The Effect of Yoga Training on Blood Glucose, Insulin and Resting Heart Rate in Type II Diabetic Females

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ABSTRACT This work has been conducted to examine the impact of 8 weeks of yoga training on blood glucose and lipid profile in patients with type II diabetes. In this quasi-experimental study, 30 women with type II diabetes and between 45 to 60 years old were randomly selected and divided into two (N=15) groups of experimental and control. Experimental group were subjected to regular yoga training for 8 weeks (3 sessions per week, 60 minutes per session), while the control group did not have any regular activity. The dependent variables were blood glucose, Insulin and resting heart rate and were examined before and after exercise training in both groups. Results indicated a significant difference in the changed levels of blood glucose, Insulin and Resting heart rate between the control and experimental groups (P≤0.05). According to the findings, it can be concluded that regular practices of yoga with appropriate intensity can improve the effects of the illness and decrease the use of diabetes drugs and also the drugs for controlling the risk factors of coronary diseases in patients, along with having a diet, can use this type of sport to control the dangerous factors related to diabetes.

KEYWORDS Yoga, Type II Diabetes, Blood Glucose, Insulin, Resting Heart Rate.

INTRODUCTION

The Melitus diabetes is a kind of metabolic disorder that has turned into one of the greatest sanitary challenges all around the world. The evidences show that physical activities have outstanding effects in prevention of this disease (Teixeira et al., 2011). Melitus diabetes occurs when the blood sugar level is so high as a result of malfunctioning in the release of insulin, in the work of insulin or both(Arian, 2008). This disease is determined by insulin resistance, increased hepatic glucose production, and in some cases reduce in blood insulin levels (relatively, not absolute). Main problem in type II is observed in muscle tissues so that, insulin resistance is high in these tissues and causes hyperglycemia (ADA, 1999). Oxidative stress is increased in the patients and eventually leads to micro-and macro vascular complications (Penckofer, 2002).
Abnormalities that cause insulin resistance can be reversible with weight loss and increased physical activity. To prevent diabetes complications and associated costs, primary prevention and early treatment of the disease seems to be necessary.

On this subject, effective non-pharmacologic measures, such as regular physical activity to prevent the complications of diabetes and the complications associated with the drugs appear to be effective (Teixeira et al., 2011). Based on several studies in medicine and science, exercise is effective at primary and secondary prevention of cardiovascular diseases and complications of diabetes. The benefits of physical activity in patients with type II diabetes is considerable and recent studies have considered the importance of long-term exercise programs focused on prevention and treatment of common metabolic problems. To improve glycemic control and reducing weight and cardiovascular diseases, it is recommended to perform aerobic exercise at least 150 minutes per week of moderate-intensity between 40 to 60 percent of maximum oxygen consumption or 50 to 70 percent of maximum heart rate for at least 90 minutes of vigorous aerobic exercise (Robergs et al., 2010). Regular activities in diabetic people remove severe insulin reaction, since the more stored glycogen in muscle and liver increases peripheral and visceral insulin sensitivity in patients with type II diabetes (Gordon et al., 2008).

Therefore, it quickly reduces blood sugar in diabetic patients and improves their cardiovascular condition (Rajab, 2006). In physically active people, the ability of cells to respond to insulin and glucose uptake is higher than others. In addition, regular exercise can also reduce the ongoing insulin sensitivity by aging (Gordon, 2001). Some findings suggest that, reducing adipose tissue in these patients can decreased insulin resistance, reducing weight is as one of the most important advices for the treatment of type II diabetes (Ersoy et al., 2004). The important advice for those who suffer from type 2 diabetes or those danger of catching it, is to do appropriate physical activities (Yang et al., 2009). It seems that physical activities increase the amount of glucose absorption by the muscles up to 15 times more than resting mode (Bavaghar, 2003). Different kind of physical activity, along with an appropriate diet, are recommended to prevent type 2 diabetes. Among them, yoga can have an optimum effect on many of the physiological factors and can decrease the risk factors in type 2 diabetic patients (Yang et al., 2009).

Beside the physical advantage, the mental effects of exercising are also proven. Doing group activities can create self-confidence and social relations and motivation. It also can decrease the amount of anxiety and stress (Moghadasian et al., 2008). Because type II diabetes is more common among older people, and many of these individuals are also faced with problems of joint and muscle pain, doing exercises is an exhausting action for them and they lack the desire to high-intensity aerobic exercises (Sigal et al, 2004). Yoga as a form of physical activity has several advantages. The exercises are low-cost and easy to perform. Yoga has no bad side effects, does not need special supplies and, contrary to other sports, can be practiced by any body with the least equipments from childhood to middle age all through the life. Some of the findings have shown that yoga practices have positive effects on the mental variables and can improve the physiological variables like the blood pressure and heart rate (Bavaghar, 2003).

