Summary

Introduction

Type 1 diabetes mellitus (T1DM) is a metabolic disorder characterized by insufficient or absent insulin production by the pancreas. Children and adolescents with this condition often experience limitations in their daily functioning, including engaging in physical exercise.

Aim

The aim of this doctoral thesis was to assess the physical fitness of children and adolescents with T1DM, taking into account body composition, duration of the disease, and hemoglobin A1c levels. Additionally, a comparison of physical fitness, physiological parameters, and body composition was made between children and adolescents with T1DM and a control group of healthy children, both physically active and inactive.

Materials and Methods

The study included patients with T1DM and healthy volunteers (control group - children without T1DM diagnosis). The control group was divided into two subgroups: healthy non-athletes (without regular physical activity) and healthy athletes (actively involved in sports sections). A total of 167 participants of both genders were recruited for the study, divided into two age groups: 9-14 and 15-18. Spiroergometry testing and body composition assessment were conducted. The obtained results were statistically analyzed to determine differences in physical fitness between the study groups and to identify correlations between physical fitness and somatic characteristics of the participants. Additional factors such as disease duration and hemoglobin A1c levels were taken into account in the analysis of results obtained from T1DM patients.

Results

The research results indicated significant differences between the T1DM group and the control group volunteers. Individuals with T1DM demonstrated significantly lower physical fitness, as expressed by the parameter of peak oxygen uptake (VO2max), in the 9-14-year-old male group compared to the healthy athletes (36.17±6.70 ml/min/kg vs. 44.29±8.73 ml/min/kg; $p<0.01$) and in the 15-18-year-old group between the same groups (39.30±8.13 ml/min/kg vs. 44.54±6.05 ml/min/kg; $p<0.05$). Most participants reached the aerobic/anaerobic threshold VT1, while a larger percentage did not achieve the appropriate parameters for assessing the anaerobic threshold VT2, especially in the T1DM group. In the 9-14-year-old group, approximately 33% of girls and 40% of boys reached the VT2 value during the test. Similar results were obtained in the 15-18-year-old girls' group, with a percentage of 36%. However, among boys in the same age group, the percentage was nearly twice as high, reaching 70%. Correlation analysis in children and adolescents with T1DM showed that age, body weight, and height influenced physical fitness parameters such as achieved power, oxygen uptake, and respiratory rate.

Conclusions

The research results indicate significant differences in physical fitness and physiological parameters among children and adolescents with type 1 diabetes compared to a control group of healthy physically active and inactive children. Children and adolescents with T1DM typically exhibit lower levels of physical fitness, face difficulties during anaerobic efforts, and demonstrate distinct physiological parameters and body composition. Evaluation of these parameters, including spiroergometry testing and considering body composition, disease duration, and HbA1c level, is crucial for monitoring their health status, training control, and increasing awareness and safety during physical activity and the training period in children and adolescents with T1DM.