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The Influence of Progressive Relaxation on Anxiety in Pregnant Women with Hypertension

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A B S T R A C T

Hypertensive disorders during pregnancy are a serious issue affecting between 5% to 10% of all pregnancies globally. Women experiencing hypertension during pregnancy may suffer significant psychological impacts, including anxiety. Progressive muscle relaxation exercises can help reduce muscle tension, enhance feelings of happiness, and alleviate stress and anxiety during pregnancy. The purpose of the study was to determine the effect of progressive relaxation on anxiety in pregnant women with hypertension. The research employed a Quasi-Experimental approach using a pretest-posttest control group design with 60 participants. The participants were split into two groups: the intervention group (30 participants), who received progressive relaxation twice a day for 14 days, and the control group (30 participants), who received standard care. The Paired Sample T-Test revealed a noteworthy reduction in anxiety levels ($p = 0.000$) among the intervention group. In contrast, the control group did not exhibit significant alterations in anxiety levels ($p = 0.746$) after the treatment. Thus, progressive relaxation proves effective in reducing anxiety levels among pregnant women with hypertension. Future research should consider increasing the frequency and duration of interventions and exploring alternative approaches to further address hypertension issues during pregnancy.

Introduction

Pregnancy-induced hypertension involves a sustained elevation in blood pressure that exceeds the specified limit, characterized by a systolic pressure greater than 140 mmHg and diastolic pressure greater than 90 mmHg. (Pradono et al., 2020). Hypertensive disorders complicate between 5% and 10% of all pregnancies worldwide. (Li et al., 2022). The prevalence of hypertension in pregnancy globally stands at 116.4 per 100,000 women of reproductive age. When looking at specific regions, Africa demonstrates the highest prevalence of hypertension in pregnancy, averaging 334.9 per 100,000 women of reproductive age, followed by Southeast Asia and the Middle East, with average prevalences of 136.8 and 121.4 per 100,000 women of reproductive age, respectively (The Global Burden of Disease: a critical resource for informed policymaking, 2021). In 2020, the leading cause of maternal deaths in Indonesia was bleeding, accounting for 1,330 cases. Additionally, hypertension in pregnancy caused 1,110 deaths, and circulatory system disorders led to 230 fatalities (Kementerian Kesehatan Republik Indonesia, 2021).

Some risk factors for hypertension in pregnancy include Body Mass Index (BMI), anemia, advanced maternal age (< 40 years), a history of hypertension in previous pregnancies, gestational diabetes mellitus (GDM), twin pregnancies, and a family history of hypertension in pregnancy (Lane-Cordova *et al*., 2018; Chen *et al*., 2018; Smith *et al*., 2018; Ying *et al*., 2018; Lara-Barea *et al*., 2022; Narang & Szymanski, 2021; Gray *et al*., 2018).

Pregnancy hypertension can be a complication in around 5-10% of pregnancies, leading to maternal, fetal, and neonatal morbidity and mortality (Agrawal & Wenger, 2020). Pregnant women with hypertensive disorders during pregnancy are at risk of developing chronic hypertension after pregnancy, impaired kidney function, and cardiovascular diseases (Behrens *et al*., 2017; Brouwers *et al*., 2018; Dai *et al*., 2018; Hitti *et al*., 2018; Riise *et al*., 2018). In addition to affecting the mother, hypertension in pregnancy can also impact the fetus, such as low birth weight (LBW) (Poudel *et al*., 2021).

Psychological impact: Mothers who experience hypertension during pregnancy may have feelings of fear, disturbed relationships between mother and fetus (Værland et al., 2016), feelings of sadness, anxiety, and fear about their pregnancy and facing childbirth, fear of recurrence, and other possible health complications(Sakurai et al., 2022).

During pregnancy, a woman experiences physiological, psychological, hormonal, and social changes, which can elevate the likelihood of emotional distress and psychiatric issues (Din et al., 2016). Some of the most prevalent mental health conditions are comprised of anxiety disorders (Javaid et al., 2023). Approximately 301 million people, or 4.05% of the world's population, are estimated to have anxiety disorders. The global prevalence of anxiety disorders was 4.05% in 2019, showing a significant increase from 194.9 million to 301.4 million cases globally between 1990 and 2019 (Javaid *et al*., 2023).

