

Knowledge of Epigenesis of Obesity for its Primary Prevention

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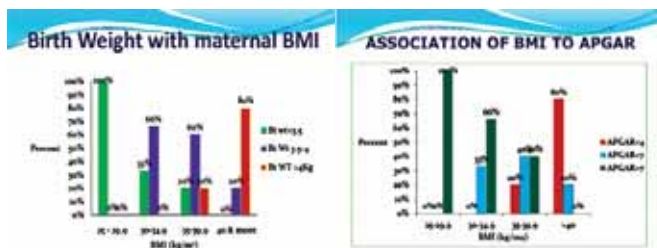
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Abstract: The incidence of obesity and overweight has doubled in the West same trend exist in the East. 'Developmental Origins of Adult Health and Disease' says that maternal obesity and fetal metabolic programming is a fertile epigenetic soil for obesity. Obesity is prevented by altering metabolic distribution from occurring in the intra uterine environment. This is simply achievable if the diet of every pregnant woman is adapted in the pre pregnancy / early pregnancy stage, and weight gain in pregnancy is controlled, preventing occurrence of GDM

The incidence of obesity and overweight has almost doubled in Western societies and the trend is mirrored in Eastern nations. The 'fetal origins' hypothesis, first proposed by Barker termed the 'Developmental Origins of Adult Health and Disease' (DOHaD), states that exposure to an unfavourable environment during development, programmes changes in fetus such that the individual is then at greater risk of developing lifestyle diseases.

Thus maternal obesity and fetal metabolic programming is a fertile epigenetic soil for obesity. Infants born to obese, overweight, and diabetic mothers, even when normal weight, has increased adiposity and are at increased risk of later metabolic disease. The usual increase in insulin resistance seen in late pregnancy is enhanced in obese mothers, causing marked postprandial increases in glucose, lipids, and amino acids and excessive fetal exposure to fuel sources, which in turn increases fetal size, fat stores, and risk for diseases. (Legend 1)

In a longitudinal study of women with GDM, it was noted that obesity was an added risk for complications and poorer outcome for the fetus. The women entered the study at diagnosis of GDM as per protocol testing in the antenatal clinic. BMI was calculated and groups divided on its basis. Glycaemic control was achieved by diet alone or diet and insulin as needed. If control was not satisfactory, the case was excluded from the study. The pregnancy was followed up till delivery, the mode of delivery and fetal outcome were noted. It was seen that the outcome measured by lower APGAR score, macrosomia, and neonatal ICU admission were all directly proportional to the maternal BMI even when the glycaemia was controlled. This proves that obesity is an independent risk factor for complications, macrosomia and future obesity¹.(Legend 2)



Legend 1: Birth Weight and Maternal BMI

Legend 2: Association of BMI to APGAR scores

Impaired glucose tolerance, gestational diabetes, and hyperlipidemia are more common among obese mothers. Maternal obesity also intensifies the insulin resistance and probably exaggerates the metabolic abnormalities attending GDM that impact on fetal growth and development³. It has been reported in other studies that there is a significant increase in fat mass, percent body fat and skin fold measures in the infants of the mothers with GDM as compared with infants of women with NGT even in AGA neonates. Interestingly, the fat-free mass in the infants of the mothers with GDM was significantly less compared with the infants in the NGT group. Similar results were obtained when they limited the analysis to only LGA neonates².

Another review summarizes evidence that the intrauterine environment influences

the risk of later obesity and considers the mechanisms by which this may occur. The association between birth weight and adult weight suggests that there are enduring effects of the intrauterine environment on later obesity risk⁴. All potential mechanisms involve an altered transfer of metabolic substrates between mother and fetus, which may influence the developing structure or function of the organs involved in energy metabolism^{5,6}. In addition to maternal glucose, hyperlipidemia and inflammation may contribute to the childhood obesity epidemic through fetal metabolic programming, the mechanisms of which are still under study⁷.

There is hope for the future in that the studies of women with impaired glucose tolerance show that replacing refined carbohydrates and saturated fat with complex, low-glycemic carbohydrates and polyunsaturated fatty acids improves metabolic homeostasis and pregnancy outcomes. Also large maternal weight loss from obesity surgery prevents transmission of obesity to children even when followed for 2 to 18 years. These studies also show that maternal obesity is the direct cause of obesity in the offspring by epigenesis.

What is the way forward for Primary Prevention of Obesity? The answer lies in preventing the above mentioned metabolic programming from occurring in the intra uterine environment. This is so simply achievable if the diet of every pregnant woman is adapted in the pre pregnancy or early pregnancy stage. Our Data on Universal Screening for GDM(DIPSI) shows (Ongoing study in 2012 – Data from 6 months) the incidence of GDM as 23.33%, higher than Seshiah et al in 2004. But the type of control was diet alone in 90.47% and diet and insulin in only 09.52% There is an interesting finding that there were no babies above 4 Kg, in the study group, though there were 2 birth asphyxia, 1 shoulder dystocia, and 1 IUFD, whereas we picked up macrosomia (0.09%) in the non GDM, obese women who delivered in the study period. The only difference being strict diet followed by the study group, closely monitored by the clinicians, where as the obese women were given one instruction in the first visit and when found to be non GDM, they were not followed up. This pointed out the importance of weight control in pregnancy for prevention of future obesity, by preventing the process of macrosomia.

The need of the hour is to sensitise the population to this factor, especially at the beginning of pregnancy, antenatal check up calculation of the BMI has become an essential step at the first. Incidence of GDM is almost equal to that of anaemia, and the outcome of the pregnancy is endangered as much or more by obesity as by anaemia.

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