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Reliability of the Anthropometric Indicators of Acute Malnutrition in Pastoralist Populations: Secondary Analysis of a Recent Survey in Bahr-El-Ghazal, Chad

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A cross-sectional survey conducted by ACF among the Gorane pastoralist population of the north Bahr-El-Ghazal region, Chad, in April 2013, confirmed the existence of a massive difference in the diagnosis of acute malnutrition according to Mid Upper Arm Circumference (MUAC) and Weight-for-Height Z-score (WHZ), with WHZ returning much larger estimates of acute malnutrition than MUAC. While both indicators are recommended proxies to identify 6 to 59 months old children suffering from non-oedematous acute malnutrition, a previously formulated hypothesis is that WHZ overestimates the diagnosis of acute malnutrition among pastoralist children because of their assumed slender morphology. An alternative hypothesis is that MUAC underestimates acute malnutrition in the older, male, and non-stunted children. We aimed at testing these hypotheses, as well as evaluating if MUAC could be considered as a suitable stand-alone criterion in this context.

Besides anthropometric measurements (including sitting height), statements of the caretaker regarding child's morbidity, loss of weight and lack of food intake has been collected. We first assessed the association between risk factors such as age, sex, stunting and proportion of legs in total body size, and MUAC- or WHZ-based diagnoses. We then described the cases of moderate or severe acute malnutrition diagnosed by WHZ but not by MUAC in terms of slender morphology (high height-for-age and/or long legs compared to the trunk) and vulnerability (anthropometric deficits and caretaker's anamnesis). Finally, we defined alternative indicators of acute malnutrition by combining subjective statements of the caretaker and anthropometric deficits (underweight without stunting). We assessed if MUAC diagnosis was, more than WHZ, associated with these indicators, first through sensitivity and specificity calculations, then through logistic regression. Analyses were further stratified by legs proportion.

Having a high proportion of legs in the body size was associated with WHZ-based diagnosis, while gender (being a girl), young age and stunting were associated with MUAC-based diagnosis. However, cases of moderate or severe acute malnutrition according to WHZ displayed large rates of vulnerability-associated characteristics, while not systematically presenting slender shape profiles. Further analysis showed a strong association between WHZ-based diagnosis and alternative indicators of acute malnutrition, which remained stable across categories of legs proportion, thereby contradicting the hypothesis of a bias due to slender shape in WHZ-based diagnosis. On another hand, no association could be found between MUAC and alternative indicators of acute malnutrition, thereby confirming the low sensitivity of MUAC towards these indicators.

These results indicate that WHZ-only diagnosis can hardly be considered as misdiagnosis, while, in contrast, MUAC is probably missing "at risk" children in need for treatment. Further medical investigation of cases diagnosed only by WHZ should be conducted. In the meanwhile, the common assumption that MUAC is sufficient to estimate the prevalence of acute malnutrition in nomadic populations should be questioned, and strategies for the detection, referral and admission of WHZ-only cases should be defined.