Comparative Study of the Effectiveness of Chronic Aerobic Exercise and Irisin on Atherosclerotic Risk in a Rat Model of Type 2 Diabetes Mellitus

Thesis

Submitted in partial Fulfillment of M.D. Degree in Basic Medical Science (Physiology)

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2019


بسم الله الرحمن الرحيم
قالوا
سبحانك لا علم لنا
إلا ما علمتنا إنك أنت
العليم الحكيم
صدق الله العظيم
سورة البقرة الآية: ٣٢

Acknowledgement

First of all, I thank **Allah** for blessing this work as a part of his generous help throughout my life.

I would like to express my sincere gratitude and deepest thanks to ***Prof. Fatma Mohammad Lebda,*** Professor of Physiology, Faculty of Medicine, Ain Shams University, for her scientific support, judicious guidance, generous help and valuable supervision through the whole work. To her, I am deeply indebted and admit I am so much privileged and honored to have her as my supervisor. I really owe her more than I can express.

I would like to display my indebtedness to ***Prof. Mona Ahmed Ahmed,*** Professor of Physiology, Faculty of Medicine, Ain Shams University, for her wise council, expert guidance, faithful advice, keen supervision and valuable instructions which helped me to overcome many difficulties.

I would like to display my indebtedness to ***Dr. Mona Kamal El-Din Shawky Ismail,*** Lecturer of Physiology, Faculty of Medicine, Ain Shams University, for her limitless help, kind encouragement and generous assistance throughout the whole work.

I would, also, like to acknowledge ***Dr. Walaa Baher Mostafa,*** Lecturer of Histology and Cell biology, Faculty of Medicine, Ain Shams University, for her useful and helpful contribution in this work.

I would, also, like to acknowledge my deepest gratitude and appreciation to ***Prof. Dr. Bataa Mohammad El-kafoury,*** Head of Physiology Department, Faculty of Medicine, Ain Shams University, for her support and encouragement.

Finally, I would like to express my deepest gratitude to all my family and all who did help me and supported me throughout this work.

Yasmine Gamal Sabry Sherif

List of Contents

List of Tables

List of Individual Tables

List of Figures

List of Abbreviations

Abbr.	Full-term
ABP	**:** Arterial blood pressure
AGE	**:** Advanced glycation end products
AI	**:** Atherogenic index
AMPK	**:** AMP-activated protein kinase
BAT	**:** Brown adipose tissue
BMI	**:** Body mass index
BW	**:** Body weight
CRP	**:** C-reactive protein
CVD	**:** Cardio-vascular diseases
DBP	**:** Diastolic blood pressure
DM	**:** Diabetes mellitus
eNOS	**:** Endothelial nitric oxide synthase
FBG	**:** Fasting blood glucose
FFA	**:** Free fatty acids
FNDC5	**:** Fibronectin type III domain-containing protein 5
GLUT-4	**:** Glucose transporter type 4
HbA1c	**:** Glycated haemoglobin
HDL-C	**:** High density lipoprotein cholesterol
HFD	**:** High fat diet
HOMA-IR	**:** Homeostasis model assessment of insulin resistance
HSL	**:** Hormone-sensitive lipase
IL-6	**:** Interleukin-6
LDL-C	**:** Low density lipoprotein cholesterol
LSD	**:** Least significant difference
MBP	**:** Mean arterial blood pressure

MDA : Malondialdehyde
NEFA : Non-esterified fatty acids
NO : Nitric oxide
PAD : Peripheral arterial diseases
PF : Perirenal fat
PFI : Perirenal fat index
PGC1-α : Peroxisome proliferator-activated receptor: gamma coactivator 1-alpha
PKA : Protein kinase A
PPAR : Peroxisome proliferator-activated receptors
PVC : Polyvinyl chloride pipes
ROS : Reactive oxygen species
SAT : Subcutaneous adipose tissue
SBP : Systolic blood pressure
STZ : Streptozotocin
T1DM : Type 1 diabetes
T2DM : Type 2 diabetes mellitus
TAC : Total antioxidant capacity
TC : Total cholesterol
TG : Triglycerides
TNF-α : Tumor necrosis factor-α
UCP1 : Uncoupling protein 1
VAT : Visceral adipose tissue
WAT : White adipose tissue

Introduction

Type 2 diabetes mellitus (T2DM) is a complex heterogeneous group of metabolic disorders characterized by hyperglycemia, impaired insulin action, and/or insulin secretion ***(Karalliedde and Gnudi, 2014).*** The major cause of morbidity and mortality in diabetes is cardiovascular disease, which is exacerbated by the associated risk factors; atherosclerosis, hypertension, dyslipidemia, and obesity ***(Petrie et al., 2018).***

Animal models of T2DM have been proved to be useful to study the impact of, and to find a new therapy for, the disease. The combination of high fat-diet and low dose of streptozotocin treatment have been effectively used to generate a rat model that mimic the natural history and metabolic characteristics of the common type 2 diabetes in humans ***(Gheibi et al., 2017a).*** They hypothesized that this may be the most suited model for studying the pathophysiology of T2DM and evaluating the therapeutic lines for its treatment.

Though the current development of therapeutic agents, there is no effective treatment without side effects; it is therefore necessary to find out new protective strategy. Low-cost exercise interventions were effective in improving glycemic control, lipid profile, blood pressure, and anthropometric profile factors in middle-aged and older patients with type 2 diabetes ***(Mendes et al., 2017).***