Original Article

The Effect of Body Relaxation Techniques on Pre-Eclampsia Syndrome

Mahboubeh Valiani[1], Parvin Bahadoran[1], Mohammadreza Azizi[2], Zahra Naseh[3]

[1]Nursing and Midwifery Care Research Center, Faculty of Nursing and Midwifery, Isfahan University of Medical Sciences, Isfahan, Iran, [2]Administrator of Erythron Laboratory, [3]Midwifery Student, Department of Midwifery, School of Nursing and Midwifery, Isfahan University of Medical, University in Isfahan, Iran

Abstract

Background: Hypertension in the second trimester of pregnancy is accompanied by proteinuria that is called Preeclampsia Syndrome (PES). Body relaxation is a technique which makes harmony between mind and body. The aim of this study was to investigate the effect of Body Relaxation Technique (BRT) on some symptoms of Preeclampsia Syndrome (PES). **Materials and Methods:** This clinical trial was conducted on 96 high-risk pregnant women who were selected by random sampling method from among women referring to community health centers of Isfahan city. The samples were divided into intervention and control groups by even and odd numbers. The intervention group members received BRT during 16 sessions. Blood pressure and proteinuria were measured and recorded before and after the intervention in both groups at the beginning and in the 36th week of pregnancy. The collected data were analyzed. **Result:** According to the Chi-square test, the frequency of PES was 11.10% and 23.50% in the intervention and control groups, respectively (χ^2 = 3.95, df = 1, p = 0.046). After the intervention, there was no significant difference between the two groups in terms of the diastolic blood pressure and proteinuria. Systolic blood pressure and stress were also significantly reduced in the intervention group. However, proteinuria was not significantly different between the two groups. **Conclusions:** Based on the results, the relaxation technique, as an easy technique, is recommended for pregnant women who are susceptible to pregnancy hypertension and preeclampsia. Moreover, as a clinical complementary method, it can be recommended for preventing the symptoms of PES.

Keywords: *Iran, preeclampsia, relaxation, stress physiological*

Introduction

Preeclampsia Syndrome (PES) causes many problems during pregnancy. Hypertension in the second trimester of pregnancy is accompanied by proteinuria that is called (PES). Hypertension during pregnancy refers to the systolic blood pressure of ≥140 mmHg and diastolic blood pressure of ≥90 mmHg.[1] PES is a pregnancy syndrome characterized by a variety of placental disorders and maternal systemic inflammatory reactions which can affect almost all organs.[2] According to Cunningham, the WHO has systematically reported maternal mortalities all around the world, where 16% of maternal deaths in developed countries were attributable to hypertensive disorders of pregnancy.[1] PES is the third most common cause of maternal mortality in the world and the second cause of maternal mortality in Iran.[3] The prevalence of PES in Iran has increased from 0.04 (in 1996–2005) to 0.07 (in 2010–2013), while the prevalence of eclampsia has decreased from 0.30% to 0.01% during the same years.[4]

The cause of PES has remained unknown.[5] It is now revealed that diseases such as hypertension, vascular headaches, respiratory problems, heart attack, and gastrointestinal problems are associated with stress.[6] Belinda *et al*.[7] showed in their study that stress led to a significant increase in systolic and diastolic blood pressure. Pregnancy creates a stressful period for women, which contributes to PES, as levels of pro-inflammatory cytokines interleukin 6 (IL-6) and tumor necrosis factor alpha (TNF-a) increase in women who are more stressful during their pregnancies. Increased levels of corticotrophin, growth stimulating hormone, and increased sympathetic activity, as stress-induced changes, have also been observed in women with PES. Based on these findings, there is a link between stress and the incidence of PES.[8]

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Address for correspondence:
Mahboubeh Valiani, Nursing and Midwifery Care Research Center, Faculty of Nursing and Midwifery, Isfahan University of Medical Sciences, Isfahan, Iran.
E-mail: valiani@nm.mui.ac.ir

