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Influence of Morning Aerobic Exercise on Glucose Levels of Type 2 Diabetic Patients

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Abstract
The purpose of the present study was to find out the influence of morning aerobic exercise on glucose (Fg & Ppg) levels of type 2 diabetic patients. For the purpose of the study fifteen type 2 diabetic patients (N = 15) were randomly selected as subjects. The selected subjects underwent aerobic exercise in the morning for a period of 16 weeks (4 days per week). The data were collected before and after the intervention and the collected data were analyzed by using the correlated t-test. The result of the study revealed that the morning exercise reduced glucose (Fg & Ppg) levels of these type 2 diabetic patients.

Keywords: Aerobic exercise, fasting glucose, post prandial glucose.

1. Introduction

The blood glucose level is the amount of glucose present in the body of humans and animals. Normally in mammals the body maintains the blood glucose level at a reference range between 64.8 and 104.4 mg/dl. The human body naturally tightly regulates blood glucose levels as a part of metabolic homeostasis (Baker *et al*) [1]. Blood glucose levels outside a normal range may be an indicator of a medical condition. A persistently high level is referred to as hyper glycemia and low level is referred to as hypoglycemia. Diabetes mellitus is characterized by persistent hyperglycemia from any of the several causes and is the most prominent disease related to the failure of blood glucose regulation (Ali *et al*) [2]. So assessment of blood glucose levels accurately is very important to find out the glucose related pathophysiological condition. Glucose is the main fuel of human body. The primary role of glucose is to provide energy to cells in the body, particularly the brain, which is the only carbohydrate-dependent organ in the body. The Recommended Dietary Allowance (RDA) for carbohydrate is set at 130 gm/day for adults and children based on the average minimum amount of glucose utilized by the brain. This level of intake, however, is typically exceeded to meet energy needs while consuming acceptable intake levels of fat and protein. The median intake of carbohydrates is approximately 220 to 330 gm/day for men and 180 to 230 gm/day for women. The maintenance of a normal concentration of blood glucose (5 mmol/l to 100 mg/dl) - i.e. only one-fifth of a teaspoon of sugar in a liter of blood - is essential for survival. When the blood glucose decreases to less than 2.25 mmol/l, hypoglycemia develops and compromises the brain function, leading to confusion, disorientation and possibly life-threatening coma. Hypoglycemia poses an immediate threat to life (Egi *et al*) [3], on the other hand persisting hyperglycemia with concentrations greater than 6.25 mmol/l puts a human at risk for renal, vascular and eye diseases. Glycemic control is a major therapeutic goal for type 2 diabetes patients. The deleterious effects of glucotoxicity have an important role in the progressive impairment of insulin secretion and sensitivity, two major factors in the pathogenesis of type 2 diabetes, which can lead to future microvascular diseases or others complications (Giaccari *et al*) [4]. Studies have shown that glycemic control is the key to diabetes control, because it is associated with significant reductions of microvascular complication rates (retinopathy and nephropathy) and neuropathy. One way to achieve a good glycemic control is through exercise (Moura *et al*) [5] that has a well-known effect on type 2 diabetes (Colberg *et al*) [6]. Thus exercise has been recommended for diabetics because increase glucose uptake to active muscle and decrease the risk of cardiovascular diseases (Marwick *et al*) [7]. Fasting Plasma Glucose (FPG) and postprandial glucose are the most common analysis for monitoring blood glucose levels. Exercise is now considered to contribute to both the reduction in the prevalence of type 2 diabetes and the improvement of glucose tolerance. The effect on glucose was observed even after a single bout of exercise, however, the delay between the exercise session and the test meal is an important parameter. In the immediate post-exercise period and up to 90 min later, glucose concentrations have been reported to be increased or unchanged (Manders *et al*) [8]. This is thought to be mainly the consequence of reduced insulin concentrations. Another hypothesis is that exercise may transiently blunt glucose tolerance by changing the sympathovagal balance. Prior exercise has been shown to stimulate postprandial sympathetic activity (Matsuo *et al*) [9] leading to a reduction in pancreatic insulin release (Ahren *et al*) [10] Exercise also improves the insulin sensitivity and thus helps to keep the glucose levels under control. Morning exercise is believed to keep a person fresh for whole day and helps in burning more calories during the day. So our goal was to test the effect of morning exercise on glucose (Fg & Ppg) levels.

Methodology

The purpose of the study was to evaluate the influence of morning aerobic exercise on glucose (Fg & Ppg) levels of type 2 diabetic patients. To achieve the purpose, fifteen type 2 diabetic patients were selected at random as subjects (N=15). The selected subjects underwent aerobic exercise in the morning for duration of 45 minutes for 16 weeks (4 days per week). The data was collected at the base line and at the end of

the exercise programme and the collected data were statistically analysed by using correlated t-test. The level of confidence was fixed as 0.05.

Results and Discussion

Variables	Pre mean gm/ml	Post mean gm/ml	t value
Fg	131.26	122.40	5.562*
Ppg	160.40	153.40	5.567*

*P value 2.14@0.05 (P<0.05)

It's either the deficiency of the insulin or the failure of glucose uptake that leads to backup of glucose in the blood, resulting in hyperglycemia. The treatment of diabetes consists of, education, exercise, diet, oral hypoglycemic drugs and subcutaneous insulin therapy. So exercise awareness has been the corner stone for the treatment of diabetes and maintaining near normal blood glucose levels (Krall and Beaser). The triad of insulin, diet and exercise has been the basis for treatment of diabetes for the past 60 years. If insulin is given regularly and diet is also managed very strictly but the lifestyle is sedentary, it will be impossible to treat the diabetic patients and regulate their blood glucose levels. But with the introduction of exercise the other two will double their effect. So in other words exercise is the primary criterion to control glucose levels of type 2 diabetic patients and also for healthy individuals not to become type 2 diabetes. (Erikson and Lindgarde). Each individually or in combination has place in the treatment regimen. The exercise program in conjunction with diet and oral medication can cause glycemic control, weight and cardiovascular risk factors reduction and improvement in the mental well-being of the patient. So it is like 'united we stand divide we fall'. With the mingling of exercise with diet and medication wonders work for the treatment of type 2 diabetic patients and the control of glucose levels. Exercise itself can maintain glucose levels to a great extent except in some serious cases (Franz and Giacca and Elane). Efficacy of the treadmill walking exercise as a supplement to diet and drug in controlling the diabetic mellitus has been proven. It is important to exercise and adopt an active life style in order to cure diabetes and regulate the glucose metabolism (Nayak, Maiya and Hande). The results of our study are matching the results of the above mentioned studies as our study also shows that morning exercise significantly reduces the blood glucose (Fg & Ppg) levels of type 2 diabetic patients and helps them to maintain it near normal.

Conclusion

The result of the study revealed that the morning aerobic exercise significantly reduces the fasting as well as postprandial glucose levels of type 2 diabetic patients. It can also be concluded that participation in regular exercise will be very beneficial for type 2 diabetic patients and this practice will enable them to maintain near normal blood glucose levels and also in the therapy of their diabetes.

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