MEASURING VITAMIN A AND VITAMIN E LEVELS IN NEONATES ADMITTED IN NEONATAL INTENSIVE CARE UNIT AS INDIRECT SCREEN FOR OXIDATIVE STRESS

Thesis

Submitted for partial Fulfillment of Master Degree in Pediaterics

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2013

سورة البقرة الآية: ٣٢

Acknowledgment

First thanks to **ALLAH** *to whom I relate any success in achieving any work in my life.*

I wish to express my deepest thanks, gratitude and appreciation to Prof. Dr. Mohammed Sami Elsheimy, Professor of Pediatrics for his meticulous supervision, kind guidance, valuable instructions and generous help.

Special thanks are due to Prof. Sahar Abd ElMaksoud, Professor of Clinical Pathology for her sincere efforts and fruitful encouragement.

I am deeply thankful to Dr. Suzan Abd El-Razek, Lecturer of Pediatrics for her great help, outstanding support, active participation and guidance.

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List of Abbreviations

Abb.	Full term
7-NI	*7-nitroindazole*
AGEs	*Advanced glycation end products*
AVED	*Ataxia with vitamin E deficiency*
BAL	*Bronchoalveolar lavage*
BPD	*Bronchopulmonary dysplasia*
CAT	*Catalase*
CEHC	*carboxyethyl hydroxychroman metabolites*
cGMP	*cyclic guanosine monophosphate*
CLD	*Chronic lung disease*
CML	*Carboxyl methyl lysine*
CoQ10	*Coenzyme Q10*
CRBP	*Cellular retinol binding protein*
Cu, Zn-SOD	*Cupper, zinc-soperoxide dismutase*
DHA	*Docosahexaenoic acid*
DNA	*Deoxyribonucleic acid*
EEG	*Electroencephalogram*
EPA	*Eicosapentaenoic*
EPR	*Electron paramagnetic resonance*
ERG	*Electroretinogram*
FIO_2	*Inspiratory oxygen fraction*
GPx	*Glutathione peroxidase*
GSH	*Glutathione*
GSSG	*Oxidized glutathione*
HClO	*hypochlorous acid*
HDL	*High density lipoprotein*
HI	*Hypoxiaischemia*
HIE	*Hypoxic-ischemic encephalopathy*
HNE	*4-hydroxy- 2-nonenal*
HO-1	*Heme oxygenase-1*
ICAM-1	*Intracellular adhesion molecule*
IDL	*Intermediate density lipoprotein*
iNOS	*Inducible nitric oxide synthase*
IRE	*Iron responsive elements*
IRE-BP	*Iron responsive elements biding protein*
IU	*International unit*
IUGR	*Intrauterine growth restriction*
JNK/ AP1	*C-jun NH2 terminal kinase/activator protein-1*
LDL	*Low density lipoprotein*
LHP	*Lipid hydroperoxide*

LIP	*Labile iron pool*
LPS	*Maternal lipopolysaccharide*
MAPK	*Mitogen-Activated Protein Kinase*
MDA	*Malondialdehyde*
Mn	*Manganese*
MPO	*Myelperoxidase*
mtPT	*Mitochondrial permeability transition*
NAC	*N-Acetylcysteine*
NAD(P)H	*Nicotine adenine di-nucleotide phosphate*
NEC	*Necrotizing enterocolitis*
NF-κB	*Necrosis factor-kappa beta*
nNOS	*Neuronal NOS*
NOSs	*Nitric oxide synthases*
OxR	*Oxygen resuscitated*
PCO_2	*Carbon dioxide tension*
PMN	*Polymorphnuclear*
Pon3	*Paraoxonase 3*
PPAR-α	*Peroxisome proliferators activated receptor-α*
pPROM	*Preterm premature rupture of membranes*
PUFA	*Polyunsaturated fatty acid*
PVL	*Periventricular leukomalacia*
RA	*Retinoic acid*
RAR	*Room air resuscitated*
RAR	*Retinoid A receptor*
RBP	*Retinol biding protein*
RDS	*Respiratory distress syndrome*
rhSOD	*Recombinant human SOD*
RNS	*Reactive nitrogen species*
ROP	*Retinopathy of prematurity*
ROS	*Reactive oxygen species*
RXR	*Retinoid X receptor*
SOD	*Superoxide dismutase*
SpO_2	*Arterial oxygen saturation*
TAC	*Total antioxidant capacity*
TNF	*Tumour necrosis factor*
ToH	*tocopherol-o-hydroxylase*
TRX	*Thioredoxin*
TTP	*Tocopherol transfer protein*
UK	*United Kingdom*
UVA	*Ultraviolet A*
VCAM-1	*Vascular cell adhesion molecule*
VEGF	*Vascular endothelial growth factor*
VLBW	*Very low birth weight*
VLDL	*Low density lipoprotein*
V_T	*Tidal volume*
XOR	*Xanthine oxidoreductase*

