

THE EFFECT OF HYPOXIA AND EXERCISE ON PHYSIOLOGICAL AND IMMUNE RESPONSES IN PATIENTS WITH TYPE 1 DIABETES MELLITUS

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Objective: Hypoxia and physical activity have been shown to induce beneficial effects on glycaemic control, cardiovascular system and exercise tolerance. There are limited data regarding the effect of hypoxia on physiological adaptation in diabetes mellitus. We investigated cardiorespiratory adaptation, immune response and glycaemic control following hypoxia with and without exercise in type 1 diabetic patients.

Methods: Fourteen patients (age: 30.4 ± 8.7 years), suffering from diabetes for 12.1 ± 6 years, participated in the following trials: normoxic (No) and hypoxic rest (Hy: $\text{FIO}_2=15\%$) and normoxic (NoEx) and hypoxic exercise test (HyEx: $\text{FIO}_2=15\%$). Cardiorespiratory variables, haematological indices, glycaemia, and serum cytokine concentrations were measured at rest and after each exercise test.

Results: Hypoxia caused significant decreases in oxyhemoglobin saturation at rest and in response to exercise compared to normoxia. Graded exercise tests (both NoEx and HyEx) resulted in a significant decrease in serum glucose concentration ($P<0.05$ vs. $P<0.01$). Hypoxia and exercise had a significant impact on hyperglycemic and hypoglycemic incidents and post exercise glucose concentrations. Hypoxia significantly increased maximal oxygen uptake, maximal lung ventilation with no differences in heart rate and blood pressure compared to NoEx. Significant increases in TGF- β ($P<0.05$), white blood cells and lymphocyte count were observed in response to hypoxic compared to normoxic exercise.

Conclusions: Our study demonstrated that hypoxia might improve glycaemic control in type 1 diabetes mellitus. Hypoxia combined with exercise might be a valuable method for increasing the efficiency of the respiratory and immune systems.

Key words: hypoxia, pulmonary function, exercise, diabetes mellitus, cytokines