Research Report

Pregnancy Exercise Reduce Oxidative Damage in Pregnant Women

Olahraga Ringan Mengurangi Kerusakan Oksidatif pada Perempuan Hamil

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Abstract

Objective: To determine the effect of exercise during pregnancy in reducing oxidative damage marked by decrease of malondialdehyde (MDA) and 8-hydroxy-2-deoxy-guanosine (8-OHdG) levels.

Method: 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 week until fullterm. Blood sample was taken for MDA and 8 OHdG level at the beginning of research, at 20 weeks of gestation, and at intial delivery or fullterm. Student's t-test was applied to compared the difference between treatment and control group with 5% significant value.

Result: This study reveals that there were significant decrease of MDA and 8-OHdG level amongs treatment and control groups ($p < 0.05$).

Conclusion: Light exercise started from pregnancy age 20 weeks will decrease MDA and raised 8-OHdG levels compared to control group without exercise.

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

Abstrak

***Tujuan**: Penelitian ini bertujuan untuk mengetahui efek aktivitas olahraga ringan selama kehamilan dalam menurunkan kerusakan oksidatf dengan menilai kadar malondialdehide dan 8-hidroksi-2-deoksi-guanosin.*

***Metode**: Subjek penelitian adalah 66 perempuan hamil mulai usia kehamilan 20 minggu yang terbagi dalam 2 kelompok, 30 perempuan hamil sebagai kontrol, tidak melakukan kegiatan aktivitas olahraga, sedangkan sebanyak 36 perempuan hamil mulai usia kehamilan 20 minggu melakukan aktivitas olahraga, dilakukan dua kali dalam seminggu yang lamanya 30 menit setiap kali latihan sampai usia kehamilan aterm. Pengambilan sampel darah untuk pemeriksaan MDA dan 8-OHdG, ketika akan mulai penelitian yaitu usia kehamilan 20 minggu dan waktu kehamilan aterm atau akan melahirkan. Uji statistik menggunakan student's t-test untuk membandingkan perlakuan dan kontrol dengan nilai kemaknaan 5%.*

***Hasil**: Ditemukan bahwa terjadi penurunan kadar MDA dan kadar 8-OHdG secara signifikan pada perlakuan dibandingkan dengan konrtrol ($p<0,05$)*

***Kesimpulan**: Aktivitas olahraga ringan selama kehamilan yang dimulai sejak usia kehamilan 20 minggu akan menurunkan kadar malondialdehide dan peningkatan kadar 8-hidroksi-2-deoksi-guanosin dibandingkan tanpa aktivitas olahraga.*

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***Kata kunci**: stres oksidatif, malondialdehida, 8-hidroksi-2-deoksi-guanosin*

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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.[1,2] 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.[3]

Nowadays, 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.[4-6]

Physical training or exercise in pregnancy can maintain excess body weight, preventing diabetes, hypertension, and shorten the delivery time.[7] 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.[1,8]. Patil et al, (2006)[1] 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.[9] Common complaints during pregnancy, such as fatigue, varicosities, swelling of extremities, insomnia, stress, anxiety, and depression can also be reduced by exercising.[10] Scientific evidence also shows that by exercising during pregnancy can reduce labor time (length of labor) and reduce complications of labor.[9,11] 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.[12]

This research was conducted to determine the effect of exercise during pregnancy in reducing oxidative demage marked by decrease of malondialdehyde and 8-hydroxy-2-deoxyguanosine levels.

METHOD

This study is employing a randomized experimental, using pretest-posttest control groups design. Sixty six pregnant women were admited in this study and devided 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 week. On the other hand, daily activities was suggested 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 Group (n = 36)	Control Group (n = 30)
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%)
Education		
• Elementary School	3 (10.0%)	3 (10.0%)
• Junior High School	6 (16.7%)	2 (6,7%)
• Senior High School	26 (72.2%)	21 (70.0%)
• University	1 (2.8%)	4 (13.3%)
Occupation		
• Housewife	28 (77.8%)	22 (73.3%)
• Private	6 (16.7%)	6 (20.0%)
• Civil Servant	0 (0%)	2 (6.7%)
• Students	2 (5.6%)	0 (0%)
Hb (g/dl)		
• Average	11.61 ± 0.93	11,89 ± 1.02
• Minimum	11.00	11.00
• Maximum	15.00	14.60

Decrease of Malondialdehyde and 8-Hydroxy-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)		Control 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.

