Faculty of Science
Zoology Department

Evaluation of the Protective Effects of Vitamin C and Vitamin E Antioxidants on Type 2 Diabetes in Gaza Strip

A Thesis

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By

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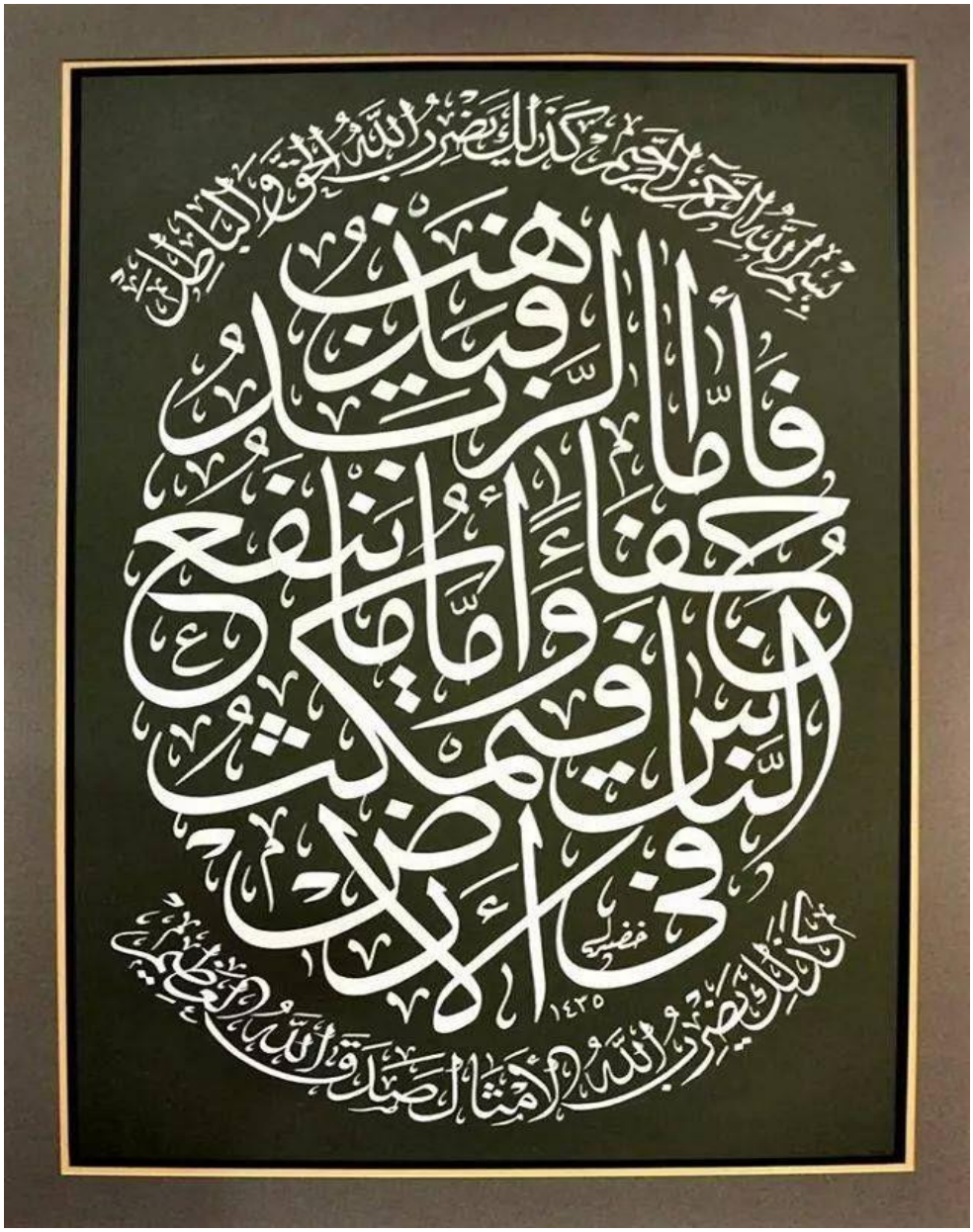
بسم الله الرحمن الرحيم كذلك يضرب الله الحق والباطل
فأما الزبد فيذهب جفاء وأما ما ينفع الناس فيمكث في الأرض
كذلك يضرب الله الأمثال صدق الله العظيم
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Dedication

I would like to dedicate my thesis
To my parents with everlasting love who taught me reading and writing since childhood, and without their love, support through my life, this work would not have been possible.

