# Effects of Moderate Exercise on Serum Immunoglobulin (G) During Last Two Trimesters of Pregnancy

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## ABSTRACT

*This study was conducted to determine the effect of moderate exercise on serum immunoglobulin (G) during last two trimesters of pregnancy. Thirty volunteer pregnant women (primigravidae and multiparae) were participated in this study. Their age ranged from 20-32 years old. They were recruited from the outpatient clinic of the Obstetrics Departemnt of Bab El-Sheria Hospital, Al-Azhar University. They were divided into two groups (A and B) equal in number. Group (A) consisted of 15 subjects in second trimester of pregnancy. And Group (B) consisted of 15 subjects in third trimester of pregnanay. Each subject in both groups (A&B) performed moderate exercise at (70% of maximum heart rate) on an electronic bicycle ergometer for 25 minutes (5 minutes warming up, 15 minutes active stage, and 5 minutes cooling down). Evaluation was done for each subject through blood sample which was drawn from antecubital vein before and immediately after exercise, to estimate serum level of IgG. The results showed that in group (A) there was a statistically significant (P< 0.05) increase in serum IgG level immediately after moderate exercise, while in group (B) the results showed that there was statistically non significant difference (P>0.05) in serum IgG level immediately after moderate exercise. So it could be concluded that practicing moderate type of exercise during second trimester of pregnancy is effective for the mother and her fetus as it result in an increase in serum IgG level thus lend protection to the newborn in his first months of life.*
*Key words: Immunity, Immunoglobulin (G), Moderate exercise, Pregnancy.*

## INTRODUCTION

Immunity is the ability of the human body to resist foreign organisms or toxins that tend to damage the tissues and organs. Immunity may be innate or acquired[4].

IgG is an ambivalent antibody and constitutes 70-75 percent of the antibodies of the normal person, plays an important role in all human defence reactions. It is the only immunoglobulin that passes the placental barriers, thus lending protection to the new born in the first months of life[12].

Maternal IgG crosses the placenta as early as the late first trimester, but the efficiency of the transport is poor until 30 weeks. The bulk of IgG is acquired by the fetus (from the mother) during the last 4 weeks of pregnancy. For this reason premature infants are not as well protected by maternal antibodies[3].

Short term, low intensity exercise does not appear to have negative consequences during pregnancy[11].

There is growing evidence that moderate type of exercise training improve the immune function and decrease the risk of infection[10].

However, it has been shown, that moderate exercise can lead to enhancement of the immune system[9]. Some studies reported a decrease in serum IgG level immediately after moderate exercise[1].

Few studies investigated the relationship between moderate exercise and serum IgG level concerning different trimesters of normal pregnancy. So the purpose of this study was to determine the effect of moderate type of exercise on serum IgG during last two trimesters of pregnancy.

## SUBJECTS, MATERIAL AND METHODS

### Subjects

Thirty healthy primigravidae and multiparae pregnant women in the second and third trimestes of pregnancy, were participated in this study. They were recruited from the outpatient clinic of the Obstetrics Department of Bab El-Sheria Hospital, Al-Azhar University. Their age ranged from 20 to 32 years old. Subjects were classified into two groups (A and B) equal in number.

Group (A): Consisted of 15 pregnant women in the second trimester of pregnancy.

Group (B): Consisted of 15 pregnant women in the third trimester of pregnancy. Each pregnant women in both groups (A and B) was subjected to moderate exercise on a bicycle ergometer at 70% of maximal heart rate for one trial. The duration of the exercise was 25 minutes.

Subjects complained from cardiovascular diseases, diabetes mellitus, repeated abortion and musculoskeletal disorders were excluded from this study.

Informed consent form was assigned by each subject in both groups (A and B) before starting the study.

Subjects physical characteristics of both groups (A and B) are summarized in Table (1).

*Table (1): Statistical summary of the physical characteristics of all subjects for both groups (A and B).*

| | Group | Mean | SD | P-value | Significance |
|---|---|---|---|---|---|
| Age (years) | (A) | 24.3 | ±3.99 | > 0.05 | NS |
| | (B) | 24.5 | ±4.05 | | |
| Weight (kgs) | (A) | 78.75 | ±17.55 | > 0.05 | NS |
| | (B) | 78.75 | ±15.93 | | |
| Height (meter) | (A) | 80.35 | ±0.07 | > 0.05 | NS |
| | (B) | 1.59 | ±0.06 | | |
| MBI (kgs/meter$^2$) | (A) | 31.13 | ±7.25 | > 0.05 | NS |
| | (B) | 32.01 | ±7.18 | | |

This table showed that differences concerning age, weight, height and body mass index were non statistically significant between both groups (A and B).

### Instrumentations

1- An electronic bicycle ergometer (Medfit 1000s).
2- Weight and height scale for measuring weight and height of each subject in both groups (A&B) before beginning of the exercise, and calculate their body mass index.
3- Disposable plastic syringes and special kits to measure IgG.

