Paediatric update

Kiran Atwal,
Freelance Paediatric Dietitian

Welcome to our paediatric nutrition column 'Paediatric update'. In each column, Kiran Atwal, Freelance Paediatric Dietitian, will update you on new guidance, tools and current affairs. Here, Kiran explores the significance of mid-upper arm circumference in childhood malnutrition screening.

Background

Growth markers such as weight and height are typically used to evaluate the nutritional status of children to detect weight changes and stunting. Clinicians readily measure these, however other markers such as mid-upper arm circumference (MUAC) to readily detect body composition are less used, although recommended in several childhood malnutrition guidelines such as ESPGHAN and ASPEN.[1,2] Even among dietitians, one survey found that MUAC is only used by 25%.[3] A recently published narrative review discusses some of the uses, challenges and areas of development needed to encompass MUAC into routine clinical practice.[4]

The authors of the narrative review discussed:

1. Clinical scenarios where MUAC may be more useful than other markers of growth to indicate malnutrition in children, such as measurement barriers (i.e. neurological impairment, hydrocephalus, critical illness), malnutrition risk (i.e. cancer, eating disorders, malabsorption), iatrogenic weight gain (i.e. fluid shifts, steroid use or other medications), patients who dislike weighing (i.e. intellectual disability, eating disorders), and lack of access to calibrated equipment (i.e. remote or community settings, or high patient volume).

2. Evidence where MUAC is particularly useful, which includes: paediatric intensive care (MUAC was a significant predictor of 60-day mortality and length of stay);[5] congenital heart defects (MUAC z-scores ≤-2 were associated with greater length of stay and prolonged ventilation);[6] neurological impairment (MUAC had the best agreement of all growth markers with subjective global nutrition assessment scores);[7] and cystic fibrosis (MUAC z-scores correlated with BMI and weight-for-length z-scores, but MUAC z-scores identified significantly more children as malnourished [49% vs.12%], which was significantly related to pulmonary function also).[8]

3. Factors that influence MUAC accuracy, such as which arm is used, whether the patient is sitting or supine and the arm is relaxed or bent, methods used to locate the middle of the upper arm, the type of tape used (including material and brand) and how many times the measurement is repeated.

4. Limitations of the evidence on MUAC in that it may not capture the entirety of a child's nutritional status (though one single marker does not exist that can). Condition-specific z-score reference ranges are needed for children 0-18 years, as current data comes from large, healthy populations with multiple variables (such as the WHO multicentre growth reference study conducted across six countries), which are unlikely to sensitively represent subgroups of sick children. This is particularly important where there are differences between subgroups of sick children, such as fat and muscle distribution which may be altered due to disease. Equations exist that can enable calculations of estimated body weight (e.g. in children with cerebral palsy), however, these require more rigorous validity testing in their ability to detect malnutrition.

Summary

MUAC may be under-utilised in childhood malnutrition despite its simplicity and potential cost-effectiveness. This is especially true where weight and height measurements are challenging, particularly in specific populations such as neurological impairment. This makes it a valuable and readily available marker of growth. It is a useful indicator of body composition that is not captured through weight and height alone, and some of the evidence in this review indicates MUAC sensitively detects malnutrition in certain patient groups. Moreover, MUAC was the most sensitive marker of malnutrition, morbidity and even mortality in some cases.

The use of MUAC is poorly adopted and requires more guidance and promotion in clinical practice to be widely employed. MUAC is not an acute measure and requires regular monitoring to enable greater availability of measurements over time. This will enhance the detection, monitoring and management of malnutrition changes and risks. Further research is needed to refine the available MUAC reference ranges for specific conditions and validate their use across diverse patient groups.

References: **1.** Hulst JM, *et al.* (2022). A Practical Approach to Identifying Pediatric Disease-Associated Undernutrition. J Pediatr Gastroenterol Nutr.; 74(5): 693-705. **2.** Becker PJ, *et al.* (2015). Consensus Statement of the Academy of Nutrition and Dietetics/American Society for Parenteral and Enteral Nutrition: Indicators Recommended for the Identification and Documentation of Pediatric Malnutrition (Undernutrition). Nutr Clin Pract.; 30(1): 147-161. **3.** Bellini SG, *et al.* (2020). Current Practices Using Pediatric Malnutrition Indicators: A Survey of Dietitians Working in Pediatrics. Nutr Clin Pract.; 35(6): 1080-1086. **4.** Becker P, *et al.* (2024). Measurement of mid-upper arm circumference to screen for childhood malnutrition: General applicability and use in special populations. Nutr Clin Pract.; doi: 10.1002/ncp.11208 [online ahead of print]. **5.** Ventura JC, *et al.* (2020). Undernutrition at PICU Admission Is Predictor of 60-Day Mortality and PICU Length of Stay in Critically Ill Children. J Acad Nutr Diet.; 120(2): 219-229. **6.** Aryafar M, *et al.* (2023). Pre-operative nutritional status and its association with short-term post-operative outcomes in Iranian children with CHD. Cardio Young.; 33(4): 579-89. **7.** Bell KC, *et al.* (2020). The Pediatric Subjective Global Nutrition Assessment Classifies More Children With Cerebral Palsy as Malnourished Compared With Anthropometry. J Acad Nutr Diet.; 120(11): 1893-1901. **8.** Phong RL, *et al.* (2020). Utility of Mid-Upper Arm Circumference in Diagnosing Malnutrition in Children With Cystic Fibrosis. Nutr Clin Pract.; 35(6): 1094-1100.

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