

International Conference on

METABOLOMICS AND DIABETOLOGY

May 23-24, 2018 | New York, USA

Oxygen kinetics, oxidative stress, and cardiac autonomic function in type 2 diabetes mellitus: Is nitric oxide the connecting link?

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Background: Type 2 diabetes mellitus (T2DM) is a multi-faceted metabolic disorder associated with a spectrum of complications, such as the commonly overlooked- cardiac autonomic neuropathy. Additionally, oxidative stress is increased in diabetes and may be linked to the development of chronic complications. T2DM is also shown to blunt the oxygen uptake kinetics, implying impairment of the control of oxygen delivery to and/or utilization of oxygen by contracting muscles. Nitric oxide (NO) has been proposed as a common denominator in the molecular mechanisms underlying these manifestations; however its behavior in diabetics is still controversial.

Purpose: The purpose of this study was to examine the correlation between levels of nitric oxide and oxygen uptake kinetics, antioxidant defense, and autonomic function in patients with type 2 diabetes.

Methods: Sixty T2DM patients were assessed for plasma levels of nitric oxide, oxygen uptake kinetics (time constant of steady state), antioxidant enzymes (catalase, superoxide dismutase), and cardiac autonomic function (heart rate variability).

Results: Our results revealed that NO levels were correlated positively with τVO_2 ($r = 0.503$), LFnu ($r = 0.334$), and LF: HF ratio ($r = 0.270$), and negatively with CAT ($r = -0.456$), AvgNN ($r = -0.384$), RMSSD ($r = -0.323$), and pRR50 ($r = -0.353$).

Conclusion: Nitric oxide levels showed a negative correlation with antioxidant enzymes, oxygen uptake kinetics, and vagal indices of heart rate variability. These results are contradictory to the previously proposed protective effects of nitric oxide.

Biography

Shalini Verma is currently a PhD Research Scholar (Exercise Physiology). Her Doctoral work is focused on the compromised oxygen uptake kinetics, elevated oxidative stress, and autonomic dysfunction in patients with type 2 diabetes and the effect of exercise on the same. She has been a part of the Diabetes Research Group exploring the role of physical activity in prevention and management of diabetic complications. With previous research work in exercise-induced muscle damage, and cardiovascular and neuromuscular physiology, she has over 15 papers in reputed journals. Her research interests include metabolic syndrome and physical activity, cardiovascular and pulmonary complications in type 2 diabetes, autonomic dysfunction, and oxygen uptake kinetics in healthy vs. diseased.

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