

## EFFECTS OF AEROBIC EXERCISE ON INFLAMMATION MARKERS AMONG OVERWEIGHT WOMEN

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### Abstract

The purpose of this research was to examine the effects of 12 weeks of aerobic exercise on inflammation markers among overweight women. A sample of 20 overweight females between the ages of 18 to 24 years were recruited from the Women's University of Azad Jammu & Kashmir Bagh. Plasma interleukin-6 (IL-6), C-reactive protein (CRP), and anthropometric parameters were checked before and after 12 weeks of aerobic training (AT). Paired sample T-test was used for changes over time. The study revealed a significant effect of aerobic exercise on participant's CRP ( $4.98 \pm 1.65$  vs  $3.74 \pm .61$   $P = 0.003$ ) and IL-6 ( $8.41 \pm 4.02$  vs  $5.22 \pm 2.93$   $P = 0.001$ ) levels. The study also found significant positive effects of long-term aerobic training on weight and BMI. Aerobic training significantly improves CRP and IL-6 and anthropometric measurements such as waist-hip ratio (WHR) weight and body mass index (BMI). The training protocol used can be used as a good tool for the reduction of weight and maintenance of good health, especially for females. Being overweight should not be considered trivial and needs special consideration and awareness for the serious consequences associated with obesity and overweight.

**Keywords:** Interleukin; C-reactive; Inflammation; Markers; Overweight Women; Aerobic training.

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### Introduction

Pakistan is a developing country with a larger cohort of younger populations (more than 60%) (Humayun, Shah, & Sultana 2009). A detailed report presented by the National

Human Development Report (NHDR) records Pakistan among the countries with the highest youth population and is ranked second to this effect in the South Asian region. It adds that

the majority of the population (64%) are aged less than 30 and (29%) of them are between 15-29 years old. According to the National Representative Survey, in Pakistan 25% of the total population is overweight and 10% is obese (Humayun et al., 2009). About 33% of the population lives below the poverty line and is malnourished. Being overweight is highlighted in the literature as one of the major problems for youth that tends towards the development of chronic heart diseases, tumors and diabetes (Johnson-Wimbley & Graham 2011).

Currently, youngsters consume more junk food and do not take a balanced diet as per basal metabolic rate (BMR), age, and gender. In addition, a balanced diet and exercise are required to maintain optimal health levels. Due to a lack of proper exercise and a balanced diet population in general and females in particular face overweight problems which causes a high level of lipid and heart diseases in young age affecting healthy life (Pasricha et al., 2013).

Females in our society are a protected segment and usually live a sedentary lifestyle. The related studies reveal that there are social and religious barriers to the popularization of sports, particularly among females (Woods & Butler 2020; Eime et al. 2013; Spaaij 2012). This social practice consequently leads to

overweight problems which resultantly causes health problems like diabetes, cardiovascular diseases, and cancer. Being overweight is a critical community health issue that increases clinical costs (Organization, 2011). Being overweight is categorized as extra energy consumption that results in the development of visceral adiposity, hyperplasia, adipocyte dysfunction, and hypertrophy. Secretion of anti-inflammatory adipokines in overweight individuals decreases and pro-inflammatory adipokines like Interleukin-6, TNF-alpha (tumor-necrosis factor alpha), and leptin secretion increase (Organization, 2011). In the development of cardiovascular diseases, increased levels of inflammation and adhesion have been reported to be involved. C-reactive protein and interleukin-6 are the standardized inflammatory markers associated with being overweight and are considered strong predictors of ongoing inflammation (Spaaij, 2012b). Raised levels of CRP, IL-6, and TNF-alpha determine low-grade systemic inflammation. These inflammation markers have a strong positive correlation with an inactive lifestyle and lack of aerobic fitness (Olson et al. 2007).

Keeping all these facts in view it becomes essential to value and look after young females to have a better lifestyle. Hence the present study has been designed to detect

the association between aerobic training and inflammation markers. This study will help to determine the inflammatory markers among young females that can cause health-related problems and chronic diseases.

