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EFFECT OF PRENATAL YOGA ON ANXIETY, BLOOD PRESSURE, AND FETAL HEART RATE IN PRIMIGRAVIDA MOTHERS

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ABSTRACT
Background: Pregnancy increases the risk of developing anxiety that may affect the fetus. Yoga is considered as an alternative therapy to reduce anxiety, blood pressure, and fetal heart rate.
Objective: This study aimed to examine the effect of prenatal yoga on anxiety, blood pressure, and fetal heart rate in primigravida mothers.
Methods: There were 39 primigravida mothers selected using purposive sampling, which divided into three groups - an experiment group with four-times prenatal yoga, an experiment group with eight-times prenatal yoga, and a control group. The Hamilton Rating Scale for Anxiety (HRSA) was used. Data were analyzed using One-way ANOVA and MANOVA.
Results: There was a statistically significant difference of prenatal yoga on anxiety (p=0.005), systolic blood pressure (p=0.045), and fetal heart rate (p=0.010). However, there was no significant difference of prenatal yoga on diastolic blood pressure with p-value 0.586 (>0.05).
Conclusion: There were significant effects of prenatal yoga on anxiety level, systolic blood pressure, and the fetal heart rates in primigravida mothers. The findings of this study can be an alternative treatment for midwife to deal with anxiety during pregnancy and an input for the class program of pregnant women to improve the quality of maternal and fetal health.

Keywords: prenatal yoga, anxiety, blood pressure, fetal heart rate

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INTRODUCTION

Body's biochemical dysregulation in pregnant women may lead to anxiety, which increases blood pressure and uterine artery resistance resulting in fetal distress.[1,2] So, if not resolved, it may cause maternal and fetal death. According to the World Health Organization (WHO),[3] Indonesia is ranked third highest for maternal mortality compared to ASEAN countries. Maternal mortality in Indonesia in 2012 reached 359 per 100,000 live births, and perinatal mortality reached 26 per 1,000 pregnancies.[4] The perinatal mortality rate in Semarang has increased from 128 in 2013 to 130 in 2014,[5] while the number of infant mortality the Health Center of Lebdosari Semarang reached 7 cases.[5]

In response to this, several efforts have been done, one of which is physical activity. But this activity only focuses on physical health ranged between 15-20 minutes.[6] Thus, the physical activity that combines all aspects of physic, mental, and spiritual is needed. Yoga is one of the exercises that addresses all those aspects, which is called as "Prenatal Yoga".[7]

Yoga is a system of movement and breathing exercises that combine physical connection with mental, emotional and spiritual.[7] Prenatal yoga forms of physical exercise that fits the needs during pregnancy. It can be implemented once or twice a week in the morning or afternoon for 60 minutes to minimize the incidence of physical injury or cause chronic illness.[8,9]

Study stated that prenatal yoga is useful to reduce anxiety in pregnant women, especially during labor, and is able to prevent depression.[10] In addition, it can reduce systolic and diastolic pressure in 3 to 4 mmHg.[11] Therefore, this study aimed to examine the effect of prenatal yoga on the level of anxiety, blood pressure, and fetal heart rate in primigravida mother in the Health Center of Lebdosari Semarang, Indonesia.

METHODS

Design

This was a quasi-experimental study with pretest posttest control group design.

Setting

This research was conducted in the working area of the Health Center of Lebdosari Semarang from November to December 2016.

Population and Sample

There were 39 primigravida mothers selected using purposive sampling, which divided into three groups: 1) an experiment group with four-times prenatal yoga (14 respondents), 2) an experiment group with eight-times prenatal yoga (13 respondents), and 3) a control group (12 respondents). The inclusion criteria in this study were primigravida, aged <35 years, gestational age 13-33 weeks, pregnant women who did not consume foods and beverages that contain alcohol, such as durian and tapai just before prenatal yoga, those who did not consume cardiovascular drugs, sedatives, and were willing to be respondents. The exclusion criteria were pregnant women who smoked during pregnancy, mothers with diabetes, and having contraindications for prenatal yoga, such as premature rupture of membranes, premature birth, cervical incompetence, palpitations arrhythmia, history of bleeding, and bleeding in the second and third trimester.