The psychological state of the mother can have a detrimental effect on the child she is carrying, with anxiety disorders being identified as a risk factor for pregnancy outcomes. Babies born to mothers with depression are more likely to experience premature birth, have lower Apgar scores, weigh less at birth, breastfeed for shorter durations and less frequently, and have a higher likelihood of developmental issues (Domínguez-Solís et al., 2021).

Therefore, there is a need for the management of anxiety in pregnant women with hypertension. As mentioned, anxiety has negative impacts on the mother, such as a higher risk of abortion, increased risk of pre-eclampsia, and impacts on the emotional, psychological, and social development of the newborn. Psychological support for pregnant women can be done by managing stress, practicing mindfulness as it can reduce blood pressure in hypertensive pregnancies, music therapy, yoga, massages by partners, and progressive muscle relaxation (Sandsæter *et al*., 2019; Bublitz *et al*., 2023; González et al., 2017; Domínguez-Solís *et al*., 2021; Özlü et al., 2021).

Muscle relaxation is believed to reduce anxiety levels in pregnant women. Progressive muscle relaxation can be done anywhere and anytime (Özlü *et al*., 2021). Progressive muscle relaxation exercises help relieve muscle tension, increase feelings of happiness, and reduce stress and anxiety during pregnancy, providing a pleasant pregnancy experience (Rajeswari & Sanjeevareddy, 2020). Supported by other studies, progressive muscle relaxation also has a positive effect on anxiety during

pregnancy (Rajeswari & Sanjeevareddy, 2020). Related to blood pressure, progressive muscle relaxation exercises can reduce anxiety and improve sleep quality by reducing tension, stress, and blood pressure when done correctly (Aksu *et al*., 2018).

Preliminary research carried out at the Kediri City Health Office in 2022 forms the basis for the following information: From 9 health centers in the Kediri Work Area, the highest-risk pregnancy cases were in Sukorame Health Center, Kediri City, with 18.9% or 169 cases, and Pesantren II Health Center, with 13.8% or 123 high-risk pregnancy cases. A preliminary study at Sukorame Health Center found 60 cases of hypertension in pregnancy, while at Pesantren II Health Center, there were 42 cases of hypertension in pregnancy. The purpose of the study was to determine the effect of progressive relaxation on anxiety in pregnant women with hypertension.

Method

This study employs a quantitative approach and utilizes the Quasi-Experimental research method. This study utilizes a pretest-posttest control group design. The design involves the random selection of two groups, followed by administering a pre-test and post-test to assess potential differences between the experimental and control groups. The research will take place at Sukorame Health Center and Pesantren II Health Center in Kediri City from May 13 to May 27, 2024, spanning 15 days. It will focus on the entirety of pregnant women with hypertension in the Kediri Health Center area, totaling 82 people in 2023 (Sukorame Health Center with 60 cases and Pesantren II Health Center with 42 cases). A type of probability sampling technique, simple random sampling, is used to sample this research. The inclusion criteria were pregnant women in their second and third trimesters, those in stable health (suitable for therapy), and those who were willing and committed to participating in the study. The exclusion criteria were pregnant women who had acute injuries or musculoskeletal discomfort, severe or acute heart disease, and hypotension. Around 60 participants were recruited in this study randomly, with 30 subjects in the experimental group from the Sukorame Health Center and 30 subjects in the control group from the Pesantren II Health Center. The progressive relaxation intervention in this study was conducted twice a day, with sessions lasting 20-30 minutes each, during the day and before bedtime, for 14 days. The participants were asked to complete the demographic data form and the DASS 42 (Depression Anxiety Stress Scale-42) and PRAQ-r2 (Pregnancy-Related Anxiety Questionnaire – revised 2) questionnaires before entering the clinical setting. The experimental group was administered the Progressive relaxation technique, which was participated directly on the first day and was provided in the form of a video that was practiced by participants on their own every day; the monitoring was conducted every day from 10.00 AM to ensure that participants had practiced the progressive relaxation. Meanwhile, the control group was given general information about anxiety during pregnancy. The assessment of anxiety was given after the intervention on the 15th day at 09.00 AM. This study uses instruments in the form of questionnaires to obtain primary data such as respondent's personal information, DASS 42 (Depression Anxiety Stress Scale-42) and PRAQ-r2 (Pregnancy-Related Anxiety

Questionnaire –revised 2) questionnaires, and observation sheets to obtain primary data on anxiety levels and assessments of the regularity of progressive muscle relaxation exercises.