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The only known treatment for PES is pregnancy termination.[1] Interventions such as low-salt diet, calcium supplementation, vitamin D and E supplementations, aspirin, and low-molecular-weight heparin can prevent PES.[9] Pharmacological treatments, such as methyldopa, hydralazine, labetalol, and nifedipine, are among the most prevalent treatments.[1] The protective effect of these drugs against PES has not hitherto been confirmed.[10] Other complementary treatments for PES are non-pharmacological approaches, one of which is stress management through physical relaxation and mental visualization.[11] These methods have no effect on the delivery and any side effects on the mother and fetus.[12] Body Relaxation Techniques (BRTs) are among the most effective ways to reduce symptoms of preeclampsia and control stress.[13] As a complementary method, BRT can control or reduce stress effectively.[14] BRT is a self-control and mind management strategy.[15] As a non-pharmacological and low-cost method, BRT is applicable in the form of Jacobson and Benson combination. In their study, Julie E M *et al*. (2017)[16] investigated the impact of reflexology on pregnancy-related stress. In their study, stress decreased and blood pressure remained unchanged or increased slightly. Few studies have investigated the effect of BRT on stress, hypertension, or PES.[17-19] Given the importance of PES in pregnancy, the adverse effects of antihypertensive drugs, and their inability to prevent PES, the complications of uncontrolled PES, such as premature birth, detrimental effects on health, financial problems, and other consequences, may cause problems for families. As such, this study aimed to investigate the effect of BRT on some symptoms of PES.

Materials and Methods

This clinical trial (IRCT20091219002889N11) was conducted on 96 pregnant mothers who were at risk of PES and had referred to selected community health centers of Isfahan city from October 2018 to May 2019. The sample size was calculated to be 98 (49 subjects in each group) with respect to 95% confidence interval, test power of 80%, significance level of 5%, and the probable drop of 8%. In this study, five centers were selected by drawing from among the crowded comprehensive health centers of Isfahan city. The number of samples in each center was quota, and the individuals in each center were randomly selected. The initial selection of pregnancy records of pregnant mothers was performed randomly based on a table of random numbers. The samples were randomly divided into the two groups of intervention and control according to the even and odd numbers they received at the beginning of the study. High-risk pregnant mothers, with the gestational age of 20 weeks, were randomly divided into the two groups by the even (intervention group) and odd numbers (control group) [Figure 1]. Sampling at all centers was performed within a week and, then, the class schedules were coordinated and continued and, finally, the classes were ended under the same conditions. The high-risk pregnant women are those women who have at least three of the following features: being either under 20 or above 35 years old, primiparous or multiparous with a history of hypertension, BMI of under 19 or above 25, multiple pregnancy, chronic hypertension (with or without use of drug), diabetes, history of having PES. Inclusion

