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Effect of Cardio Exercise, Resistance Training, or Combined Exercising on Cardiovascular Disease Risk Factors in Type 2 Diabetes Patients

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Abstract

Type 2 diabetes (T2D) and cardiovascular disease (CVD) complications are among the leading causes of mortality today. Since the two conditions are comorbidities, there are also high chances of them shortening the lives of patients. Despite them being leading causes of mortality, they can be easily controlled by integrating interventions. Strength training and cardio are some of the recommended exercises for the management of these conditions. Cardio exercises are considered effective in reducing body weight, while strength training is considered effective in increasing lean body mass. When combined, a person can enjoy both benefits in improving health. This study was designed to assess the impacts of strength training, aerobic exercises, and a mixture of exercises plus other interventions in managing T2D. In a retrospective study involving 320 patients, the results showed that even though one category of exercise alone had a significant impact in improving the management of the conditions, combined exercises plus other interventions had more positive impacts.

Key words: Type 2 diabetes, cardiovascular diseases, comorbid conditions, aerobic exercises, resistance training, sedentary lifestyle, morbidity, peripheral parameters

Introduction

Among the most prevalent health condition in the world today is diabetes, while cardiovascular diseases are sometimes comorbid conditions associated with diabetes [1]. T2D is also among the leading causes of death and disease in patients. These have caused a lot of clinical issues regarding the care of patients and the delivery of quality care. Despite the concerns about T2D, studies show that its prevalence is set to rise in the coming years due to lifestyle and genetic factors [2].

Among the major causes of type two diabetes are insulin resistance, genetics, age, and environmental factors. Research has also pointed out that the increase in T2D is partially caused by a surge in cardiovascular issues brought about by obesity from Living a sedentary lifestyle [3]. Since T2D is also caused by dysfunction, it is also connected to the dysfunction of various body organs such as blood vessels and the heart, causing cardiovascular complications in patients. Type 2 diabetes often causes long-term complications in patients that are also life-threatening, such as Stroke and different heart conditions [4]. These conditions are the leading cause of premature death among T2D patients [5].

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An integration of interventions has always been used to manage such comorbidities and reduce the incidence of death. A combination of pharmacological treatments, physical exercises, and dietary changes has been considered the ideal way of managing type T2D and CVD [6]. For a long time now, exercises have been considered ideal in managing T2D and body weight [7]. Diet and medications are also equally important as they go hand in hand in improving the negative effects of a sedentary lifestyle. Regular physical exercise is particularly effective in reducing the incidences of cardiovascular risk factors in patients.

Research has always focused on determining the most effective exercise regime in managing T2D and cardiovascular risk factors. Aerobic exercises have always been recommended since it is believed that they help in managing insulin resistance while at the same type they control body weight [8]. Aerobic exercises are also essential in managing cardiovascular risk factors through increased blood flow and muscle capitalization. Patients are always advised to participate in more than 30 minutes of daily aerobic exercise while not going for more than two days without exercise [9]. These have shown a lot of improvement in managing conditions.

Another exercise that has proved to be beneficial is resistance exercises. The importance of strength training is improvement in glucose utilization in the body while shifting muscle fiber [10]. It is known to develop body strength and endurance in both patients with diabetes and those without. Patients have been advised to participate in resistance training as it increases the insulin receptors in cells and allows for improvement in insulin receptors. The literature so far suggests that the doing away with a sedentary lifestyle has a lot of benefits in T2D patients. This research is founded on the fact that there is a need for more research to describe the impacts of strength training, aerobic exercise, and combining exercises to achieve faster results during the management of type 2 diabetes and cardiovascular risk factors.

Methodology

In this retrospective study, 320 patients from different health management facilities were considered for the study. The study entailed collecting data about the health progress of these patients based on their engagement in a combination of management procedures for T2D and CVD risk factors. The inclusion criteria entailed considering patients who have been diagnosed with T2D and have potential cardiovascular risk factors for at least one year. The patient's age was between 35 and 69 years. Other characteristics of the patients are that they were not taking any insulin. The patients also lived a sedentary lifestyle before being part of a program to improve physical activity as a form of therapy.

A BMI of 40 and age was also considered in the inclusion criteria since the elderly patients were more likely to have CVD and T2D complications. A history of CVD complications was considered essential to determine the impacts of the treatment on the patients during the whole period. The data was collected in six months across two health care centres providing a combination of therapeutic interventions for patients with type 2 diabetes and cardiovascular complications. Cardio exercises and weight training were among the exercises used by patients. Many of the patients were also involved in dieting support groups and the use of medications.

