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A brief overview of the debate around anthropometric measurements for identifying children requiring nutrition treatment

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Introduction

The purpose of the Global Nutrition Cluster (GNC) Technical Alliance (the Alliance) is to support practitioners to improve the quality of nutrition preparedness, response and recovery, by enabling and providing technical support through multiple channels. The Technical Support Team (TST) within the Alliance is available to provide technical support on nutrition in emergencies, and is the first port of call for answering related technical questions posed by practitioners. One area in relation to which repeated questions are received within the Alliance concerns the selection of appropriate anthropometric measures to use in different contexts. Specifically, practitioners ask for guidance on understanding the global debates and diverse evidence base relating to anthropometric criteria for identifying wasted children requiring nutrition treatment.

Anthropometric measures have long been used to classify wasting, including severe wasting. In their 2007 and 2009 joint statements, the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) are clear on which anthropometric measures to use at community and facility level to identify severe acute malnutrition, stating: "Community health workers or volunteers can easily identify the children affected by severe acute malnutrition using simple coloured plastic strips that are designed to measure mid-upper arm circumference (MUAC)" [1], and "where feasible, it is important to use both mid-upper arm circumference (MUAC)[1] and weight for height (WHZ)[2] anthropometric indicators at a facility level for identifying children with severe wasting for admission into therapeutic treatment" [2]. However, it is not always possible and/or practical to use both measures and MUAC-only programmes have become increasingly common[3]. Thus, for several decades a debate has continued on the optimal, most practical anthropometric measure for identifying children who are severely wasted who require admission to nutrition treatment programmes. The debate has ebbed and flowed, with new evidence, elements and explanations emerging at different times over the last decade.

This brief does not intend to wade into the debate, nor does it intend to comprehensively cover all of its elements, complexities and differing viewpoints. We recognise that there may be different potential approaches in different contexts. Rather, the aim of this brief is to simply describe some of the key elements/viewpoints within the debate, in order to equip practitioners to make decisions for their specific contexts. The brief also aims to highlight some useful resources[4] for readers who may wish to explore this topic in more detail.

[1] MUAC measurements identifying children with wasting are normally as follows: MUAC<125mm for wasting/moderate wasting and <115mm for severe wasting.
[2] Defined as weight-for-height Z-score (WHZ) <-2 for wasting and <-3 for severe wasting.
[3] As evidenced in many countries during the start of the COVID-19 pandemic and response, as well as in many conflict-affected contexts.
[4] Though not an exhaustive list

Describing the debate around anthropometry

The debate around anthropometry has centred on several aspects, including (but not limited to) the following:

The fact that MUAC and WHZ measurements tend to identify different children

The two criteria identify different children in virtually all contexts: most children with severe wasting have either severely low WHZ or severely low MUAC, rather than both [2-4]. WHO estimates that the two criteria only overlap in 40% of cases, but this figure may be as low as 16.5% [3]. The degree of this overlap appears to vary drastically from country to country and across regions [3]. In some contexts, the number of children (modelled from survey data) that would be identified as wasted using WHZ is much greater than those identified as wasted using MUAC, while in other contexts the situation is reversed [5].

The factors that explain these differences in anthropometric classifications remain contested. Potential reasons outlined in research include differences in body shape, fat distribution, muscle mass, leg length, stunting prevalence and micronutrient deficiencies, as well as differences in clinical and biochemical markers [6-8].

A debate around the optimal anthropometric measure(s) for identifying the severest cases (i.e., those with the highest mortality risk) to prioritise for the most urgent treatment

Improving children's growth and development is an important aim of treatment for children with severe wasting. However, of primary importance is the consideration of mortality risk. The most useful anthropometric criterion in this regard is that which is able to identify children who are at a high risk of dying if they remain untreated, and who would likely survive if treated within an appropriate therapeutic programme [9]. Both anthropometric measures (WHZ and MUAC) appear to be relatively good predictors of elevated mortality risk [10]. As noted in the WHO Guidance [2], children below a WHZ -3 Z score cut-off have a highly elevated risk of death compared to those who are above the cut-off. Similarly, children with a MUAC less than 115mm have a highly elevated risk of death compared to those who are above this cut-off. Evidence for each of these anthropometric indicators being good predictors of mortality risk dates back several decades [10, 11].

Despite this evidence, the debate has focused on which measure is best able to determine mortality risk and, if one measure is better than the other, if there is a need to advocate for the use of both anthropometric measures. This question has been driven by the desire to simplify treatment approaches as far as possible in some contexts, and to expand nutrition treatment from facility to community level to increase treatment coverage[5].