Despite it’s popularity and positive physiological effects, yoga has not yet become an attempt to prevent and treat chronic diseases like diabetes (Yoga, 2007). Regarding the fact that this type of physical activity can be used as a simple, harmless (without bad side effects), low-cost, non-medical and non-aggressive method to promote the quality of life in all cultures and social and economic groups and also the fact that there is a
small number of investigation about the effects of yoga exercise on the different kinds of diseases, the researcher, besides examining the effects of eight weeks of yoga exercises on insulin, blood glucose and resting heart in type 2 diabetic patients, hopes to attract the authorities’ attention toward this field and give them useful informations.

MATERIALS AND METHODS

This work is a quasi-experimental and applied research with test and control groups and using pre-test and post-test. Statistical population for this study included all women with type II diabetes who visiting the diabetes clinic of martyr Montazeri hospital in the city of Najaf Abad, Iran. With reference to the clinical records of 500 patients, 30 patients were randomly selected and randomly divided into two 15-member groups of test and control. In order to investigate the blood glucose level and insulin, the blood samples of patients after 8 to 12 hours fasting were used. For this purpose, they were asked visit the lab 24 hours before and after the exercises. Analysis of blood samples from subjects were conducted using biochemistry laboratory kits made in Iran. For measuring the resting heart rate of samples one day before and one day after the yoga exercises, they were asked to measure the number of their heart rate in relaxing mode, in the morning before leaving the bed, repeat it three times and report it’s average to the researcher. Training program that was used in this study consists of a series of yoga exercises 3 times a week (1 hour) for 2 months (8 weeks). In order to analyze the data we first used Kolmogorov-Smirnov test for normality of the data and the t test was used for the comparison between the test and control groups to determine significant differences between groups in pre-test and post-test. The level of significance was considered equal to (P≤0.05).

RESULTS

The results of this study show that after eight weeks of yoga practices, there were significant differences between the average of blood glucose level, blood insulin level and resting heart rate in the experimental and witness groups (P≤0.05). Differences in examined variables of each group are shown in table 1.

Table 1. Comparison of the indices in the groups before and after intervention.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Experimental group</th>
<th>Control group</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-test</td>
<td>Post-test</td>
<td>Pre-test</td>
</tr>
<tr>
<td>Blood Glucose</td>
<td>141.46±22.29</td>
<td>119.06±24.41</td>
<td>109.93±27.44</td>
</tr>
<tr>
<td>Blood Insulin</td>
<td>12.62±2.79</td>
<td>17.54±2.30</td>
<td>12.93±1.83</td>
</tr>
<tr>
<td>Resting Heart Rate</td>
<td>76.40±2.16</td>
<td>74.53±1.06</td>
<td>76.46±2.53</td>
</tr>
</tbody>
</table>

*Significant differences from pre to posttest between groups (p≤0.05).

DISCUSSION AND CONCLUSION

Based on the results of the study, in comparison with control group, yoga significantly decreases the blood glucose (P≤0.05). In terms of blood glucose levels, our results are consistent with the results of Amita (2007), Gordon (2008). In all of mentioned studies,
the researcher has tried to evaluate the effect of yoga on blood glucose levels in diabetes along with other risk factors. Despite minor differences in the number of samples, time of exercise and the individual characteristics of the subjects, their results were similar. However, some studies on this issue have reached different conclusions such as Sardar (2007). As can be seen, the results of these works suggest the positive effects of yoga on blood glucose levels that are consistent with the results of this study.

The reason of this consistency between these studies on blood glucose levels can be explained as the following that, perhaps muscle contraction and dilation in asana and pranayama exercises stimulate the pancreas gland, so that the relaxation, deep breathing, bending and twists and turns of the spine where the pancreas is located, directly stimulate pancreatic cells, thus performing the asana increases insulin secretion and regulation (Dacosta et al., 2004). Moreover, skeletal muscles have great ability in glucose uptake during exercise which is independent of insulin. Impact of exercise is to stimulate and reshape the GLUT-4 carrier of cell membrane from their intracellular storage location. Mechanisms of exercise are different messaging that rooted in an increase in calcium concentration caused by activation of the muscle fibers of the related motor neurons (Malhotra et al., 2004). In fact, the intracellular muscle glucose transports (GLUT-4), typically, do not move from the cytoplasm to the plasma membrane unless the mRNA has a normal state.