The collected data also entailed data from patients screened for T2D and heart conditions. Interviews were also used to collect data about patient experiences in the health improvement program and demographic information. All the data were collected and stored progressively. The data examination was done through SPSS version 20.

Results

The data collected during the study period was from 320 patients engaged in different exercises and a mixture of exercises. The mean age of the patients was 52.72. Among the patients, 157 were females, while 163 were male patients. Among all the patients, 135 were engaged in cardio exercises at least 2 to three times per week. Eighty-five of the patients preferred weight training, and the remaining 100 considered a combination of both aerobic and resistant training. Two hundred thirty-five patients strictly followed some form of diet, while the rest struggled with maintaining a proper diet during the study period. All the patients were, however, engaged in pharmacological treatment as they were using medications during the treatment.

Among the clinical data collected, was data on the decrease in body mass index during the study period. For most of the patients, a decrease in body mass index was a significant indicator of improved health. Therefore, the researchers considered the changes in BMI over the study period. The below shows the changes in body mass index as experienced by the patients.Cardiovascular factors were also monitored and compared in the three clusters of patients. It was essential to consider the changes in cardiovascular factors and their relation to insulin resistance. 283 patients experienced positive changes in CVD dynamics. Age didn't seem to be a factor in determining the changes experienced by the patients.

Table 1: Comparison of BMI and age

Variable	AEROBIC EXERCISE	RESISTANCE	COMBINED TRAINING
Age (year)	48.3 ± 9.2	53.5 ± 6.1	51.4 ± 9.8
BMI (kg·m-2)	28.4 ± 5.7	31.3 ± 5.0	29.2 ± 6.3

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Table 2: Comparison of Pre and Post-Intervention Values of Measured Variables (MEANS ± SD)

Parameter	Aerobic exercise	Resistance training	Combined training
FBS (mg · dl^{-1})			
Pre	153.9 ± 39.3	144.9 ± 27.0	**163.7 ± 47.5**
Post	130.6 ± 31.2	122.7 ± 23.4	**117.2 ± 37.5**
Weight (kg)			
Pre	67.9 ± 12.6	84.1 ± 9.0	**82.6 ± 16.6**
Post	69.3 ± 12.4	82.9 ± 9.4	**81.1 ± 14.4**
BMI (kg · m^{-2})			
Pre	29.4 ± 5.7	30.3 ± 4.0	**28.8± 5.4**
Post	27.5 ± 4.7	29.7 ± 3.9	**27.8 ± 4.9**
BF (%)			
Pre	40.7 ± 5.9	32.7 ± 9.6	**29.4 ± 9.8**
Post	39.1 ± 5.7	30.5 ± 10.5	**26.1 ± 9.9**
Visceral fat (%)			
Pre	9.4 ± 2.4	12.8 ± 3.8	**11.8 ± 5.2**
Post	8.9 ± 2.5	12.1 ± 3.4	**10.7 ± 4.7**
Pre	25.6 ± 1.8	30.8 ± 4.9	**31.8 ± 4.9**
Post	26.4 ± 1.8	31.9 ± 5.4	**33.7 ± 4.9**
SBP (mmHg)			
Pre	131.5 ± 18.3	129.7 ± 15.5	**135.8 ± 13.3**
Post	118.5 ± 20.1	118.4 ± 12.2	**123.0 ± 12.5**
DBP (mmHg)			
Pre	79.9 ± 9.0	82.6 ± 9.5	**83.6 ± 9.5**
Post	71.9 ± 8.5	75.8 ± 8.5	**78.3 ± 8.8**
HR (bpm)			
Pre	86.8 ± 16.8	85.3 ± 11.8	**89.1 ± 11.6**
Post	85.0 ± 9.6	84.5 ± 13.1	**88.1 ± 7.50**
BMR (kcal · h^{-1})			
Pre	1372.3 ± 149	1711.9 ± 168	**1721.3 ± 255**
Post	1381.3 ± 154	1701.4 ± 157	**1691.9 ± 223**
Pre	26.7 ± 7.6	32.2 ± 10.8	**32.0 ± 7.4**
Post	**30.3 ± 9.5**	**35.9 ± 10.7**	**34.8 ± 6.9**

