



Effect of Aerobic Exercise and Resisted Exercise on Immunoglobulins in Breast Cancer Patients

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Abstract: Breast cancer is a malignant tumor that starts in the cells of the breast. A malignant tumor is a group of cancer cells that can grow into (invade) surrounding tissues or spread (metastasize) to distant areas of the body. The disease occurs almost entirely in women, but men can get it, too. The purpose of the study was to determine the effect of aerobic and resisted exercise on immunoglobulin. Sixty patients with breast cancer were included in this study and were randomly divided into three equal groups: (A,B and C). Group A underwent chemotherapy received Aerobic exercise, 3 times per week for 5 month, group B underwent chemotherapy received Resisted exercise, 3 times per week for 5 month and Group C received chemotherapy for one session every 21 day .The clinical findings of the patients were analysed before and after the treatment via serum blood analysis. All sixty patients completed the study. There were no adverse effects observed. Serum immunoglobulin IgA analysis difference before and after the treatment was statistically significant ($p = 0.0001$). It was concluded that Aerobic and Resisted exercise has an significant effect on immunoglobulin IgA.

Keywords: Breast cancer, Aerobic Exercise, Resisted Exercise, Immunoglobulin.

Introduction

Breast cancer starts in the cells of the breast. The breast tissue covers an area larger than just the breast. It extends up to the collarbone and from the armpit across to the breastbone in the centre of the chest. The breasts sit on the chest muscles that cover the ribs. Each breast is made of glands, ducts (thin tubes) and fatty tissue. Lobules are groups of glands that can produce milk. Milk flows from the lobules through a network of ducts to the nipple. The nipple is in the centre of a darker area of skin called the areola. Fatty tissue fills the spaces between the lobules and ducts and protects them.¹

During the past decade, insight have been gained about the role of the immunological response in the breast cancer disease process,²and the possible use of immunological parameters in the prognosis of breast cancer.³Serum immunoglobulin levels were found to be related to the disease stage and tumor load in breast cancer patients. The obvious alteration in serum IgA levels in breast cancer patients reflects a disturbance in cell-mediated immunity and humoral immunity.⁴The complement activity is found to be raised in breast cancer patients and increased with the progression of the disease stage.⁵ The cytotoxic activity of the complements is insufficient as a surveillance mechanism against tumor.⁶ This is suggested to be due to the presence of an intrinsic cellular complement resistance mechanism.⁷

Breast cancer is a prevalent disease that requires intense and prolonged treatments. Although the outlook for surviving cancer is often very good, it almost always requires medical intervention.⁸

The most common treatment modalities for cancer are surgery, radiation therapy, chemotherapy and hormonal therapy. Such pro-longed and intensive medical treatments may take a heavy toll on the physical, functional, emotional, spiritual and social well-being of cancer survivors. Thus, such treatments are responsible for a plethora of physiological and psychological problems, which have a negative impact in the patient's quality of life.⁹

Chemotherapy may be given prior to surgery (neo-adjuvant) with the aim of reducing tumour size and the need for extensive surgery, or after surgery (adjuvant) to reduce the chances of the cancer coming back. When the cancer has spread to other parts of the body (metastatic), chemotherapy may be used to reduce symptoms, improve quality of life and extend survival. Chemotherapy drugs can be given intravenously (directly into the blood), or orally in a tablet. Chemotherapy is typically associated with adverse side effects such as fatigue, nausea and diarrhea; this is because of its toxic nature and non-specific mode of action, which means that all cells are attacked (even healthy cells)¹⁰.

So, the purpose of this study was designed to determine the effect of aerobic and resisted exercise program on immunoglobulins in breast cancer patients.

