



The effect of twelve weeks of average aerobic training on IL-33 serum levels of type 2 diabetic patients

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Abstract

Physical activities can change many components and function of the immune system. The aim of this study was to evaluate the effects of twelve weeks of average aerobic exercise on serum levels of IL-33 in patients with type 2 diabetes. The subjects of this study were diabetic patients attending to diabetes clinic in Karaj. They were invited by target and 60 diabetic patients aged 35 to 55 years, were chosen and divided randomly into two groups. This study was performed with equivalent of 50 to 55% vo_{2max} aerobic exercise. Blood samples were collected one day before and one day after practice and serum levels of IL-33 in the laboratory using ELISA kits of bendermed Canada. The results showed a significant decrease in IL-33 levels after exercise ($P > 0.01$). These results indicated that 8 weeks of aerobic training provide significantly reduced interleukin-33 inflammatory indexes among diabetics.

Keywords: interleukin-33, type 2 diabetes, aerobic exercise.

Introduction

The human body is always influenced by an environment of microbial agents' infection. These microorganisms have the potential for uncontrolled proliferation, pathological damage and eventually destroy their host (1). Many infections have limited time that this issue resulted by the immune system to fight infections. In recent years, evident in studies have been conducted on the role of physical stress on the immune system. Some studies have studied the effect of exercise on immune function (2). Studies have shown regular and moderate-intensity exercises

have played an important role in the prevention and treatment of many diseases, including cardiovascular disease, obesity, diabetes type II, hypertension and osteoporosis (3). Study of the effects of exercise on immune function covers wide range of sporting activities, including the activities of short-term and severe, long-endurance activities and regular light exercise. Study of Long-term effects of regular exercise on the performance of the immune system has extensively in the development of public health and prevention among nations that active aging population is increasing so rapidly (4-6). Type 2 diabetic is an epidemic metabolic disease based on estimates provided by about 5 to 8 percent of worldwide adults

living with the disease. International Diabetes Federation reported the number of people with type 2 diabetes in 2010, 285 million people and predicted to reach 438 million people till 2030. Direct and indirect costs of diabetes have been reported 174 billion dollars in the world in a year (7). The risk of early mortality, heart disease, kidney, infections, weakened immune systems and blindness is twice in people with diabetes than of people with no diabetes (8). The development of type 2 diabetes in the world has caused the disease to become one of the most important issues in health care (8).

Type 2 diabetes is a metabolic disorder occurs resulting in a deficiency of insulin secretion or action or both (9). American Diabetes Association and College of Sports Medicine confirmed that the rehabilitation program is better a combination of aerobic and resistance training or aerobic exercise for diabetics (9). Cytokines are glycoprotein group of proteins or soluble proteins that exert transmit messages between cells of the immune and other cells and can have different effects on the growth, differentiation and activation of normal cells and tumor (1). Cytokines have pro-inflammatory or anti-inflammatory activity or immunosuppressive treatment (1). Studies have shown that intense physical activity causes inflammation and secretion of pro-inflammatory cytokines exhaustive, including IL-6 - IL-1 and TNFa (10).

So intense training has a significant impact on the balance of cytokine activity and may change in the distribution of these cells and suppresses the immune system is temporarily weakened (9). InterLukin IL-33 is a family member of Interlukin 1, which in recent years has been found mainly in the skin, lung, adipose tissue and synovial fibroblasts. Similarly, IL-1 and IL-18, IL-33 and IL-33 are first IL-33 and pre-produced intracellular and then after the break it is released as original IL-33 out of the cell. IL-33 biological effects are applied by binding to its receptors and activation of NF-KB and MAP kinase (4). Research has shown that IL-33 protein with dual function plays as an inflammatory cytokine or intracellular transcription factor (which is characteristic of regulatory transcription). The second role, IL-33 goes to the cell nucleus where it binds to chromatin and regulates gene expression (11). Cytokine receptors are called ST2 and belong to a large family called IL-1 receptor which has the important roles in inflammatory and immunological responses (10). Exercise duration is one of the main

reasons for the changes in inflammatory markers (12). Balducci and colleagues observed significantly reduced of il-6 and crp levels after 12 months of exercise training in patients with type 2 diabetes while no changes was seen at the first quarter (12). More studies have reported the changes in cytokine levels of interference between 6 and 12 weeks (11). Due to lack of research we need to know the impact of exercise on the immune system of diabetics in 12 weeks of aerobic exercise on serum levels of inflammatory cytokines (IL-33) in patients with type 2 diabetes.

Materials and Methods

This study is a clinical trial which is cross-sectional one.

Subjects

All patients with type 2 diabetes of Karaj city participated in this study. Inclusion criteria for the study included male patients suffering from type 2 diabetes based on the criteria for diagnosis of Internal Medicine and Endocrinology, had fasting blood sugar between mg/d 150-250 during the study and their ages ranging from 35 to 55.

Criteria of inclusion

The risk of other chronic diseases

Illnesses mental

Having a regular exercise program in the last three months , having a myocardial infarction, uncontrolled Artiman, third degree heart block, severe high blood pressure (100/200 mmhg treated over), diabetic complications such as diabetic foot ulcers and diabetic nephropathy (microalbuminuria more than 20 micrograms of albumin per minute) or PDR. If any one of subjects were exposed to infectious diseases were excluded during the 12-week study (11).

