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CIRCURATION LEVELS OF LIFED HYELD, BESIDES, MALONDIALDE HYDE AND TOTAL AND INVESTIGATE MEASUREMENT IN TYPE 2 DIAGREES PATREETS

KOMSIT SATHAPANAPITUK III

A Thesis Submitted to the Grainate School of Maresum University in Partial Rulfillment of the Requirements for the Master of Science Degree in Bismodical Sciences April 2011 Copyright 2011 by Nasesum University



# CIRCURATION LEVELS OF LIPID HYDROPEROXIDE, MALONDIALDEHYDE AND TOTAL ANTIOXIDANT MEASUREMENT IN TYPE 2 DIABETES PATIENTS



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A Thesis Submitted to the Graduate School of Naresuan University
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#### ABSTRACT

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Type 2 diabetes mellitus (T2D) was well known as a chronic disease and increased risk to develop cardiovascular disease. Hyperglycemia was a major factor of the excess production of free radical. Free radical was any molecule capable of independent existence that contains one or more unpaired electrons in orbital and caused free radical were very reactive. The major compounds of arterial cell membrane were phospholipid with consist of polyunsaturated fatty acid (PUFAs) their conjugated double bonds were sensitive to free radical damage and produced biochemical products such as lipid hydroperoxide (LOOH) and malondialdehyde (MDA). Living organism produced antioxidant system to protected organism from free radical damage. Antioxidant in the body worked together against free radical then the studied of network of antioxidant can provide interesting data than any antioxidant alone. This study measure two oxidative stress biomarkers, lipid hydroperoxide (LOOH) and malondialdehyde (MDA) in addition this study will measure total antioxidant. The results showed that both 2 oxidative stress biomarker (lipid hydroperoxide and malondialdehyde) of T2D patients (n=123) were significantly higher than healthy control (n = 83) (P < 0.001 for both oxidative stress biomarker) and total antioxidant capacity of T2D (n=123) patients was significantly lower than healthy control (n = 83) (P < 0.001). The result of bivariate correlation among oxidative stress biomarker and total antioxidant capacity showed positive correlation

between oxidative stress biomarker, lipid hydroperoxide and malondialdehyde both type 2 diabetic patients and healthy control subjects (LOOH and MDA of type 2 diabetic patients, r = 0.435, P < 0.001, LOOH and MDA of healthy control subjects, r = 0.365, P < 0.001). And negative correlation between oxidative stress biomarker with total antioxidant capacity both type 2 diabetic patients and healthy control subjects (LOOH and total antioxidant capacity of type 2 diabetic patients, r = -0.638, P < 0.001, MDA and total antioxidant capacity of type 2 diabetic patients, r = -0.677, P < 0.001, correlation among LOOH and total antioxidant capacity of healthy control subjects, r = -0.582, P < 0.001, MDA and total antioxidant capacity of healthy control subjects, r = -0.759, P < 0.001). In conclusion patients with T2D had increased in oxidative stress biomarker indicated by elevated lipid hydroperoxide and malondialdehyde. The total antioxidant capacity levels of T2D patients were decreased this may be cause by the counter action for the oxidative stress in T2D patients.

## **ABBREVIATIONS**

WHO = World Health Organization

HDL = High-density lipoproteins

LDL = Low density lipoprotein

LOOH = Lipid hydroperoxide

MDA = Malondialdehyde

IDDM = Insulin dependent diabetes mellitus

NIDDM = Non insulin dependent diabetes mellitus

GDM = Gastational diabetes mellitus

GPx = Glutathiona peroxidase

AGEs = Advanced glycation end-products

ROS = Reactive oxygen species

RNS = Reactive nitrogen species

COX = Cyclooxygenase

PUFAs = Polyunsaturated fatty acids

L• = Carbon centered radical

LOO• = Lipid peroxyl radical

LOOH = Lipid hydroperoxide

ROO· = Peroxyl radicals

R-O = Akoxyl radicals

NO = Nitric oxide

 $NO_2$  = Nitrite

SOD = Superoxide dismutase

OH• = Hydroxyl radicals

ONOO- = Peroxynitrite radicals

O2•- = Superoxide

GAPDH = Glyceraldehyde phosphate dehydrogenase

DAG = Dihydro glycerol

PLC = Phospholipase C

TGF-β1 = Tumor growth factor-β1

NADP<sup>+</sup> = Nicotinamide adenine dinucleotide phosphate

## **ABBREVIATIONS (CONT.)**

GFAT = Glutamine fructose-6-phosphate aminotransferase

PAI-1 = Plasminogen activator inhibitor-1

GSH = Glutathione

Gred = Glutathione reductase

GSSG = Oxidized glutathione, Glutathione disulfide

LH = Lipid hydroxide

PKC = Protein kinase C

TNF = Tumor necrosis factor

GC = Gas chromatography

HPLC = High performance liquid chromatography

ICAM-1 = Intercellular adhesion molecule 1

NAD(P)H = Nicotinamide adenine dinucleotide phosphate (H+)

TBARS = Thiobarbituric acid reactive substance

TBA = Thiobarbituric acid

BMI = Body Mass Index

FOX = Ferrous oxidation xylenol orange assay

MS = Mass spectrometry

WC = Waist circumstance

CHD = Coronary heart disease

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