Original Research Paper

Volume - 13 | Issue - 05 | May - 2023 | PRINT ISSN No. 2249 - 555X | DOI : 10.36106/ijar

Biochemistry

OXIDATIVE STRESS IN NEWBORNS AND ITS CORRELATION WITH THEIR BIRTH WEIGHT

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ABSTRACT **Introduction:** Pregnancy is a stressful physiological condition and it has been associated with oxidative stress injury. The attack of free radicals on membrane lipid starts a chain of reactions that has malondialdehyde (MDA) as one of the intermediate products. Antioxidants produced in the body are Glutathione peroxidase, superoxide dismutase, vitamins as well as uric acid. They counteract with free radicals (MDA). Measuring MDA will access the effect of oxidative stress in the new born, thus evaluating the effect of oxidative stress in the new born and their birth weight. Aims and Objectives: 1. To measure birth weight of newborns 2. To measure oxidative stress (MDA) in newborns. 3. To establish correlation between oxidative stress (MDA) and birth weight of newborn **Materials and Methods:** Study was conducted in Department of Biochemistry in association with Department of Obstetrics and Gynecology, SMS Medical College, Jaipur. A total of 50 pregnant females were included in this study. Samples were taken immediately after the delivery and assayed for routine parameters and MDA level. Birth weight of newborns were taken. These newborns were divided into two groups, Group I (≤2.5kg) & Group II (>2.5kg) on the basis of their birth weight. Association between these were calculated and $p<0.05$ was considered statistically significant. Observation and Results: The age group the pregnant women were between 19 – 34 years. All these women had term normal vaginal delivery. The mean birth weight of the newborns was 2.8 ± 1.2 (1.5 kg – 3.7kg). Mean MDA values in group I was higher as compared to Group II and it was found to be statistically significant. **Conclusion:** The Birth weight of newborns is negatively correlated with MDA level. i.e. oxidative stress.

KEYWORDS : Oxidative stress, birth weight, Malondialdehyde(MDA), antioxidant.

Introduction:

- Pregnancy is a stressful physiological condition and it has been associated with oxidative stress injury.
- Several complications have been linked with oxidative stress during pregnancy
- Preeclampsia
- Intrauterine growth retardation
- Intrauterine foetal death
- Perinatal death
- Weight gain during pregnancy is one of the key factor in accessing the newborn weight.
- Improper weight gain leads to increase oxidative stress injury.
- Oxidative stress occurs when there is an imbalance in oxidant (free radical) and antioxidant.
- The attack of free radicals on membrane lipid starts a chain of reactions that has malondialdehyde (MDA) as one of the intermediate products.
- Antioxidants produced in the body are Glutathione peroxidase, superoxide dismutase, vitamins as well as uric acid. They counteract with free radicals (MDA).
- Measuring MDA will access the effect of oxidative stress in the new born, thus evaluating the effect of oxidative stress in the new born and their birth weight.

Aims & Objectives:

1. To measure birth weight of newborns
2. To measure oxidative stress (MDA) in newborns
3. To establish correlation between oxidative stress (MDA) and birth weight of newborn

Materials & Method

- Study Place: Department of Biochemistry and Department of Obstetrics and Gynaecology, S.M.S. Medical College and attached hospitals, Jaipur Rajasthan
- Sample Size: 50
- The newborns were divided into 2 groups on the basis of their birth weight
- A) Group I : Birth weight ≤2.5 kg
- B) Group II : Birth Weight >2.5 kg
- Type of Study: Observational Study
- Study design: Hospital based cross sectional study
- Ethical clearance was taken from ethical committee and Research review board of S.M.S. Medical college, Jaipur

Inclusion & Exclusion Criteria

Inclusion Criteria

- Full term Normal Vaginal Delivered new born

Exclusion Criteria

- Chronic illness of pregnant women – Hypertension and Diabetes
- History of Smoking
- Preeclampsia

Sample Collection

- Samples were collected by heel prick method and was centrifuged to obtain plasma and serum
- Sample was tested for routine investigation (CBC, Urea, Creatinine) and MDA

Estimation of MDA

- Plasma MDA was measured using method by Buege et al (1978).
- Principle: Malondialdehyde in the plasma reacts with thiobarbituric acid (TBA) in acidic medium to form a pink colour complex. It was measured spectrophotometrically.