Discussion

The results proved exercises effectively control type 2 diabetes and the risk factors associated with cardiovascular disease. All the groups experienced significant changes in the course of the study. The blood glucose tests revealed a significant decrease in FBG levels in all the groups of patients. The group involved in aerobic exercise had the least change in FBG levels as likened to the other groups. The findings are comparable to other studies where aerobic exercises were found to effectively reduce blood glucose only when combined with other forms of exercise [11]. On the other hand, resistance training exercises are considered more effective in reducing blood sugar levels. Brown et al.'s findings show that glucose levels reduced significantly when aerobic was combined with resistance training [12]. In contrast, other studies by ABdelbasset [13] showed that resistance training was the most effective in reducing FBG levels.

Blood pressure was the most affected by the two types of exercises. All the groups of patients experienced a decrease in blood pressure during the study period. Data showed a gradual decrease diastolic and systolic blood pressure. The results are in line with other studies by Zhang et al and Battista et al that proves that exercising has a positive impact on blood pressure [14, 15]. According to Masroor, combined exercises were more effective in reducing heart rate, while aerobic exercises alone or strength training alone didn't significantly impact heart rate [16].

Even though it is always expected that blood pressure is directly associated with heart rate, the results didn't show such a relationship. Surprisingly, even though the blood pressure was significantly affected, the heart rate was not significantly affected, with the rate unaffected in a small number of individuals across the groups with type 2 diabetes. It is known to be associated with abnormalities in the function and structure of the cardiovascular system, including abnormalities in the peripheral parameters [17]. However, the benefits of exercises include a change in endothelial function such as flow-mediated dilation and intima Media thickness. Exercises also improve the capacity to perform other activities. Studies by Naci et al also indicate that pharmacological therapy is still imperative for optimal control of heart rate and blood pressure [18]. Therefore the use of exercises plus pharmacological treatment was essential for type 2 diabetes patients.

The most visible impact of exercise is body composition which entails reducing obesity-related factors. Studies by Duclos suggest that abdominal obesity is the major risk factor for cardiovascular diseases and the progression of type 2 diabetes and other comorbidities [19]. Exercises help improve endurance, muscles formation, cardiorespiratory fitness, and strength, among others [20]. This study showed that combined therapies were very effective in changing body composition. The different exercises considered in studies are aerobic and resistance exercises. Exercises alone are ineffective in changing body composition unless combined with an effective dieting regime.

The impact of exercise on body mass is associated with metabolic effects. Exercising is known to improve metabolism. It also provides an avenue for weight loss via

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metabolism and an increased potential for energy use. Aerobic exercises are considered to have the greatest effect on altering body composition in relation to reducing body weight. In the present study, alteration in body composition was witnessed in only a few patients over the study period, while a majority experienced insignificant changes. The study, therefore, proved that there is a need for a lot of exercises and a longer duration of exercising to achieve an ideal alteration to body composition. Exercise is also needed to achieve greater results in managing weight loss and other risk factors.

The group involved in a combination of exercises plus dieting and pharmacological treatment experienced the greatest changes in weight loss and managing blood sugar and blood pressure levels. Aerobic exercises plus resistance training were particularly effective in increasing muscular density and improving heart rate. The resistance training groups also experienced changes in muscular density. The increase in lean body mass is specifically significant in the management of type 2 diabetes and cardiovascular risk factors since lean body mass increases glycogen storage capacity and other mechanisms elevating resting metabolic rate and improving sensitivity to insulin [21]. Exercising also led to the loss of visceral fat. The loss of visceral fat is essential since it improves metabolic rate and the use of glucose. A combination of exercises, therefore, proved to be more efficient than using one exercise regime alone.

Conclusion

The main conclusion made from the study is that exercising is essential in the management of type 2 diabetes and cardiovascular risk factors. Combining cardio exercises and strength training plus dieting and pharmacological treatment is an ideal way of managing type 2 diabetes and related comorbidities. In general, performing any kind of exercise alone over a long period of time still had positive impacts on the management of cardiovascular risk factors and diabetes. However, each exercise plays a different role, and the noteworthiness of their impact can be increased when combined. This study offers insight that can be used in the management of type 2 diabetes and minimizing the risk of cardiovascular complications in patients. This study also paves the way for future long-term studies that would yield more comprehensive results to contribute to managing type 2 diabetes.

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