

## Screening for SAM in the Community: Is MUAC a ‘Simple Tool’?

Anthropometric data from our survey of 1,879 children in Madhya Pradesh revealed low sensitivity (17.5%) and positive predictive value (30.4%) of Mid-Upper Arm Circumference (MUAC) at the recommended cut-off of 115 mm for identifying Severe Acute Malnutrition (SAM). This led us to question the reliability of MUAC as a screening tool to identify SAM at the community level, especially in the context of very high levels of stunting.

**Key words:** Anthropometry, Malnutrition, Reference standards, Severe acute malnutrition.

Recent anthropometric studies have emphasized the need for larger datasets from the community level to validate the use of Mid-Upper Arm Circumference (MUAC), with a cut-off of 115mm, as an anthropometric marker to diagnose Severe Acute Malnutrition (SAM) [1].

10 gram panchayats were randomly selected from each of the five blocks, across three poorest districts of Madhya Pradesh. In every panchayat, the list of children in the age group of 0-6 years was collected from the anganwadi centres. From this list, 50 children were randomly selected. Of the children included in the sample, 1879 were in the age group of 6 months to 3 years. Weight, height/length and MUAC of all children were recorded using standard procedures with adequate quality assurance measures. Z-scores were calculated using the WHO Anthro for PC software.

57.2% of our sample children belonged to tribal communities and 48% had BPL cards. 48% were girls. The mean (SD) weight, height and MUAC were 8.6 (1.67) kg, 75.4 (8.42) cm, and 13.3 (1.0) cm, respectively. The overlap between MUAC and WHZ is low. While

8.9% of our sample have a WHZ <-3; 4.9% were with MUAC ≤115mm. **Table I** presents the performance of different cut-offs of MUAC for diagnosing severe wasting. The prevalence of stunting in children with MUAC ≤11.5 cm was greater than in those with WHZ ≤3. In our sample, 26% (47/181) of the children who had a WHZ ≤3 were severely stunted compared to 60.9% (56/92) of children with a MUAC ≤11.5. Further 80.4% (74/92) children with MUAC ≤11.5 were either severely stunted or severely underweight or both.

Current guidelines in India for (active and passive) screening of SAM by ASHAs and ANMs at the community level advocate using “simple colored plastic strips” with a MUAC cut-off of <115 mm [2,3]. Some issues related to the dangers of using inappropriate screening tools for referring SAM children have also been raised earlier [4]. MUAC as a screening tool should not be identifying less children than WHZ (the ‘gold standard’).

Stunting levels in India are higher than African children and exceedingly so in our sample (57% had heights <-3 SD) as the most marginalized (including tribals) were purposively sampled. This brings us to question the reliability and validity of MUAC as a screening tool in chronically undernourished populations. The correlation of weight-for-height and MUAC is hard to come by; one source reported it as 60-70% [5]. MUAC has been considered to correlate better with lean mass ratio (LMR is the ratio of estimated mass of limbs to estimated mass of trunk) [6]. Further, pediatric body composition data is not yet available for Indian populations.

**TABLE I** CUT-OFFS OF MID-UPPER ARM CIRCUMFERENCE IN 1879 STUDY CHILDREN

Performance Parameter	MUAC Cut-Off (in mm)				
	110	115	120	125	130
Sensitivity	6.3% (10/160)	17.5% (28/160)	33.1% (53/160)	46.9% (75/160)	71.3% (114/160)
Specificity	98.5% (1693/1719)	96.3% (1655/1719)	85.0% (1462/1719)	75.2% (1292/1719)	49.6% (852/1719)
Positive predictive value	27.8(10/36)	30.4(28/92)	17.1(53/310)	14.9(75/502)	11.6(114/867)
Negative predictive value	91.9(1693/1843)	92.6(1655/1787)	93.2(1462/1569)	93.8(1292/1377)	94.9(852/898)
Youden index	0.05	0.14	0.18	0.22	0.21
LR for positive test	4.1	4.7	2.2	1.9	1.4
LR for negative test	1.0	0.9	0.8	0.7	0.6

LR: likelihood ratio.

Higher cutoffs of 140 mm and even 155 cm have been proposed by Indian and Nigerian scholars, respectively [7,8]. While MUAC is generally understood to be age-independent, MUAC-for-height reference curves have been considered to be a better alternative (height being measured by WHO-modified QUAC sticks in field settings) [9]. In the light of our findings, there is a need to introspect on the suitability of current MUAC cut-offs. It is imperative that the screening tool not be a reason for exclusion of those who need institutional and rehabilitative support the most.

*Acknowledgments:* This survey was conducted jointly by Vikas Samvad, Bhopal; Spandan, Khandwa and Community Development Centre, Balaghat.

*Contributors:* SKJ and DS conceptualized and led the data collection; all authors contributed to the data analysis; DS and RD drafted the initial manuscript; SKJ and VP provided critical inputs and revised the draft; all authors have approved the final draft.

*Funding:* Sir Dorabji Tata Trust; *Competing interests:* None.

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