EXERCISE REDUCE OXIDATIVE DAMAGE IN PREGNANCY

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ABSTRACT

Pregnancy is a vulnerable condition to all kinds of "stress", resulting in changes of physiological and metabolic functions. This research aims to determine effect of exercise during pregnancy in reducing oxidative demage marked by decrease of malondialdehyde and 8-hydroxy-diguanosine levels. Randomized pre and posttest control group design was employed in this study. A number of 66 pregnant women were recruited in this study and grouped to two groups, i.e 30 of them as control group and the rest as treatment group. Pregnancy exercise was performed to all 36 pregnant women from 20 weeks gestation on treatment group. The exercise was performed in the morning for about 30 minutes, twice a weeks. On the other hand, daily activities was sugested for control group. Student's t-test was then applied to determine the mean different of treatment and control group with 5 % of significant value.

This study reveals that there were significantly higher decrease of (MDA) and 8-OHdG about 0.15 nmol/ml and 0.08 ng/ml, respectively, amongs treatment and control groups ($p < 0.05$). Clinical outcomes, such as strengten of pelvic muscle and quality of life of treatment group were significantly better compared to control group ($p < 0.05$). This means that exercise during pregnancy ages of 20 weeks decrease MDA and 8-OHdG levels higher compare to control group without exercise.

Keywords: oxidative stress, malondialdehyde, 8-hidroxy-2-deoxy-diguanosine,

INTRODUCTION

Pregnancy is a condition that is vulnerable to all kinds of "stress", resulting in changes of physiological and metabolic functions. In pregnancy there is an increasing in energy and oxygen demand (Patil, et al. 2006; 2007). In addition, the placenta is in fact contains many mitochondria which increases the oxidative metabolism to produce energy. These metabolic processes increase the use of oxygen and when oxygen available is not used maximum, it can cause the formation of oxidative stress and excessive free radicals that affect the continuity of pregnancy (Casanueva and Viteri, 2003).

Nowdays, the role of decreasing antioxidants and the increase of oxidants or free radicals in pregnant women has been widely studied. It is important to follow the development of pregnancy. The imbalance between antioxidants and free radicals in pregnancy causing pathological changes that can lead to complications in pregnancy. Antioxidants and oxidants biochemical marker are very useful in observing the complications that may arise in pregnancy (Carol, et al., 2000; Argawal, et al., 2005; Redman and Sargent, 2005; Patil, et al., 2006; 2007).

Physical training or exercise in pregnancy can maintain excess body weight, preventing diabetes, hypertension, and shorten the delivery time (Pivarnik, 2008). Exercise

for pregnant women can affect fetal growth in uterus. Sports activities should be accompanied by an adequate energy supply. The energy needed by the body when doing sports produced by the mitochondria. The locus of the catabolism, metabolism and oxidation reactions within the cells is mitochondria. The reaction in the mitochondria will generate the energy needed by the body.

Malondialdehyde (MDA), which is the result of lipid peroxidation can be measured to determine the presence of oxidative stress caused by free radical destruction (Patil, et al., 2006; 2008). Patil, et al., (2006) found that MDA levels in pregnant women, is higher than non-pregnant women. The increased levels of MDA are in line with the increasing gestational age.

Exercise during pregnant is beneficial for some extents involving, diabetic prevention and glycemic control improvement in pregnant women with diabetes, protective effects against heart disease, osteoporosis, hypertension, reducing the risk of colon and breast cancer, and can reduce body fat (Paisley, et al., 2003). Common complaints during pregnancy, such as fatigue, varicosities, swelling of extremities, insomnia, stress, anxiety, and depression can also be reduced by exercising (Barakat, et al., 2011). Scientific evidence also shows that by exercising during pregnancy can reduce labor time (length of labor) and reduce complications of labor (Juhl, et al., 2010; Paisley, et al. 2003). Other studies also find that the birth process was significantly associated with pregnancy exercise execution, the mothers who take pregnancy exercise proved to be through the birth process smoother and faster than no pregnancy exercise (Mariani and Nunik-Puspitasari, 2006).

This research was conducted to determine the effect of exercise during pregnancy in reducing oxidative demage marked by decrease of malondialdehyde and 8-hydroxy-diguanosine levels.

MATERIALS AND METHOD

This study is employing a randomized experimental, using pretest-posttest control groups design. A number of 66 pregnant women were admited in this study and grouped to two groups, i.e 30 of them as control group and the rest as treatment group. Pregnancy exercise was performed to all 36 pregnant women from 20 weeks gestation on treatment group. The exercise was performed in the morning for about 30 minutes, twice a weeks. On the other hand, daily activities was sugested for control group. Student’s t-test was then applied to determine the mean different of treatment and control group with 5 % of significant value.

RESULTS

Subject Characteristics

In this study, 66 pregnant women were recruited, 30 of them were studied as control group and 36 as treatment group. Characteristics of research subjects can be seen in Table 1.