Subjects:

Patients: Sixty patients suffered from breast cancer(1st degree),were included in the study. Their age ranged from (30-50) years. Patients had not received drugs that can affect results. All participants were informed about the purpose of the study, signed a consent form before participation in the study and take the same dose of chemotherapy. They were randomly assigned into three groups. Group A composed of twenty patients who had breast cancer underwent chemotherapy, and they received supervised aerobic exercise for 5 month, 3 sessions per week, and thirty minutes per session. Group B composed of twenty patients who had breast cancer underwent chemotherapy, and they received supervised resisted exercise for 5 month, 3 sessions per week, and twenty minutes per session. Group C composed of twenty patients who had breast cancer, and they received Chemotherapy for one session every 21day.

Those who were not diagnosed as mentioned before were excluded from the study. The Ethical Committee of Physical Therapy College of Cairo University approved the study.

Materials and Methods

Evaluation Procedures: Immunoglobulins were assessed by:

1-Serum Blood Analysis:: Differential blood counts through serum blood draws was used to measure (IgA) for all patients in all groups before and after the treatment.¹¹

Treatment Procedures:

Group A underwent chemotherapy, and they received supervised aerobic exercise for 5 months, 3 sessions per week, and thirty minutes per session. The AET group was asked to exercise three times per week on a cycle ergometer, treadmill, or elliptical beginning at 60% of their maximal oxygen consumption, or VO_{2max}, for weeks 1 to 6 and progressing to 70% during weeks 7 to 12 and 80% beyond week 12.Exercise duration began at 15 minutes for weeks 1 to 3 and increased by 5 minutes every 3 weeks until the duration reached 45 minutes at week 18.¹²

Group B underwent chemotherapy, and they received supervised resisted exercise for 5 months, 3 sessions per week, and twenty minutes per session. The RET group were asked to exercise three times per week performing two sets of eight to 12repetitions of nine different exercises at 60% to 70% of their estimated one-repetition maximum. The exercises were leg extension, leg curl, leg press, calf raises, chest press, seated row, triceps extension, biceps curls, and modified curl-ups. Resistance was increased by 10% when participants completedmore than 12 repetitions.¹³

Group C received Chemotherapy for one session every 21days.

For Group A: Patient was informed about treatment procedures, also about aerobic exercise and its value. Before beginning the treatment. Patient was asked to wear comfortable clothes during the exercise. Switch the device on.

For Group B: If the patient were new to resistance training, she began with a lighter weight, and then patient performed a set of 10 repetitions with the light weight.

Statistical Analysis:

Descriptive statistics and ANOVA-test for comparison of the mean age of the three groups. ANOVA test for comparison of pre and post treatment measurements of mean values of IgA between the three groups. Paired t test for comparison between pre and post treatment measurements of mean values of IgA in each group. The level of significance for all statistical tests was set at $p < 0.05$. All statistical measures were performed through the statistical package for social studies (SPSS) version 19 for windows.

Results

Descriptive data of both groups (study and control):

Patient demographic data as observed in table (1) and demonstrated in figure (1), showed the mean \pm SD age of group A, Band C. There was no significant difference between both groups in the mean age ($p > 0.05$)

Table (1). Descriptive statistics and ANOVA test for the mean age (years) of the group A, B, and C:

	Age (years)		
	Group A	Group B	Group C
$\bar{X} \pm SD$	42.75 ± 8.18	44.5 ± 7.33	43.25 ± 6.52
Minimum	30	34	34
Maximum	58	59	57
F-value		0.29	
p-value		0.74	
Significance		NS	

