

Effect of Neuromuscular Electrical Stimulation on Fasting Blood Glucose in Sedentary Overweight and Obese Population

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ABSTRACT

Glucose is a vital source of energy for muscle contraction, and it is essential for health that glucose is properly metabolized. The rate of glucose metabolism in the contracting skeletal muscles increases rapidly as a result of exercise. Neuromuscular electrical stimulation (NMES) may be used as an alternative for muscle contraction in those who are physically unable or unwilling to exercise, such as those with excessive obesity, functional limitations, and other mobility impairments. **PURPOSE:** To determine the effect of NMES induced muscle contraction on fasting blood glucose level. **METHODS:** Eighteen participants without diabetes were recruited in the study (Males: 6; Females: 12; Age: 35.00 ± 13.28 years; BMI: 32.34 ± 8.40 kg/m²). Physical activity of participants was measured using ActiGraph accelerometer. Each participant underwent 30 mins of NMES on the quadriceps muscles of both legs delivered by 8 electrodes while lying supine on a bed. NMES was set to cycled biphasic waveform at a frequency of 50Hz with a pulse duration of 300 μ s up to maximum tolerable intensity. Blood glucose and lactate levels were determined at baseline and at 5-minute intervals during the stimulation. The experimental procedure was performed in a fasting condition and was directly preceded by a day of dietary control. Results were analyzed using GraphPad Prism software (version 9.2). Paired t-test was used to compare baseline vs. mean fasting blood glucose. One-way ANOVA was also used to determine the significant changes in fasting blood glucose levels at different time points during stimulation. **RESULTS:** Blood glucose levels decreased significantly during NMES compared to the baseline (95.67 ± 8.07 mg/dL vs 92.76 ± 8.68 mg/dL; $p < 0.05$). Compared to the baseline glucose level (95.67 ± 8.07 mg/dL), blood glucose started decreasing after 15min of stimulation (93.26 ± 8.25 mg/dL; $p < 0.05$) and continued to decrease until the end of 30min of stimulation (91.68 ± 8.70 mg/dL; $p < 0.05$). Blood lactate level remained unaffected throughout the experimental procedure. **CONCLUSION:** These findings suggest that NMES may be convenient and beneficial for reducing blood glucose levels and consequently preventing hyperglycemia in overweight and obese individuals. This method may be of particular benefit to those who are unable to meet the recommended exercise goals.