Intervention

The duration of prenatal yoga was 60 minutes, guided by a certified trainer of prenatal yoga. The steps of prenatal yoga were divided into early stage, core stage, and final stage. The early stages consisted of respiration and warming up. The core stage begun with *tadasana, utkatasana,*

uttanasana, lunges early posture, low lunges, lunges twist, balasana, virabhadrasana 1, virabhadrasana 2, sun warior, parsvakonasana, bilikasana 2, vasishtasana, kapotasana, janushir-sasana, upavistha anantasana, and savasana. The final stage consisted of metta meditation and final relaxation. The obstacle from participants during this study was the less motivation of participants to follow prenatal yoga, and it was resolved by direct picking by enumerators.

Each group had different time and place to implement the intervention. The group of four-times prenatal yoga was the participants who lived in Gisikdrono village and did Yoga on Saturday at 07.30 am at Gisikdrono urban village hall. The group of eight-times prenatal yoga was the participants who lived in the village Tambakharjo and did Yoga on Saturday at 09.00 am in the Hall of Tambakharjo urban village.

The control group was the participants who domiciled in Kalibanteng Kidul and Kalibanteng Kulon villages and did Yoga once a month according to the schedule of pregnant women in the Health Center of Lebdosari.

Instrument

The instrument used to measure anxiety was the Hamilton Rating Scale For Anxiety (HRSA),[12] which has been translated into Indonesian language.[13] The questionnaire has been tested for validity with a range of r-values of 0.39-0.79 and Cronbach's alpha value of 0.948. The questionnaire consisted of 42 questions that were the result of modifications from the Hamilton Rating Scale for Anxiety which included 13 groups of anxiety symptoms that each of the symptoms described specifically. With an assessment of <14 (no anxiety), 14-20 (mild anxiety), 21-27 (moderate anxiety), 28-41 (severe anxiety), and 42-56 (severe anxiety). As for blood pressure measurements, aneroid sphygmomano-meter was used, and a doppler research tool for measuring fetal heart rate.

Data Analysis

To find the effect of anxiety level, blood pressure value and the number of fetal heart rate in each prenatal yoga group were analyzed using One-Way ANOVA. Furthermore, the MANCOVA test was performed to examine the effect of prenatal yoga on anxiety levels, blood pressure values and prenatal fetal heart rate.

Ethical Consideration

The ethical feasibility of the research was obtained from the Health Research Ethics Committee (K.EP.K) of Health Polytechnic of Ministry of Health (Poltekkes) of Semarang with No. 182/KEPK/Poltekkes-Smg/EC/2016. Each respondent involved in this research has obtained an appropriate informed consent.

RESULTS

The majority of the characteristics of the respondents in the intervention and control groups as shown in the table 1 aged 22-24, gestational age 22 – 24 weeks, and BMI in prenatal: 21 kg/m^2. While the appropriate body weight during pregnancy between the three groups were difference, which in the four times prenatal yoga group was 20.51%, eight times prenatal yoga group was 5.12%, and control group was 10.26%.

Table 1 Frequency Distribution of Age, Gestational Age, and Nutritional Status in Primigravida Mothers

Variable	Group		
	Four-times Prenatal Yoga (n=14)	**Eight-times Prenatal Yoga (n=12)**	**Control (n=13)**
Age (year)			
Mean ±SD Min-Max	22.71 ± 3.049 17-27	24.08 ± 3.630 17-29	23.38 ± 3.548 19-31
Gestational Age (week)			
Mean ±SD Min-Max	24.736 ± 4.8473 18.1-32.5	22.133± 6.272 14.0-32.4	23.854 ± 5.1717 15-32
Nutritional Status			
BMI Prenatal			
Mean ±SD Min-Max	21.73±3.749 16.23-29.14	21.78 ± 4.323 17.12-32.46	21.64 ± 2.625 17.04-25.97

However, the normality test for the data of variable age, gestational age, BMI, anxiety, blood pressure, and fetal heart rate were normally distributed. The homogeneity test for those variables between the three groups were homogenous.