\bar{X} : Mean

SD : Standard deviation

p value

NS

: Probability value

: Non significant

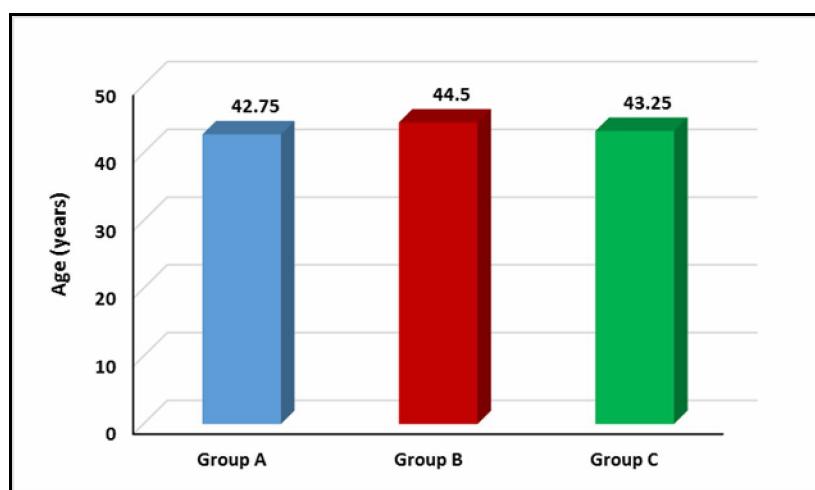


Fig (1).Mean age (years) of group A, B, and C.

I. Pre-treatment mean values of IgA of the three groups (A, B and C):

The mean \pm SD IgA pre-treatment of group A, B, and C were 231.05 ± 6.15 , 233.25 ± 4.73 , and 234.4 ± 3.8 mg/dl respectively. There was no significant difference in the IgA between the three groups pre-treatment ($p = 0.1$). (Table 2, figure2).

Table (2). ANOVA test for comparison between pre-treatment mean values of IgA of group A, B, and C:

IgA (mg/dl)			F- value	p- value	Sig
$\bar{X} \pm SD$					
Group A	Group B	Group C			
231.05 ± 6.15	233.25 ± 4.73	234.4 ± 3.8	2.32	0.1	NS

\bar{X} : Mean p value : Probability value
 SD : Standard deviation NS : Non significant

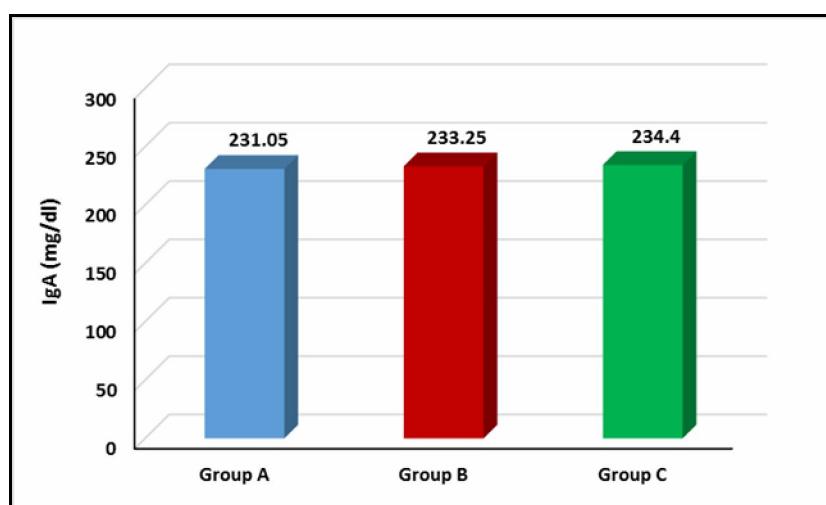


Fig (2).Pre-treatment mean values of IgA of group A, B, and C.

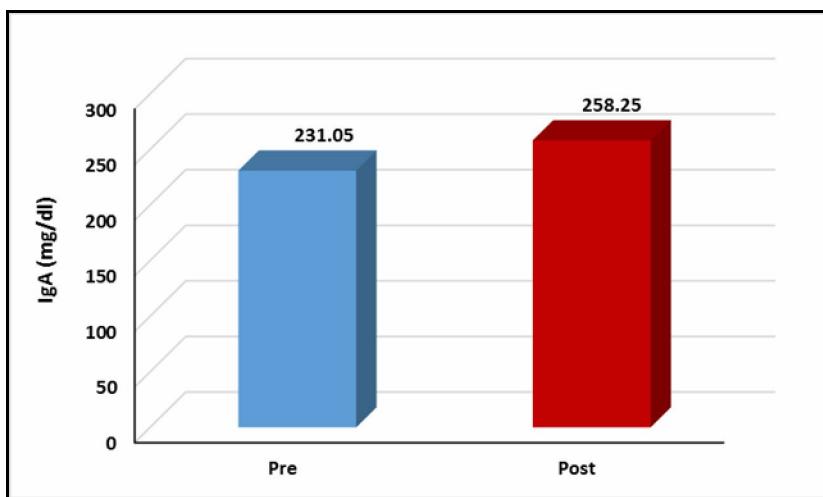
II. Pre and post treatment mean values of IgA of group A;