Data collection was conducted in two stages: preparation and implementation. The preparation stage involved obtaining a research permit and coordinating with the coordinating midwife to collect data on hypertensive mothers during pregnancy. During the implementation phase, we sought approval from the ethics commission, chose participants based on specific criteria, provided an explanation of the study's objectives and procedures, and obtained informed consent. Prior to data collection, informed consent was given to respondents, and personal data was collected from respondents, including age, pregnancy age, occupation, and informing intervention group respondents that progressive relaxation would be given for 14 days. The assessment of anxiety was given after the intervention on the 15th day.

The ethical approval utilized was founded on four fundamental principles of research ethics, specifically including respect for individuals, the idea of doing good, minimizing harm to subjects, and ensuring their protection. Justice underscores that everyone deserves something based on their rights pertaining to fair distribution. The Ethics Clearance Number is DP.04.03/F.XXI.31/0826/2024.

Results

Table 1. Characteristics of Respondents in the Intervention Group and Control Group

Characteristic	Intervention Group (n=30)		Control Group (n=30)		*P value*
	F/M	%/SD	F/M	%/SD	
Age					0,285[a]
1. < 20 Years	1	3,3	1	3,3	
2. 20 – 30 Years	17	56,7	20	66,7	
3. > 30 Years	12	40	9	30	
Education					0,257[a]
1. Primary	0	0	1	3,3	
2. Secondary	20	66,7	22	73,3	
3. Higher	10	33,3	7	23,3	
Employment					1,000[a]
1. Employed	11	36,7	11	36,7	
2. Unemployed	19	63,3	19	63,3	
Gestational Age					0,100[a]
1. 14 – 27 Weeks	4	13,3	10	33,3	
2. 28 – 40 Weeks	26	86,7	20	66,7	
Anxiety					
1. Anxiety (DASS-42)	11,67	±3,284	17,07	±3,443	0,060[b]
2. Anxiety (PRAQ-r2)	13,43	±2,501	16,87	±3,739	0,242[b]

Based on Table 1, in both the intervention and control groups, most of the participants fell within the 20-30 age range. Specifically, 17 respondents (56.7%) in the intervention group and 20 respondents (66.7%) in the control group were within this age range. The majority of participants in both the intervention and control groups possessed a secondary education as their highest level of education: 20 respondents (66,7%) in the intervention group and 22 respondents (73.3%) in the control group. In terms of employment status, most participants in both the intervention and control groups were not employed: 19 respondents (63,3%) in the intervention group and 19 respondents (63,3%) in the control group. The majority of participants in both the intervention and control groups were between 28 and 40 weeks of

gestational age: 26 respondents (86,7%) in the intervention group and 20 respondents (66,7%) in the control group. The mean anxiety score on the post-test using the DASS-42 questionnaire in the intervention group was 11.67, and using the PRAQ-r2 questionnaire was 13,43. Meanwhile, the mean anxiety score on the post-test using the DASS-42 questionnaire in the control group was 17.07, and using the PRAQ-r2 questionnaire was 16.87.

Based on Table 1, the results of the Shapiro-Wilk normality test show that all test variables have p-values higher than 0.05, suggesting that the data follows a normal distribution. The results of the homogeneity test carried out using Levene's test approach indicate a significance value greater than 0.05, suggesting that the data displays homogeneity.

In the intervention group, the average anxiety scores before the intervention were 18.80 (severe) according to the DASS-42 questionnaire and 18.23 (mild) according to the PRAQ-r2 questionnaire. Meanwhile, the mean anxiety scores during the posttest were 11.67 (mild) using the DASS-42 questionnaire and 13.30 (mild) using the PRAQ-r2 questionnaire. The results suggest that anxiety levels decreased in the intervention group, as seen from the average pretest and posttest scores.

Table 2. Anxiety Levels Before and After Progressive Relaxation in the Intervention Group

Variable	Intervention Group (n=30)		*P value*
	Pretest	***Posttest***	
	Mean ± SD	**Mean ± SD**	
Anxiety (DASS-42)	18,80 ± 4,552	11,67 ± 3,284	0,000
Anxiety (PRAQ-r2)	18,23 ± 4,911	13,30 ± 2,575	0,000

The results from Table 2 indicate that the paired t-test conducted on anxiety levels for the intervention group yielded a significant result, with a p-value of 0.000. From this, it can be inferred that anxiety levels decreased following the administration of progressive relaxation.