### Procedures

Before exercise each subject in both groups was instructed to sit on a chair for 10 minutes during which measurement of heart rate was taken for each one, and blood samples (3cm of blood was drawn from the antecubital vein) to measure serum IgG level. Then each

subject was instructed to sit on an electronic bicycle ergometer to perform moderate exercise with duration of 25 minutes consists of three stages. Stage 1 (warming up) consisted of 5 minutes warming up exercise in the form of pedaling at speed of 60 revolutions per minute without load. Stage 2 (active stage), consisted of 15 minutes of pedaling at speed of 60 revolutions per minute with adjustive load to achieve 70% of maximal heart rate. And stage 3 (cooling down), which was consisted of 5 minutes cooling down exercise in the form of pedaling at speed of 60 revolutions per minute without load.

Immediately after the termination of exercise, another blood sample was taken from each subject in both groups (A and B). Chemical analysis was done and the concentration of IgG was determined by measuring the ring diameters produced by antigen antibody complexes.

**Statistical analysis**

The collected data was statistically analyzed by using t-test for comparing each group before and after exercise, and comparing between the two groups (A&B)

I- Descriptive statistics
- Mean.
- Standard deviation.
- Percentage.

II- Significance level of 0.05 was used throughout all statistical tests within this study; P-value <0.05 indicate significant result, P-value <0.01 indicate a highly significant result[2].

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**RESULTS**

As shown in table (2) and fig (1), the mean values of serum IgG levels for group (A), before moderate exercise it was (1200.00 ±302.75 ml/dl), while immediately after moderate exercise it was (1450.30 ±285.85 ml/dl), with a mean difference of 250.3 ml/dl and percentage of difference of 20.8%. This difference was found to be statistically significant (P< 0.05) increase.

Also, the mean values of serum IgG level in group (B) before moderate exercise, it was (1120.80 ±210.09 ml/dl) while immediately after moderate exercise, it was (998.50 ±233.5 ml/dl) with a mean difference of 122.3 ml/dl and a percentage of difference of 10.9%. This difference was found to be statistically non- significant (P>0.05) decrease.

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*Table (2) mean values of serum IgG levels (ml/dl) before and immediately after moderate exercise in both groups (A).*

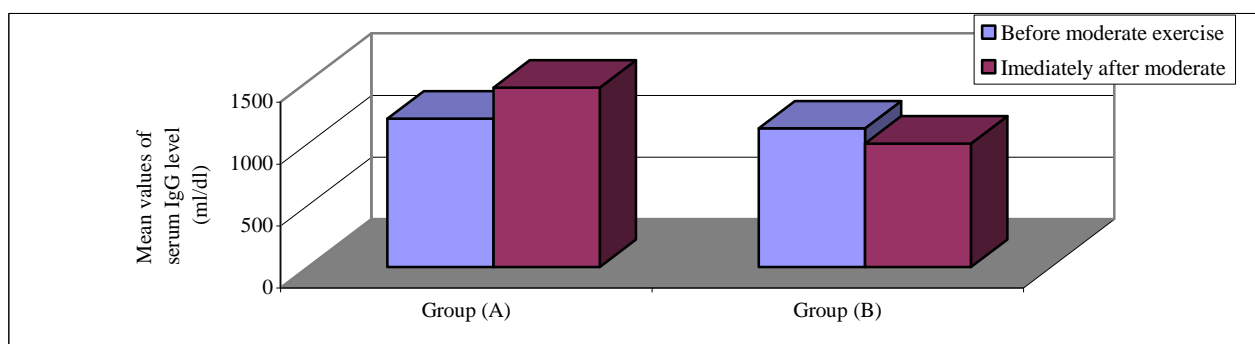|  | Group (A) | | Group (B) | |
|---|---|---|---|---|
|  | Before moderate exercise | Immediately after moderate exercise | Before moderate exercise | Immediately after moderate exercise |
| Mean | 1200.00 | 1450.30 | 1120.80 | 998.50 |
| SD | ±302.75 | ±285.85 | ±210.09 | ±233.5 |
| Mean difference | 250.3 | | 122.3 | |
| Percentage change | 20.8% | | 10.9% | |
| P-value | P< 0.05 | | > 0.05 | |
| Significant | S | | NS | |

*Fig. (1): Shows mean values of serum IgG level (ml/dl) before and immediately after moderate exercise in both groups (A&B).*

## DISCUSSION

Immune system is very important for the pregnant woman and her fetus. Immunoglobulins are very important for the fetus especially immunoglobulin (G), as it is the only immunoglobulin that is transported across the placenta. So significant passive immunity can be transferred in this manner to the fetus and aids in protecting it from infection during the prenatal period[12]. Exercise is today an integral part of normal life for many women. Moderate exercise on a regular basis during pregnancy is likely to lead to an improved course of pregnancy when compared with that of sedentary life style[6].

Healthy and well conditioned women may take part in exercise during pregnancy without compromising fetal growth and development as judged by birth weight or complicating the course of pregnancy or labor[7].