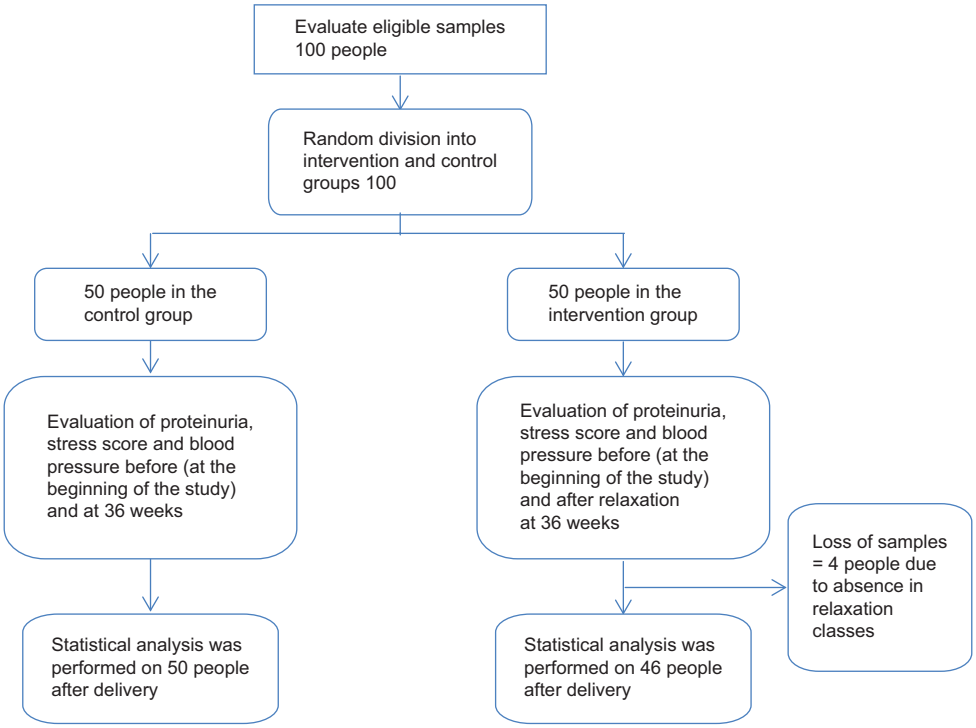

Figure 1: Consort diagram of randomization, allocation, follow-up, and analysis

criteria were as follows: pregnant mothers with the gestational age of 20–24 weeks, literacy, first or second pregnancy, PES history in previous pregnancy or chronic hypertension, no smoking, no history of consuming alcohol and psychotropic substances, high proteinuria up to TRACE level, blood pressure of lower than 140/90 mm Hg, no psychiatric disorders and severe anxiety (for those who scored above 26 on DASS21 questionnaire), having CD player, and a computer or an Android mobile phone for listening to the audio of relaxation file at home. Exclusion criteria included not attending more than two consecutive sessions of relaxation, failure to perform more than three consecutive relaxation sessions at home, lack of willingness to continue the study, symptoms of PES, eclampsia, HELLP syndrome or preterm delivery, and severe anxiety before completing four sessions of relaxation technique (the data of intervention group subjects were entered the study if they participated in more than four relaxation sessions; by contrast, their data were excluded from the study if they had lost more than four sessions).[20]

The instruments used in this study were demographic information and midwifery record form, digital blood pressure monitor, DASS21 standard questionnaire, and urine protein analysis laboratory equipment (by Roche kit, via Erythron formal laboratory). Demographic information form was completed by one of the researchers. The DASS21 questionnaire is a universal standard test whose validity and reliability have been evaluated in Iran. Its Cronbach's alpha coefficient and its validity are 0.82 and 0.75, respectively.[21]

First, the high-risk selected mothers completed the DASS21 questionnaire and were enrolled in the study if their score was lower than 26, blood pressure of lower than 140/90, and urine protein trace and less; the same processes were performed for the subjects of the control group and re-examined in 36th week of the pregnancy. In addition to receiving routine medical care and participating in preparation for labor classes (PLCs), the subjects of the intervention group participated in sixteen 30-minute relaxation sessions with Jacobson and Benson methods (eight sessions in the class and eight sessions at home). Thus, while the first session was held in 20–24 weeks of pregnancy, the next five sessions were held in 24–34 weeks of pregnancy, every two weeks. Then, two more weekly sessions were held in 34–36 weeks of pregnancy. The number of relaxation sessions at home was the same as the distribution of relaxation classes during the weeks of pregnancy. The blood pressure of mothers was recorded before and after each session using a microlife digital device (device specification: weight 310 g, size 68*186*90 mm, LCD (liquid crystal display), www.microlife.com). Then, each participant in the first session was given a CD and relaxation technique training. In the first 10 minutes of relaxation technique, the following actions were performed for physical relaxation. At first, the mother was in a relaxed position (semi-prone position) and, after concentration, deep breathing and abdominal breathing exercises were performed. BRT was performed with Jacobson's method of contraction (5 seconds) and then conscious muscle release (30 seconds) to relieve muscle tension consciously.[13] Then, in the last 20 minutes, visualization and mind imagery were carried out using Benson's method, which contained three fictional content each of which was performed in each session. As such, after three sessions, all three contents were performed. The relaxation CD (like the relaxation CD in the class) was given to the subjects of the intervention group, and the exercises were performed at home as well. According to the gestational age of the mothers at the time of entering the study, intervals and eight sessions of BRT at home were taught to them. In addition, at the end of each BRT session, the pregnant mothers were reminded to do the trained exercises at home. At the end of eighth session, the mothers completed the DASS21 questionnaire again.

