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Original Research Paper

Correlation of Cord Blood Malondialdehyde With Birth Weight and Placental Weight in Newborns

Medical Sciences

KEYWORDS : Malondialdehyde (MDA), Oxidative stress.

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ABSTRACT

Background: Oxidative stress injury has been linked with some clinical conditions in newborn. Measuring placental and birth weight along with other features may help in predicting likelihood of oxidative stress injury,babies have suffered. Lipid peroxides are unstable indicators of oxidative stress in cells that decompose to form more complex and reactive compounds such as Malondialdehyde(MDA) bi-product of lipid peroxidation.
Aim : To measure birth weight and placental weight of new born babies as well as determining cord blood malondialdehyde levels (product of oxidant injury).
Methods: Seventy two term newborns were recruited into the study. Their birth weight and placental weight are recorded and serum cord blood was used for the determination of MDA and uric acid. MDA levels were measured using ELISA Kit.
Results: There were positive correlations between placental weight and uric acid and between birth weight and uric acid. There were significant negative correlations between placental weight and MDA.
Conclusion:The weight of the placenta is negatively correlated with cord blood MDA.

INTRODUCTION

Pregnancy is a stressful physiological condition and it has been associated with oxidative stress injury.[1,2]Oxidative stress in pregnancy has been linked with some complications like preeclampsia [3,4] intrauterine growth retardation [5,6]. With all that have been said in the literatures about oxidative stress injury, it cannot still be readily measured in our day-to-day practice. The search for readily measured parameters may help in predicting oxidative stress injury.

Weight of the baby and the placental weight are measured almost immediately after birth. Pregnant women gain weight appropriately as the pregnancy advances and one of the contributory factors is the growth of the baby. Inability of pregnant women to gain weight appropriately has been associated with an increase in oxidative stress injury[6].

However,its reported that increasing product of free radical injury, in women who significantly gained weight during pregnancy[7]. Oxidative stress occurs when there is an imbalance in oxidant (free radical) and antioxidant in excess of oxidant. The attack of free radicals on membrane lipid starts a chain of reactions that has malondialdehyde(MDA) as one of the intermediate products[8]. This is being measured widely to show the evidence of oxidant (free radical injury) in biological samples. Uric acid is one of the antioxidants expected to counteract the effects of free radical injury. In view of what has been said in the literatures concerning oxidative stress injury and its difficulty in measurement from biological samples in our day-to-day practice, this study was designed to correlate the product of free radical injury (MDA) and uric acid (UA) with placental weight and birth weight.

MATERIALS AND METHODS

Study type, site and population

It was a prospective study and site was labour wards of A J Institute of medical sciences where 72 term newborn babies were recruited into the study. Each mother was certified of not being a known hypertensive, diabetic, active smokers and none had preeclampsia. Those babies with obvious congenital malformations were excluded.

Ethical clearance was taken from ethical and research committee of A J Institute of medical sciences Mangalore.

Sample collection and processing

The umbilical cord blood is collected immediately from the newborn in the delivery room or OT after delivery.5 ml specimen of cord blood was collected in sterile URICOSOL container. The blood samples were kept at 4°C and transferred to Central lab, AJ hospital Mangalore for further analysis. Samples are centrifuged and 500 micro lits of serum was extracted. Serum Uric acid levels was immediately assessed and the rest of the extracted serum was stored in aliquots at -30°C in the Central Lab for the assessment of MDA by ELISA .Baby and placenta were also weighed in kilograms immediately after delivery

Biochemical Analysis

The OxiSelect™ MDA Adduct ELISA Kit is an enzyme immunoassay developed for rapid detection and quantitation of MDA-protein adducts. The quantity of MDA adduct in protein samples is determined by comparing its absorbance with that of a known MDA-BSA standard curve. The absorbance of each well is read on a microplate reader using 450 nm as the primary wave length. The kit has detection sensitivity limit of 2 pmol/mg MDA adduct.

Statistical Analysis

Statistical analysis was done by the aid of SPSS. Correlation analysis was performed using Pearson's correlation coefficient (r). P-value <0.05 was regarded as significant.

RESULTS

The age of all the pregnant women was between 18 and 32 years. They all delivered at gestational age of between 37 and 40 weeks. The mean average weight of placenta was 454gms and that of birth weight was 2823gms. Mean values of malondialdehyde (MDA) and uric acid were 0.818pmol/mg and 3.567mmol/l respectively. All these are shown in table 1

Table 2 grouped subjects in their various ranges of measured variables. Subjects with birth weight less than 2500gms had mean serum MDA was 1.035pmol/mgand uric acid was 3.572mmol/l. Those subjects that had birth weight to be 2500gms-3500gms were found to have mean serum MDA to be 0.318pmol/mg, uric acid to be 3.47mmol/l. Similarly those subjects that had birth weight

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greater than 3500gms were observed to have mean plasma values of MDA to be 3.05pmol/mg, uric acid to be 4.1mmol/l. Similar trend was observed when different ranges of placenta weight was related to mean values of biochemical parameters.

