# Mid upper arm circumference as an alternative measure to assess the nutritional status of adolescents: a study in India based on NFHS-4 data

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## Abstract

Use of body mass index (BMI) to assess the nutritional status of adolescents requires many resources, especially for country-level assessment. This study aimed to determine the relationship between BMI and mid upper arm circumference (MUAC) among adolescent males and females in India and to examine whether MUAC effectively represents the nutritional status of adolescents. The study utilized anthropometric measurement data collected by India's National Family Health Survey-4 (2015–16). The weighted sample for analysis included 91,315 female and 14,893 male adolescents. The BMI and MUAC measurements showed a positive correlation in both female and male adolescents. Using BMI-for-age Z-score classifications, 12.7% of the adolescents were undernourished. Using MUAC (in cm) as per NACS (Nutrition Assessment, Counselling, and Support) guidelines and Mramba et al. (2017) classified 22.9% and 3.7% of the adolescents as undernourished respectively. Finally, using the MUAC-for-age Z-score classification, 98.4% of adolescents were determined to be normal and 1.7% undernourished. Sensitivity and specificity tests of the MUAC cut-offs, in comparison with BMI cut-offs, showed that all three MUAC cut-off classifications had high specificity (NACS cut-off: 81.3%; Mramba et al. cut-off (cm): 97.7%; Mramba et al. cut-off (Z-score): 99.1%). The NACS cut-off had moderately high sensitivity (52.2%) but the Mramba et al. cut-offs had low sensitivity (13.3% for the centimetre cut-off and 6.6% for the Z-score cut-off). Sensitivity and specificity tests proved the relationship between BMI and MUAC, and that MUAC represents adolescent nutritional status with considerable efficiency. With further research, it may be established that MUAC is a better and promising measure of adolescent nutrition, having the advantage of needing fewer resources for data collection. The MUAC has the potential to offer a simple and low-resource alternative to BMI to assess nutritional status among adolescents in poor countries.