

Relationship of Levels of Glycemia Capilar with the Maximum VO₂ of Diabetic Patients Type 2 Submitted to the Ergometric Test

Diogo Soares Menezes Lins¹, Patricia Luana Barbosa da Silva Ribeiro², Denise Maria Martins Vancea³ and Jonathan Nicolás dos Santos Ribeiro^{2,3*}

Research Article

Volume 4 Issue 1

Received Date: January 24, 2019

Published Date: February 14, 2019

DOI: 10.23880/doi-16000193

¹Physical Education Student, University Center Mauritius, Brazil

²Member of the Laboratory of Immune Metabolism, Institute of Biological Sciences, University of Pernambuco, Brazil

³Member of the Research Group on Physical Exercise and Non-Communicable Chronic Diseases, School of Physical Education, University of Pernambuco, Brazil

***Corresponding author:** Jonathan Nicolás dos Santos Ribeiro, Member of the Research Group on Physical Exercise and Non-Communicable Chronic Diseases, School of Physical Education, University of Pernambuco, Rua Dagoberto Pires, 216, 51010-140, Recife-PE, Brazil, Tel: +55 81 992213748; Email: jonathannicolas01@gmail.com

Abstract

Diabetes Mellitus is a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion and / or action. The low physical capacity obtained by the measurement of VO₂max may be related to the development of metabolic diseases. The objective of the present study was to analyze the relationship of capillary glycemia levels on the maximal VO₂ of type 2 diabetic patients submitted to the ergometric test. Using a sample calculation, 60 type 2 diabetic patients aged 50 to 75 years were recruited from the Pernambuco Cardiovascular Emergency Room. The participants were divided into three groups: the Diabetic Group with capillary glycemia <100 mg/dL (DG <100) (n = 14), the Diabetic Group with capillary glycemia between 100 mg/dL and 200 mg/dL (DG 100-200) (n = 26) and the Diabetic Group with capillary glycemia >200 mg/dL (GD > 200) (n = 20). Exercise Test (ET), which was performed at a mean temperature between 18°C and 22°C in the morning, under electrocardiographic monitoring throughout the TE using the ERGO PC 13.0® system, using Modified Bruce Protocol. The nonparametric Kruskal-Wallis test was used for intergroup analysis and the Pearson Chi-square test for association between variables. In the correlation of capillary glycemia with VO₂max the DG >200 presented a strong negative correlation with the variable of VO₂max (blood glucose = 265,9 ± 53,7 vs VO₂max = 23,1 ± 7,3 r = -0,76). Elevated capillary glycemia levels correlate with the low VO₂max values for this sample of type 2 diabetic patients.

Keywords: Glycemia Capilar; VO₂; Type 2 Diabetic; Patients.

Introduction

Diabetes Mellitus is a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion and / or action [1]. The hyperglycemic state has deleterious effects on heart rate, blood pressure and the active lifestyle, favoring the state of physical inactivity [2].

The low physical capacity obtained by the measurement of $VO_2\text{max}$ may be related to the development of metabolic diseases being this parameter strongly correlated with the insulin sensitivity and endothelial dysfunction [3-5].

Therefore, the objective of the present study was to analyze the relationship of capillary glycemia levels on the maximal VO_2 of type 2 diabetic patients submitted to the ergometric test.

Methodology

This quantitative trait cross-sectional study was approved by the CEP/UPE nº 775654. Using a sample calculation, 60 type 2 diabetic patients aged 50 to 75 years were recruited from the Pernambuco Cardiovascular Emergency Room.

The participants were divided into three groups: the Diabetic Group with capillary glycemia <100 mg/dL (DG <100) (n = 14), the Diabetic Group with capillary glycemia between 100 mg/dL and 200 mg/dL (DG 100-200) (n = 26) and the Diabetic Group with capillary glycemia >200 mg/dL (DG >200) (n = 20).

Capillary glycemia was performed following the recommendations of Hortensius [6] before and after the Exercise Test (ET), which was performed at a mean temperature between 18°C and 22°C in the morning, under electrocardiographic monitoring throughout the TE using the ERGO PC 13.0® system, using Modified Bruce Protocol and for obtaining the maximum VO_2 was predicted after the ET was used the formulas ($\text{♂} = (3,7778 \times \text{time}) + 0,19$ / $\text{♀} = (3,36 \times \text{time}) + 1,06$) intrinsic in the system ERGO PC 13.0®.