Table 1 Characteristics of Research Subjects

Clinical Characteristics	Treatment Groups (N = 36)	Control Group (N = 30)
1) Age (year)		
16-18	7 (19,4%)	3 (10,0%)
19-21	10 (27,8%)	11 (36,7%)
22-24	13 (36,1%)	6 (20,0%)
25-29	6 (16,7%)	10 (33,3%)
2) Education		
SD	3 (10,0%)	3 (10,0%)
SLTP	6 (16,7%)	2 (6,7%)
SLTA	26 (72,2%)	21 (70,0%)
PT	1 (2,8%)	4 (13,3%)
3) Occupation		
IRT	28 (77,8%)	22 (73,3%)
Swasta	6 (16,7%)	6 (20,0%)
PNS	0 (0%)	2 (6,7%)
MHS	2 (5,6%)	0 (0%)
4) Hb (g/dL)		
Rata-rata	11,61 ± 0,93	11,89 ± 1,02
Minimum	11,00	11,00
Maksimum	15,00	14,60

Notes: SD = Primary School, SLTP = Junior High School, SLTA = Senior High School, PT = University, IRT = Housewife, PNS = Civil Servant, MHS = Students.

Decrease of Malondialdehyde and 8-Hydroksy-2-deoxy-guanosine Levels

MDA and 8-OHdG levels data of pre and post test for control and treatment groups are explored with SPSS for Windows. All data are normally distributed ($p > 0.05$) and its variants homogeneous ($p > 0.05$) as indicated in Table 2.

Table 2 Data of MDA and 8-OHdG in Control and Treatment Groups

Parameter	**Treatment Group (n=36)**		**Kontrol Group (n=30)**	
	Pretest	***Posttest***	***Pretest***	***Posttest***
MDA (nmol/ml)				
Average	1,79±0,06	1,63±0,07	1,80±0,05	1,78±0,06
Minimum	1,61	1,49	1,70	1,65
Maximum	1,91	1,77	1,91	1,90
p normality	0,401	0,193	0,740	0,370
p homogenity	0,347		0,416	
8-OHdG (ng/ml)				
Average	0,76±0,05	0,68±0,06	0,76±0,05	0,76±0,29
Minimum	0,66	0,56	0,63	0,71
Maximum	0,91	0,79	0,89	0,82
p normality	0,094	0,36	0,7702	0,080
p homogenity	0,497		0,072	

Description: Data with normal distribution and homogeneous variants with $p > 0.05$.

To analyze the differences in treatment effect of without any pregnancy exercise and with pregnancy exercise to the decreased levels of MDA and 8-OHdG is analyzed by analyzing the data of post test levels of MDA and 8-OHdG of control and treatment groups. This can be carried out because in t-test *independent*, levels of MDA and 8-OHdG pre test of control groups were not significantly different than the treatment group (p> 0.05). The results are presented in Table 3.

Table 3 Summary Results The average difference in levels of MDA and 8-OHdG post test control group by Treatment Group

Parameter	Average	SD	*p*	Diversity Average	IK 95%
MDA *post test* (nmol/ml)					
Control	1,78	0,06	0,00	0,15	0,10 - 0,19
Treatment	1,63	0,07			
8-OHdG *post test* (ng/ml)					
Control	0,76	0,29	0,00	0,08	0,06 - 0,10
Treatment	0,68	0,06			

Significant p <0.05

In this study, it is hypothesized that the decreased levels of MDA and 8-OHdG in the treatment group is greater than control group. The value of decline in each group also shown in Figure 1 and 2.

