



Commentary

Global mid-upper arm circumference cut-offs for adults: a call to action

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Since 2009, mid-upper arm circumference (MUAC) has become an accepted measure for screening children for acute malnutrition and determining eligibility for services to manage acute malnutrition⁽¹⁾. Use of MUAC has increased the reach and enhanced the quality of community-based management of acute malnutrition services. Increasingly, MUAC is also used to assess nutritional status and eligibility for nutrition support among adolescents and adults, including pregnant and lactating women and HIV and TB clients^(2,3). However, globally recognised cut-offs have not been established to classify malnutrition among adults using MUAC. Therefore, different countries and programmes use different MUAC cut-offs to determine eligibility for programme services. Patient monitoring guidelines provided by WHO for country adaptation to support the integrated management of adult illness do not include MUAC, in part because guidance does not exist about what MUAC cut-off should trigger further action.

To address this gap, the Food and Nutrition Technical Assistance III Project, with support from the Bureau for Global Health at USAID, convened a technical consultation to review the results of analyses exploring whether standardised MUAC cut-offs can be used to identify undernutrition among adults and to reach consensus on the possibility of recommending a global cut-off for identifying undernutrition in adults. The consultation was held on February 12–13, 2018 in Washington, DC, and brought together stakeholders and anthropometry experts, who are the authors of this Commentary.

The analysis conducted by Tang *et al.*⁽⁴⁾ was a rigorous and systematic effort to compile data on the association

between MUAC and BMI in adults (using BMI as a gold standard) and provided a detailed analysis of MUAC's predictive capability of a low BMI (<18.5 kg/m²)⁽⁴⁾. The geographic and demographic spread of the data collected from twenty studies (seven from Africa, eight from South Asia, two from Southeast Asia, two from North America and one from South America) provides support for the likelihood of reproducibility and global reach of the findings.

After discussions and review of evidence at the consultation, the authors of this Comment reached consensus on acceptance of MUAC as an indicator of adult undernutrition when time/availability of equipment does not allow for measurement of BMI. Although the work started by the Food and Nutrition Technical Assistance III Project and the rigour of the work of Tang *et al.*⁽⁴⁾ have generated important momentum, the authors agreed that there are several gaps that prevent proposing a cut-off (or a set of cut-offs). The approach of using BMI as the gold standard against which to compare MUAC raised some concern, as BMI is not always the most adequate marker of adult undernutrition. Second is the issue of confounding of the association between MUAC and BMI by oedema; the analyses by Tang *et al.*⁽⁴⁾ did not exclude participants with oedema, as that information was not available in most data sets included in the analysis. Furthermore, even if BMI is considered an adequate gold standard, a BMI of 18.5 kg/m² may not be an appropriate cut-off for all settings and purposes; for instance, in emergency situations, a lower cut-off BMI may be desirable to screen the most vulnerable or as an entry criterion for services because of resource or other limitations. Finally, BMI and MUAC may

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not be identifying undernutrition at the same stages, for instance, in cases of severe or short-term/acute malnutrition, MUAC might decrease before BMI is affected or *vice versa*, depending on the timing of catabolism or protection of peripheral tissues *v.* central stores and organs. A related concern is a potential differential effect of various acute and chronic infections (e.g. HIV and TB) and other health conditions on MUAC *v.* BMI that have not been examined.

The authors recommend that MUAC can be evaluated against functional indicators of adult undernutrition, such as recent weight loss, muscle weakness, loss of muscle mass, grip strength, body composition (i.e. percentage of fat *v.* lean mass), ability to stand, other morbidities and mortality. Data on the MUAC response to treatment when undernutrition is identified using MUAC, as well as a comparison of MUAC used alone *v.* a combination of MUAC and BMI, would provide further support to recommend cut-offs. The authors also recommended extending the analyses to several settings and including more data from humanitarian/emergency settings, as well as settings with a low prevalence of undernutrition.

The authors strongly recommend building on the work of Tang *et al.*⁽⁴⁾ and filling the data gaps outlined above. They call all stakeholders and donors to join this important effort in determining global MUAC cut-offs for undernutrition in adults.

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