ORIGINAL ARTICLE

Yoga Exercise in Series Decreased Soluble Fms-like Tyrosine Kinase-1 (SFLT-1) Level Among the High-risk Preeclampsia Mother

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ABSTRACT

Introduction: An essential part of the pathophysiology of PE is played by SFlt-1. According to earlier studies, sFlt-1 expression starts to rise five weeks prior to conception and increases dramatically in the placenta preeclampsia at 11 weeks of pregnancy. For mothers who are at high risk, exercise in series can avoid preeclampsia. The purpose of this study is to examine how yoga practice affects blood sFLT-1 levels in moms who are at high risk of developing preeclampsia. **Materials and methods:** Forty-six high-risk mothers with preeclampsia, aged 9-16 weeks pregnant randomly grouped into control groups and yoga exercises. All subjects get standard treatment for preeclampsia. The yoga sports group also performed 20 sets of yoga under supervision. SFLT-1 levels were measured before and after the treatment course. **Results:** In the yoga group the sFLT1 levels differed significantly (p=0.010), before (1.13 ± 0.42 ng/ml) and after (0.94 ±0.38 ng/mL) the treatment program. In the control group the levels of sFTL-1 also differed signally (p = 0.049). before (0.85 ± 0.029 ng/ ml) and following (1.01 ± 0,38 ng / ml) the therapy program. **Conclusion:** Yoga consistently lowers serum sFLT-1 levels in mothers at high risk of preeclampsia.
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Keywords: Yoga, Exercise, sFTL-1, Preeclampsia, Pregnancy

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INTRODUCTION

Preeclampsia is an abnormality in pregnancy characterized by hypertension, proteinuria in pregnant age after 20 weeks. One of the main causes of death for both mothers and fetuses is preeclampsia (1). Preeclampsia can only be prevented by delivering the baby and placenta as soon as feasible. Other clinical symptoms and blood pressure management are the major focus of treatment. Preeclampsia is the most prevalent medical complication of pregnancy and affects 5%–15% of pregnancies worldwide. Its incidence is rising (2). Preeclampsia is identified in about 70% of pregnant women with hypertension. Pregnancy hypertension, particularly eclampsia, accounts for 16% of maternal fatalities in underdeveloped nations, according to data from the World Health Organization (WHO), with preeclampsia occurring in 2-8% of pregnancies (3).

To maintain the circulation in both the mother and the fetus, the placenta layer and uterine circulation undergo substantial vascularization during normal pregnancies. Vasculogenesis, angiogenesis, and remodeling of the maternal spiral arteries are all involved in the vascularization of the placenta (4). The molecular equilibrium that controls angiogenesis and vascular remodeling is necessary for this process. Placental damage and ischemia are caused by deficiencies in appropriate vascularization and remodeling (5). Soluble endoglin (sENG) and soluble Fms-Like Tyrosine Kinase-1 (sFLT1) are two examples of antiangiogenic substances that are produced in higher quantities than usual by the defective placenta in women with PE and released into the mother's blood (6). It is believed that PE is caused by an imbalance between proangiogenic and antiangiogenetic substances in the bloodstream, which causes microangiopathy in target organs including the

kidneys, liver, or brain (7). Clinical PE syndrome and maternal endothelial dysfunction are associated with elevated levels of sFLT1 in the blood (8).

Curative therapeutic efforts for preeclampsia so far have encountered many obstacles, limited to speeding up the birth of the fetus and the placenta. Another attempt is to treat symptomatically the signs and symptoms that appear, such as the administration of antihypertensive, antithrombotic and antioxidant drugs. Antioxidants and heparin are two frequent medications whose potential benefits on preeclampsia have been examined, but with little success (1,9). One of the therapies used is yoga practice. Yoga, unlike other sports, focuses not only on physical but also physiological aspects and mental well-being with asana practices, pranayama, and yoga meditation practices. The aerobic function produced by the yoga-based exercise program affects the physiological function of angiogenic and can cause intermittent hypoxia that can affect the angiogenesis mechanism and regulate stem cell migration. Consequently, the risk and severity of cardiovascular disease can be reduced by the new blood vessels that yoga causes to sprout from pre-existing vessels.