In the control group, the analysis results for anxiety indicate that the average anxiety scores before the test were 16.90 (severe) with the DASS-42 questionnaire and 16.93 (mild) with the PRAQ-r2 questionnaire. Meanwhile, the mean anxiety scores during the posttest were 17.07 (severe) using the DASS-42 questionnaire and 16.87 (mild) using the PRAQ-r2 questionnaire. According to the average scores from the pretest and posttest, it appears that there was no decrease in anxiety levels within the control group.

Table 3. Anxiety Levels Before and After Progressive Relaxation in the Control Group

Variable	Control group (n=30)		*P value*
	Pretest	***Posttest***	
	Mean ± SD	**Mean ± SD**	
Anxiety (DASS-42)	16,90 ± 4,122	17,07 ± 3,443	0,643
Anxiety (PRAQ-r2)	16,93 ± 3,107	16,87 ± 3,739	0,850

Based on Table 3, the results of the paired t-test on anxiety levels for the control group show a non-significant result with a p-value of 0.746. It can be concluded that anxiety levels did not significantly decrease in the control group.

The analysis results indicate that the average anxiety scores after the intervention in the intervention group were 11.67 (moderate) when using the DASS-42 questionnaire and 13.43 (mild) when using the PRAQ-r2 questionnaire. In the control group, the average post-test anxiety scores were

17.07 (indicating severe anxiety) on the DASS-42 questionnaire and 16.87 (indicating mild anxiety) on the PRAQ-r2 questionnaire.

Table 4. Differences in Anxiety Levels Between the Intervention Group and the Control Group

Variable	Intervention Group (n=30)		Control Group (n=30)		*P Value*
	Mean	**±SD**	**Mean**	**±SD**	
Anxiety (DASS-42)	11,67	±3,284	17,07	±3,443	0,000
Anxiety (PRAQ-r2)	13,43	±2,501	16,87	±3,739	0,000

Based on Table 4, The Independent Sample t-test revealed a significant difference in anxiety levels between the two groups of pregnant women with hypertension, as indicated by a p-value of 0.000. This suggests that there is indeed a discernible contrast in anxiety levels between the two groups.

Discussion

Table 1 shows that the majority of respondents in both the intervention and control groups are in the age range of 20-30 years. Ages 20 to 30 are often considered the optimal period for pregnancy and childbirth due to a lower risk of complications. Research indicates that women in this age group generally experience fewer adverse outcomes during labor and delivery compared to younger teenagers or older mothers. A study analyzing data from the 2009 U.S. National Inpatient Sample found that women aged 25-29 were significantly less likely to face complications such as preterm labor, severe preeclampsia, and fetal distress compared to women aged 15-19 or those over 35 (Cavazos-Rehg et al., 2024). At this age, women's bodies tend to be more capable of responding to pregnancy physically and psychologically compared to too-young or too-old ages. During the final three months of pregnancy, the mother's psychological changes become more intricate and are more likely to intensify. This includes higher anxiety levels related to the delivery process and the condition of the baby to be born.

The characteristics of respondents based on their last education level show that most of them graduated from secondary education. Previous research indicates no relationship between the last education level and stress. Good knowledge is not only acquired through formal education but also through various means such as self-initiative or encouragement from others. Additionally, knowledge can be obtained through experience and learning processes, both formal and informal (Orpa Wangguway et al., 2023). Although higher education levels do not always guarantee good knowledge, education still plays an important role in raising health awareness.

Previous research mentions a relationship between being a housewife and the incidence of high blood pressure. Being a housewife is a determining factor for pre-eclampsia (Mareg et al., 2020). This may be because women who are always at home are vulnerable to stress or psychological disorders early in pregnancy, leading to pre-eclampsia.

Therefore, it is important to enhance understanding and support for pregnant women, including identifying potential risks based on characteristics such as age, education, and employment status. Proper preventive and care measures can help reduce the risk of complications during pregnancy and ensure the well-being of both mother and baby.