The phosphatization of the insulin receptor compound (IRS-3) in this process is a crucial step. IRS-1 acts as an inhibitor protein that facilitates the phosphatization of other intracellular proteins such as Phosphatidylinositol (PL3-kinas). PL3-kinas plays a role in the path where GLUT-4 transporters enter to plasma membrane. Abnormalities in IRS-1 or other combinations of insulin receptors have been identified in insulin resistance. Therefore, by adjusting its sensitivity and increased insulin secretion and increases glucose uptake by glucose transporter of the plasma membrane and oxidative enzymes during yoga, the reduction of blood glucose seems reasonable (Church et al., 2011). Also, by the use informations gained through the experiential group, the average of the blood insulin level has increased from 12.62 to 17.54. In comparison with the control group, we have seen a considerable increase (P≤0.05).

The result of this study about examining the effect of yoga exercises on the blood insulin level in type 2 diabetic patients are in line with the findings of Yang (2009) and Singh (2008) studies. Many of the researchers have stated that yoga increases the absorption of glucose and the blood flowing by the muscles. It also decreases the insulin resistance and increases it’s sensitivity, so is effective in decreasing the blood glucose level (Tritos et al., 1997). Yoga exercise can also improve the function of pancreas and liver. These two organs are effective in adjusting the blood glucose level. Perform the assanas helps to the rebuilding and reproducing pancreas cells and thus increases the release of insulin. Yoga decreases cortisol level (The stress producing hormone), (Mohammadzade et al., 2008). The temporary increase of cortisol helps the long-term memory but high clinical levels can cause memory weaknesses and may lead to the permanent changes in the brain. Besides, the excessive amounts of cortisol are in direct relation to depression, osteoporosis, high blood pressure and insulin resistance (Gordon et al., 2008). Some other researchers have claimed that resistance against insulin, which is typical of the type 2 diabetes, is related the disorder in mitochondria function. According to the result of the Cambridge scientists’ investigations the disorder of mitochondria function can cause resistance against insulin. The results of another investigation in 2010 show that
Saturated fatty acids can activate the immune system cells in response to inflammatory proteins like interleukin-1 Beta. The cellular process in which the fatty acid metabolism occurs is one of the production paths of interleukin-1 Beta. Interleukin-1 Beta influences the tissues and organs like liver, fatty tissues and muscles, destroys their responses to insulin and then causes insulin resistance.

Therefore activating this path by the fatty acids can cause the insulin resistance and the emergence of the symptoms of type 2 diabetes. Interleukin-6 (IL-6) is a cytokine that is produced by the fatty tissue in large amount of its flowing depends on the body mass index, sensitivity to insulin and the glucose tolerance. The cytokines can effect on the immune cells and lead to the topical or general inflammation and thus, with the effect on the function of Endothelial system, cause disorders of overweighting like diabetes (Taghdir, 2010). In relation to the examination of resting heart rate, it can be said that according to the findings of the experiential group, the average of heart rate level has decreased from 79.40 (in a minute) to 74.53 (in a minute). It has been statistically meaningful. The finding of this study are in line with finding of Bavagh (2003), Sardar (2007) and Afzal pour(2004). Performing relation techniques and deep respiration in yoga activates the Parasympathetic nervous system and decreases the sympathetic activity. As a result of this process will lead to a decrease in resting heart rate (Amita et al., 2007).

James & etal (2002) have attributed the decrease of blood pressure as a result of yoga exercises to conscious performing of practices and deep respiration, because these two factors can provide enough oxygen in the blood and the uniform flowing of Electro – magnetic energy inside the nerves and thus decrease the heart rate(Izadpanah, 2007).The results of the present study indicate that, 8-week yoga training has positive effects on total cholesterol, triglycerides, LDL and HDL in patients with type II diabetes. However, the mechanisms involved in these changes have not been fully characterized. According to the conducted studies, we can conclude that, regular yoga exercise can have a positive impact on reducing the complications of diabetes and improve the quality of life for diabetic patients and may prevent disease progression. In some cases, it may also reduce the need for medications.

Doctors and scientists are always trying to identify appropriate strategies for lifestyle modification in diabetic patients. Incorporating exercise in a patient's treatment plan provides additional benefits than diet alone, and it is the reason that sports are introduced as an important part of treatment for patients and life style modification. Yoga is a non-drug, non-invasive and cost-effective method to improve the quality of life. In addition, the effects of yoga on the connection of mind and body and reducing stress hormones have been proved since long times. Therefore, it seems that, patients with type II diabetes, along with fully compliance with their diet, can benefit these exercises in order to control some risk factors associated with diabetes.

REFERENCES


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