Table 2 Frequency distribution of Anxiety, Systolic and Diastolic Blood Pressure, and Fetal Heart Rate (Pretest)

Variable	Group		
	Prenatal Yoga (4)	**Prenatal Yoga (8)**	**Control**
Pretest			
Anxiety			
Mean ±SD Min-Max	31.86 ± 6.882 21-45	29.67±10.773 16-53	31.15 ± 11.408 20-53
Systolic blood pressure			
Mean ±SD Min-Max	107.86±12.514 80-130	106.67±10.731 90-120	113.08 ± 10.316 90-130
Diastolic blood pressure			
Mean ±SD Min-Max	77.14± 10.69 60-90	77.5 ± 11.382 60-90	83.08 ± 10.316 60-100
Fetal heart rate			
Mean ±SD Min-Max	144.29 ± 4.795 135-152	145.75 ± 9.285 125-156	144.69 ± 6,277 134-152
Posttest			
Anxiety			
Mean ±SD Min-Max	23.00 ± 6.691 8-34	18.67±7.992 6-31	31.15±12,047 12-57
Systolic blood pressure			
Mean ±SD Min-Max	101.43±12.92 80-120	100±12.792 80-120	112.31±13.634 80-130
Diastolic blood pressure			
Mean ±SD Min-Max	75±10.190 60-90	77.50±11.382 60-90	79.23±10.377 60-100
Fetal heart rate			
Mean ±SD Min-Max	133.5±7.325 122-152	140±8.045 125-154	130.92±6.062 121-143

As shown in the Table 2, the mean of anxiety in pretest between the four-time prenatal yoga, eight-times prenatal yoga, and control group had no much difference ranged from 29 to 31.86, while in the posttest, the anxiety level decreased especially in the eight-times prenatal yoga than the other two groups. The blood pressure both systolic and diastolic were seen almost in the similar range either in pretest and posttest. However, the fetal rates decreased in the four-times yoga (133.5) and control group (130.92) than the eight-times prenatal yoga (140).

Based on statistical test results of One Way ANOVA, confounding variables in this study can be controlled with p-value of age variable was 0.597 (>0.05), gestational age was 0.476 (>0.05), and BMI value was 0.995 (>0.05), which indicated that there was no bias effect in the analysis of the study.

Table 2 Effect of Prenatal Yoga on anxiety, blood pressure, and fetal heart rate in primigravida mothers (Posttest) using One Way ANOVA

Variable	Mean Square	F	p-value
Anxiety	507.436	6.036	0.005*
Systolic blood pressure	583.516	3.387	0.045*
Diastolic blood pressure	61.218	0.542	0.586
Fetal Heart Rate	271.276	5.278	0.010*

**Significant level (<0.05)*

One Way ANOVA test result for posttest as shown in the table 2 revealed that p-values of anxiety (0.005), systolic blood pressure (0.045), and fetal heart rate (0.010) were below 0.05, which indicated that there was statistically significant difference in those variables after the treatment. However, there was no significant difference in the diastolic blood pressure with p-value 0.586 (>0.05).

Table 3 Effect of Prenatal Yoga on anxiety, blood pressure, and fetal heart rate in primigravida mothers (Posttest) using MANOVA

Variable	Group	Mean	F	95% Confidence Interval		*p-value*	
				Lower Bound	Upper Bound		
Anxiety	Prenatal Yoga (4) Prenatal Yoga (8) Control	23 18.67 31.15	6.036	18.030 13.299 25.997	27.970 24.035 36.311	0.005	0.001*
Systolic blood pressure	Prenatal Yoga (4) Prenatal Yoga (8) Control	101.42 100 112.30	3.387	94.314 92.315 104.925	108.543 107.685 119.691	0.045	
Fetal Heart Rate	Prenatal Yoga (4) Prenatal Yoga (8) Control	133.5 140 130.92	5.278	129.614 135.803 126.890	137.386 144.197 134.956	0.010	

**Significant level <0.05*

Table 3 shows the results of MANOVA test revealed that the p-value of the variables of anxiety, systolic blood pressure, and fetal heart rate was 0.001 (<0.005), which indicated that there was a statistically significant effect of prenatal yoga on anxiety, systolic blood pressure, and fetal heart rate. Post Hoc test with

LSD was also performed and showed that anxiety level and systolic blood pressure value in the eight-times prenatal yoga group were in the lowest average value, but the best in the fetal heart rate.

