EDITORIAL

Size at Birth and Later "Metabesity"

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Metabolic syndrome, often used synonymously with Syndrome X or Insulin resistance syndrome, is a constellation of risk factors that predisposes to an enhanced risk of Type 2 diabetes and cardiovascular disease [1]. The clustering of atleast three of five risk factors – elevated blood pressure, elevated fasting plasma glucose, high triglycerides, low HDL-cholesterol and increased waist circumference – have been variously described to constitute the metabolic syndrome. The International Diabetes Federation [2], revised National Cholesterol Education Program (NCEP-ATP III) [3] and WHO [4] have different diagnostic criteria, and this necessitated guidelines for a harmonized definition, accounting for ethnic differences in adiposity and metabolic risk [5].

The pathways to developing metabolic syndrome have been researched over the last few decades in different populations [6–9]. The role of size at birth and later disease proposed by Prof. David Barker stimulated research that has now established this link for a number of adult diseases and risk factors, including those that constitute the metabolic syndrome [10]. However, increasingly, birth weight was seen as a proxy measure, as the earlier intrauterine growth trajectory and the factors that influence this were seen as important factors too. Maternal pre-pregnancy nutrition and nutrition during pregnancy can cause significant changes in fetal structure, growth and metabolism that set the stage for future disease risk. Classical studies like the Dutch Hunger Winter have established the role of even the time during gestation when maternal nutrition has differing and lasting impacts on later life disease in their offspring [11]. Again, other studies have focused on gestational diabetes mellitus and greater maternal pre-pregnancy body mass index (BMI), both alone or in combination interacting to result in fetal macrosomia [12]. More recent studies both in animals and humans show that maternal nutritional status affects pancreatic beta-cell size and function which causes early changes that predispose to altered glucose and fat metabolism in the next generation [13].

Subsequent years saw the progress from use of birth size measurements to postnatal size and growth patterns during infancy and childhood as implicating factors in predisposition to adult cardiometabolic disease. Studies from both developed and developing countries established that a small size at birth, lower infant anthropometric measurements and consequent accelerated growth patterns in childhood, were in combination most predictive of a poor cardiometabolic risk profile in adulthood. In particular, studies that had serial measurements of length/height, weight and BMI from birth, through childhood, adolescence and adulthood were able to clearly exemplify that lower birth size, thinner infants, early age of peaking BMI and adiposity rebound (earliest age at which the BMI starts to climb in childhood) were important predictors of adult disease risk [14]. Those in the lowest category of size at birth and highest category of childhood BMI were more likely to be overweight/obese, have increased adiposity measures (whether measured by traditional methods of waist circumference or skinfold measurements or sophisticated methods of fat measurement using DEXA scans and MRI), impaired glucose tolerance, higher blood pressure and abnormal lipid measurements.

The study by Chaudhari, *et al.* [15], published in this issue of *Indian Pediatrics,* has prospectively followed low birth weight (LBW) infants to young adulthood and assessed their cardiometabolic risk profile at 22 years in comparison with children of normal birth weight. They used the IDF criteria to establish that the LBW group had greater prevalence of two risk factors as compared to normal weight infants, with hypertension being the first risk factor to appear. There was not enough evidence pointing to the presence of a minimum of three risk factors to define greater metabolic syndrome amongst the low birth weight group. However, the findings corroborate earlier evidence that being born small and

gaining rapidly in weight to fall in the higher weight categories in adulthood portends serious adverse disease risk, including the components of the metabolic syndrome.

What emerges from the above discussion is a clear need to move from only a developmental origins perspective to a life-course perspective in tackling the rising epidemic of "metabisity." Early life origins school of researchers had emphasized the importance of focusing on the prenatal and maternal pregnancy nutrition and socio-demographic factors to ensure delivery of healthy newborns. This stimulated policy changes and programs in different settings that included nutritional supplementation of the girl child and pregnant women to ensure that the health of future generations was protected. India's own flagship program of Integrated Child Development Services (ICDS) rolled out in the late 80's was a step in the right direction given the poor maternal nutrition and consequent infant morbidity and mortality statistics. Back then, it was crucial to arrest the vicious cycle of mothers with adverse nutritional environments giving birth to babies of lower birth weight, in turn vulnerable to a host of early childhood infections and higher childhood morbidity. However the epidemiological transition, coupled with a significant nutritional and environmental transition in recent decades, has led to the rapid emergence of lifestyle disorders including hypertension, diabetes, overweight and obesity with a significant proportion of younger individuals displaying a tendency to develop one or more risk factors. This calls for using a different lens to look at the programs and interventions that will encourage, enable and sensitize individuals to adopt a healthy lifestyle across their lifespan. This necessarily means presenting to policy makers the substantial evidence that we now have to push for effective and impactful programs that will help arrest the growing epidemic of metabolic risk and lifestyle-related disorders in India.

Funding: None; *Competing interests*: None stated.

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