According to research by Karthiga et al., yoga exercises can improve neonatal feto-maternal outcomes, decrease the incidence of hypertension, and lower the risk of cardiometabolic events in pregnant women who are at risk of developing hypertension during pregnancy. They can also lower blood pressure, increase HRV, BRS, birth weight, and improve endothelial function (10).The rationale, meanwhile, is restricted to research on how yoga exercise affects hypertension during pregnancy. Thus, the purpose of this research is to examine how yoga practice affects blood sFLT-1 levels in moms who are at a high risk of developing preeclampsia.

MATERIALS AND METHODS

Research Design

Pre-posttest and control group designs combined in an experimental study design (9). Research variable is, independent variable: Prenatal yoga practice. Variable dependent: Serum SFLT-1 ratio. Subjects of the study: mothers at high risk of preeclampsia in trimester II (age of pregnancy 9-16 weeks) with the inclusion criteria there is one of the risks of pre-eclampsia i.e.: moderate risk (Age >35 years, zero-par, multiplepar with pregnancies by a new partner, multipara with a distance between pregnancy previously 10 years/more, PE history of mother or sister, multiple pregnancy, pregnancy with donor sperm insemination, oocytes or embryos, pre-pregnant obesity and IMT > 30 at the first time of ANC, high risk (multiple pregnancy with a history of PE). Exclusion criteria of the object of the research, i.e.: Insulin dependent diabetes mellitus (IDDM), chronic hypertension, kidney disease, antiphospholipid syndrome (APS), musculoskeletal problems (1,11,12). Pregnant women meet the criteria for high-risk preeclampsia if they have 2 moderate risks or 1 high risk (13). Sample size determined by formula Lemeshow et al. 1997, (14)

Sample size is determined based on the formula as follows:

$$n = \frac{(Z_{1-\alpha/2} + Z_{1-\beta})^2 (\sigma_1^2 + \sigma_2^2)}{(\mu^1 - \mu^2)^2}$$

Description:
μ_1=139,2
σ_1=6,718 -> σ_1^2=45,13
μ_2=145,87
σ_2=5,582 ->σ_2^2=31,16

$$n = \frac{(1,96+ 1,64)^2 (45,13+31,16)}{(139,2 - 145,87)^2}$$

$$n = \frac{12,96.76,29}{(-6,67)^2}$$

$$n = \frac{988,71}{44,5}$$

$$n = 22,2$$

$$n = 23$$

Implementation of yoga exercises

Both groups were given standard prenatal examinations of pregnant mothers, laboratory examinations and aspirin and calcium medications. In the treatment group added yoga exercises, with physical movement (atmosphere), controlled breathing (pranayama), relaxation and meditation (Dhyana) performed in sequence and has been adapted to the high-risk preeclampsia mother population with a duration of 30 minutes each exercise and performed 5 times a week for 4 weeks.

Measurement of serum sFLT-1 levels

The serum was taken from the blood of a patient who had met the specified inclusion criteria and had signed the approval sheet. (informed consent). Then centrifuged at 6000 rpm for 10 minutes. When the serum is ready for use, it is placed into an Eppendorf and kept at -40 °C. SFLT-1 measurement using Elisa method with the reagent: e-lab science no catalogue E-EL-H5412.

Statistical Analysis

In this study, the hypothesis test employs a different test methodology: Paired sample t-test is used to determine whether the data is normally distributed, and a Wilcoxon test is used to determine whether the data is not. P values less than 0.05 are regarded as statistically significant.

The research was approved as ethically appropriate on July 24 2023 with SK No. 194/EC/KEPK/FKUA/2023 at the Faculty of Medicine, Airlangga University.

RESULTS

In this study, 46 pregnant women at high risk of preeclampsia were obtained who met the study inclusion criteria and were randomized into 2 groups. The demographic characteristics results are as follows: Table I describes the age of pregnant women aged ≥ 35 years, there are 5 (21.7%) in the control group and 6 (26.1%) in the yoga group, the parity of Grande multiparous pregnant women in the control group is 5 (21.7%) and the yoga group 5 (21.7%), BMI of obese pregnant women in control group 8 (34.8%) and yoga group 9 (39.1%), systolic blood pressure ≥120 mmHg for control group 9 (39.1%) yoga group 5 (21.7%), diastolic blood pressure ≥80 mmHg for control group 5 (21.7%) and yoga group 4 (17.4%) and MAP > 90 mmHg for control group 10 (43.5%) and yoga group 14 (60.9%).