The mean \pm SD IgA pre-treatment of group A was 231.05 ± 6.15 mg/dl and that post treatment was 258.25 ± 6.13 mg/dl. The mean difference between pre and post treatment was -27.2 mg/dl and the percent of improvement was 11.77%. There was a significant increase in the mean values of IgA post treatment compared with pre-treatment ($p = 0.0001$). (Table 3, figure3).

Table (3). Paired t test for comparison between pre and post treatment mean values of IgA of group A:

	IgA (mg/dl)	MD	% of improvement	t- value	p-value	Sig
	$\bar{X} \pm SD$					
Pre	231.05 ± 6.15					
Post	258.25 ± 6.13	-27.2	11.77	-32.77	0.0001	S

\bar{X} : Mean MD : Mean difference
 SD : Standard deviation t value : Paired t value p value : Probability value
 S : Significant

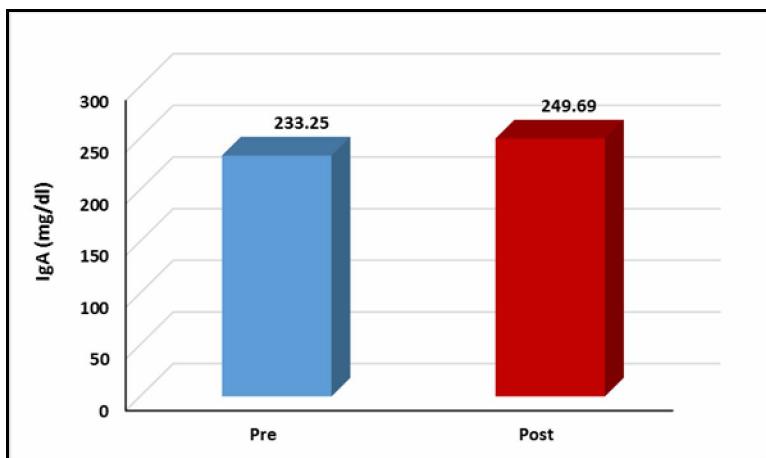
**Fig (3). Pre and post treatment mean values of IgA of group A.****III. Pre and post treatment mean values of IgA of group B;**

The mean \pm SD IgA pre-treatment of group B was 233.25 ± 4.73 mg/dl and that post treatment was 249.69 ± 5.88 mg/dl. The mean difference between pre and post treatment was -16.44 mg/dl and the percent of improvement was 7.04%. There was a significant increase in the mean values of IgA post treatment compared with pre-treatment ($p = 0.0001$). (Table 4, figure 4).

Table (4). Paired t test for comparison between pre and post treatment mean values of IgA of group B:

	IgA (mg/dl)	MD	% of improvement	t- value	p-value	Sig
	$\bar{X} \pm SD$					
Pre	233.25 ± 4.73	-16.44	7.04	-21.97	0.0001	S
Post	249.69 ± 5.88					

\bar{X} : Mean
SD : Standard deviation MD : Mean difference
t value : Paired t value p value : Probability value
S : Significant

**Fig (4). Pre and post treatment mean values of IgA of group B.****IV. Pre and post treatment mean values of IgA of group C;**

The mean \pm SD IgA pre-treatment of group C was 234.4 ± 3.8 mg/dl and that post treatment was 188.79 ± 4.88 mg/dl. The mean difference between pre and post treatment was 45.61 mg/dl and the percent of

change was 19.45%. There was a significant decrease in the mean values of IgA post treatment compared with pre-treatment ($p = 0.0001$). (Table 5, figure 5).