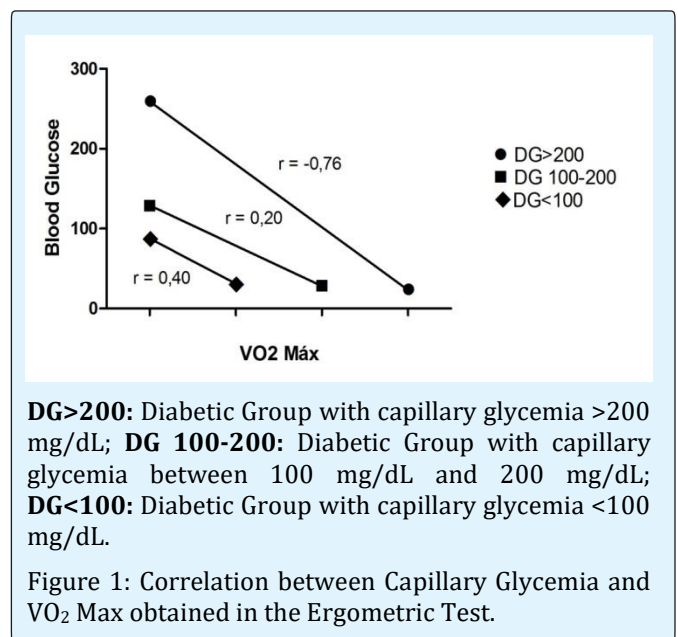
The SPSS for windows 20.0 program was used to analyze the data. All data were expressed as means and standard deviations. The nonparametric Kruskal-Wallis test was used for intergroup analysis and the Pearson Chi-

square test for association between variables. Those outcomes that presented significance level of $p \leq 0.05$ were considered significant.

Results

In the analysis of the capillary glycemia pre-exercise test the DG > 200 presented significantly increased glycemia compared to the other groups (DG >200 = $265,9 \pm 53,7$ $p=0,00$).

In the correlation of capillary glycemia with $VO_2\text{max}$ the DG >200 presented a strong negative correlation with the variable of $VO_2\text{max}$ (blood glucose = $265,9 \pm 53,7$ vs $VO_2\text{max} = 23,1 \pm 7,3$ $r = -0,76$). The other groups presented a moderate and weak correlation, respectively, between capillary glycemia and $VO_2\text{Max}$ (DG <100: blood glucose = $87,7 \pm 13,0$ vs $VO_2\text{max} = 31,1 \pm 9,2$ $r = 0,4$) (DG 100-200: blood glucose = $128,9 \pm 27,7$ vs $VO_2\text{max} = 28,1 \pm 7,8$ $r = 0,2$) (Figure 1).



Conclusion

Elevated capillary glycemia levels correlate with the low $VO_2\text{max}$ values for this sample of type 2 diabetic patients, contributing to a weakened physical fitness favoring metabolic decompensation and sedentary lifestyle.

References

1. The Expert Committee On The Diagnosis And Classification Of Diabetes Mellitus (2003) Report of the Expert Committee on the Diagnosis and Classification of Diabetes Mellitus. *Diabetes Care* 26(1): s5-s20.
2. Panzer C, Lauer MS, Brieke A, Blackstone E, Hoogwerf B (2002) Association of Fasting Plasma Glucose With Heart Rate Recovery in Healthy Adults A Population-Based Study. *Diabetes* 51(3): 803-807.
3. Leite SA, Monk AM, Upham PA, Bergenstal RM (2009) Low cardiorespiratory fitness in people at risk for type 2 diabetes: early marker for insulin resistance. *Diabetol Metab Syndr* 1(1): 1-6.
4. Wajchenberg BL (2000) Subcutaneous and visceral adipose tissue: their relation to the metabolic syndrome. *Endocrine Reviews* 21(6): 697-738.
5. Regensteiner JG, Bauer TA, Reusch JB (2004) Rosiglitazona melhora a capacidade de exercício em diabetes tipo 2. *Diabetes* 52(S2): 1-8.
6. Hortensius J, Slingerland RJ, Kleefstra N, Logtenberg SJJ, Groenier KH, et al. (2011) Self-Monitoring of Blood Glucose: The Use of The First or The Second Drop of Blood. *Diabetes Care* 34(3): 556-560.