The secondary objectives of the phenomena were to examine the physiological changes and adaptations associated with inflammatory markers in adult females. The findings of this study may help in developing guidelines for young females in particular and the public at large in general. Especially, this study will provide awareness to young females about living a healthy lifestyle.

Based on all the literature review, it is prudent to look into the effect of aerobic training for 3 months on inflammation markers (CRP, IL-6) in local overweight females aged 18-24 years of Women University of Azad Jamu & Kashmir Bagh (WUAJK). These findings can enhance our ability to quantify the basal level of CRP and IL-6 in this population. In addition, the effect of aerobic training will also be quantified, and the findings will be disseminated to the local authority for consideration.

### **Justification of the Study**

Pakistan is a developing country with a larger cohort of younger populations (more than 60%). A detailed report by the National Human Development Report (NHDR) records

that Pakistan is among the countries with highest number of youth population and is ranked the second to this effect in the South Asian region. It adds that the majority of the population (64%) are aged less than 30 and (29%) out of them are between 15-29 years old. According to the National Representative Survey, in Pakistan 25% of the total population is overweight and 10% are obese (Humayun, Shah, & Sultana 2009). About 33% of the population lives below the poverty line and is malnourished. Overweight is being highlighted in the literature as one of the major problems for youth that tends toward chronic heart diseases, tumors, and diabetes (Johnson-Wimbley, & Graham, 2011). Aerobic exercise is known to have numerous health benefits, including reducing inflammation. However, the specific effect of aerobic training on inflammation markers in overweight women may differ from those in other populations warranting targeted research in this group. (Pedersen & Febbraio 2012).

### **Materials and Methods**

This experiment-oriented quantitative study exploits deductive and contrived approaches. This has been approved by the Ethical Review Board of Sarhad University of Science and Information Technology, Peshawar. The study was accomplished between December 2019 and March 2020.

### Participants of the Study

Twenty overweight (BMI >25 <30) healthy female students (age 18-24 years) from the Women University of Azad Jammu & Kashmir, Bagh were recruited. They were informed about the protocols and benefits of the study before recruitment.

### Inclusion and Exclusion Criteria

The selected participants were non-smokers and were not involved in any drug intake during the treatment programs. Written informed consent from all the participants was taken. Nevertheless, due to dropout during the experiment, the final size was 15.

### Instruments and Instrumentation

After agreeing to take part in the study baseline measurements of weight, BMI, and WHR. Blood for the determination of CRP and IL-6 was derived from the antecubital veins by expert phlebotomists. Measurements of anthropometric and inflammatory markers were repeated at the post interventional stage in the same manner. The participants were

engaged in the aerobic training protocol devised by A.M (2013) with slight modifications. The training schedule for the experimental group lasted for 12 weeks, 5 sessions per week, and each session lasted for 50 minutes (including 10 minutes each for warm up and cool down). The running period was 15 minutes at 50 to 60% of the predicted maximum heart rate for the first Session and after every two sessions, 1.5 minutes were added to the running period in a stepwise manner until the running period reached 30 minutes. Thereafter, the running period was kept at 30 minutes till the end of the training program. Both CRP and IL-6 were quantitatively measured through ELISA. Data were analyzed using SPSS version 18.

### Results

Paired sample statistics were used for pre and post-mean comparisons and mean difference and level of significance were determined for different variables as outlined in table 1.