So, this study was conducted to determine the effect of moderate exercise on serum IgG level during last two trimesters of pregnancy.

The results of this study showed that there was a significant ($P < 0.05$) increase in serum IgG level immediately after moderate exercise in group (A), which was confirmed with that of Neeman and Nehlsen cannarella, 1991[9], who reported that acute moderate exercise had been associated with a transient rise in serum immunoglobulin levels, and concluded that this may be the result of contributions from extra vascular proteins pools and an increased lymph flow.

Also, results of this study agreed with that of Hemamy, 1996[5], who conduded that mild, moderate and severe short term exercise can increase, serum level of IgG in normal subjects. This may be due to increase influx of extravascular proteins, including globulins into intravascular pool, and / or non specific stimulation of memory B- cells. So, it can be concluded that the increase in serum level of IgG immediately after moderate exercise could be attributed to the following: Certain levels of exercise induce a release of immunoglobulins as the immune system receives a signals from the neuroendocrine network, resulting in an activation of T lymphocytes, and secretion of lymphokines[9]. These soluble substances in turn, would stimulate B – lymphocytes to synthesize and secrete immunoglobulin. Since B- cells can be specifically or non- specifically stimulatied by a number of different substance, in an exercise situation, B- cells may secrete immunoglobulin in response to non specific signals (lymphokines) from T-cells.

Norepinephrine has been shown to enhance lipopolysaccharide – induced b- cells proliferation and maturation into IgG[8].

Also, the results of this study showed that there was non-statistical significant (P> 0.05) decrease in serum level of IgG immediately after moderate exercise in group (B).

The result of this study concerning the decrease in serum IgG levels immediately after moderate exercise during third trimester of pregnancy is consistant with that of Barriga et al., 1993[1] who concluded that serum level of IgG immediately after exercise was significantly lower than before exercise. Also, it was concluded that the humoral immune response is unchanged or decrease after the exercise, depending on the characterestics of the physical exercise. Also, it was found that moderate physical exercise, did not give rise to variation in leucocytes concentration, moreover, this exercise provoked a decrease in serum IgG levels immediately after wards.

So, it could be concluded that practicing moderate exercise especially during second trimester of pregnancy was found to be effective for the mother and her fetus as it resulted in an increase in serum IgG levels thus lending protection to the new born in the first months, of life.

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| الملخص العربي |
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## تأثير التمرينات متوسطة الشدة علي مصل الأجسام المضادة (ج)
## أثناء الثلثين الأخيرين من الحمل

لقد أجريت هذه الدراسة لمعرفة تأثير التمرينات متوسطة الشدة على مصل الأجسام المضادة (ج) أثناء الثلثين الأخيرين من الحمل. وقد شاركت في هذه الدراسة ثلاثون سيدة حامل متطوعة (حمل لأول مرة ومتكررات الولادة) قد تراوحت أعمارهن من 20-32 عاما . تم اختيارهن من العيادة الخارجية لقسم أمراض النساء والتوليد بمستشفي باب الشعرية . تم تقسيمهن إلي مجموعتين متساويتين في العدد (أ ، ب) وقد تضمنت المجموعة (أ) خمسة عشر سيدة حامل في الثلث الثاني من الحمل بينما تضمنت المجموعة (ب) خمسة عشر سيدة حامل في الثلث الثالث من الحمل وقد أجرت كل سيدة في المجموعتين (أ ، ب) تمرينات متوسطة الشدة (70% من أقصي معدل لنبضات القلب) علي العجلة الالكترونية لمدة 25 دقيقة (5 دقائق تسخين للجسم ، 15 دقيقة تمرينات متوسطة الشدة، 5 دقائق تبريد للجسم) . وقد تم التقييم لكل سيدة عن طريق اخذ عينة دم وريدي من الوريد المرفقي الأمامي قبل وبعد التمرينات مباشرة لمعرفة مستوي مصل ا لأجسام المضادة ج في الدم . وقد أظهرت النتائج بالنسبة للمجموعة (أ) أن هناك زيادة ذو دلالة معنوية في مستوي مصل الأجسام المضادة ج عقب إجراء التمرينات المتوسط الشدة بينما في المجموعة (ب) أظهرت النتائج أن هناك نقص ذو دلالة غير معنوية في مستوي مصل الأجسام المضادة (ج) في الدم عقب إجراء التمرينات المتوسطة الشدة . ومن هنا يمكن أن نستخلص أن ممارسة التمرينات متوسطة الشدة خاصة في الثلث الثاني من الحمل تعد مفيدة جدا للام وللجنين حيث أنها قد أدت إلي زيادة في مستوي مصل ا لأجسام المضادة (ج) في دم الأم وهذا بدوره يؤدي إلي حماية الطفل حديث الولادة أثناء الشهور الأولي من حياته .

**الكلمات الدالة :** المناعة ، الأجسام المضادة (ج) ، التمرينات متوسطة الشدة ، الحمل .