DISCUSSION

Findings of this study showed that there was a significant effect of prenatal yoga on the anxiety level of primigravida mothers. It is because prenatal yoga is a system of movement and breathing exercises that encourage mental, physical, emotional and spiritual relationships.[8] Anxiety can be controlled by yoga breathing techniques (pranayama), janushirsasana postures and metta meditation, which can provide a calming effect and reduce anxiety by increasing the inner bond with the baby.[14] Concentration and feelings are used as an object of additional concentration that will deepen the sensation of love and comfort, as a self-help to deal with anxiety, fear or when attention is scattered.[14]

In addition, the movement of *uttanasana, marjayasana, balasana, virabhadrasana* and *parsvakonasana* are very useful for spinal flexibility, which can increase circulation of the cerebrospinal fluid around the brain and spinal cord.[15,16] Increased CSF circulation helps in enhancing endorphins and serotonin that act as a body-to-body connection to the reduction of pain that will replace catecholamines.[17] Additionally, yoga can reduce the performance of the hypothalamus to release neuropeptide which will further stimulate the pituitary gland to release ACTH, which then suppress the production of cortisol. Decreased levels of cortisol causes the symptoms of anxiety perceived to be reduced.[18] However, it is supported by the results of the research in the United States that prenatal yoga can reduce the hormone cortisol which is one of the causes of depression, anxiety and anger.[19]

Findings of this study also revealed that there was a significant effect of prenatal yoga on the systolic blood pressure. This is because prenatal yoga is useful for the physical health of pregnant women during pregnancy, which can smooth the flow of blood, expedite the supply of oxygen and nutrients, and strengthen the lung and heart muscle.[14] Breathing exercises of yoga that deal with the heart muscle and lung muscles are useful for optimizing the capacity of the lungs to attract oxygen to be dispersed and absorbed by the whole body.[14] In addition, the *utukasana* posture stimulates the work of heart and diaphragm, as well as the postures of *virabhadrasana* and *parsva-konasana* are beneficial to increase stamina and endurance and strengthen heart muscle.[16]

Furthermore, prenatal yoga movements that stimulate vagal and activate parasympathetic can suppress the sympathetic nervous system that inhibits the stimulus of the adrenal medulla to release catecholamines (epinephrine and norepinephrine).[16] The decrease in catecholamines causes vasodilation of blood vessels in the kidneys and almost all visceral organs, thereby lowering blood pressure and distributed blood volume in every minute.[16] In addition, parasympathetic activation stimulates acetylcholine (ACH) to decrease the amount of impulse production, which further slows the impulse delivery to the ventricular muscle resulting in a decrease in blood pressure.[20] Decrease in blood pressure indicates the occurrence of stress oxidation experienced by pregnant women. This is in line with the results of research in India revealed that yoga can lower blood pressure and reduce levels of oxidative stress.[21]

However, this study also revealed that there was no significant effect of prenatal yoga on diastolic blood pressure. It can be explained that diastolic pressure decreases is a reflection of increased

elasticity of arterial blood vessels, which is associated with decreased peripheral vascular resistance.[22] In this study, there was no decrease of diastolic blood pressure in the three groups, which was in line with the previous study stated that diastolic blood pressure do not decrease significantly after the activity because the peripheral deterioration is not enough to play a major role.[23]

On the other hand, the finding of this study showed that there was a significant effect of prenatal yoga on the fetal heart rates in primigravida mother. It is proved that yoga movements facilitate blood circulation and optimize the capacity of the lungs to attract oxygen and nutrients to be absorbed by organs including delivering more oxygen and nutrients to the fetus, especially on the *marjayasana* yoga posture that can smooth the oxygen-rich blood flows and nutrients to the fetus.[14]

Moreover, prenatal yoga can activate parasympathetic to reduce sympathetic performance that reduce resistance to the uterine artery that can make the better blood flow. It is supported by the study mentioned that a decrease in the resistance of the uterine artery improving blood circulation from the uterus through the placenta to the fetus, so as to promote intrauterine fetal growth and reduce the risk of prematurity.[2] In addition, research conducted in Thailand stated that prenatal yoga can increase outcome from childbirth. [24]

Besides, this study also revealed that eight-times yoga was better than four-times yoga in the decrease of anxiety level. It could be said that the more the pregnant mothers follow prenatal yoga, the lower the anxiety level will be. It is consistent with the previous study indicated that giving yoga twice a week can reduce stress and anxiety levels and increase emotional intelligence.[25]

Limitation of the study

The confounding factors such as family, environment and workplace factors might be influencing the results that could be considered as the limitation of this study.

CONCLUSION

There was statistically significant effect of prenatal yoga on anxiety level, systolic blood pressure, and the fetal heart rates in primigravida mothers. The findings of this study can be can be an alternative treatment for midwife to deal with anxiety during pregnancy and an input for the class program of pregnant women to add prenatal yoga twice a week with a duration of 60 minutes to improve the quality of maternal and fetal health.

Declaration of Conflicting Interest

None declared.

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Authorship Contribution

Authors equally contributed in this study.

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