

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

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قالوا

سبحانك لا علم لنا  
إلا ما علمتنا إنك أنت  
العليم العظيم

صدق الله العظيم

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# List of Contents

Title	Page No.
Introduction .....	1
Aim of the Work .....	4
Review of Literature	
▪ <i>Free Radicals and Antioxidants</i> .....	5
▪ <i>Morbidities Related to Excessive Oxidative Stress</i> .....	36
▪ <i>Vitamin E</i> .....	74
▪ <i>Vitamin A</i> .....	86
Patients and Methods.....	100
Results .....	110
Discussion.....	138
Summary and conclusion.....	146
Recommendations .....	149
References .....	150
Arabic sumamry	

# List of Tables

Table No.	Title	Page No.
Table (1):	Reactive oxygen species.....	8
Table (2):	Description of personal data among study cases.....	111
Table (3):	Description of Indication of admission, number of indications and LOS among study cases.....	112
Table (4):	Description of Indications of admission among cases.....	114
Table (5):	Description of NICU procedures, including, (ventilation, phototherapy/exchange transfusion, blood transfusion and nutrition) among all cases .....	115
Table (6):	Description of ventilation among RD case, phototherapy/exchange transfusion among jaundice cases, and blood transfusion among Hemorrhagic disease cases.....	116
Table (7):	Description of Vitamin A and E serum levels before admission and at discharge among cases.....	116
Table (8):	Comparison between Vitamin A and E serum levels before admission and at discharge among cases .....	117
Table (9):	Description of drop value in Vitamin A and E serum levels at discharge among study cases. ....	119
Table (10):	Description of Vitamin A and E serum levels among controls.....	119

## List of Tables (cont...)

Table No.	Title	Page No.
<b>Table (11):</b>	Comparison between cases and controls as regard Vitamin A and E serum levels.....	120
<b>Table (12):</b>	Correlations between each of GA, LOS, CRP, TSB and vitamin A level before admission and at discharge .....	121
<b>Table (13):</b>	Correlations between each of GA, LOS, CRP, TSB and vitamin E level before admission and at discharge .....	122
<b>Table (14):</b>	Correlations between each of GA, LOS, CRP, TSB and the drop value in vitamin A and vitamin E level before admission and at discharge.....	124
<b>Table (15):</b>	Relationship between indications of admission and vitamin A and E serum levels before admission and at discharge .....	127
<b>Table (16):</b>	Relationship between indication of admission and drop value in vitamin A and E .....	128
<b>Table (17):</b>	Relationship between cases' maturation and vitamin A and E serum levels before admission and at discharge .....	129
<b>Table (18):</b>	Relationship between cases' maturation and drop value in vitamin A and E serum levels.....	129
<b>Table (19):</b>	Relationship between type of ventilation and vitamin A and E serum levels before admission and at discharge.....	130

## List of Tables (cont...)

Table No.	Title	Page No.
Table (20):	Relationship between type of ventilation and drop value in vitamin A and E serum levels.....	130
Table (21):	Relationship between management strategies done in jaundice and vitamin A and E serum levels before admission and at discharge.....	131
Table (22):	Relationship between management strategies done in jaundice and drop value in vitamin A and E serum levels .....	132
Table (23):	Relationship between blood transfusion and vitamin A and E serum levels before admission and at discharge. ....	133
Table (24):	Relationship between blood transfusion and drop value in vitamin A and E serum levels.....	134
Table (25):	Relationship between parental nutrition and vitamin A and E serum levels before admission and at discharge .....	134
Table (26):	Relationship between parental nutrition and drop value in vitamin A and E .....	135
Table (27):	Relationship between number of indications for admission and vitamin A and E serum levels before admission and at discharge.....	136
Table (28):	Relationship between number of indications for admission and drop value in vitamin A and E serum levels.....	137

# List of Figures

Fig. No.	Title	Page No.
Fig. (1):	Summary of the production of reactive oxygen species (ROS) .....	14
Fig. (2):	Cell death pathways involved in hypoxic-ischemic brain injury .....	58
Fig. (3):	Absorption, transport, and metabolism of $\alpha$ - and $\gamma$ -tocopherol in the body. ....	75
Fig. (4):	Structure of naturally occurring tocotrienols.....	76
Fig. (5):	Structure of RRR- $\alpha$ -tocopherol and the seven stereo isomers.....	80
Fig. (6):	Antioxidant function of vitamin E located in the inner and outer leaflets of the membrane .....	81
Fig. (7):	Vitamin A or retinol has a structure depicted above.....	86
Fig. (8):	Uptake and metabolism of vitamin A .....	88
Fig. (9):	Calibration curve for serum retinol.....	104
Fig. (10):	Typical calibration curve obtained on a coleman Junior spectrophotometer.....	106
Fig. (11):	Description of personal data among study cases.....	111
Fig. (12):	Description of number of indication(s) of admission among cases (single & combined).....	113
Fig. (13):	Description of number of indication(s) of admission among cases (single, double and combined).....	113