Table 1. Pre- and Post-Mean Comparisons, Mean Difference, and Level of Significance

Variable	Pre Value (Mean ± SD)	Post Value (Mean ± SD)	Pre & Post Variables (Mean ± SD differences)	T-Value	P-Value
Height (m <sup>2</sup> )	1.64 ± 06	1.64 ± 06	0.00		
Weight (kg)	75.33 ± 6.13	69.66 ± 5.85	5.66 ± 1.58	13.81	< 0.001
BMI	28.13 ± 1.77	26.00 ± 1.65	2.12 ± 0.58	14.05	< 0.001
Waist Circumference	89.06 ± .71	81.95 ± 7.34	7.11 ± 2.39	11.52	< 0.001
Hip Circumference	108.28 ± 4.30	105.66 ± 4.05	2.62 ± 1.94	5.21	< 0.001
WHR	0.82 ± .08	0.77 ± .07	.04 ± .02	6.23	< 0.001
CRP	4.98 ± 1.65	3.74 ± .61	1.24 ± .34	3.60	0.003
IL-6	8.41 ± 4.02	5.22 ± 2.93	3.19 ± 2.76	4.478	0.001

As determined by the higher T values and mean difference, the 12-week aerobic exercise intervention has significantly improved the anthropometric and inflammatory parameters effectively.

### **Discussion**

This study aimed to determine the effect of aerobic training on inflammation markers (CRP, IL-6) in young obese females. Inflammatory cytokines and adiposity have been extensively linked to the pathogenesis of atherosclerosis and CVDs. The results of the current research report show that 3 months of aerobic exercise improves the inflammatory (CRP and IL-6) and anthropometric measurements.

From the data, it was found that overweight female participants had elevated CRP and IL-6 levels despite being healthy apparently. This points towards an ongoing low-level systemic inflammation that can lead to chronic health issues including diabetes and cardiovascular disease. Aerobic exercise has a positive effect on improving both inflammation markers. However, it is pertinent to mention that these inflammatory markers did not reach basal level. From this, it can be ascertained that the intensity or duration of the exercise needs to be modified or even personal exercise prescription with optimal intensity and duration may even

further improve the inflammatory markers. However, it warrants further studies and research. In addition, the decrease in adipose tissue of the participants was not quantified which could have provided better results, if considered. The findings of the current study are in line with this study's finding (Mattusch et al., 2000), which found that regular moderate-intensity training is effective in countering low-grade systemic inflammation in overweight individuals. It has also been shown that weight gain is associated with elevated inflammation markers and aerobic exercise reduces inflammation markers (Nassis et al., 2005). Consequently, a reduction in inflammation levels reduces the risk of future diseases like atherosclerosis, cardiovascular diseases, diabetes, and cancer (Tizdast, Ghazalian, & Gholami 2016).

The impact of aerobic training on the alleviation of inflammation and inflammatory markers has been established in clinical and non-clinical settings extensively (Esposito et al., 2003; Tisi & Shearman, 1998; Mattusch et al., 2000).

This study also reports a significant improvement in the anthropometric parameters including weight, BMI, and WHR. Aerobic exercise has been reported to maintain a healthy weight and help to reduce extra fat and IL-6 levels (Hong, et al 2014).

A positive correlation between abdominal fats and inflammation markers has also been reported (Gondim et al., 2015).

The findings of the current study augment the association of adiposity (BMI, WHR) with inflammation markers (CRP, IL-6). However, it should be kept in mind that the play between inflammatory markers, obesity, and adipose tissue is very complex and needs further studies to ascertain their link with each other.

### Conclusions

Based on the results of this study, it can be concluded that regular aerobic activity can be used as an effective non-pharmacological intervention for attenuation of the systemic subclinical inflammation associated with being overweight. The findings suggest the inclusion of regular aerobic activities for the reduction of CVD risk. The current study also found that baseline IL-6 and CRP levels were high among participants and twelve weeks of aerobic training reduced inflammation levels among participants.

### Implications of the Study

1. Overweight should not be considered trivial and needs special consideration and awareness for the serious

consequences associated with obesity and overweight.

2. Public awareness through seminars, workshops, and conferences about the health-related risks of obesity and the positive effects produced by aerobic training.
3. The training protocol used can be used as a good tool for the reduction of weight and maintenance of good health, especially for females.

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