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ABSTRACT
Low birth weight babies (LBW) are a source of genuine concern and worry not only to clinicians but also to society at large. Developing countries like India suffer from a huge burden of malnourished mothers with numerous complications like preterm labour, small for date and pre-term babies. Nutritional factors are implicated in the pathogenesis of low birth weight babies. This study aims to evaluate association between important microelements like magnesium, zinc with low birth weight of infants. In this study we found that Magnesium and Zine level was significantly low in TLBW infants when compared to TNBW infants, p value <0.005. We found a strong positive correlation between cord blood magnesium level (r= 0.369, p < 0.005) with the birth weight of term babies. There was a positive but weak correlation between cord blood zinc level and birth weight (r=0.178, p = 0.077). These findings suggest that zinc and magnesium have a significant impact on the growth and development of foetus and on the action of anabolic hormones. It also indicates that lower level of Mg, Zn hamper the growth and development of foetus. These findings can hypothesize that lower zinc and magnesium level, which can indicate maternal malnutrition and which can cause impairment in the action of the anabolic hormone, insulin and thus contributes to low birth weight.

Introduction:
The term low birth weight (LBW) infants include those infants whose birth weight is less or equal to 2500g (1). It may be either small for gestational age (SGA) or preterm. Low birth weight leads to neonatal morbidity, subsequent retardation of growth and development and also early onset of adulthood disease and mortality (2). India alone accounts for 40 percent of the incidence of low birth weight babies in the developing world. In Indian population, about 26.6% of total delivery occur as low birth weight babies and may represent an important predisposing factor for type 2 diabetes (T2D) and the metabolic syndrome later in life (3, 4). Although there are several factors for low birth weight, but proper diet and nutritional care of mothers along with adequate rest during pregnancy are most important among them (5). Magnesium deficiency in pregnant mother frequently occurs because of inadequate or low intake of magnesium. Magnesium deficiency during pregnancy can induce not only maternal and fetal nutritional problems at birth but also consequences like diabetes, obesity, hypertension, hypertriglyceridemia in the growth of infant during and/or after pregnancy and metabolism of infant or newborn. Abnormal serum Zn concentrations in pregnant women have been associated with a number of maternal and foetal complications which includes low birth weight, adverse outcomes of pregnancy and increased risk of infections during (10-13). Zinc participates in metabolic pathways (14). This element has an important role in the action of anabolic hormones (7-9).

Zinc, is an essential micro element, a component of many enzymes, needed for the growth of infant during and/or after pregnancy and metabolism of infant or mother. Abnormal serum Zn concentrations in pregnant women have been associated with a number of maternal and foetal complications which includes low birth weight, adverse outcomes of pregnancy and increased risk of infections during (10-13). Zinc participates in metabolic pathways (14). This element has an important role in the action of anabolic hormones (7-9).

Can Zinc and Magnesium Deficiency Lead to Low Birth Weight?

STUDY DESIGN AND SAMPLE SIZE
This study was a non-interventional, observational, hospital based study. 50 healthy term infants, whose body weight was more than 2500gm, were taken in the control group and 50 term infants having birth weight 2500 gm or less were taken in the case group.

As the participants attend the hospital OPD from a large rural base, they were expected to have approximately similar ethnicity, socioeconomic status and dietary habits.

The study followed the guidelines of the Helsinki declaration of 2009 (22) and was approved by the Institutional Ethics Committee. Informed consent was taken from every subject.

SAMPLE COLLECTION AND STORAGE
Umbilical cord blood samples from all of the subjects (cases and controls) were collected in 2 vials (fluoride-oxalate tube and plain tube). Blood in the fluoride-oxalate tube was used for the estimation of glucose while blood in plain tube was allowed to clot and serum was separated by centrifugation at 2500 rpm for 5 min at 4°C for the estimation of insulin, zinc and magnesium. Serum samples for the measurement of insulin were stored at −20°C till estimation. Samples were thawed to room temperature before every assay, and repeated thaw was avoided.

ESTIMATION OF TEST PARAMETERS:
ESTIMATION OF FASTING BLOOD GLUCOSE:
Quantitative estimation of blood glucose was done by Glucose oxidase / Peroxidase method (23) from the separated plasma by using the autoanalyzer ERBA XL 600. Internal quality control was performed simultaneously. All test reagents are supplied by Span Diagnostics Ltd, India and the quality control materials (Level 1 and 2) were supplied by Bio-Rad laboratories, USA.

ESTIMATION OF SERUM MAGNESIUM:
Principle: Magnesium ions react with Calmagite in alkaline medium to produce a red complex that was measured photometrically at 532 nm. The intensity of color produced is directly proportional to magnesium concentration (24).

ESTIMATION OF SERUM ZINC:
Principle: Serum zinc was estimated by Nitro-PAPS (pyridylazo-N-propyl-N-sulfopropylamino-Phenol) method. The intensity of color was measured photometrically at 570 nm which is directly proportional to zinc concentration (25).

STATISTICAL CALCULATIONS:
Pearson’s bivariate correlation study was performed for any correlation between the parameters within a group. Student’s ‘t’ test is used to compare means between two groups. Significance was considered at 95% confidence interval (p<0.05) for all statistical analysis. All statistical analyses were done using SPSS software v16.0 for Windows.

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CONCLUSION: The associations derived from this study indicate that lower levels of Zinc and Magnesium can indicate maternal malnutrition. They are contributory to the hampered growth of the fetus. This may be one reason for the causation of low birth weight and subsequent complications. Prospective studies with large sample population are necessary to confirm the findings of this study for better understanding of the pathogenesis of low birth weight and to understand if zinc and magnesium supplementation can prevent intrauterine growth retardation, and to open more avenues for study and management and prevention of low birth weight.

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CONFLICT OF INTEREST: None

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