Clinical Journal of Diabetes Care and Control
ISSN: 2642-0872

Research Article *Volume 3 Issue 1*

Influence of Regular Physical Exercise for 12 Weeks in Individuals With Diabetes Mellitus and Systemic Arterial Hypertension

Giovanna Vallim Jorgetto[1]*, Juliana Vallim Jorgetto[2] and Helisson dos Anjos[3]

[1]Master in Health Sciences, PhD student in Sciences at Escola Paulista de Enfermagem – UNIFESP, Brazil

[2]Physiotherapist, Specialist in Motor Activity Adapted by Unicamp, Master of Science / Clinical Endocrinology, Brazil

[3]Physical Educator in the Municipality of Albertina / MG. Brazil

***Corresponding author:** Giovanna Vallim Jorgetto, Avenida Presidente João Batista Marques Goulart, 45- Parque das Nações, São João da Boa Vista / SP- Brazil - CEP: 13870-579, Tel: (19)36235061; Email: gjorgetto1@gmail.com.br

Received Date: June 04, 2020; **Published Date:** July 08, 2020

Abstract

Objective: To analyze the influence of regular physical exercise on glycemic, metabolic and blood pressure control in type 2 and hypertensive diabetics, treated and not treated with insulin and antihypertensive drugs in a Health Unit in the South of Minas Gerais / MG, Brazil.

Methodology: Retrospective research, with data from medical records of diabetics and hypertensive patients (n = 20). Inclusion criteria: age between 30 to 75 years old, participating in the regular physical activity program, being diagnosed with type 2 diabetes and systemic arterial hypertension older than 05 years, with associated pathology. Variables analyzed: age, sex, weight, time of diagnosis, fasting blood glucose, glycated hemoglobin, triglycerides, Body Mass Index and blood pressure. The results were analyzed according to the T-paired statistical test, with 95% variation ($p < 0.05$) being considered significant.

Results: Fasting glycemia showed a significant decrease ($p = 0.00092$) between the groups before and after a regular exercise program, as well as glycated hemoglobin (HbA) ($p = 0.033$). Serum triglycerides ($p = 0.33$), systolic and diastolic blood pressure ($p = 1.36$) and BMI ($p = 0.30$) are not statistically significant.

Conclusion: The regular exercise program showed effectiveness in the glycemic and glycated hemoglobin control of the individuals surveyed, with no statistical efficacy for serum triglyceride levels, blood pressure and body mass index.

Keywords: Diabetes Mellitus Type 2; Hypertension; Physical exercise

Abbreviations: DM: Diabetes Mellitus; DM2: Type 2 Diabetes Mellitus; Fcmax: Maximum Heart Rate; SAH:Systemic Arterial Hypertension; HbA:Glycated Hemoglobin; BMI: Body Mass Index;MG: General; BP: Blood Pressure; DBP: Diastolic Blood Pressure; SBP: Systolic Blood Pressure; FICT: Informed Consent Form.

Introduction

Diabetes Mellitus (DM) is a chronic and silent disease, usually discovered in exams and routine consultations, and environmental components, such as physical inactivity, inadequate diet and genetic characteristics, where the latter increases the possibility of development by 40%, giving disease is a polygenic aspect, which is an important risk factor [1]. Worldwide, it is estimated that one in 11 adults has a confirmed diabetes diagnosis. Thus, 415 million people, that is, 8.8% of the world population has diabetes [2]. Type 2 DM has a significant increase in cases worldwide, accounting for 91% of individuals, being considered a public health problem and one of the biggest causes of mortality in the world, in 2030 the world population of diabetics can reach

to 300 million [3]. Currently, 75.4% of diabetes cases are concentrated in middle and low income countries [2]. Brazil, classified as a developing country, is among the four countries with the highest absolute number of individuals diagnosed with diabetes; approximately 14.3 million diabetics [4].