INTRODUCTION

Neonates are exposed to multiple stresses since birth, as birth trauma, hypoxic events, in addition to stresses which occur in neonatal intensive care unit as nosocomial infections, medications, and procedures **(Saugstad, 2005).** During this stresses, body releases free radicals; free radicals are defined as a chemical species with one or more unpaired electrons in their outer shell **(Blackburn, 2005).** Oxygen is used in all aerobic reactions, so free radicals production occurs mainly in all cells with aerobic energy production. In order to regain their stability, free radicals react quickly with other nearby molecules to obtain the electrons they need; this reaction causes damage to nearby molecules by changing their structure or function.

Free radicals play an important role in number of biological processes, as in defencse against viruses, bacteria, and cancer cells; they are also involved in vasodilatation, neurotransmission, and upregulation of certain genes. Their production may increase beyond body abilities to manage **(Halliwell and Cuttardge, 2007).**

Body has developed the means to take advantage of or counter free radicals activity. This defence is highly complex antioxidant systems, which combine with each other to protect the cells and organ systems of the body against damage caused by free radicals **(Mates et al., 1999).**

Antioxidant term refers to any molecule capable of stabilizing or deactivating free radicals before they attack the cells. They are classified into **enzymatic** antioxidants, such as, super oxide dismutase, catalase, glutathione peroxidase, and **non enzymatic** antioxidants including, vitamins E, C, and, A, billirubin, and ubiquinone.

In human fetus enzyme-based antioxidants start to develop and mature late in the third trimester and non enzematic antioxidant start to cross the placenta in late gestation **(Buonocore et al., 2002).**

Neonatal period is a vulnerable time for free radical damage and injury, this is especially true for preterms, because of maturational deficiencies (including their antioxidant defense system), medical interventions, nutritional issues, and increase susceptibility to infection and inflammation, as well as poor control of free radical-generating stimuli in the environment, in addition they have low levels of vitamin A, and, E in their blood **(Rodriguez and Redman, 2005).**

The most common examples of non enzymatic antioxidants are: vitamin E and vitamin A.

Vitamin E is a fat soluble vitamin and it acts as an antioxidant by protecting lipid bilayer from perioxidation. The majority of vitamin E is stored in the adipose tissue **(Halliwell & Gutteridge, 2007).**

Vitamin A is necessary for normal lung growth and for integrity of respiratory tract epithelial cells **(Darlow and Garham, 2007).**

Production of free radicals may increase beyond body abilities to manage creating an imbalance state.

Imbalance between antioxidants and free radicals has been blamed for many diseases that are manifest during neonatal period **s**uch as: bronchopulmonary dysplasia, necrotizing, enterocolitis, respiratory distress syndrome, hypoxic ischemic encephalopathy, retinopathy of prematurity, intraventricular hemorrhage, and periventricular leukomalacia **(Halliwell & Gutteridge, 2007**).

So, based on these facts and the exposure of the neonates to multiple stresses, providing antioxidants may prevent or decrease the severity of these diseases **(Lisa Baba, 2008).**

AIM OF THE WORK

Estimation of vitamin A and E in neonates exposed to oxidative stresses in order to clear their role as antioxidants, aiming at considering them as a routine supplementation to alleviate the complications of this problem in neonates.