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Oxidative Stress and Antioxidant Activity in Newborns and their Correlation with their Birth Weight

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Introduction

The weight of the infant at birth is a powerful predictor of infant growth and survival and depends on maternal health and nutrition throughout the pregnancy(1) Low birth weight has been defined by the World Health Organization (WHO) as weight at birth of less than 2500 g (5.5 lb)(2). In India prevalence of low birth weight neonate is 25–30 %(3). Maternal, fetal, placental, and external factors along with genetic growth potential throughout pregnancy are the major determinant of the normal growth of fetus. Impairments in one or more of these factors affect the fetal growth(4). There are various studies that reveal maternal as well as fetal risk factors for intrauterine growth retardation (IUGR). However, intrauterine growth retardation, which sometimes occurs without any risk factor, and etiopathogenesis could not be fully demonstrated. It can be understood by the thought that, in pathophysiology of intrauterine growth retardation, placental failure, which is contributed by oxidative stress, plays an important role(5).

Pregnancy is a stressful physiological condition and it has been associated with oxidative stress injury(6). Oxidative stress occurs when there is an imbalance in oxidant (free radical) and antioxidant. Free radicals react with membrane lipids and starts a chain of reactions result in formation of an intermediate lipid peroxidation product; Malondialdehyde (MDA). This is being measured widely to show the evidence of free radical injury in biological sample.(7) This study was designed to correlate oxidative stress (MDA) & Total Antioxidant activity (AOA) and birth weight of new-borns.

Keywords: Oxidative stress, Malondialdehyde (MDA), Total Antioxidant Activity (AOA), Birth weight, Newborn.

Aims and Objectives

1) To measure birth weight of newborns
2) To measure oxidative stress (MDA) in newborns
3) To measure Total Antioxidant Activity (AOA) in newborns.
4) To establish correlation between oxidative stress (MDA) & Total Antioxidant Activity (AOA) and birth weight of new-borns

Materials and Methods

A total of 80 new-borns were included in this study. The age group of the recruited pregnant women from new-borns had delivered were between 20 and 35 years. All these women had term normal vaginal delivery. These newborns were divided into two groups, case-having birth weight ≤2.5kg and control having birth weight >2.5 kg. on the basis of their birth weight. After obtaining written informed consent cord blood samples were taken (as per ICMR guidelines) and assayed for routine parameters and malondialdehyde (MDA)[8] and Total Antioxidant Activity (AOA) [9].

Exclusion Criteria: pregnant women with any History of Smoking, Hypertension, Thyroid disease, Diabetes mellitus, Multiple Pregnancies, Preeclampsia, Preterm delivery, Cesarean delivery & Any chronic maternal disease were excluded from the study.

Observation & Results

Result were presented as mean +_ SD. Students unpaired t-test was used for statistical analysis between case and control. Result were presented as mean +_ SD. Students unpaired t-test was used for statistical analysis between case and control. And Pearson's correlation was used for correlation of MDA and AOA with birth weight of the newborn. $p<0.05$ was considered statistically significant.

MDA is significantly increased in cases (4.82+_0.84) as compared to controls (4.1+_0.61). &Total Antioxidant Activity is significantly decreased in cases(1.4+_0.34) as compared to controls(1.7+_0.38).

Table: 1 Comparison of MDA and AOA in normal birth weight and Low birth weight.

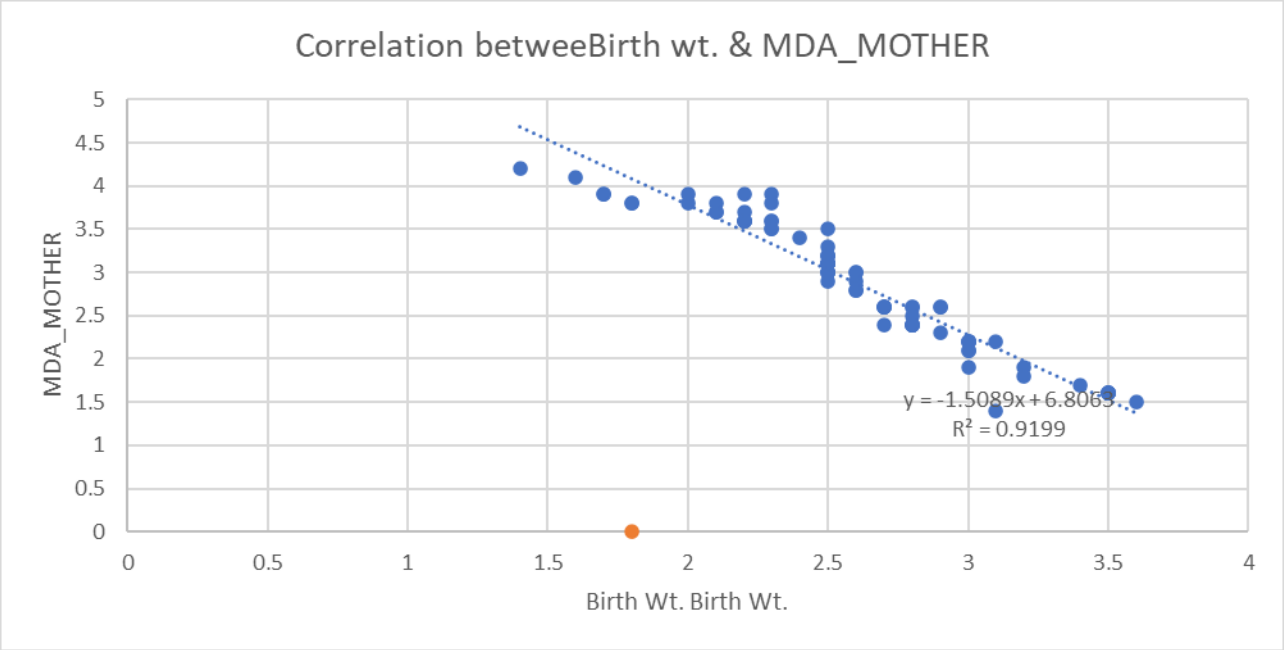
	LBW (CASE)	NBW(CONTROL)	p-value
MDA (nmol/ml)	3.4+_0.41	2.2 +_ 0.49	<0.05**
AOA (mmol/l)	1.5+_ 0.31	2.07=-0.34	<0.05**

