

Introduction

Maximization of fat oxidation during exercise may bring health benefits, help control weight, and reduce the dependence of glucose as a source of energy^{1,2}. In addition, it can reduce glucose dependence as the main source of energy in patients with diabetes, minimizing hypoglycemia during exercise³. **Objective:** Compare the maximum fat oxidation rates (FATMAX) and analyze its association with cardiorespiratory fitness can help to emphasize the exercise prescription for patients with type 1 diabetes mellitus (T1DM).

Methods

The study included 22 adolescents of both sexes, aged 11–17 years. After clinical and anthropometric evaluation, the subjects were allocated to either a T1DM group (DMG; n=10) or a control group (CG; n=12). Cardiorespiratory fitness was determined with the maximum oxygen consumption (VO₂max) during a submaximal aerobic test on a cycle ergometer using the Balke protocol. FATMAX values were calculated by ventilatory exchange ratio during exercise and were based on Lusk's table. The groups were compared by parametric and non-parametric tests, considering a difference of p < 0.05.

Results

Adolescents with T1DM showed similar cardiorespiratory fitness, however lower FATMAX (p<0.01) and %VO₂FATMAX (p=0.001) when compared with controls. FATMAX values was inversely correlated with serum glycosylated hemoglobin (HbA1c) levels (r=-0.77) and directly with BMI z-scores (r=0.76), while %VO₂FATMAX results correlated with age (r=0.81), BMI z-scores (r=0.65) and VO₂max (r=0.81). On multiple linear regression, HbA1c values explained 54% (adjusted r²=0.54, p=0.009) and BMI z-scores explained 3.1% (adjusted r²=-0.031, p=0.009) of the variation in FATMAX in the DMG (Table 1).

Table 1. General characteristics of the groups

	DMG (n=10)	CG (n=12)	p
HbA1c	9.39 (±1.25)	-	-
Sex (M/F)	(5/4)	(4/8)	0.503
Tanner (4/5)	(1/9)	(2/10)	0.509
Age (years)	13.80 (±1.90)	12.78 (±1.39)	0.163
BM (kg)†	53.88 (±14.62)	57.39 (±8.33)	0.100
Height (m)	1.59 (±0.14)	1.61 (±0.10)	0.767
BMI z-score	0.39 (±0.84)	0.81 (±0.85)	0.258
VO ₂ max(L/min)	2.09 (±0.54)	1.87 (±0.50)	0.345
R _{FATMAX} †	0.81 (±0.005)	0.80 (±0.008)	0.100
FATMAX† (Kcal/min)	3.36 (±0.51)	5.33 (±1.73)	0.01*
%VO ₂ FATMAX	35 (±11)	60 (±12)	0.001**

DMG = group with type 1 diabetes mellitus; CG = control group; BM = body mass; BMI z-score = body mass index z-score; VO₂max = maximum oxygen consumption; R_{FATMAX} = ventilatory exchange ratio at the FATMAX point; FATMAX = maximal fat oxidation; %VO₂FATMAX = percentage of maximum oxygen consumption at the FATMAX point.

Conclusion

These results suggest lower fat oxidation and higher use of glucose as an energy substrate during exercise and worse control in T1DM. Therefore, results may contribute to the prescription of physical exercises and help choose the appropriate intensity of exercise to prevent hypoglycemia in T1DM.

References

1. Sperling MA. ISPAD Clinical Practice Consensus Guidelines 2014. **Pediatric Diabetes**. 2014;15(Suppl. 20):102-114; 2. Leclair E, Kerdanet M, Riddell M, Heyman E. Type 1 Diabetes and Physical Activity in Children and Adolescents. **J Diabetes Metab**. 2013;S10:1-10; 3. Dahlberg ER, Spets E, Svedbo Engström M, Larshans M, Leksell J. Experiences of Hypoglycaemia in Adults with Diabetes Mellitus. **J Diabetes Treat**. 2017;3(J111):1-8.