

Impact of an Eight-Week High-Intensity Interval Training with Sodium Nitrite Supplementation on TNF- α , MURF1, and PI3K in Type 2 Diabetic Rats

Authors : Samane Eftekhari Ranjbar

Abstract : Diabetes mellitus, a metabolic disorder characterized by elevated blood glucose levels, ranks among the leading causes of adult mortality. This study investigates the impact of an eight-week high-intensity interval training (HIIT) program combined with sodium nitrite supplementation on TNF- α , MURF1, and PI3K in a type 2 diabetes rodent model. Elevated TNF- α levels have been associated with insulin resistance, while MURF1 and PI3K play roles in muscle atrophy and insulin signaling pathways, respectively. In this experimental study, 15 eight-week-old rats from the Sara Laboratory Center in Tabriz were assigned to one of five groups: healthy control, diabetic control, diabetic with sodium nitrite supplementation, diabetic with eight weeks of intermittent exercise, and diabetic with eight weeks of interval training plus sodium nitrite supplementation. The HIIT protocol was designed to span eight weeks, with five weekly sessions at specified intensities and durations. Sodium nitrite, known for its vasodilatory and cytoprotective properties, was administered via injection. The findings revealed that the HIIT program and sodium nitrite supplementation influenced the examined biomarkers. ANOVA test outcomes indicated statistically significant differences in TNF- α ($P=0.001$), MURF1 ($P=0.001$), and PI3K ($P=0.001$) concentrations among the various groups. The healthy control group exhibited substantially decreased TNF- α , and MURF1 levels, as well as elevated PI3K levels compared to the diabetic control group. The exercise group, in conjunction with sodium nitrite supplementation, demonstrated a significant rise in PI3K levels ($P=0.001$) and a decline in TNF- α levels ($P=0.018$) relative to the diabetic control group. These results suggest that the combined intervention may help improve insulin sensitivity and reduce inflammation. However, MURF1 levels, which are related to muscle atrophy, showed no significant difference ($P=0.24$). In conclusion, in type 2 diabetic rats, an eight-week high-intensity interval training program with sodium nitrite supplementation does not affect MURF1 levels but does influence PI3K and TNF- α levels. This combination may hold potential for improving insulin sensitivity and reducing inflammation in type 2 diabetes patients, warranting further investigation and potential translation to human clinical trials.

Keywords : high-intensity interval training, sodium nitrate supplementation, type 2 diabetes, tumor necrosis factor-alpha, phosphatidylinositol-3-kinase, muscle RING-finger protein-1

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