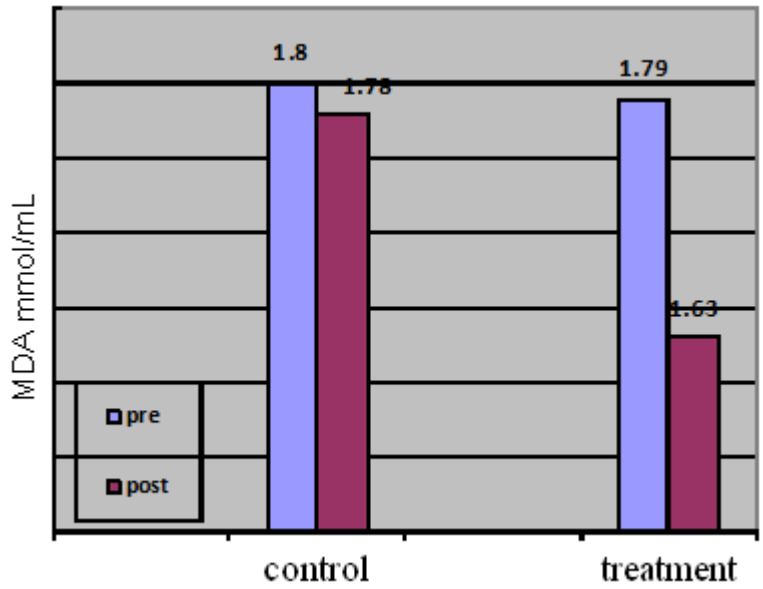

Figure 1 Profile Decreased Levels of MDA posttest of Control and Treatment Group

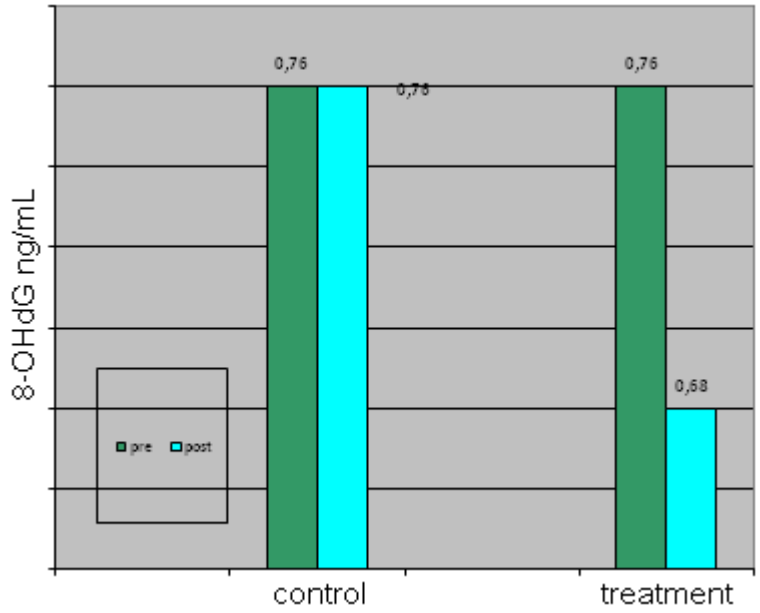

Figure 2 Profile of decreased 8-OHdG levels posttest of Control and Treatment Group

DISCUSSION

Clinical Characteristics of Research Subjects

A total of 83 people mothers of 20 weeks gestation participating in this research. The allocation is done randomly and found 38 people as control group and 45 people as treatment groups. After the drop out rate of 10%, so it does not affect the correct number of samples examined, 30 people of control group and 36 of treatment group was taken as research sample.

The average age of pregnant women in both groups is 16-29 years, details of which can be seen in Table 1. At this age mothers are ready to cope with risks that may arise during pregnancy, such as preterm birth, preeclampsia, and restricted fetal development in the womb (Malek, 2001; Webster, et al., 2008). At this age, mothers are expected to cope with the emergence of psychological complaints during pregnancy, such as dizziness, headaches, morning sickness, nausea, and vomiting (Cunningham, et al., 2005; Wiknjosastro, et al., 2006). In this research, the education of research subjects in both groups varied, and mostly high school educated.

Decrease in Levels of malondialdehyde (MDA) and 8-Hydroxy guanosine (8-OHdG)

In this research, it was found that the average MDA levels of pregnant women who receive treatment (pregnancy exercise) pre-post test is 1.79 ± 0.096 and 1.63 ± 0.07 nmol/ml. As for the group that did not get the treatment (pregnancy exercise) the average MDA levels of pre-posttest sequence is 1.80 ± 0.05 and 1.78 ± 0.06 nmol/ml.

The average 8-OHdG levels of pre-post test pregnancy exercise group (treatment group) was 0.76 ± 0.05 and 0.68 ± 0.06 nmol/ml, for the group without pregnancy exercise (control group) was 0.76 ± 0.05 and 0, 76 ± 0.29 nmol/ml. Overall these data are presented in Table 3. The result of statistical analysis of the data content of MDA and 8-OHdG pregnant women with pregnancy exercise were significantly different compared with the control group ($p < 0.05$). In this study there is a greater decline in levels of MDA and 8-OHdG in the treatment group compared to control groups, each of 0.15 nmol/ml and 0.08 nmol/ml (Figure 1and 2).

Apparently, it is clear that pregnancy exercise treatment in pregnant women decrease levels of MDA. This study is the first to reveal the relationship that pregnancy are vulnerable

to oxidative stress with 8-OHdG, a marker of DNA damage. Previous studies reported that there was a significant increase between 8-OHdG levels of normal patients with major depression patients (Forlenza and Miller, 2006).

CONCLUSION

Based on the results of research, analysis, and discussion on comparative research of the application of pregnancy exercise starting at 20 weeks of gestation and without pregnancy exercise can be concluded the following :

1. Decrease in MDA levels in pregnant women with pregnancy exercise treatment began at 20 weeks of gestation was significantly higher at 0.15 nmol/ml compared with an average decrease in MDA level without pregnancy exercise ($p < 0.05$).
2. Decrease in 8-OHdG levels in pregnant women with pregnancy exercise treatment began at 20 weeks of gestation was significantly higher by 0.08 ng/ml compared with an average reduction of 8-OHdG levels without pregnancy exercise ($p < 0.05$).

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