Table 3 showed correlation among the measured variables. There were positive correlations between placenta weight and birth weight (r=0.9544;p<0.00001), between placenta weight and Uric acid (r=0.052;p>0.05), between birth weight and Uric acid (r=0.132;p>0.05). Furthermore, there were negative correlations between placental weight (<350gms) and MDA(r= -0.005;p>0.05).

DISCUSSION

All subjects were born at term. This has helped to exclude the effect of gestational age, leading to oxidative stress. Oxidative stress has been observed to be increasing as pregnancy advances [9] The age range of mothers of recruited babies were also considered, none was above 40years. Thus the effect of ageing on our selected biochemical parameters was also removed[10].Oxidative stress in babies develops the same way it develops in adult. This is as a result of generation of free radical in excess of the available antioxidants. 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 defence comes into play. Majority of available and infact widely studied antioxidants stop the damaging effect of reactive oxygen species [11,12] . This study considered the measurement of plasma malondialdehyde to access the extent of free radical injury (lipid peroxidation). Plasma uric acid was also measured to show newborn antioxidant capacity. All these were correlated with placenta and birth weight. The positive correlation of placental and baby weight to uric acid as well as negative correlation of low placental weight with MDA observed in this study in turn shows negative correlation with oxidative stress. That is, small for gestational age and large for gestational age babies might have suffered more oxidative stress than normal birth weight baby. The report of this finding is scarce in the literature.. Also, it has been observed that newborn baby suffers some oxidative stress[13,14]This was also observed in our study.

Table 2 divides placenta and baby weight into different categories and the corresponding mean plasma biochemical parameters were obtained. With decreasing weight of the baby less than 2500gmsor increasing weight above 3500gms as well as decrease in placenta weight less than 350gms or increase that is more than 600gms were corresponding to increase in serum malondialdehyde . A hypothesis may be formulated that theincreased placental weight and baby weight are directly proportional and decreased placental weight and baby weight are indirectly proportional to oxidative stress.

CONCLUSION

The birth weight of the baby in case of low birth weight babies well as their placental weight is negatively correlated with cord blood oxidative stress. Low birth weight babies and large for gestational age babies have more oxidative stress than babies with normal birth weight. Measuring baby's birth weight and placenta weight along with other clinical features may compliment suspicion of oxidative stress. Antioxidant supplement may be more considered in babies with low birth weight.

Table-1. Mean of Variables

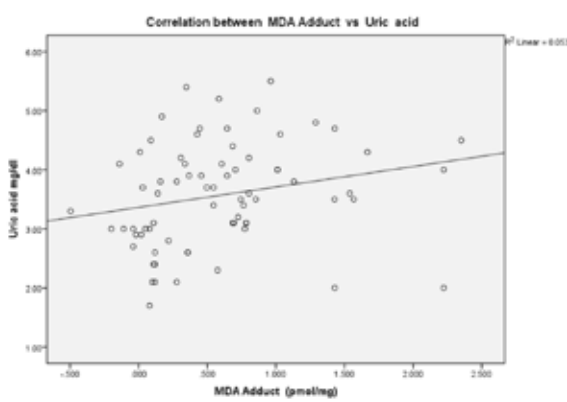
Variables	Mean
Placenta weight	454 gms
Birth weight	2823 gms
MDA	0.818pmol/mg
Uric acid	3.567mmol/L

Table -2 Birth weight and placenta weight with mean MDA and Uric Acid

Birth weight/gms	Mean MDA/ pmol/mg	Mean Uric Acid/ mmol/l
<2500	1.035	3.57
2500-3500 >3500	0.318 3.05	3.47 4.1
Placenta weight/gms	Mean MDA/ pmol/mg	Mean Uric Acid/ mmol/l
<350	1.290	3.49
350-500	0.425	3.49
>500	0.961	3.68

Table-3 Correlations among Variables

	Placenta weight/ gms	Birth weight/ gms	MDA pmol/mg	Uric acid/ mmol/l
Placenta weight/ gms	1	r=0.9544 p<0.00001	r=-0.0047 p 0.966	r=0.0516 p 0.666
Birth weight/ gms	r=0.9544 p<0.00001	1	r=0.1146 p 0.337	r=0.1328 p 0.266
MDA pmol/mg	r=-0.0047 p 0.966	r=0.1146 p 0.337	1	r=0.1705 p 0.152
Uric acid/ mmol/l	r=0.0516 p 0.666	r=0.1328 p 0.266	r=0.1705 p 0.152	1



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