

Research Article**Assessment of Total Antioxidant capacity (TAC) in Preterm
and Term Infants in Pakistan: A research analysis****Tabinda Iqbal¹, Ramsha Safdar²
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ABSTRACT

Introduction: Oxidative stress arises when the rate of free radical production is greater than the rate of removal by the cellular defense mechanisms. Reactive oxygen and nitrogen species will make cytotoxic harm lipids, proteins or DNA, unless the enzymatic and non-enzymatic antioxidants can adjust their contradicting impact. **Objectives of the study:** The main objective which we want to study is to analyze the role of TAC in term and pre-term infants. For this purpose we also find out the role of lipid peroxidation and Vit-E. **Material and methods:** The study was conducted according to the rules and regulation of THQ hospital Yazman and after the approval of ethical committee. For this purpose we select two study groups. One was pre term infants and others was term infants. In group 1 pre-term infant were selected whose gestational period is ≤ 36 weeks. **Results:** MDA is high in preterm infants compared to term infants. Total antioxidant capacity and Vitamin E levels are high in term infants compared to preterm infants. **Conclusion:** Our study states that there is an imbalance between oxidants and antioxidants resulting in an increased oxidative stress in Preterm infants.

Key words: pre-term, term, infants, TAC**INTRODUCTION**

Oxidative stress arises when the rate of free radical production is greater than the rate of removal by the cellular defense mechanisms.¹ Reactive oxygen and nitrogen species will make cytotoxic harm lipids, proteins or DNA, unless the enzymatic and non-enzymatic antioxidants can adjust their contradicting impact. Receptive oxygen species (ROS) likewise delivered by various components, for example, the ordinary electron transport chain in mitochondria and unsaturated fats, digestion of prostaglandin, reperfusion, hypoxia and hyperoxia, neutrophil

and irritation, the endothelial cell hypoxanthine oxidase framework, expanded flow of free metals, and the Fenton response.² Mammalian cells contain both enzymatic and non-enzymatic component of antioxidant barriers to decrease the cellular damage which is caused by contact between cellular constituents and oxygen free radicals (OFRs).³ Responsive oxygen species (ROS, for example, hydrogen peroxide, super oxide and hydroxyl radicals assault on bio films, fortify peroxidation of lipids and prompting an

expansion impermeability of cell and loss of endothelial respectability.⁴

ROS are created both by endogenously or exogenously. In vivo free radicals are made amid ordinary oxygen consuming breath, by start of phagocytosing cells, in peroxisomes where unsaturated fats are discolored⁵, and via auto-oxidation of different atoms. Vitamin E is an expansive term which incorporates eight lipid-solvent mixes. Vitamin E involves a gathering of four tocols, and four toco-trienols.⁶ Most dynamic atom is alpha-tocopherol which makes up 90% of the vitamin E found in human tissue. Vitamin E is found in all tissues, where it goes about as an antioxidant and free radical forager. It obstructs the regular peroxidation of Polyunsaturated Fatty Acids (PUFAs) found in lipid layers of cellular films⁷

Lipid peroxidation starts when an atom of hydrogen escapes the double bond of one of the lipid carbons and causing an intermediate situation that is highly favorable to reaction with an oxygen free radical.⁸

Objectives of the study

The main objective which we want to study is to analyze the role of TAC in term and pre-term infants. For this purpose we also find out the role of lipid peroxidation and Vit-E.

MATERIAL AND METHODS

Experimental design

The study was conducted according to the rules and regulation of THQ hospital Yazman and after the approval of ethical committee. For this purpose we select two study groups. One was pre term infants and others was term infants. In group 1 pre-term infant were selected whose gestational period is ≤ 36 weeks. Group 2 is the term infants group, the gestational period of term infants are ≥ 37 weeks. For each group physical characteristics of infants were also noted. That includes weight, sex, type of delivery, hemoglobin (Hb), hematocrit (Ht) and ferritin (Fe) levels.

Collection of blood

5.0 ml cord blood sample was taken in a clean sterile container at the time of delivery. Then

allow this blood to clot for 30 minute and after that blood was centrifuged at 3000 rpm for 10 minutes. The serum was separated and stored at -85°C for further analysis.