## List of Figures (cont...)

Fig. No.	Title	Page No.
<b>Fig. (14):</b>	Description of Indications of admission among cases.....	114
<b>Fig. (15):</b>	Description of parental nutrition among cases.....	115
<b>Fig. (16):</b>	Comparison between Vitamin A serum levels before admission and at discharge among cases.....	118
<b>Fig. (17):</b>	Comparison between Vitamin E serum levels before admission and at discharge among cases.....	118
<b>Fig. (18):</b>	Correlations between CRP and vitamin E level before admission.....	123
<b>Fig. (19):</b>	Correlations between TSB and vitamin E level before admission.....	123
<b>Fig. (20):</b>	Correlations between LOS and the drop value in vitamin A.....	125
<b>Fig. (21):</b>	Correlations between LOS and the drop value in vitamin E.....	125
<b>Fig. (22):</b>	Correlations between CRP and the drop value in vitamin E.....	126
<b>Fig. (23):</b>	Relationship between number of indications for admission and drop value in vitamin A and E serum levels.....	137

# List of Abbreviations

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

<b>LIP</b>	<i>Labile iron pool</i>
<b>LPS</b>	<i>Maternal lipopolysaccharide</i>
<b>MAPK</b>	<i>Mitogen-Activated Protein Kinase</i>
<b>MDA</b>	<i>Malondialdehyde</i>
<b>Mn</b>	<i>Manganese</i>
<b>MPO</b>	<i>Myeloperoxidase</i>
<b>mtPT</b>	<i>Mitochondrial permeability transition</i>
<b>NAC</b>	<i>N-Acetylcysteine</i>
<b>NAD(P)H</b>	<i>Nicotine adenine di-nucleotide phosphate</i>
<b>NEC</b>	<i>Necrotizing enterocolitis</i>
<b>NF-κB</b>	<i>Necrosis factor-kappa beta</i>
<b>nNOS</b>	<i>Neuronal NOS</i>
<b>NOSs</b>	<i>Nitric oxide synthases</i>
<b>OxR</b>	<i>Oxygen resuscitated</i>
<b>PCO<sub>2</sub></b>	<i>Carbon dioxide tension</i>
<b>PMN</b>	<i>Polymorphnuclear</i>
<b>Pon3</b>	<i>Paraoxonase 3</i>
<b>PPAR-α</b>	<i>Peroxisome proliferators activated receptor-α</i>
<b>pPROM</b>	<i>Preterm premature rupture of membranes</i>
<b>PUFA</b>	<i>Polyunsaturated fatty acid</i>
<b>PVL</b>	<i>Periventricular leukomalacia</i>
<b>RA</b>	<i>Retinoic acid</i>
<b>RAR</b>	<i>Room air resuscitated</i>
<b>RAR</b>	<i>Retinoid A receptor</i>
<b>RBP</b>	<i>Retinol biding protein</i>
<b>RDS</b>	<i>Respiratory distress syndrome</i>
<b>rhSOD</b>	<i>Recombinant human SOD</i>
<b>RNS</b>	<i>Reactive nitrogen species</i>
<b>ROP</b>	<i>Retinopathy of prematurity</i>
<b>ROS</b>	<i>Reactive oxygen species</i>
<b>RXR</b>	<i>Retinoid X receptor</i>
<b>SOD</b>	<i>Superoxide dismutase</i>
<b>SpO<sub>2</sub></b>	<i>Arterial oxygen saturation</i>
<b>TAC</b>	<i>Total antioxidant capacity</i>
<b>TNF</b>	<i>Tumour necrosis factor</i>
<b>ToH</b>	<i>tocopherol-o-hydroxylase</i>
<b>TRX</b>	<i>Thioredoxin</i>
<b>TTP</b>	<i>Tocopherol transfer protein</i>
<b>UK</b>	<i>United Kingdom</i>
<b>UVA</b>	<i>Ultraviolet A</i>
<b>VCAM-1</b>	<i>Vascular cell adhesion molecule</i>
<b>VEGF</b>	<i>Vascular endothelial growth factor</i>
<b>VLBW</b>	<i>Very low birth weight</i>
<b>VLDL</b>	<i>Low density lipoprotein</i>
<b>V<sub>T</sub></b>	<i>Tidal volume</i>
<b>XOR</b>	<i>Xanthine oxidoreductase</i>

## 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 defence 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, bilirubin, and ubiquinone.

In human fetus enzyme-based antioxidants start to develop and mature late in the third trimester and non enzymatic 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 peroxidation. 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 such 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.