The lifestyle of the Brazilian population, in relation to eating habits and physical activity, is becoming similar to that of developed countries. In the last 50 years, the basically rural and physically active society has been transforming itself into an urban population, of anxious, stressed, and obese citizens, with little or no involvement in physical activities [5]. Systemic arterial hypertension (SAH) and diabetes coexist very often. Approximately 60-65% of diabetics are hypertensive [6]. The coexistence of diabetes and SAH can reduce endothelium-dependent vasodilation, which can be partially explained by a reduced production or response to nitric oxide (ON) in smooth vascular musculature [7]. The practice of physical activity has been considered an important tool in the prevention and treatment of individuals with diabetes, especially type 2, as well as to avoid the metabolic syndrome, in which a physical exercise program has shown effectiveness in glycemic control, improving sensitivity ` insulin and glucose tolerance, decreasing the blood glucose of these individuals [8].Metabolic syndrome is a complex disorder represented by a set of cardiovascular risk factors, usually related to central fat deposition and insulin resistance. The literature points out that the metabolic syndrome is the association of obesity with other chronic pathologies in adults (diabetes mellitus, arterial hypertension, dyslipidemia, changes in lipid and glycid metabolism) and is characterized by a group of risk factors for cardiovascular diseases, generally linked insulin resistance and central obesity [9]. The regular practice of physical exercise induces several biochemical adaptations, mainly in the muscular system. Aerobic training causes changes that favor the improvement of physical performance, increasing both the number and the size of the mitochondria. In addition, chronic physical exercise also results in physiological and organic adaptations according to the requirements and type of activity [10,11].The aim of the present study was to analyze the effect of regular 12-week physical exercise on glycemic, sugar and fat and blood pressure control, in type 2 diabetic and hypertensive individuals, treated and untreated with insulin and antihypertensive drugs in a Health Unit from the municipality of Albertina / MG, Brazil.

Materials And Methods

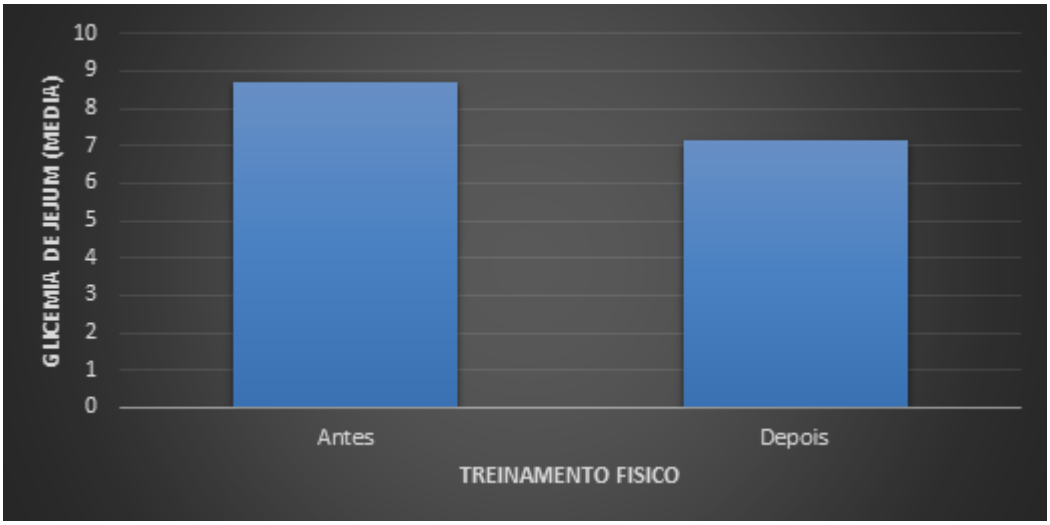
This is a retrospective, field research, with intentional probabilistic sampling, from which data were obtained from medical records of a population of diabetics and hypertensive patients (n = 20), from a small municipality in the south of the state of Minas Gerais, according to the selection by the method, whose inclusion criteria were: being diabetic and / or hypertensive, being aged between 30 and 75 years old, being participating in the physical activity program at least 3x / week, for a period of 12 weeks, having a diagnosis age greater than 05 years and present any associated pathology. The exclusion criteria were: missing the physical exercise program, and individuals who had their treatments modified during the exercise program (oral antidiabetics, antihypertensives and / or insulin). This study was carried out from May to June 2018. The variables were measured and analyzed: age, sex, body weight, time of diagnosis, medications in use, blood glucose (fasting), glycated hemoglobin, triglycerides, Body Mass Index (BMI) and pre-test blood pressure (first assessment) and post-test (last evaluation) applied to the group.