Analysis of total antioxidant capacity (TAC)

Sample was hydrolyzed 5 times in 0.25 M oxalic acid in boiling water bath, and then dialyzed against phosphate buffered saline (PBS). Protein content of each sample was determined by measurement of the absorption of UV light at 280 nm wavelength and calculated according to a standard curve. Maillard reaction-related fluorescence (FC), representative of AGEs formed and was measured as an index of advanced glycation in 360/450 nm excitation/emission fluorimeter. Quinine sulfate $1 \mu\text{M}$ in 0.1N H_2SO_4 was used as a standard. The levels of AGEs were expressed as arbitrary fluorescence units (AU) per mg protein.

Statistical analysis

Statistical analysis (t-test) was performed using the SPSS software program (17.0). All results were expressed as the mean \pm standard deviation (SD).²

RESULTS

Table 01 shows the demographic values of term infants and pre-term infants. It shows that birth weight of pre-term infants is slightly high as compared to others but the level of hemoglobin is high in term infants.

Table 1: Demographic characteristics of groups

Characteristics	Group 1 (Pre-term infants)	Group 2 (Term infants)
Gestational age	≤ 36 weeks	≥ 37 weeks
Birth weight	4-5 lbs	3-4lbs
Haemoglobin (Hb)	10.45	11.0

Table 02 shows the mean concentration of lipid peroxidation, TAC, vit-E and vit-A in term and pre-term infants. The p- value is non-significant in both term and pre-term infants.

Table 2: Mean concentration of TBARS, TAC, Vit-E and Vit-A

Parameters	Group 1 (Pre-term infants) N=	Group 2 (Term infants) N=	P- value
TBARS (nmol/lit)	0.77 ± 0.24	1.74 ± 1.45	0.003
TAC	3.74 ± 1.45	2.97 ± 0.45	0.005

(nmol/lit)			
Vit-E (mg/lit)	12.74± 1.45	10.56± 0.89	0.009
Vit-A (mg/lit)	3.74± 1.45	3.74± 1.49	0.008

Table 03 shows the correlation between TAC and other factor which we are studying. It shows that there is a significant relationship between total antioxidant capacity and Vit-A level in term and pre-term infants.

Table 3: Correlation between TAC and other factors

	TAC Vs Vit-E	TAC Vs Vit-A	TAC Vs TBARS
Pre-Term infants	0.13	0.25	-0.19
Term infants	-0.45	0.11	0.006

DISCUSSION

Oxidative stress can be defined as increased formation of reactive oxygen species or decreased antioxidant defense mechanism.⁸Newborn's antioxidant resistance framework could be inadequate and it makes the connection between harm because of oxidative stress and new conceived pathologies more essential. Untimely newborn children are at sure hazard from oxidative stress on the grounds that both endogenous and exogenous antioxidant barrier frameworks don't quicken in development until late in the third trimester.⁹ Oxidative stress is a contributing element for tissue damage through the development of free radicals and responsive oxygen species (ROS) and receptive nitrogen species (RNS) prompting provocative cytokines which result in untimely birth.¹⁰

The newborn baby, particularly those babies who conveyed rashly, is extremely subject to free radical actuated oxidative harm. Since the untimely babies much of the time presented to oxygen treatment which are wealthier in oxygen atoms than the intra uterine condition presenting the newborn child to an overabundance of free radicals.¹⁰The generation of ROS can increments because of numerous conditions which influence both mother and newborn baby. Aversion of maternal diabetes which if not treated is additionally connected with an expanded generation of ROS.¹¹There are numerous

examinations on creatures which demonstrate that untimely newborn children are formatively ill-equipped to battle with the oxidative stress. For instance examines on rabbits showed that there is an impressive increment in antioxidant compound exercises amid the last time of development.¹²

Oxygen free radicals have been ensnared as specialists of cellular harm in numerous infections related with untimely newborn children. Add up to Antioxidant limit measures the low sub-atomic weight, chain-breaking antioxidant, barring the commitment of antioxidant chemicals and metal restricting proteins. Low Total Antioxidant Activity could be characteristic of oxidative stress or expanded defenselessness to oxidative stress.¹³

CONCLUSION

Our study states that there is an imbalance between oxidants and antioxidants resulting in an increased oxidative stress in Preterm infants. Thus, this study helps in the prevention of prematurity related disorders that may occur in later life.

Contribution of authors

All the authors contributed equally. Dr. Tabinda conceived of the presented idea and do all the lab work and carried out the experiment with other co-authors. Dr. Ramshadeveloped the theory and performed the computations. Dr. Nuzhat supervised the findings of this work and developed the theoretical formalism, performed the analytic calculations and performed the numerical simulations. All the authors contributed to the final version of the manuscript.

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