Table 2 shows that the average anxiety score decreased, with a score of 7,13 using the DASS-42 questionnaire and 4,93 using the PRAQ-r2 questionnaire. Thus, it can be concluded that anxiety decreased after progressive relaxation was administered to pregnant women with hypertension.

Progressive muscle relaxation exercises help relieve muscle stress, enhance feelings of happiness, and reduce stress and anxiety during pregnancy, providing a pleasant pregnancy experience (Rajeswari & Sanjeevareddy, 2020). The mechanism for reducing anxiety is due to the balance between the nucleus and the hypothalamus. The hypothalamus receives signals from within the body through hormone receptors and nerve pathways. It plays a role in integrating emotional and sensory information through pathways such as the fornix and mammillothalamic tracts into the limbic system in the brain. This regulates emotions, and it transmits crucial signals, like those sent through the stria terminalis, to the amygdala. The medial prefrontal cortex receives sensory input from the cortex, and light signals are conveyed to the suprachiasmatic nucleus by the retinohypothalamic tract, which governs the daily hormone release cycle. The hypothalamus combines all of this data to generate suitable physiological and behavioral reactions, which are crucial for sustaining life in the long run. The arcuate nucleus releases hormones into the hypothalamo-hypophyseal portal venous system to control the release of hormones from the anterior pituitary gland. The release of adrenocorticotropic hormone from the pituitary is stimulated by corticotropin-releasing hormone, which in turn impacts the adrenal cortex to generate cortisol. This hormone plays a role in the body's stress response. The body is able to respond to physical and psychological stress due to the hypothalamus' different inputs (Raise-Abdullahi et al., 2023).

The progressive relaxation intervention in this study was conducted twice a day, with sessions lasting 20-30 minutes each, during the day and before bedtime, for 14 days. This differs from previous studies that conducted progressive muscle relaxation for 30 minutes per day for five consecutive days (Huddar et al., 2023; Özlü et al., 2021), as well as daily self-practice at home for six weeks (Nguyen et al., 2023; Ramasamy et al., 2018), and interventions twice a week for one month with a duration of 30 minutes (Huddar *et al*., 2023). It should be noted that muscle relaxation training as an induction therapy may require a longer time thus, increasing the frequency and duration of treatment is necessary to achieve a significant reduction in anxiety (Lu et al., 2020).

Pregnant women with hypertension were the participants in this study, while previous studies involved respondents such as COVID-19 patients, women with breast and gynecological cancer undergoing chemotherapy, cancer patients, and collegiate athletic teams. The results of the study may be influenced by chronic mental illness processes and severe disease factors that may hinder an individual's ability to adopt effective behavioral practices (Lu et al., 2020).

Additionally, the anxiety instruments used in this study were the DASS-42 and PRAQ-r2 questionnaires, whereas previous studies used The State-Trait Anxiety Inventory (STAI), DASS-21, Hamilton Anxiety Rating Scale (HARS), and Competitive State Anxiety Inventory-2 (CSAI-2).

The study findings indicated that there was a mean decrease of 7.13 in pretest and posttest scores when utilizing the DASS-42 questionnaire and a 4.93 decrease when using the PRAQ-r2 questionnaire.

From several previous journals, it can be concluded that the highest average reduction was from a controlled trial study on COVID-19 patients with progressive relaxation intervention for 5 days with an estimated time of 20-30 minutes.

The sample size in this study was 60 respondents. In previous studies on progressive relaxation, the average sample size was less than 60 respondents. With a large sample, the mean and standard deviation values are more likely to approximate the population mean and standard deviation. This is because the sample size is related to statistical hypothesis testing. Although a large sample is more desirable, a small randomly selected sample can also accurately represent the population (Simbolon et al., 2023).

Progressive muscle relaxation holds great potential as an effective adjunctive method in managing anxiety and stress, particularly in both medical and non-medical contexts. One of its advantages is that it is non-pharmacological, making it safe and affordable for individuals with various health conditions.

However, despite clear evidence of the benefits of progressive muscle relaxation, it must be acknowledged that the study results should be considered in light of specific populations and clinical conditions. Since everyone responds to therapy differently, it is important to tailor the use of progressive muscle relaxation individually to maximize its benefits. Furthermore, more investigation is required in order to develop a more comprehensive comprehension of the impact of progressive muscle relaxation on the nervous system, hormones, and other physiological reactions. With a better understanding, healthcare professionals can better design effective treatment methods using progressive muscle relaxation.