The control group subjects underwent routine medical care and participated in PLC; then, the blood pressure, stress, and urine protein were measured once at the very onset of the study in the same manner as the intervention group and once again in the 36th week of pregnancy. Only Benson›s relaxation method was performed for 10 minutes with completely different content without Jackson›s relaxation and deep relaxation. In the control group, Benson relaxation was considered to be a placebo for body relaxation technique. Visualization (Benson's method) for relaxation has 5 steps: 1) be in a comfortable position; 2) start with a diaphragmatic breath (the idea that you relieve stress by breathing); 3) think that your body is relaxed in a place ; 4) create a place that you can easily manage and 5) stay in the selected relaxation place for as long as you want. From the 36th week of pregnancy, the mothers were followed up weekly by telephone. Furthermore, the researcher was present at the hospital during the delivery, and the mother was evaluated for gestational age, maternal hypertension, and PES. Maternal PES was diagnosed and approved by a gynecologist.

The data were analyzed and through using paired t-test and Chi-square test. p values of ≤0.050 were considered to be statistically significant.

Ethical considerations

Informed written consent was obtained from all participants. This study was approved by the Ethics Committee of Isfahan University of Medical Sciences with the ethics code of IR.MUI.RESEARCH.REC.1397.312. The consent forms were obtained from the participants by giving a code to their questionnaire; the forms are currently available and can be offered in the request of the journal.

Results

This study was conducted on 96 pregnant mothers who were divided into two groups of intervention (n = 46)

and control (n = 50) [Figure 1]. In terms of demographic characteristics, no significant difference was observed between the two groups [Table 1]. After using aspirin for hypertension, the result of Chi-square test was 8.90% for the intervention group (four women) and 11.80% for the control group (six women). There was no significant difference between the two groups (x2 = 2.64, df = 2, p = 0.270).

As shown in Table 2, based on the paired t-test results, the mean scores of systolic blood pressure (t = 0.80 df = 44 p = 0.430),), diastolic blood pressure (p = 0.240), and urine protein (p = 0.140) were not significantly different in the intervention group before and after the intervention. The results of the test also showed that the mean scores of diastolic blood pressure (p = 0.060) and urine protein (p0.180) were not significantly different in the control group before and after the intervention. However, in the control group, the mean score of systolic blood pressure after the intervention was significantly higher than before the intervention (p = 0.020). But, there was no significant difference in the intervention group (p = 0.430) in terms of this score. The mean score of systolic blood pressure in the intervention group was significantly lower than the control group (p = 0.030). The level of stress was assessed in the pregnant mothers through using DASS21 questionnaire [Table 3]. The results showed that, after the intervention, the mean score of stress was significantly lower than before the intervention (p = 0.004). However, no significant difference was observed in the mean score of stress of the control group before and after the intervention (p = 0.180). Based on the independent t-test, after the intervention, the mean score of stress in the intervention group was significantly lower than the control group (p = 0.020). Chi-square test showed that PES was significantly lower in the intervention group (5 out of 46 participants during the delivery) than the control group (12 out of 50 participants) (p = 0.046).