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	0,00		
8-OHdG post test (ng/ml)					
Control	0,76	0,29	0,00	0,08	0,06 - 0,10
Treatment	0,68	0,06	0,00		

Significant 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.

In this study, it is hypothesized that the decreased levels of MDA and 8-OHdG in the treatment group is greater than control group.

DISCUSSION

Clinical Characteristics of Research Subjects

A total of 83 people mothers of 20 weeks gestation participating in this research. The allocation was 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.[13,14] 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.[15,16] 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-2-deoxy 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

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.[17]

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 that decrease of MDA and 8-OHdG levels in pregnant women with pregnancy exercise treatment began at 20 weeks of gestation was significantly higher compared with an average decrease in without pregnancy exercise ($p < 0.05$).

REFERENCES

1. Patil SB, Kodliwadmath MV, Sheela MK. Lipid peroxidation and nonenzymatic antioxidants in normal pregnancy. J Obstet Gynecol Ind. 2006; 56(5): 399-401
2. Patil SB, Kodliwadmath MV, Sheela MK. Study of Oxidative stress and Enzymatic Antioxidant in Normal Pregnancy. Ind J Clin Biochem. 2007; 22(1): 135-7
3. Casanueva R, Viteri FR. Iron and Oxidative Stress in Pregnancy. J. Nutr. 2003: 1700-85
4. Carol J, Rhoda W, Judith R, Helen M, McKillop JH, Walker JJ. Antioxidant: Their Role in Pregnancy and Miscarriage. Antioxidants and Redox Signaling. 2000; 12(3): 623-8
5. Argawal A, Gupta S, Sharma RK. Role of Oxidative Stress in Female Reproduction. Rep Biol Endocrinol. 2005; 3: 28-35
6. Redman CW, Sargent IL. Latest Advances in Understanding Preeclampsia. Science. 2005; 308: 1592-94
7. Pivarnik J. Exercise During Pregnancy: Safe And Beneficial. Available access at http://www.medicalnewstoday.com/articles/101793.php.2008.
8. Patil SB, Kodliwadmath MV, Sheela MK. Correlation Between Lipid Peroxidation and Non-enzymatic Antioxidant in Pregnancy Induced Hypertension. Ind J Clin Biochem. 2008; 23(1): 45-8

9. Paisley TS, Joy EA, Price RJ. Exercise during pregnancy: A practical approach. Curr Sport Med Rep. 2003; 2: 325-30
10. Barakat R, Stirling JR, Lucia A. ORIGINAL ARTICLES Does exercise training during pregnancy affect gestational age? A randomised controlled trial. Br J Sport Med. 2008; 42: 674-8
11. Juhl M, Olsen J, Andersen PK, Nøhr EA, Andersen AN. Physical exercise during pregnancy and fetal growth measures: a study within the Danish National Birth Cohort. Am J Obstet Gynecol. 2010; 202(63): 1-8
12. Mariani, Nunik P. Praktik Senam Hamil Hubungannya dengan Kelancaran Proses Persalinan. Indones J Public Health. 2006; 3(1): 10-4
13. Malek A, Sager R, Schneider H. Pathobiology: Oxidant, Stress, Angiogenesis and Neoplasia. Effect of Hypoxia, Oxidative Stress and Lipopolysaccharides on the Release of Prostaglandins and Cytokines from Human Term Placental Explants. Placenta. 2001; 22: 15, 45-50
14. Webster RP, Roberts VHJ, Myatt L. Protein Nitration in Placenta Functional Significance. Placenta. 2008; 29:(12): 985-94
15. Cunningham GF, Leveno KJ, Bloom SL, Hauth J, Rause DJ, Spong YS. Williams Obstetrics. 23rd Edition. McGraw-Hill Comp, USA. 2010
16. Wiknjosastro H, Saifuddin AB, Rachimhadhi T. Ilmu Kebidanan. Ed. 3, cetakan ke 6. Yayasan Bina Pustaka Sarwono Prawirohardjo. Jakarta 2006
17. Forlenze MJ, Miller GE. Increased Serum Levels of 8-Hydroxy-2-Deoxyguanosine in Clinical Depression. Psychosomatic Medicine. 2006; 68: 1-7