[5] The collection of interventions known as 'simplified protocols' are not intended to be implemented nationally but rather sub-nationally or in areas where such protocols are necessitated. They are intended to complement existing standard protocols.

Evidence has been used to support both sides of the debate in relation to mortality risk, with different findings noted [5, 10-19]. Some reasons for the differences in findings may be the different statistical methods used, the age ranges of subjects, the study contexts, the available treatment options and the type of data used [19][6].

It may also be that the two measures not only identify different children but also indicate different underlying metabolic changes that these children are experiencing that lead to differing mortality risks [19]. It is also interesting to note that some studies have found that children who are identified as wasted by both MUAC and WHZ have almost double the mortality risk of those identified using either standalone indicator [18, 19], which points to the validity of WHO guidance and the use of both anthropometric measures where appropriate.

Concern that the selection of one anthropometric measure over the other may have implications for achieving greater coverage

The selection of anthropometric indicators also needs to be considered within the broader framework of achieving high coverage of wasting treatment services and identifying as many children who are severely wasted and in need of life-saving treatment as possible. In general, there is agreement that MUAC is better able to facilitate high programme coverage. Reasons for this include that it is simpler, faster, more easily portable (particularly in hard-to-reach areas) and easier for caregivers and communities to understand and use themselves [5, 9, 20-23]. Given such factors, it is appropriate for use both at the community and facility level, allowing children with severe wasting to be identified in a widespread and timely fashion. It is therefore often more attractive in acute or even prolonged emergencies, where there are large numbers of wasted children, and in situations where facilities have few resources [24].

Although MUAC may be a better measure for enabling high coverage of wasting treatment programmes, there is a concern that using only MUAC admission misses those children with wasting as identified through only WHZ, who therefore remain untreated [25] (this is further explored below).

[6] For example, the use of programme data is limited by their relating to a selected population with particular characteristics (e.g., better access to treatment services), and the fact that they are therefore unlikely to be representative of the general population.

Concerns about admitting children for therapeutic treatment who should not be receiving it (based on admissions using different anthropometric criteria), or vice versa – not admitting children for therapeutic treatment who should be receiving treatment

The major concerns around anthropometry and coverage relate not to which anthropometric measure is better but rather to the implications of omitting children due to using only one indicator. This concern is particularly focused on MUAC-only programmes[7] and, as a result, expanded MUAC thresholds have been proposed and trialled in order to include, as far as possible, more of the children meeting the WHZ case definition who would not otherwise be included [25]. The implications of expanding MUAC thresholds have been discussed in both programming examples and research. Published programming examples from several challenging emergency contexts found that the expansion of admission criteria[8] increased the number of children benefiting from treatment, while reducing the potential exclusion of WHZ-only children [25]. On the other hand, research papers have found that expanding MUAC thresholds captured some WHZ-only cases but at the cost of capturing many children who did not need therapeutic feeding, and that even with this adaptation to treatment protocols 20–25% of the severely wasted caseload, as defined using WHZ, were still missed [25]. As such, these research papers concluded that extending MUAC thresholds will result in a large influx of relatively healthy children for treatment, increasing healthcare workers' workload to the detriment of other essential health services and drastically increasing the cost and burden of ready-to-use therapeutic food [3, 25].

Conclusion

Anthropometric measures, while incredibly useful, are imperfect proxy measures of the physiological/clinical changes in the body caused by undernutrition that lead to illness, impaired development and death. There are pros and cons of adopting either, or both, anthropometric measures (MUAC and WHZ) to identify children with wasting requiring therapeutic treatment at different points of contact. What is feasible in one context may not be feasible in another. There are also situations where both measures are needed and can be used within the same context. Efforts to gain additional knowledge and experience on this topic continue to be a global priority.

This brief was produced as a result of a question posed on the Alliance's website. To find out more about the Alliance or to ask a question or request support directly, please click here: https://ta.nutritioncluster.net/request-support or email a member of the Alliance at: technicalalliance@nutritioncluster.net

[7] MUAC-only programmes have been promoted as a mechanism to simplify programmes. In contrast, those advocating for the use of WHZ do not seem to suggest a WHZ-only approach but rather advocate for both anthropometric measures to be used. It must be noted that in some contexts MUAC-only programming is sometimes the only option in certain sub-national areas (for example, in hard-to-reach areas) and is therefore run in parallel national protocols on using both MUAC and WHZ programming.

[8] E.g., using MUAC cut-offs of 120mm and 125mm, rather than the standard cut-off of 115mm

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