## LETTER TO THE EDITOR

# Feasibility and diagnostic accuracy of using armband mid-upper arm circumference as a simple screening tool for maternal wasting in rural India

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## Dear Editor

Lack of a single, universally accepted, and widely accessible approach to diagnosing and documenting adult malnutrition has impeded accurate estimations of human and financial burdens associated with prevention and treatment of malnutrition[1]. In January 2016 we tested the feasibility of armband mid-upper arm circumference (MUAC)<23 cm as a simple screening tool for maternal nutritional status and its diagnostic accuracy during a monthly village health and nutrition day in Bihar state, India. Using standard methods, weight, height and MUAC measurements were taken for 99 adolescent and adult women by trained health workers. Measurement time for armband MUAC, MUAC by non-stretchable tape and height by a stadiometer were compared. MUAC diagnostic accuracy was tested against body mass index (BMI)<18.5 kg/m$^2$ as the gold standard. A total of 82.5% of participants had a BMI of less than 18.5 kg/m$^2$ with the mean BMI of the sample population being 16.37 kg/m$^2$ and the mean age 20.5±5 years. The result shows that the proportions of women with MUAC<23 cm and MUAC<21 cm were 29% and 69%, respectively. MUAC<23 cm in women (area under curve=0.75) had the highest Youden's index (0.64), which corresponds to BMI<18.5 kg/m$^2$. A strong significant power of association (*r*) between MUAC and BMI<18.5 kg/m$^2$ was found in adolescent girls (*r*=0.64; *p*<0.0001), but only a slightly moderate association for adult women (*r*=0.47; *p*=0.005). Taking the MUAC cut-off, 49% adult women were found to be under-nourished compared to 51% using the BMI underweight cut-off. Similarly, 81% of adolescent girls were found to be under-nourished taking the MUAC

cut-off value compared to 89% by using the BMI underweight cut-off.

Although BMI has been well established as a useful indicator to assess nutritional status, at the field level it has limitations because it involves multiple instruments like stadiometers and accurate weighing scales to measure height and weight. Our study demonstrated that, with limited capacity of health workers to use equipment (stadiometer, weighing scale, BMI chart), we found armband MUAC<23 cm to be the most viable screening tool for identifying nutritionally at-risk women at the community level, even in a busy village health and nutrition day in a resource-poor setting. Average measuring time per person for armband MUAC was 10 s, compared to 54 s for MUAC using non-stretchable tape and 59 s for height using a stadiometer. MUAC correlates closely with BMI. For its simplicity and ease of remembering, MUAC<23 cm for adolescents and <22.5 cm for adult women may be considered as a simpler alternative to BMI cut-off <18.5 kg/m$^2$ to detect under-nutrition. Studies in similar settings have also shown that use of MUAC has improved the ability of front-line health workers to screen and assess for acute malnutrition among children for community-based management of acute malnutrition services[2-4]. Studies comparing diagnostic accuracy established that MUAC correlates well with BMI in adult populations[5-10].

In India, where healthcare providers are limited in number, and are required more for service delivery than for field nutritional data collection or validation, armband MUAC could be considered as a viable cost- and time-effective measurement tool for screening women at risk of under-nutrition in rural settings. Measurement of armband MUAC requires minimal equipment and calculations as compared to BMI or other anthropometric measurements. It also offers the advantages of being a simple and relatively inexpensive measurement that can be carried out at both community- and facility-based settings. Armband MUAC should thus be promoted to screen for nutritional status of women in low-resource settings to determine eligibility to provide nutrition support to them. Additional feasibility studies in similar settings and a high level of advocacy are required to recognize armband MUAC as a cost- and time-effective screening tool for identifying women at risk of under-nutrition in India.

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