For data collection, the variables were extracted from the medical records evaluated in this study.The 12-week physical exercise program, to which the patients were submitted, consisted of three 50-minute sessions per week, being: 05 minutes of warm-up (stretching of limbs and trunk), 35 minutes of walking and 10 minutes of walking. cooling (stretching and relaxation). According to [12], the exercises followed a mild to moderate intensity (50% - 80% of Fcmáx.), Calculated by the Karvonen formula (Fcmáx. = 220 - age) and applied by a physical education professional, such as demonstrated [13-15].The results were analyzed by performing the mean and standard deviation of the variables, as well as the application of the paired T-student statistical test, with 95% variation between the pre- and post-physical training group being significant (p <0 , 05), compatible with health values. There was institutional authorization for data collection and exemption from the application of the Free and Informed Consent Term (ICF), as it is a medical record review.

Results and Discussion

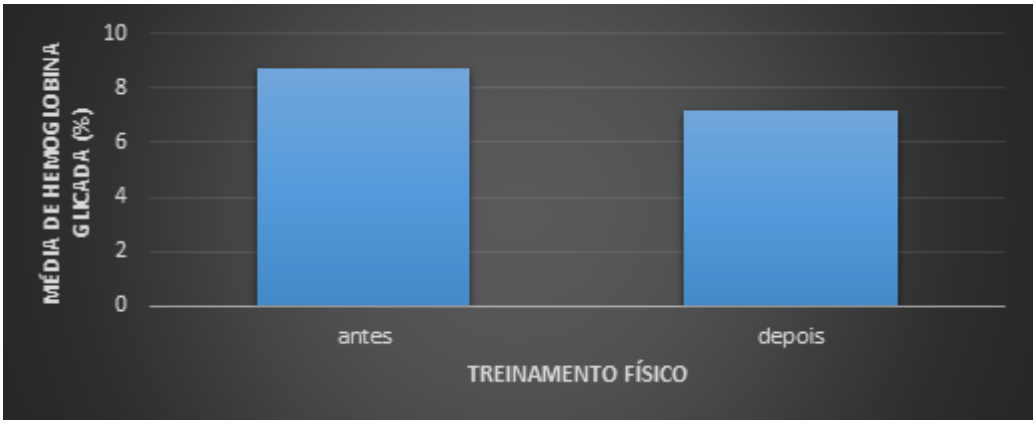
The sample consisted of 20 individuals, 15 women and 05 men, diabetic and hypertensive, with a mean age of 63.0 (± 9.2) years, with a body weight of 73.1 (± 10.6) kg. As for the time of diagnosis, for Diabetes Mellitus it was 12 (± 2.7) years and arterial hypertension was 17 (± 3.6) years. Of the subjects in the sample, all had DM2 and / or hypertension, with 09 (45%) having DM and HA, 05 (25%) only DM and 06 (30%) SAH. DM 2 were treated with the drugs glibenclamide, glycazide, metformin and / or glyphage and insulin, while hypertensive patients treated with nifidipine, simvastatin, captopril, hydrochlorothiazide and furosemide. On the other hand, diabetic and hypertensive subjects were treated with metformin and / or glyphage, glibenclamide, glycazide, captopril, hydrochlorothiazide, insulin, nifidipine and furosemide.Of these evaluated, 04 (20%) had coronary disease, 02 (10%) had already suffered acute myocardial

infarction (AI) or angina, 1 (5%) 5th finger amputation and 10 (50%) had dyslipidemia.Graph 1 shows the fasting blood glucose results of the sample subjects that indicate a significant decrease (p = 0.00092) between the groups before and after a regular exercise program, meeting what the literature considers as expected [16-20].



