**Role of Zinc in Intrauterine Growth Retardation (IUGR)**

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**Introduction**

IUGR has great significance as it has ramifications on maternal health, fetal well-being, neonatal problem and long term infant sequelae. Each year 30 million infants in the developing world are born with IUGR, leading to low weight at birth. It is hence important that IUGR should be recognized earlier, the underlying maternal fetal condition should be treated vigorously and it should be ensured that the neonate is not only born alive but also born in good condition. Of the different methods of management of these features, the zinc has got some roles in presenting the development of fetal growth retardation and continuing to maintain the well being of these fetuses.

**Definition**

The most common definition of IUGR is the weight of the fetus below 10th percentile for gestational age or a birth weight 2nd standard deviation below the mean for gestational age.

Ponderal index is used to identify a neonate who has loss of subcutaneous tissue and muscle mass even though the birth weight is normal for gestation age.

\[ P.I. = \text{Birth weight} \times 100(\text{crown heel length}) \]

A Ponderal index below the 10th percentile indicates IUGR.

**Incidence**

IUGR affecting 3% to 7% of all deliveries.

**Associated mortality and morbidity**

Fetal growth retardation is one of the 3 major causes of perinatal death. Associated morbidity are birth asphyxia, neonatal hypoglycemia, hypocalcaemia, polycythemia, meconium aspiration and persistent fetal circulation.

**Risk factors of intrauterine growth retardation**

- **Maternal Risk Factors**
  - Anemia, malnutrition, chronic hypertension, cyanotic heart disease, pregnancy induced hypertension, diabetesmellitus with vasculopathy, alcohol, smoking.

- **Fetal risk factors**
  - Genetic disorders, chromosomal abnormalities, congenital anomalies,

- **Fetal infections uteroplacental risk factors**
  - Pre eclamsia (PE), placental abruption.

**Types of IUGR**

- **Symmetrical IUGR (20% to 30%)**
  - Decreased growth potential, early in gestation, fetus is proportionally small, all biometry is below the 10th percentile for gestational age, ponderal index is normal.

- **Asymmetrical IUGR (70% to 80%)**
  - Restricted growth usually occurs after 28 weeks, head growth remains normal while abdominal growth slows down, low ponderal index.

**Diagnosis**

To make the diagnosis the gestational age needs to be known with the greatest possible accuracy.

**Clinically**

The superficial fundal height (SFH) is used as a gross screening method for IUGR. Uterine size < dates using a cutoff of > 3cm discrepancy detect at best 30% of affected pregnancy. The presence of oligohydramnios is useful in detecting frank IUGR.

**Ultrasonogram findings**

Placental grade - At term only 20% of placentas are classified as grade 3, and it increases to 45% by 42 weeks. The appearance of this grade 3
placenta prior to 35 weeks has a positive predictive value 59% of IUGR. Other USG findings suggestive of IUGR are elevated FL/AC, small BPD, low estimated fetal weight, decreased amniotic fluid volume and elevated HC/AC.

**Doppler blood flow studies**
Serial umbilical and uterine blood flow studies are more useful in predicting IUGR. The pulsatility index (PI) is defined as the systolic velocity/diastolic velocity or S:D ratio. The S:D ratio normally decreases with gestational age. But in IUGR, PI increases. In IUGR there are also decreased diastolic velocity flow and this flow may also be reversed.

**Management**
Once the IUGR fetus is detected, the pregnancy should be monitored clinically, by regular USG and CTG and if possible by a serial Doppler blood flow studies of uterine and umbilical arteries.

Delivery is advised once the maturity is reached.

**Role of Zinc**
Zinc is involved in more than 300 enzymes and acts a stabilizer in molecular structure of the subcellular constituents and membranes. Zinc participates in the synthesis and degradation of carbohydrates, lipids, proteins and nucleic acids. It also plays an essential role in the process of genetic expressions.

Fetal growth normally occurs in three phases. In phase-I there is only cellular hyperplasia, and this phase lasts up to 16th weeks of gestation. In phase-II there are both hyperplasia and hypertrophy of cells, and this continues up to 32 weeks. In phase-III there is only hypertrophy and it continues till term.

Zinc deficiency leads to failure of these cells to divide and subsequently impairment of growth occurs. Moreover zinc is essential for normal embryonic development. Deficiency results in malformations of the brain, eyes, bones, heart and other organs. The survival of embryo is placed at risk when zinc intake is reduced even for a period of days particularly in the first trimester.3

It has been well known that zinc deficiency in pregnant woman cause fetal growth retardation. Kirksey et al revealed a significant correlation between maternal plasma zinc conc. measured at midpregnancy and birth weight.4 Negger et al reported that the prevalence of low birth weight infants was significantly higher (eight times) among women with serum zinc conc. in the lowest quartile in early pregnancy, independent of other risk factors.

An estimated distribution of zinc required by a woman to meet their normal needs during pregnancy of 11.5 ± 1.75 mg/d (based on the US RDA) it can be estimated that 82% of pregnant women worldwide likely to have inadequate intakes of zinc.5

From the above point of view the zinc is therefore essential not only for normal embryonic development but also for normal growth of the fetus.

**References**
1. JAEA Bulletin 43/3/2001
3. Harrison's P491