In Table 3, it can be seen that the mean anxiety level rose by 0.17 from an initial score of 16.90 (indicating severe anxiety) to a final score of 17.07 (also indicating severe anxiety). These results suggest that anxiety levels experienced an increase within the control group.

The study's discovery that the control group encountered a rise in anxiety suggests the necessity for additional advancements in psychological interventions to enhance the mental health of pregnant women effectively. This underscores the importance of ongoing research to discover more effective intervention strategies for managing anxiety during pregnancy.

The appropriate methodology used in this study, including prenatal yoga as a non-pharmacological approach, provides a strong foundation for considering it as the best option for managing anxiety in pregnant women. Prenatal yoga has been proven safe and effective in enhancing the emotional well-being of pregnant women while also providing positive physical benefits. Prenatal yoga shows potential as part of a comprehensive holistic care approach. The primary focus for enhancing the mental and physical health of pregnant women and the health of the unborn baby is to continue implementing this approach.

Table 4 is designed to evaluate anxiety levels in both the intervention and control groups through the use of the Independent Sample t-test. The results of the analysis indicate that the intervention group has an average post-test anxiety score of 11.00 (Moderate) as measured by the DASS-42 questionnaire and 12.90 (Mild) according to the PRAQ-r2 questionnaire. Meanwhile, the average post-test anxiety

score in the control group is 17.07 (Severe) using the DASS-42 questionnaire and 16.87 (Mild) using the PRAQ-r2 questionnaire. The data suggests that there is a discrepancy in anxiety levels between the two groups following the application of progressive relaxation.

Pregnant women with hypertension were the participants in this research, while earlier research included pregnant women with COVID-19, individuals with burn injuries, men studying maternity nursing, nurses in hospitals with COVID-19 patients, and first-year nursing students. The results of the study may be influenced by chronic mental conditions and severe disease factors, which can impede individuals' ability to adopt effective behavioral practices (Lu et al., 2020).

Additionally, the anxiety instruments used in this study were the DASS-42 and PRAQ-r2 questionnaires, whereas previous studies used the Corona Disease Anxiety Scale (CDAS), Spielberger State-Trait Anxiety Inventory (STAI), Depression Anxiety Stress Scale-21 (DASS-21), and the S-Anxiety Scale (STAI Form Y-1).

The results of this study showed that the mean reduction in anxiety from pretest to posttest using the DASS-42 questionnaire was 7.13, and using the PRAQ-r2 questionnaire was 4.93. Previous studies noted that the highest mean reduction in anxiety was 12.91 with progressive muscle relaxation intervention for 20-30 minutes daily for three consecutive days in burn patients(Harorani et al., 2020).

This study involved 60 participants. Previous studies discussing the effects of progressive relaxation typically used fewer than 60 respondents. With a large sample size, the mean and standard deviation found are highly likely to reflect the mean and standard deviation of the population. This sample size is important in statistical hypothesis testing. Although a large sample is desirable, a small randomly selected sample can also accurately represent the population (Simbolon *et al*., 2023).

A study carried out in Taiwan included 80 patients who underwent progressive muscle relaxation intervention, while the control group received standard care. The study revealed varying outcomes. The findings of the research suggested that progressive muscle relaxation could lead to short-term reductions in anxiety, but no noticeable impact was observed at the 3-month follow-up (Lu et al., 2020).

Overall, these findings support the effectiveness of progressive relaxation techniques as a non-pharmacological method to help manage anxiety. However, it is important to note that this study highlights the need to consider variations in how anxiety is measured (such as using different questionnaires) as well as additional factors that may influence results, such as the duration and intensity of the intervention. In-depth research on the biological mechanisms behind the effects of progressive relaxation is needed to understand its impact on anxiety management fully.

Conclusions

After examining the results and discussing the impact of progressive relaxation on anxiety in pregnant women with hypertension, the conclusion reached is that anxiety levels decreased in the intervention group following the administration of progressive relaxation to pregnant women with hypertension. The anxiety levels did not significantly change in the control group of pregnant women

with hypertension. Furthermore, pregnant women with hypertension who received progressive relaxation and standard care showed different anxiety levels compared to the other group.

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