Table (5). Paired t test for comparison between pre and post treatment mean values of IgA of group C:

	IgA (mg/dl)	MD	% of change	t- value	p-value	Sig
	$\bar{X} \pm SD$					
Pre	234.4 ± 3.8	45.61	19.45	43.56	0.0001	S
Post	188.79 ± 4.88					

\bar{X} : Mean

SD : Standard deviation

MD

t -value

: Mean difference

: Paired t value

p -value

S : Probability value

: Significant

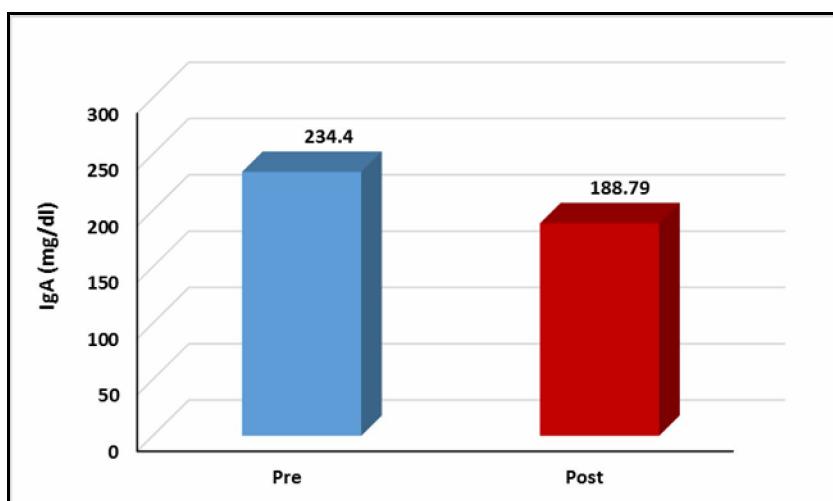


Fig (5). Pre and post treatment mean values of IgA of group C.

V. Post treatment mean values of IgA of the three groups (A, B, and C):

The mean \pm SD IgA post treatment of group A, B, and C were 258.25 ± 6.13 , 249.69 ± 5.88 , and 188.79 ± 4.88 mg/dl respectively. There was a significant difference between group A, B and C in IgA post treatment ($p = 0.0001$). (Table 6, figure 6).

The mean difference between group A and B was 8.56 mg/dl. There was a significant increase in IgA of group A compared with group B ($p = 0.0001$). The mean difference between group A and C was 69.46 mg/dl. There was a significant increase in IgA of group A compared with group C ($p = 0.0001$). The mean difference between group B and C was 60.9 mg/dl. There was a significant increase in IgA of group B compared with group C ($p = 0.0001$).

Table (6). ANOVA test for comparison between post treatment mean values of IgA of group A, B, and C:

IgA (mg/dl)			F- value	p- value	Sig
$\bar{X} \pm SD$					
Group A	Group B	Group C			
258.25 ± 6.13	249.69 ± 5.88	188.79 ± 4.88	895.46	0.0001	S
Multiple comparison (Bonferroni test)					
	MD	p- value			Sig
Group A - Group B	8.56	0.0001			S
Group A - Group C	69.46	0.0001			S
Group B - Group C	60.9	0.0001			S

