantly higher than the average scores in the control group ($p = 0.000$).

The above- mentioned findings validated the third research hypothesis, which envisaged that women who will practice progressive muscle relaxation technique will show high sleep quality than those who don't.

Concerning correlation between studied variables, the results of the current research

Shows that, there was a highly statistically significant positive correlation between total stress score and total anxiety score in both groups at pre intervention, post intervention and follow up phases ($P \leq 0.001$). On the other hand, there was a highly statistically significant negative correlation between total stress score and total sleep quality score in both groups at pre intervention, post intervention and follow up phases ($P \leq 0.001$). This may be due to when women feels anxious about the disease and continuously thinks about its possible complications on her fetus, this make women stressed and usually reduce sleep quality.

Conclusions:

The findings of current research concluded that the progressive muscle relaxation technique was effective and have a significant improvement of knowledge, physiological parameters and psychological factors and sleep quality among women with mild pregnancy induced hypertension. Additionally, the total score of knowledge and sleep quality in the study group showed significant improvement post-intervention and two weeks post-intervention compared to pre intervention while in the control group, there was minimal improvement. Also, the physiological parameters, total level of anxiety and total level of stress were significantly decreased in the study group post-intervention and two weeks post- intervention compared to control group. As a result, both the study's aim and the hypotheses were supported.

Recommendation:

- Pregnant women with hypertension should be provided with pregnancy induced hypertension relaxation techniques in antenatal care to improve knowledge, physiological parameters and reduce blood pressure and stress level which result in improvement of the pregnancy outcome and limit occurrence of complications.
- Utilizing various instructional and mass media platforms to demonstrate the risk factors, symptoms, and moderating factors of stress and hypertension, along with relaxation techniques.
- Midwifery education curricula should incorporate accurate, evidence-based information from the most recent research regarding non-pharmacological interventions for preeclamptic pregnant women .

Further researches:

- It is recommended that nurses in preeclampsia units take training courses on the application of non-pharmacological therapies, such as progressive muscle relaxation technique.
- larger-scale, longer-term replication of this study to ascertain the effects of PMR therapy

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