Graph 1: Fasting glucose averages before and after 12 weeks of physical training. Albertina / MG, Brazil. 2018.

Several long-term studies, as conducted [21], have demonstrated a consistent beneficial effect of regular exercise on carbohydrate metabolism and on insulin sensitivity that can be maintained for at least five years, as with physical training there is greater mobilization and release of glucose (glycogenolysis), but also, there is a greater use of this substrate for the production of energy and maintenance of physical activity [22]. Also, it is known that physical exercise activates the glucose transporter (GLUT-4) even with changes in the production and release of insulin, as explained [23,24], regular physical exercise stimulates glucose uptake by peripheral tissues and decreases the actions of the sympathetic nervous system. Thus, beside the diet, it represents the first form of approach in the treatment of hypertensive and / or type 2 diabetic patients.Glycated hemoglobin (HbA) (Graph 2), showed a significant difference between the groups before and after physical training (p = 0.033). Normal values range from 5.00 to 8.00 mg / dl [25].



Graph 2: Means of glycated hemoglobin before and after 12 weeks of physical training. Albertina / MG, Brazil. 2018.

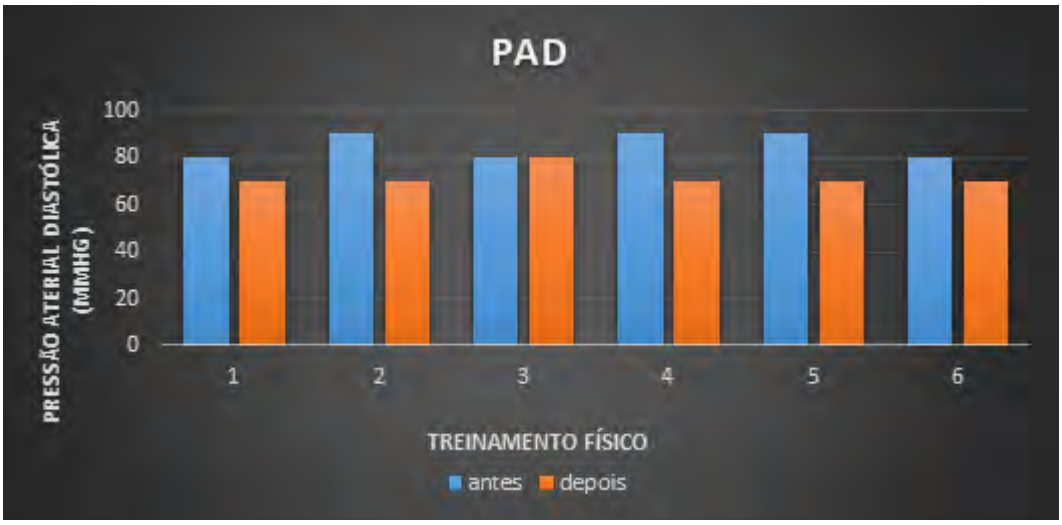
The reduction in the concentration of glycated hemoglobin went from 8.72 +/- 2.81 mg / dl to 7.16 +/- 1.64 mg / dl, which demonstrates improvement in diabetes control [26,27], because according to the studies carried out [28], for each percentage of HbA reduction in DM2, there is a 25% reduction in deaths related to DM, in addition to reducing

the incidence of ophthalmic complications in 76%, 60% of neuropathies, 50% of diabetic nephropathy and 35% in the incidence of cardiovascular disease, according to [12]. The serum triglyceride levels of the subjects in the sample are shown in Graph 3, which showed an average of 200 +/- 107.09 mg / dL and 186.66 +/- 85.68 mg / dL, before and after physical activity 12 weeks, but without statistical significance (p = 0.33).

Graph 3: Averages of serum triglycerides before and after physical training for 12 weeks. Albertina / MG, Brazil. 2018.

