Mid-upper arm circumference as a screening tool for identifying adolescents with thinness

Research snapshot[1]

Adolescence is a unique period of rapid growth and, when combined with household food insecurity, is also a period of an increased risk of under-nutrition. Failure to achieve optimal nutrition during adolescence may lead to delayed physical growth and sexual maturation and, for adolescent girls, increases the risk of giving birth to under-nourished infants. There is a need for a simple, reliable and accurate screening tool to identify undernutrition in this age group to underpin effective interventions. This cross-sectional study aimed to evaluate the performance of mid-upper-arm circumference (MUAC) as an alternative to the World Health Organization-recommended body mass index (BMI) z-score to identify thinness in the late adolescence period.

In a sample of 851 adolescents aged 15 to 19 years from 15 schools in Addis Ababa, Ethiopia, the study found that MUAC had a significant strong positive correlation with BMI z-score, r = 0.81 (95% CI 0.79, 0.84) but was poorly correlated with age, r = 0.15 (95% CI 0.08, 0.21). MUAC could identify thinness among adolescents with excellent discriminatory performance (area under the curve (AUC) 0.91). The optimum MUAC cut-off point to identify thinness was ≤23.3 cm for males (sensitivity: 87.9%; specificity: 75.9%), whereas the optimum MUAC cut-off point for females was ≤22.6 cm (sensitivity: 100%; specificity:

88.2%). Based on the proposed cut-off point for the total sample (≤23.3 cm), MUAC had a high negative predictive value (NPV) – among those adolescents who identified as non-thin by MUAC, 98.0% were non-thin by BMI Z-score – and lower positive predictive value (PPV) – among those adolescents identified as thin by MUAC, only 32.4% were thin by BMI Z-score.

This indicates that MUAC is a good indicator for ruling in and ruling out thinness among adolescents but that, due to the low PPV, a large number of adolescents would be incorrectly considered to be thin leading to unnecessary nutritional support, poor use of resources and an overburdened healthcare system. When used in a relatively well-nourished population, it would be necessary to choose a cut-off with a greater positive predictive value.

[1] Sisay, B., Haile, D., Hassen, H., & Gebreyesus, S. (2020). Mid-upper arm circumference as a screening tool for identifying adolescents with thinness. *Public Health Nutrition*, 1-10. doi:10.1017/S1368980020003869

Food systems for children and adolescents

Research snapshot[1]

Well-nourished children and adolescents are the foundation of thriving communities and nations. Undernutrition, in the form of stunting, wasting and micronutrient deficiencies, remains widespread among young children while overweight, obesity and diet-related non-communicable diseases are increasing rapidly among children and adolescents including in countries and regions where undernutrition is still prevalent. Recognising that food systems are essential to supporting diet quality among children and adolescents but that their nutritional needs are rarely prioritised in efforts to reorient food systems, the United Nations Children's Fund (UNICEF) and the Global Alliance for Improved Nutrition (GAIN) convened a 'Global consultation on food systems for children and adolescents' in November 2018 to identify priority actions for food systems and diet quality among children and adolescents. A special issue of 'Global Food Security' contains a series of 10 papers that were commissioned based on the priorities identified before and during the consultation.

Three papers describe the distinctive way that children and adolescents engage with the food system and how this influences their diets (Fox & Timmer, 2020), nutrition recommendations for the dietary intakes of children and adolescents (Hollis *et al.*, 2020) and what data is available on diet quality in low- and middle-income settings (Kupka *et al.*, 2020). These three papers indicate that children and adolescents require special attention in food system reorientations for improved diets and that, despite existing data gaps, there is evidence

that children's and adolescents' dietary intakes are sub-optimal compared to dietary recommendations. A further paper builds on this evidence to create a conceptual framework of food systems for the diets of children and adolescents – the 'Innocenti Framework' – that depicts drivers, determinants, influencers and interactions (Raza *et al.*, 2020) and another paper details specific actions to reorient food systems for improved diets in this age group (Hawkes *et al.*, 2020). These tools address important conceptual and practice gaps and create common analytical reference points for different stakeholders working on food systems and nutrition.
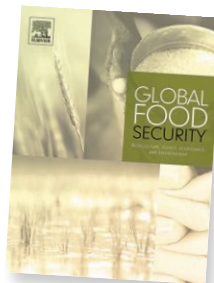
Reviews of evidence are included regarding how to improve food supply chains (Nordhagen, 2020), food environments (Downs & Demmler, 2020) and food behaviours (Tumilowicz & Pelto, 2020) – the key determinants of food systems outlined in the Innocenti Framework. Recognising the changing landscape of malnutrition, a review of evidence is included regarding the marketing of unhealthy, ultra-processed foods to children and adolescents, especially on digital platforms (Tatlow-Golden & Garde, 2020). A concluding paper presents the key implications for public policies and programmes with specific country-level illustrations (Morris *et al.*, 2020). This special issue will be useful for food system reorientations in support of improved diet quality among children and adolescents, as protecting the diets of children and adolescents has never been more urgent and relevant than now.

References

Downs, S., & Demmler, K. M. (2020). Food environment interventions targeting children and adolescents: A scoping review. *Global Food Security*, 27, 100403. doi:https://doi.org/10.1016/j.gfs.2020.100403

Fox, E. L., & Timmer, A. (2020). Children's and adolescents' characteristics and interactions with the food system. *Global Food Security*, 27, 100419. doi:https://doi.org/10.1016/j.gfs.2020.100419

Hawkes, C., Fox, E., Downs, S. M., Fanzo, J., & Neve, K. (2020). Child-centered food systems: Reorienting food systems towards healthy diets for children. *Global Food Security*, 27, 100414. doi:https://doi.org/10.1016/j.gfs.2020.100414

Hollis, J. L., Collins, C. E., DeClerck, F., Chai, L. K., McColl, K., & Demaio, A. R. (2020). Defining healthy and sustainable diets for infants, children and adolescents. *Global Food Security*, 27, 100401. doi:https://doi.org/10.1016/j.gfs.2020.100401

Kupka, R., Siekmans, K., & Beal, T. (2020). The diets of children: Overview of available data for children and

adolescents. *Global Food Security,* 27, 100442. doi:https://doi.org/10.1016/j.gfs.2020.100442

Morris, S. S., Barquera, S., Sutrisna, A., Izwardy, D., & Kupka, R. (2020). Perspective: Interventions to improve the diets of children and adolescents. *Global Food Security*, 27, 100379. doi:https://doi.org/10.1016/j.gfs.2020.100379

Nordhagen, S. (2020). Food supply chains and child and adolescent diets: A review. *Global Food Security*, 27, 100443. doi:https://doi.org/10.1016/j.gfs.2020.100443

Raza, A., Fox, E. L., Morris, S. S., Kupka, R., Timmer, A., Dalmiya, N., & Fanzo, J. (2020). Conceptual framework of food systems for children and adolescents. *Global Food Security*, 27, 100436. doi:https://doi.org/10.1016/j.gfs.2020.100436

Tatlow-Golden, M., & Garde, A. (2020). Digital food marketing to children: Exploitation, surveillance and rights violations. *Global Food Security*, 27, 100423. doi:https://doi.org/10.1016/j.gfs.2020.100423

Tumilowicz, A., & Pelto, G. H. (2020). Interventions to improve dietary intake behaviors among children and adolescents. *Global Food Security*, 27, 100413. doi:https://doi.org/10.1016/j.gfs.2020.100413