Table I: Respondent Distribution Based on Characteristics

Characteristics	Control	Yoga	*p Value*
Mother's age*	27.87±8.884	26.39±8.648	.636
Parities*	2.35±1.799	2.43±2.019	.952
Pregnancy age	14.83±1.114	14.87±.968	.945
BMI*	27.67±4.12	28.22±3.68	.635
Preeclampsia history			
No	18 (78.3 %)	15 (65.2%)	.513
Yes	5(21.7%)	8 (34.8 %)	
A history of preeclampsia in the mother or brother/sister			
No	14 (60.9%)	13 (56.5%)	1.000
Yes	9 (39.1%))	10 (43.5%)	
Multiparas with pregnancy distances ≥ 10 years			
No	18 (78.3%)	17 (73.9%)	1.000
Yes	5 (21.7%))	6 (26.1%)	

* Presented mean ± SD

Average serum levels of SFLT-1 in the control group and the yoga group are presented in Table II. Table II describes the minimum-maximum value of the pretest (.60-1.80 ng/ml) whereas the maximum-minimum value in the posttest is (.50-1.80 Ng/mL) in the control group, and the maximum minimum-value in the pretext (.70-2.20 ng/ml) while in the yoga group the maximum value in posttest was (.60-2.10 ng/ mL).

Table II: Wilcoxon SFLT-1 control group and yoga test results

SFLT-1	Pre-test		Post-test		*p Value*
	Control (a)	Yoga (b)	Control (c)	Yoga (d)	
Mean± SD	0.85 ± 0.29	1.13 ± 0.42	1.01 ± 0.38	0.94 ± 0.38	(axc) 0.049 (bxc) 0.010

Wilcoxon ranked test significant at <0.05

DISCUSSION

By increasing angiogenesis and CD34+ cells, yoga lowers the risk of cardiovascular disease. By directly inducing intermittent hypoxia through breathing techniques, yoga can improve blood flow and the sympathetic nervous system during exercise, which in turn can alter angiogenesis (15). Yoga exercises also affect angiogenic physiological functions. Growth of new blood vessels from pre-existing vases can lower the risk and severity of cardiovascular disease. The benefits of yoga exercise reduce the risk of developing hypertension in pregnancy, because yoga is a structured exercise (consisting of aerobic exercise, strength, and flexibility) that is more beneficial than doing aerobics alone. Yoga is considered to be a low-impact and safer physical activity for pregnant women in reducing the risk of developing hypertension during pregnancy, so it is more acceptable to be used as a preventive effort.

The results of a study of serum sFLt-1 levels in high-risk preeclampsia mothers who performed 20 yoga sessions for 4 weeks showed a significant decrease in the yoga group. This is in line with the study's findings. According to Mamlukhah et al.,(16) the antenatal yoga group's sFlt-1 was significantly lower than that of the therapy group "Murattal" al-Qur'an. a pregnant mother-friendly exercise that is low-impact, simple to regulate, and adaptable. Antenatal yoga groups are more likely to drop sflt-1 levels due to the potential of lengthier physical activities and breathing than a combination or "murattal" al-Qur'an group. As a result, yoga is among the safest techniques available to reduce oxidative stress in expectant mothers. Besides yoga, the age of mother, age of pregnancy and BMI were candidate of variable who able to influence SFLT-1 levels. Fortunately, these all were not significantly different between groups (p>0.05) it was shown on Table I. A strong direct correlation was found between an increasing body mass index (BMI) and the risk of developing preeclampsia and pregnancy induced hypertension (17). The adjusted risk of developing preeclampsia doubled for overweight mothers with a BMI of 26 kg/m2, and almost tripled for obese mothers with a BMI of 30 kg/m2 (18,19).

sFLT-1 initiates the pathobiological mechanism of preeclampsia because sFlt-1 has an inhibitory effect on the vascularization of the placenta by reducing the VEGF signal, causing apoptosis of the fetal blood vessels and disturbance of the differentiation of the placenta and nutritional exchange, which ultimately results in an obstruction of fetal growth, similar to pre-eclampsia conditions (20).

Serum SFLT-1 levels in pregnant women at a significant risk of preeclampsia can be lowered with effective yoga. One preventive strategy for preeclampsia in expectant moms is prenatal yoga. Yoga exercises can be given to the class of pregnant mothers who are already scheduled in posyandu and health care.

CONCLUSION

Yoga consecutively lowers serum sFLT-1 levels in

mothers at high risk of preeclampsia.

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