Another fact that must be taken into account is that we do not consider patients on diet therapy as an inclusion factor for this study. It is worth mentioning that in order to decrease the triglyceride values, it is necessary to change food consumption (decrease in intake of products derived from white flour and sugars), a fact that is widely discussed in the literature, such as [29,30]. showed a direct association between average triglyceride levels and the risk of total long-term mortality in older adult type 2 diabetes patients. This finding suggests that more attention is paid to cardiovascular risk management in patients with type 2 diabetes with high levels of triglycerides.The results (Graphs 4 and 5) of the systolic and diastolic blood pressure of the subjects in the sample do not indicate statistical significance (p = 1.36) between the groups before and after a regular exercise program, although they show a reduction in systolic blood pressure levels of 136 , 66 +/- 8.16 mmHg to 85 +/- 5.41 mmHg, as well as in diastolic blood pressure levels (from 118.33 +/- 5.47 mmHg to 71.66 +/- 4.08 mmHg).

Graph 4: Mean Systolic Blood Pressure (SBP) in mmHg, before and after 12 weeks of physical training. Albertina / MG, Brazil. 2018.



Graph 5: Averages of Diastolic Blood Pressure (DBP) in mmHg, before and after physical training for 12 weeks. Albertina / MG, Brazil. 2018.

Epidemiological and clinical studies have demonstrated beneficial effects of physical activity on blood pressure (BP) in individuals of all ages, especially people with Diabetes Mellitus and Hypertension, which was not evidenced in the population in study [16]. This fact may be associated with the type and intensity of physical activity practiced by individuals, since it is known that a high level of daily physical activity is associated with lower levels of blood pressure at rest [26].

The BMI of the subjects in the sample is shown in Table 1.

12-week physical activity			
Patients	**Before**	**After**	**p***
A	25,73	23,82	0,612
B	32,00	28,88	
C	31,50	31,49	
D	28,39	32,70	
E	27,57	25,73	
F	26,66	25,77	

Table 1: Body mass index (BMI) measurements of individuals before and after 12 weeks of physical training. Albertina / MG. 2018.

* Paired t-student test.

The mean Body Mass Index (BMI) in the study group was 28.64 +/- 2.57 kg / m^2 (before physical training) and 28.06 +/- 3.53 kg / m^2 in the post-physical training, this decrease was not significant (p = 0.612).Tjonna et al. (2008) studied 32 individuals with metabolic syndrome and observed that such individuals, after 16 weeks of moderate aerobic exercise, showed a decrease in BMI, but without statistically significant reduction, a fact also evidenced in this study.It must also be considered that the increase in the prevalence of diabetes is also due to the already established increase in the prevalence of obesity in Brazil. Obesity has been identified as one of the main risk factors for type 2 diabetes. It is estimated that between 80 and 90% of individuals affected by this disease are obese and the risk is directly associated with an increase in body mass index [31]. Overweight individuals are 180.0% more likely to develop high blood pressure and 1,000% more likely to develop insulin resistance compared to normal weight individuals, which shows the direct association between BMI and blood pressure.

Conclusion

The regular practice of physical activity has been recommended for the prevention and rehabilitation of cardiovascular diseases by different health associations in the world, being also considered an important tool in the

prevention and treatment of individuals with diabetes, mainly type 2, treated or not with insulin. A regular 12-week exercise program proved to be effective in controlling glycemic and glycated hemoglobin levels in the individuals surveyed, although this efficacy is only suggestive, as in this study we did not have a control group. There was no statistical significance for the assessment items such as serum triglyceride levels, blood pressure and body mass index (BMI), remembering that such changes may be associated with a longer program of physical exercise and food consumed.Given the facts, it can be concluded that regular practice of physical activity is recommended for diabetic patients, because in this sample, it promoted glycemic control. It is suggested that such patients be followed up for more than 12 weeks in order to verify the evolution of the effectiveness of physical activity in decreasing triglycerides, body mass index, total cholesterol and fractions and blood pressure.

Conflict Of Interest

The authors declare that they have no conflict and interest.

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