Discussion

The aim of this study was to determine the effect of BRT on some symptoms of PES. The results of this study showed that the frequency distribution of PES decreased significantly in the intervention group after the BRT. Moreover, the mean score of stress in the high-risk pregnant mothers decreased significantly in the intervention group after the BRT. By contrast, the mean score of stress did not show any significant difference in the control group before and after the intervention. According to the results of some studies, there is a positive relationship between maternal psychological aspects and preeclampsia. Participation in progressive muscle relaxation classes through a full 30-minute concentration session until the feelings of

Table 1: Demographic-fertility characteristics of the subjects in the two groups

Variable	Mean (SD)		Independent *t*-test		
	Intervention group	Control group	t	df	p
Age	28.93 (7.06)	29.24 (6.40)	0.22	94	0.830**
Number of pregnancies	1.29 (0.11)	1.53 (0.10)	1.50	94	0.140**
Weight (Kg)	70.55 (13.78)	73.34 (14.94)	0.95	94	0.350**
Height (cm)	160.98 (6.10)	160.84 (7.34)	0.10	94	0.920**
BMI (GA=20-24w)*	27.26 (5.36)	28.30 (5.10)	0.97	94	0.330**

*Body mass index **Independent *t*-test

Table 2: Mean systolic blood pressure, diastolic blood pressure, and proteinuria in the two groups before and after the intervention

Time	variable	Mean (SD)		Independent *t*-test		
		Intervention group	Control group	*t*	df	*p*
Before the intervention	Systolic blood pressure	107.71 (11.09)	109.82 (12.39)	0.87	94	0.381
	Diastolic blood pressure	69.47 (8.49)	69.31 (9.61)	0.08	94	0.930
	Protein content in urine	7.32 (1.01)	8.32 (1.18)	0.63	94	0.530
After the intervention	Systolic blood pressure	108.91 (11.05)	113.82 (14.35)	1.86	94	0.032
	Diastolic blood pressure	71 (7.73)	72.47 (9.99)	0.80	94	0.430
	Protein content in urine	9.14 (0.75)	10.24 (1.45)	0.65	94	0.520

Table 3: Mean stress score in the two groups before and after the intervention

Variable	Mean (SD)		Independent *t*-test		
	Intervention group	Control group	*t*	df	*p*
Stress score before intervention	10.64 (1.25)	9.41 (1.07)	0.75	94	0.450
Stress score after intervention	6.80 (1.08)	10.63 (1.20)	2.35	94	0.020
Paired-*t* test	*p*=0.004	*p*=0.180			

relaxation and calmness are achieved can decrease a person's Corticotrophin Releasing Hormone (CRH) and Adrenocorticotropic Hormone (ACTH) levels in the hypothalamus.[18,19] This process decreases sympathetic nerve activity to the extent that adrenaline and non-adrenaline levels can also decrease.[22] This can result in a decreased heart rate, widening of the blood vessels, decreased blood vessel resistance, and decreased exertion of cardiac muscles, thereby decreasing cardiac arterial blood pressure.[18] Therefore, stress control can effectively control high blood pressure. In this regard, Awad *et al*. (2018) showed that "stretching exercises" and "relaxation technique" can significantly reduce the risk of severe PES in mothers with mild PES. These results are consistent with the results of our study.[19] Additionally, Kordi *et al*. (2017) and Moafi *et al*. (2013) showed that PES was more prevalent in mothers with higher anxiety.[22,23] The use of BRT in the present study decreased the stress and anxiety of pregnant mothers. Therefore, the results of the present study are in line with the results of these studies. Relaxation affects the release of neurotransmitters and stress-releasing hormones. Accordingly, it stimulates the body to produce nitric oxide (NO) molecules. These substances affect the walls of blood vessels, thereby decreasing the blood pressure.[18]