To my husband whose endless love, support and encouragement allowed me to achieve my goals.

To my lovely brothers, and children.

To all of them, I dedicate this work.

Asmaa abughali
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Contents

LIST OF ABBREVIATIONS

4-AA	4-Aminoantipyrine
AFR	Ascorbate free radical
AGEs	Advanced glycosylation end products
ALAT	Alanine aminotransferase
ASAT	Aspartate aminotransferase
BMI	Body mass index
CAT	Catalase
CHE	Cholesterol Esterase
CHO	Cholesterol Oxidase
DPP-4	Dipeptidyl peptidase 4
DBP	Daistolic blood pressure
FBG	Fasting blood glucose
G-6-PD	Glucose-6-phosphate dehydrogenase
GR	Glutathione reductase
GSH	Glutathione reduced
GSH-Px	Glutathione peroxidase
GST	Glutathione-S-transferase
H_2O_2	Hydrogen peroxide
Hb	Hemoglobin concentration
HbA1c	Glycated hemoglobin
HCO_3^-	Bicarbonate
HCT	Hematocrit
HDL-C	High-density lipoproteins cholesterol
HNO_2	Nitrous oxide
HOMA- IR	Homeostasis model assessment insulin resistance

IDDM	Insulin dependent diabetes mellitus
LDH	lactate dehydrogenase
LDL-C	Low-density lipoprotein cholesterol
LPL	Lipoprotein lipase
MCH	Mean corpuscular hemoglobin
MCHC	Mean corpuscular hemoglobin concentration
MCV	Mean corpuscular volume
MDA	Malondialdehyde
MDH	Malate dehydrogenase
MPV	Mean platelet volume
NADP	Nicotinamide adenine dinucleotide phosphate
NIDDM	Non-insulin dependent diabetes mellitus
PLT	Platelets
POD	Peroxidase
PPARs	Peroxisome proliferator-activated receptors
PPBG	Postprandial blood glucose
QISCI	Quantitative insulin sensitivity check index
RBCs	Red blood corpuscles
RDW	Red blood cell distribution width
RNS	Reactive nitrogen species
ROS	Reactive oxygen species
SBP	Systolic blood pressure
SOD	Super oxide dismutase
TC	Total cholesterol
TCA	Tricarboxilic acid

TG	Triglycerides
TZDs	Thiazolidinediones
UNRWA	United Nations Relief and Works Agency
VLDL- C	Very low-density lipoprotein cholesterol
WC	Waist circumference
WBC	White blood cell
WHO	World Health Organization
WHR	Waist -hip ratio

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Abstract

The most important benefits of vitamins C and E are their role as antioxidants and scavengers of particles as reactive oxygen species (ROS) that also sometimes called oxidants. The objectives of the study are to evaluate the antioxidant effect of vitamin C or/and vitamin E as supplements in glycemic control and controlling the lipid profile among type 2 diabetic patients treated with metformin in Gaza strip. The study was carried using 40 men type 2 diabetes mellitus patients from the UNRWA health centers in Gaza Strip, Palestine and 10 controls healthy non-diabetic individuals. Type 2 diabetic patients were treated with metformin and divided into four groups; each group (n=10) receiving one of the followings orally placebo; vitamin C; vitamin E; vitamin C plus vitamin E for 90 days. Before and after treatment, blood samples were collected and the results were analyzed A significant decrease in FBG, HbA1c, serum insulin, HOMA-IR, ASAT, TC, TC/HDL-C, TG/HDL-C and GR, in contrast, a significant increase in QISCI, GSH-Px and GSH were seen in the group supplemented with vitamin C or/and vitamin E compared with diabetic patients group that received placebo. Whereas a significant decrease in ALAT was seen in the group supplemented with vitamin C only, as well as a significant decrease in uric acid, TG and VLDL-C was seen in the group supplemented with vitamin C and vitamin C plus vitamin E. However, the group supplemented