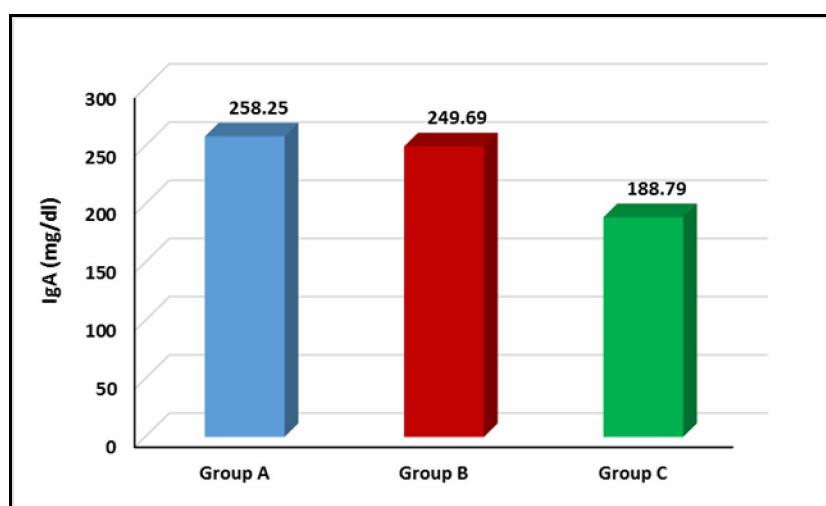
 \bar{X} : Mean

SD : Standard deviation

MD : Mean difference

p value : Probability value

S : Significant

**Figure (6). Post treatment mean values of IgA of group A, B, and C.**

Discussion

The findings of this study indicated that patients suffering from immune deficiency due to the medical intervention of chemotherapy as a method for treatment of breast cancer patients had a significant improvement in immunoglobulin IgA after application of supervised aerobic and resisted exercise.

The statistical analysis revealed a significant improvement of IgA in group A and B than that of group C; the percentage of improvement was 11.7%, 7.04% respectively.

These results are consistent with authors who supported that physical intervention for breast cancer patients; The California Teachers Study of a cohort of 3539 women with invasive breast cancer found that high or intermediate levels of long- term pre-diagnosis physical activity was associated with a lower risk of breast cancer death (RR, 0.53; 9 5% CI, 0.35e 0 .80; and RR, 0.65; 95% CI, 0.45 e 0.93, respectively).¹⁴

These associations were confined to overweight women and were consistent across oestrogen receptor status and disease stage. The authors conclude that consistent long- term participation in physical activity before breast cancer diagnosis may lower the risk of breast cancer death.¹⁴

Aerobic exercise has the capacity to protect and even enhance the immune response. Experimental studies have shown that a regular aerobic exercise program of brisk walking can enhance many defenses of the immune system, including the antibody response and the natural killer (T cell) response.¹⁵

During physical exercise several positive changes occur in the immune system. Moderate exercise increases the recirculation of neutrophils and natural killer cells, two cells that play a critical role in innate immune defenses. Animal data indicate that lung macrophages play an important role in mediating the beneficial effects of moderate exercise on lowered susceptibility to infection.¹⁶

Aerobic exercise is the type of moderate-intensity physical activity that you can sustain for more than just a few minutes with the objective of improving your cardio respiratory fitness and your health. "Aerobic" means "in the presence of, or with, oxygen."¹⁷

Resistance training is any exercise that causes the muscles to contract against an external resistance with the expectation of increases in strength, tone, mass, and/or endurance. The external resistance can be dumbbells, rubber exercise tubing, your own body weight, bricks, bottles of water, or any other object that causes the muscles to contract.¹⁸

Resistance training promotes improvements in muscle strength and endurance and increases muscle mass, but little is known about the immune responses to resistance exercise in elderly people. The effect of resistance training on immune function in the elderly has been investigated in a limited number of studies. Most of them found that 8–12 wk of resistance training programs had minimal effects on resting inflammatory, innate, or acquired immune parameters, as assessed by analysis of peripheral blood.¹⁸

Conclusion

In this study, it could be concluded that aerobic and resisted exercise has significant improvement in immunoglobulin IgA at breast cancer patients underwent chemotherapy as evidenced by serum blood analysis. Aerobic and Resisted exercise was considered as a safe and effective modality for improvement of immunoglobulin at breast cancer patients.

Acknowledgments

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