Sania A, Spiegelman D, Rich-Edwars J, Hertzmark E, Mwiru RS, Kisenge R, Fawzi WW. **The contribution of preterm birth and intrauterine growth restriction to childhood undernutrition in Tanzania**. Maternal and Child Nutrition, 2014 April 10.

Introduction

Undernutrition, including stunting, underweight and wasting, is associated with an increased risk of mortality from infectious diseases and poorer cognitive and motor development outcomes in childhood. In 2009, 42% of children < 5 years of age in Tanzania were stunted (short-for-age), 17% were underweight, and 4% were wasted (1).

Compared to infants with normal birth weight, low birth weight (LBW) infants are at higher risk of stunting. The two underlying biological factors contributing to LBW – preterm birth and growth restriction during the prenatal period – have different etiologies, and therefore may have different relative contributions to child undernutrition in the post-natal period. However, there are limited data on gestational age-specific longitudinal growth patterns. Therefore, Sania *et al* (2) examined the growth trajectories of preterm and intrauterine growth restricted infants, and their association with stunting, underweight and wasting during the first 18 months of life in a cohort of infants in Dar es Salaam, Tanzania. This issue of NNA summarizes the findings recently published in *Maternal and Child Nutrition*.

Methods

The study was a longitudinal postnatal study of 6664 infants in Dar es Salaam, Tanzania, whose mothers were HIV-negative participants in a randomized, double-blind placebo controlled trial designed to evaluate the effects of maternal multiple micronutrient supplements on adverse pregnancy outcomes. Gestational age was calculated based on maternal report of last menstrual period and birth weight was recorded at the time of delivery. Birth weight and gestational age were used to classify children as either small for gestational age (SGA; birth weight < $10^{\%ile}$ for gestational week) or appropriate for gestational age (AGA; birth weight > $10^{\%ile}$ for gestational week) based on a US population-based standard of birth weight by gestational age (3). Preterm was defined as birth at less than 37 weeks of gestational age. Infants were then classified into one of four categories, based on birth weight and gestational age at birth: term-AGA (reference group), preterm-AGA, term-SGA and preterm-SGA.

From 1 – 18 months of age, infants' weight and length were assessed monthly. Length-for-age (LAZ), weight-for-age (WAZ), and weight-for-length (WLZ) z-scores were calculated using the 2006 World Health Organization Child Growth Standards. Stunting, underweight, and wasting were defined as z-scores < -2 SD for the aforementioned indicators, respectively.

Results and Conclusions

Among the 6664 infants, 14.4% were preterm and 5.6% of children had LBW. Using the above described categorization, 65.1% of infants in the birth cohort were term-AGA; of the remaining children, 13.8% were preterm-AGA, 20.5% were term-SGA and 0.6% were preterm-SGA. Infants who were born preterm-AGA, term-SGA and preterm-SGA weighed less and were significantly shorter than term-AGA infants at every time

point from birth to 18 months of age (with the exception of weight in preterm-AGA infants at 18 months). LAZ, WAZ and WHZ z-scores decreased among term-AGA, preterm-AGA and term-SGA infants from birth and 18 months; and the gaps in z-scores present at birth among groups remaining similar throughout the follow-up period. Preterm-SGA infants experienced some catch-up growth in the first 5 months after birth which led to increased z-scores at 18 months compared to birth; however, they had the lowest z-scores among all groups over the entire follow-up period.

Preterm-AGA and term-SGA infants were 2-3 times as likely as term-AGA infants to be stunted and underweight at 18 months of age. The magnitude of risk was slightly higher among term-SGA than preterm-AGA infants, suggesting that intra-uterine growth restriction has a greater impact than preterm birth on undernutrition during infancy. The relative risk of undernutrition at 18 months was very high in preterm-SGA infants, who were ~7.5 times more likely than term-AGA infants to be stunted and underweight. However, it has to be noted that this group comprised < 1% of the birth cohort.

Policy and Program Implications

The standard definition of LBW (< 2500 g) is often used to identify children at a high risk of stunting. However, based on the data from the present study, this definition identified only 5.6% of infants and failed to identify a large proportion of normal birth weight infants born either preterm-AGA or term-SGA who are also at high risk of growth faltering. By incorporating gestational age and birth weight for gestational age into routine newborn assessments, healthcare professionals in resource-limited settings could better identify infants at high risk of growth faltering. Although the programmatic implementation of both the assessment of birth weight and gestational age presents a challenge in areas of low-income countries, where attendance of antenatal care is low and home births are frequent.

Importantly, the results of these analyses indicate that a large proportion of malnutrition present at birth continues during infancy. Interventions such as prenatal multiple micronutrient supplementation and balanced protein energy supplementation during pregnancy have been shown to be efficacious in reducing SGA, and may reduce subsequent stunting and underweight among the infants and children of prenatally supplemented mothers.

NNA Editors comments

The results by Sania *et al*. (2) are supported by a meta-analysis by Christian *et al.* (4), which analyzed longitudinal data from 19 birth cohorts in low- and middle-income countries, and reported magnitudes of relative risk of stunting, wasting and underweight among those born SGA and/or pre-term which were similar to those observed in the present study.

The meta-analyses also confirmed that intra-uterine growth restriction and preterm birth had large impacts on undernutrition during infancy and young childhood. Christian *et al.* (4) estimated population attributable risk for childhood stunting for the risk categories of SGA and preterm birth and found that about 20% of childhood stunting could have its origins during the fetal period. Based on the strength of associations with stunting in the meta-analysis, it appears that SGA may have more severe long-term growth consequences than preterm birth. On the other hand, preterm birth was associated with a greater risk of neonatal mortality when compared with SGA (5).

Causes of childhood stunting are multifactorial. Nevertheless, these results highlight the importance of the 1,000 days approach in addressing childhood undernutrition. Adequate nutrition for both a mother and her

child during the 1,000 day period from conception until the child is two years of age could have an important impact on reducing the prevalence of stunting, underweight and wasting among infants and young children in resource-limited settings.

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Announcements

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A webinar related to this month's NNA:
Fetal growth restriction: nutritional determinants, consequences in childhood and interventions by Prof. Robert Black
http://webcast.ucdavis.edu/llnd/263bde60

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