

## Pregnancy Exercise Increase Enzymatic Antioxidant In Pregnant Women

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**Objectives:** 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 increasing enzymatic antioxidant marked by increase of superoxide dismutase (SOD), glutathion peroxidase (GSHPx), and catalase (CAT) levels.

**Methods:** 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 into 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 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:** This study reveals that there were significantly higher increase of (superoxide dismutase (SOD), glutathion peroxidase (GSHPx), and catalase (CAT) levels of treatment group compare to control group. These enzymatic antioxidant increase among these two group were around 1.36 µg/gHb for SOD; 1.14 IU/gHb for GSHPx; and 0.97 IU/gHb for CAT, ( $p < 0.05$ ). Clinical outcomes, such as strengten of pelvic muscle and quality of life of treatment group were significantly better compared to control group ( $p < 0.05$ ).

**Conclusions:** This means that exercise during pregnancy ages of 20 weeks increase enzymatic antioxidant levels SOD, GSHPx, and CAT higher compare to control group without exercise.

**Keywords:** oxidative stress, superoxide dismutase, glutathion peroxidase, catalase

### 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.<sup>1,2</sup> 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.<sup>3</sup>

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.<sup>1,2,4,5,6</sup> Physical training or exercise in pregnancy can maintain excess body weight, preventing diabetes, hypertension, and shorten the

delivery time.<sup>7</sup> 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.

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.<sup>8</sup> Common complaints during pregnancy, such as fatigue, varicosities, swelling of extremities, insomnia, stress, anxiety, and depression can also be reduced by exercising.<sup>9</sup> Scientific evidence also shows that by exercising during pregnancy can reduce labor time (length of labor) and reduce complications of labor.<sup>8,10</sup> 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.<sup>11</sup>

This research was conducted to determine the effect of exercise during pregnancy in increasing

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enzymatic antioxidant, marked by increase of SOD, GSHPx, and CAT levels.

## METHODS AND PATIENTS

This study is employing a randomized experimental, using pretest-posttest control groups design. A number of 66 pregnant women were admitted 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 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.

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%)
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)		
Average	11.61 ± 0.93	11.89 ± 1.02
Minimum	11.00	11.00
Maximum	15.00	14.60

SD = Elementary School, SLTP = Yuniior High School, SLTA = Senior High School, PT = University, IRT = servant, Swasts = private, PNS = civil servant, MHS = students.

### Increased Levels of Superoxide dismutase (SOD), Glutathione peroxidase (GSHPx) and catalase (CAT)

Test of normality and homogeneity of data distribution levels of SOD, GSHPx, and CAT was performed using Shapiro Wilk test and Levene's Test at the significance level ( $\alpha$ ) of 0.05. This is done

using the explore facilities of SPSS for Windows. The data content of SOD, GSHPx, and CAT are in normal distribution and also homogeneous with  $p > 0.05$ , as presented in Table 2a,b.

Table 2a  
Data Pretest of SOD, GSHPx, and CAT Levels in Control and Treatment Group

Parameter	Treatment Group (n=36)	Control Group (n=30)
	Pretest	Pretest
SOD ( $\mu\text{g/gHb}$ )		
Average	104.30±0.62	104.54±0.59
Minimum	103.15	103.09
Maximum	105.23	105.1
p normality	0.780	0.060
GSHPx (IU/gHb)		
Average	20.32±0.63	20.53±0.81
Minimum	19.06	18.88
Maximum	22.16	22.08
p normality	0.095	0.122
CAT (IU/gHb)		
Average	6.18±0.66	6.38±0.57
Minimum	5.06	5.15
Maximum	7.81	7.85
p normality	0.237	0.220

Table 2b  
Data Posttest of SOD, GSHPx, and CAT Levels in Control and Treatment Group

Parameter	Treatment Group (n=36)	Control Group (n=30)
	Posttest	Posttest
SOD ( $\mu\text{g/gHb}$ )		
Average	105.53±0.66	104.17±0.55
Minimum	104.14	103.09
Maximum	106.95	105.29
p normality	0.249	0.416
GSHPx (IU/gHb)		
Average	21.57±0.81	20.42±0.59
Minimum	19.79	19.20
Maximum	22.90	22.13
p normality	0.062	0.297
CAT (IU/gHb)		
Average	7.18±0.53	6.22±0.49
Minimum	6.25	5.01
Maximum	7.99	7.51
p normality	0.065	0.131

Analysis of differences in the effect of treatment without any pregnancy exercise and with pregnancy exercise against increased levels of SOD, GSHPx, and CAT is carried out by analyzing the data of post test SOD, GSHPx, and CAT levels in control group and treatment group. This can be applied by using independent t-test. It was found that the posttest data

of SOD, GSHPx, and CAT level on control group was significantly different to treatment group as shown with  $p$  values  $<0.05$ . Resume of the results of analysis are presented in Table 3.