Consistent with the results of Awad *et al*.,[19] in our study, stretching exercises and relaxation significantly decreased the systolic and diastolic blood pressure of the pregnant mothers (with mild PES) after the intervention. The results of the present study are, thus, consistent with the results of their study. Exercise and relaxation can improve endothelial function of the arteries and help to reduce endothelin-1 levels and vasodilatation-inducing factors by stimulating the release of nitric oxide, which is the most important mechanism of walking and relaxation to control gestational blood pressure abnormalities and preeclampsia. Similarly, in the study of Azimian *et al*. (2017),[24] the mean systolic blood pressure decreased significantly in the intervention group compared to the control group. Being conducted on pregnant mothers, the study of Urech *et al*.[17] found that the BRT did not lead to any change in systolic and diastolic blood pressure of the intervention group. The present study is inconsistent with these studies. In the study of Azimian quoted by Urech, only one relaxation session was performed and BRT was done through using headphones and without the presence of a researcher. It seems that the number of sessions and kind of technique have led to different results. Based on the results of the studies, it can be concluded that the implementation of any technique that reduces stress and anxiety can affect systolic blood pressure.[19] The findings revealed that sixteen 20–30-minute BRT sessions held during the pregnancy (from 20 to 36 weeks of pregnancy) could prevent symptoms of preeclampsia in women at risk of hypertension. Thus, after analyzing the data, it was found that among 46 pregnant women of the intervention group, 5 pregnant women were diagnosed with preeclampsia; however, in the control group, 11 pregnant women had preeclampsia. These findings showed that the incidence of preeclampsia in the intervention group was significantly lower than the control group.[25] According to Niken *et al*. (2019),[18] following progressive muscle relaxation with music therapy in older adults with high blood pressure did not reduce diastolic blood pressure in the intervention group. In the study of Jallo *et al*.,[26] there was no statistically significant difference in diastolic blood pressure before and after the intervention. The results of the present study are consistent with this study. Relaxation can affect sympathetic-adrenergic activity and control plasma catecholamine levels. According to the results of the present study and the mentioned studies, it can be concluded that the implementation of any technique that reduces stress and anxiety can affect systolic blood pressure. Diastolic hypertension is often associated with a decreased cardiac muscle function, decreased ability of the heart to pump, and stiffness of the heart muscle. In systolic hypertension, cardiovascular function can progressively change because of the changes in the elasticity of the blood vessels; thus, systolic blood pressure can change more rapidly than diastolic blood pressure.[18] It was shown in the present study that relaxation technique has a positive effect on systolic blood pressure, stress, and anxiety.

It was shown in the study of Awad *et al*. (2018)[19] that the use of stretching exercises and relaxation decreased 24-hour proteinuria significantly in both groups. Comparing the two groups, no statistically significant difference was observed between both groups before and after the intervention. The results of the present study are inconsistent with this study. This inconsistency is perhaps due to two different types of proteinuria.[1] According to the instructions of the Ministry of Health of Iran, high-risk pregnant women should be identified immediately and be registered in the mother–infant system. Moreover, severe forms of preeclampsia and eclampsia can be prevented by arranging the care teams to deal with the complications of pregnant women as well as the women with severe preeclampsia who are under the special care and advice of a group of doctors such as internal medicine and hematology as well as direct supervision of the university's vice chancellor. Furthermore, identifying the at-risk pregnant women in the health centers of Isfahan and introducing them to the health deputy and sending their names to the health centers and hospitals can also affect the early diagnosis of these pregnant women and their timely treatment as well as the formation of a morbidity committee as soon as possible. This study was conducted in Iran, which may have a different culture and religion to other countries or areas. Therefore, this finding may have limited transferability to other setting.

Conclusion

Considering the fact that PES is one of the health problems in Iran and one of the main causes of morbidity and mortality

of pregnant women, BRT, as an easy and accessible physical activity, can be recommended to reduce these disorders and consequently the complications of pregnancy and delivery in these pregnant women. Presenting the findings of this study to deputies of health and treatment in Isfahan University of Medical Sciences, in order to inform the gynecologists and midwives about the effect of this type of BRT on some symptoms of preeclampsia during pregnancy, can improve pregnant women's health, especially those who are susceptible to this disorder.

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Conflicts of interest

Nothing to declare.

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