The sample size

The study population consisted of all patients with type 2 diabetes to diabetes clinic in Karaj city, which were selected from among volunteers. Sixty were selected in total.

Sampling Method

Patients with type 2 diabetes who were referred to the clinic and after getting epidemiological data from their biographies and questionnaires, tests, hematology and immunology were taken as follows.

1. At baseline, 5 mL of peripheral venous blood clots was prepared,
2. Serum was isolated and kept in -80° until testing. After 12 weeks of exercise training, blood was taken again.
3. Measurement of IL-33 serum was conducted before and after exercise by vitro ELISA and the results were analyzed using statistical tests.

Methods and tools for data collection

Measuring of IL-33 by ELISA was performed by using a special kit.

The method of the project

In this study, a 12-week aerobic training program, 3 sessions of one hour in a week was used including

heating and cooling at first then do the training at the end of each session. The exercise program included running movements on a treadmill with 50% VO_{2max} .

Blood samples were collected before the start of the first practice session and 24 hours after the last practiced by specialists and transferred to the laboratory for testing. The blood samples were analyzed using special equipment.

Analysis and data description:

The results of the blood samples were analyzed using SPSS software.

Descriptive statistics was used for classification and data set and determine the central tendency (mean and standard deviation diffusion index). To determine the normal distribution of data Kolmogorov-Smirnov (KS) and Pre-test and post-test to compare the groups T-test was used. In general, the analysis of variance was used for repeated data in case of circumstance.

Results

Table 1. Anthropometric characteristics of the subjects such as age, height, weight and BMI

Subjects	Height	Weight	Age	BMI
	175±8	76±7	40±10	24±3

Table 2: Comparison of mean and standard deviation and IL-33 before and after exercise on diabetic patients (case and control groups)

	Group	Before the intervention/ Std Dev	After the intervention/ Std Dev	
IL-33	Case	4.11±11.2544	2.71±5.963	0.004
	Control	3.98±12.0256	4.21±11.7145	0.613

Discussion

Diabetes mellitus type 2 is a major public health problem that affects more than 285 million people in the world. According to the World Health Organization, in 2000 almost 2 million have had diabetes in Iran. It is predicted to increase by 6 million people till 2030. Exercises play a critical role in the prevention and control of type 2 diabetes. Physical activities can prevent the development of type 2 diabetes, therefore, appropriate exercise programs need to be more clinical in care system of type 2 diabetes. Although regular physical activity may help prevent and treat diabetes and its complications are important, but most people are exposed to passive type

2 diabetes. However, despite of the importance of physical activity in improving the condition of diabetes, there are a lot debates about the sports program for the health of the people (13-14). Diabetes increases blood sugar levels and hormonal changes and changes in the immune system. Physical exercise causes changes in the diabetic patient's immune system (15). There is little information in the case of IL-33 serum levels in diabetics so it is essential to measure serum IL in these patients. The results showed that aerobic exercise improves the diabetic patient's immune system. The results showed that aerobic exercise improves the diabetic patient's immune system. The exercises also help to reduce inflammation, thereby reducing the resistance to

insulin. The results also showed significant difference between case and control groups in serum levels of IL-33 after 12 weeks of aerobic training. IL-6 affects as like as IL-33 in the body.

And also associated with TH2 cytokine release effects similar to IL-4, IL-5 and IL-13 and TNF and IL-6, and play a central role in the immune system. This cytokine increases insulin sensitivity and reduces the progression of the disease.

So decreasing of inflammation levels cause to improve diabetes and increase sensitivity to insulin. Recent studies have shown that exercises especially aerobic exercise improves the diabetic condition. Aerobic exercise increases GLUT-4 protein. This protein causes a decrease in fasting blood glucose and therefore insulin sensitivity increase (16-18). Decreased levels of cytokines in inflammatory and pro inflammatory increase insulin sensitivity and improve diabetes, Block and colleagues (2010) found that glycogen resistance training leads to improve insulin sensitivity by increasing expression, GLUT-4 glycogen synthase, adiponectin and decreased TNF- . Our results were not in line with the results of Jalili and Khazaei (2014). The researchers found that IL-17 did not change significantly after intense anaerobic training but was consistent with other researchers' studies (2014). The researchers also showed that IL-33, IL-6 significantly changed after an intense aerobic workout session (beam test) (19-22).

Conclusion

Our results indicated that the diabetic patient's immune system to be changed and improved with aerobic exercise and cause to improve immune function and inflammation and reduce the levels of IL-33. The changes can reduce insulin use and improve diabetes disease. The results showed a significant decrease of IL-33 after 12 weeks. As a result it can be concluded that aerobic exercise reduces levels of inflammation and relieve disease of diabetes. However, the effects of exercise and sports on various variables need to be researched further on inflammatory and immune systems.

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DOI: [10.22192/ijarbs.2020.07.03.014](https://doi.org/10.22192/ijarbs.2020.07.03.014)

How to cite this article:

Ali Alidadi, Hamed Taheri, Arman Jalili. (2020). The effect of twelve weeks of average aerobic training on IL-33 serum levels of type 2 diabetic patients. *Int. J. Adv. Res. Biol. Sci.* 7(3): 118-122.

DOI: <http://dx.doi.org/10.22192/ijarbs.2020.07.03.014>