Results

- The mean average birth weight of the newborns was 2.8 ± 1.2 (1.5 kg – 3.7kg).
- The age of the pregnant women ranges from 19 – 34 years

Table 1: Variables and its Mean values

Parameters	Mean ± SD
Age of Pregnant Women	26.61 ± 7.19 vrs (19-34)
Birth weight of new born	2.8 ± 1.2 kg (1.5-3.7)

Table 2: Biochemical parameters and its Mean values

Parameters	Mean ± SD
Hb (gm%)	17.2 ± 1.34
Urea (mg/dl)	6.32 ± 1.22
Creatinine (mg/dl)	0.65 ± 0.23
Uric Acid (mg/dl)	0.22 ± 0.09
Total Bilirubin (mg/dl)	6.98 ± 1.76

- The newborns were divided into two groups on the basis of their birth weight
- Group I ≤ 2.5 kg (n = 16)
- Group II >2.5 kg (n = 34)

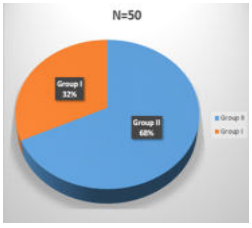


Table 4: Correlation of Birth Weight & Biochemical Parameters

Variables	Group I (≤ 2.5kg)	Group II (> 2.5kg)
HB (gm%)	16.2 ± 0.13	17.56 ± 0.45
Urea (mg/dl)	13.43 ± 1.32	15.45 ± 1.23
Creatinine (mg/dl)	0.71 ± 0.09	0.64 ± 0.16
Uric Acid (mg/dl)	0.18 ± 0.11	0.27 ± 0.25
Total Bilirubin (mg/dl)	7.32 ± 0.34	7.11 ± 0.42

Table 5: MDA and its Mean values

Oxidative stress	Mean ± SD
MDA (µmol/l)	6.34 ± 1.8 µmol/l (5.24 – 10.44)

The mean MDA was 6.34 µmol/l ranging from 5.24 to 10.44

Table 6: Correlation of Birth Weight & MDA

Birth Weight	MDA
	Mean ± SD
Group I (≤ 2.5kg)	8.48 ± 2.35 µmol/l
Group II (>2.5 kg)	6.87 ± 1.75 µmol/l

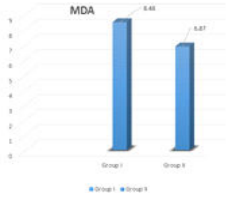
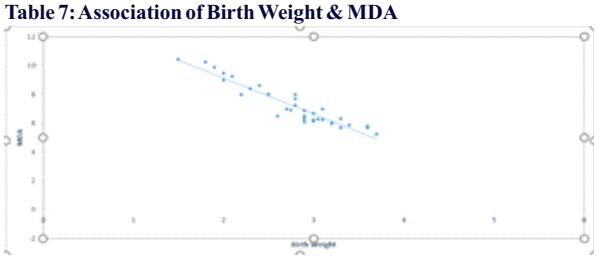


Table 7: Association of Birth Weight & MDA



Parameters	Group I (≤ 2.5kg) (n=16)		Group II (> 2.5kg) (n=34)		Student 't' test	
	Mean	SD	Mean	SD	't'	'p'
MDA (µmol/l)	8.48	2.35	6.87	1.75	-0.094	0.042

Mean MDA values in group I was higher as compared to Group II and it was found to be statistically significant

Discussion

- Oxidative stress has been observed to be increasing as pregnancy advances. Similar findings of increasing oxidative stress as the pregnancy advances have been studied by Idogun et al and Luqman et al in 2008.
- Age of mother also affects the oxidative stress increases and this has been studied by Clarissa et al in 2013
- A study done by Calderon et al in 2008 showed that newborn born via caesarian section generally have less oxidative stress as compared to normal vaginal delivery. This is probably due to stress of labor and time taken during delivery
- Whenever there is an active insult, the value of oxidative stress markers overtakes the antioxidants leading to development of oxidative injury
- Free radicals like reactive oxygen species when they attack, cellular polyunsaturated membrane lipid, a stepwise reaction comes into play.
- These set of dangerous reactions go on until when antioxidant defense comes into play.
- In this study we found that low birth weight of the newborn shows negative correlation with MDA i.e. oxidative stress. Low birth weight baby might have suffered more oxidative stress than normal birth weight baby. This was supported by the study done by Dolope et al in 2013

Conclusion

- Birth weight of the newborn is negatively associated with oxidative stress.
- Measuring baby's birth weight along with other clinical features (related to IUGR) may arise suspicion of oxidative stress.
- Supplement of antioxidants may be more considered in babies with low birth weight

Limitations

- Low sample size
- Incorporation of more parameters related to oxidative stress

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