Table 3  
Summary Results of The Average Difference in SOD, GSHPx, and CAT levels post test of Control Group and Treatment Group

Parameter	Average	SD	$p$	Different	95% CI
<b>SOD</b> ( $\mu\text{g/gHb}$ )					
Control	104.17	0.55	0.001	-1.36	-1.66
Treatment	105.53	0.66			to -1.06
<b>GSHPx</b> (IU/gHb)					
Control	20.42	0.59	0.001	-1.14	-1.49
Treatment	21.57	0.81			to -0.78
<b>CAT</b> (IU/gHb)					
Control	6.22	0.49	0.001	-0.97	-1.22
Treatment	7.18	0.53			to -0.71

SD = standard deviation,  $p$  = significance, CI = confidence interval, SOD = superoxide dismutase, GSHPx = glutathione peroxidase, CAT = catalase.

## DISCUSSION

### Clinical Characteristics of Research Subjects

A total of 83 pregnant women of 20 weeks gestation participate in this research. Random allocation was applied 38 of them as control group and 45 of them as treatment group. During the study, only 30 pregnant women were examined on control group and 36 pregnant women for treatment group. This 10% drop out does not affect the samples needed in this study.

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, the women are ready to cope risks that may arise during pregnancy, such as preterm birth, preeclampsia, and restricted fetal development in the womb.<sup>14,16</sup> At this age, mothers are also expected to cope with the emergence of psychological complaints during pregnancy, such as dizziness, headaches, morning sickness, nausea, and vomiting.<sup>17,18</sup> In this research, the education of research subjects in both groups varied, and mostly high school educated.

### Increased Levels of Superoxide dismutase Glutathione peroxidase and catalase

In this study it was found that SOD levels, GSHPx, and CAT pretest pregnancy exercise group without exercise (control) were comparable with

pregnancy exercise (treatment), this shows the value of  $p > 0.05$ . The entire data can be seen in Table 2a,b. Average pre and post SOD levels in the control group and treatment group obtained at  $104.54 \pm 0.59$  and  $104.17 \pm 0.55 \mu\text{g/gHb}$ ;  $104.30 \pm 0.62$  and  $105.53 \pm 0.66 \mu\text{g/gHb}$ , respectively. Furthermore, the average GSHPx levels pre and posttest in the control and treatment groups obtained respectively by  $20.53 \pm 0.81$  and  $20.42 \pm 0.59 \mu\text{g/gHb}$ ;  $20.32 \pm 0.63$  and  $21.57 \pm 0.81 \mu\text{g/gHb}$ , respectively. Also from the same table, average levels of CAT pre and posttest control group and treatment group obtained is  $6.38 \pm 0.57$  and  $6.22 \pm 0.49 \mu\text{g/gHb}$ ;  $6.18 \pm 0.66$  and  $7.18 \pm 0.53 \mu\text{g/gHb}$ , respectively.

In this research there were elevated levels of SOD, GSHPx, and CAT in the treatment group compared with the control group. A significant increase in SOD levels of  $1.36 \mu\text{g/gHb}$  found in the group who received pregnancy exercise compared with the group that did not get a pregnancy exercise, indicated by the value of  $p < 0.05$ . Overall data presented in Table 3. The table also show increased levels of GSHPx and CAT which are significant, of  $1.14$  and  $0.97 \mu\text{g/gHb}$ , respectively, indicated by the value of  $p < 0.05$ .

At trimester of the pregnancy, from the 1<sup>st</sup> until the 3<sup>rd</sup> trimester, will be accompanied by a decrease of enzymatic antioxidants, SOD, GSHPx, and CAT. This is consistent with the findings of Patil, et al., (2007), who found that there is a decline in enzymatic antioxidant levels in pregnant women compared with women who are not pregnant.<sup>2</sup> In this study, there is an increase in levels of enzymatic antioxidants, SOD, GSHPx, and CAT in pregnant women who get pregnancy exercise since the 20 weeks gestation. This is because of oxygen was consumed during exercise, so that the remaining oxygen was used for respiration, and did not caused oxidative stress. In that case, not too much enzymatic antioxidants used to balance free radical due to oxidative stress (countervailing biologic mechanism) and this situation shows an increase of the enzymatic antioxidant.

## CONCLUSION

Increased levels of SOD in the treatment of pregnant women with pregnancy exercise began at 20 weeks of gestation was significantly higher of  $1.36 \mu\text{g/gHb}$  compared with an average increase of SOD without pregnancy exercise ( $p < 0.05$ ).

Elevated levels of GSHPx in the treatment of pregnant women with pregnancy exercise began at 20 weeks of gestation was significantly higher of  $1.14 \mu\text{g/gHb}$  compared to an average increase of GSHPx without pregnancy exercise levels ( $p < 0.05$ ).

Increased levels of CAT in the treatment of pregnant women with pregnancy exercise began at 20 weeks of gestation was significantly higher by 0.97 IU/gHb compared with an average increase of CAT without pregnancy exercise levels ( $p < 0.05$ ).

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