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Perinatal Programming of the 'Thin-Fat Baby'

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India has the largest number of diabetic patients in any one country and is called the world's capital of diabetes. It is also the country with largest number of undernourished children, and contributes to more than 2/3rds of low birth weight babies in the world. Indians get diabetes at a younger age and at a lower BMI compared to Europeans, which is partly explained by higher adiposity (body fat percent) and higher central adiposity (abdominal-visceral fat) of the Indians (the 'thin-fat' Indian). The Pune Maternal Nutrition Study demonstrated that the 'thin-fat' body composition originates in utero, and that it is linked to maternal nutrition, metabolism and other environmental factors. Low vitamin B12 status and high folate status (due to vegetarian food habits and supplementation by obstetricians) predicted higher adiposity and insulin resistance in the child. Urban Indian mothers seem to suffer from a double burden: as yet uncorrected, predominantly micronutrient undernutrition side by side with rapidly increasing prevalence of gestational diabetes, which both cooperate in influencing adverse fetal programming ('Dual Teratogenesis'). In addition to (as yet unidentified) genetic factors, epigenetic changes involving methylation of the genome may underpin fetal programming. A woman's position in the society is an important determinant.

In a randomized controlled trial we found that physiological doses of vitamin B12 given for 12 months in 9-year-old children reduced plasma total homocysteine concentrations, but did not affect body composition, neuro-cognitive function or metabolic parameters. This suggests that intrauterine programming may be difficult to reverse in a short period in post-natal life, and that pre- and peri-conceptional windows of opportunity should be investigated to influence diabetes susceptibility.

Tackling the epidemic will require a 'life-cycle' approach and given the intergenerational influences it may take a few generations to reduce the susceptibility to type 2 diabetes.

References

1. Yajnik CS, Fall CHD, Coyaji KJ, Hirve SS, Rao S, Barker DJP, Joglekar C, Kellingray S. Neonatal anthropometry: The thin-fat Indian baby, The Pune Maternal Nutrition Study. International Journal of Obesity 2003; 26:173-180.

2. Yajnik CS, Deshpande SS, Jackson AA, Refsum H, Rao S, Fisher D, Bhat DS, Naik SS, Coyaji KJ, Joglekar CV, Joshi N, Lubree HG, Deshpande VU, Rege SDS, Fall CHD. Vitamin B12 and folate concentrations during pregnancy and insulin resistance in the offspring: The Pune Maternal Nutrition Study. Diabetologia 2008; 51:29-38.

3. Yajnik CS. Nutrient-mediated teratogenesis and fuel-mediated teratogenesis: Two pathways of intrauterine programming of diabetes. International Journal of Gynecology and Obstetrics 104 (2009) S27–S31.

4. YajnikCS, Deshmukh US. Intrauterine programming of diabetes. Current medical literature, 2009;26:61-71.

*** Yajnik CS, Deshmukh US, Early life origins of diabetes and obesity. In: Plagemann A, editor. Perinatal programming – The State of the Art. Berlin: Walter de Gruyter, 2011.**

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