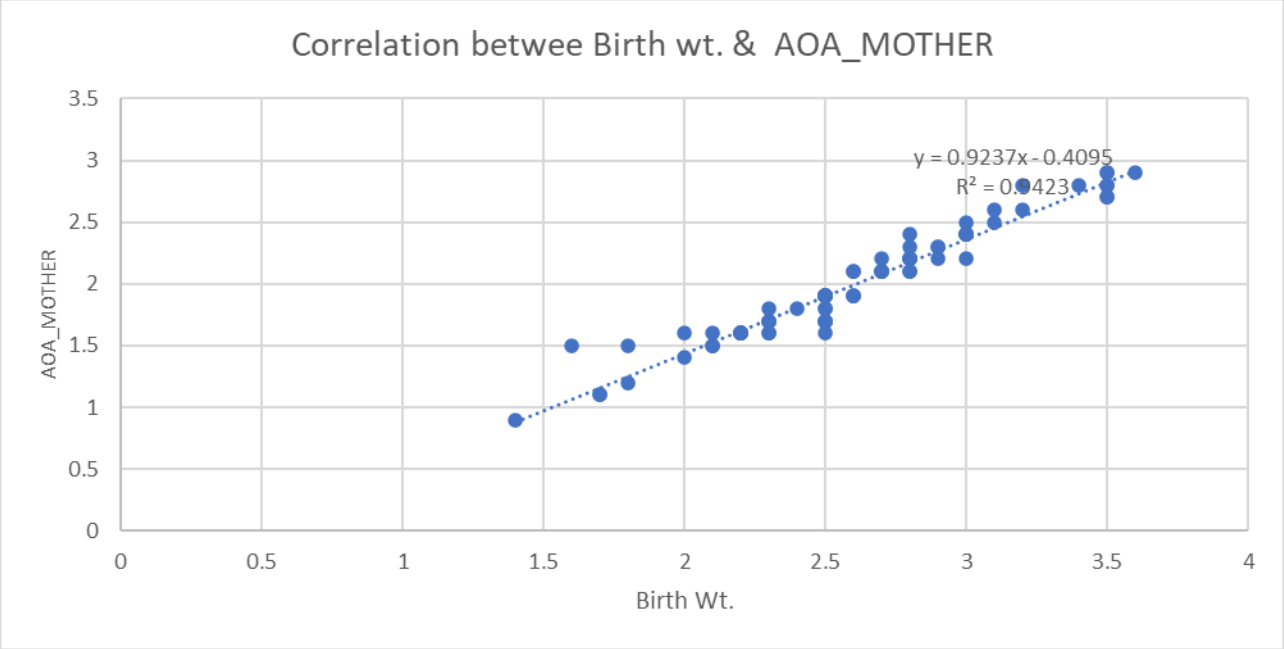
MDA-Melondialdehyde
AOA-Antioxidant Activity
**significant

Table: 2 Correlation of MDA and AOA with birth weight

	Birth weight Pearson's correlation (r)	p-value
MDA	-.897**	0.000**
AOA	.971**	0.000**

MDA-Melondialdehyde
AOA-Antioxidant Activity
**significant





Discussion

Reactive oxygen species (ROS) and antioxidants have been implicated in the regulation of reproductive process in both animals and human, such as luteal and endometrial changes, follicular development, ovulation, fertilization, embryogenesis, embryonic implantation and placental differentiation and growth. In contrast, imbalances between ROS production and antioxidant system induce oxidative stress that negatively impact reproductive processes. High level of ROS during embryonic, fetal and placental development is a feature of pregnancy. Consequently, oxidative stress has emerged as a likely promoter of several pregnancy related disorders, such as spontaneous abortions, embryopathies, preeclampsia, fetal growth restriction, preterm labor and low birth weight.[10]

Strength and limitation of the study

Cord blood is the mixing of maternal and foetal blood. oxidative stress in cord blood may be due to maternal oxidative stress. So further need to study oxidative stress in 2nd or 3rd trimester, & by

giving supplementation of antioxidants, birth weight of newborn can be improved. A small sample size is also the limitation of the study.

Low Birth Weight new-borns were found to have higher amount of oxidative stress and low antioxidant activity.

Conclusion

The birth weight of the new-borns is negatively correlated with MDA and positively correlated with AOA (Anti-Oxidant Activity).

So further need to study oxidative stress in 2nd or 3rd trimester, & by giving supplementation of antioxidants, birth weight of newborn can be improved.

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