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

KOMSIT SATHAPANAPITUKMIJ

A Thesis Submitted to the Graduate School of Naresuan University
in Partial Fulfillment of the Requirements
for the Master of Science Degree in Biomedical Sciences
April 2011

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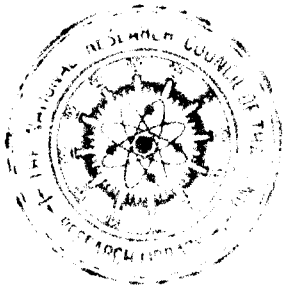

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This thesis entitled "Circulation levels of lipid hydroperoxide, malondialdehyde and total antioxidant measurement in Type 2 diabetes patients" submitted by Komsit sathapanapitukkij in partial fulfillment of the requirements for the Master of Science Degree in Biomedical Sciences is hereby approved.

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Komsit Sathapanapitukkij

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

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
$NADP^+$	=	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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