Wasting and stunting – similarities and differences - programmatic implications

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Wasting and stunting often presented as different forms of malnutrition

Two FAQ:

Question 1: What form of malnutrition is associated with the most important mortality? Wasting? Or stunting?

Question 2: Which children most benefit from interventions?

To answer these FAQ, we need to understand why malnourished children are at high risk of dying
Malnourished children don’t die « because » they have low z-scores

There is no “sizostat”: children unable to assess whether they are above or below the WHO growth standard median – no physiological signal

Z-score is a statistical concept and has no direct biological meaning!
Survival when energy intake is insufficient

- Proteins breakdown kept at minimum
- Fat is the main fuel
- Survival linked to fat stores (in absence of infections)

What happens when malnutrition is associated with infection?

Increased protein breakdown during aggression, including infections, to produce acute phase proteins leading to muscle wasting.

Do the Differences between the Amino Acid Compositions of Acute-Phase and Muscle Proteins Have a Bearing on Nitrogen Loss in Traumatic States?\(^1\)

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It has been known for at least 60 years that, during the period immediately following accidental injury and surgical trauma (Cuthbertson 1932) as well as infection (Grossman et al. 1945), there is a substantial loss of body nitrogen (>150 mg N/kg body weight-dl). Indeed, it has been argued that it is the change in the muscle glutamine concentration that induces the changes in muscle protein turnover leading to the eventual depletion of muscle protein (MacLennan et al. 1987 and 1988, Rennie et al. 1986). Conditions...
Muscle loss and survival

Heymsfield et al, Am J Clin Nutr 1982

Survival linked to muscle mass in many clinical conditions: cirrhosis, cancer, liver transplant,
Fat, muscle and survival:

Fat key to survival in case of starvation (lack of food)

Muscle key to survival in case of malnutrition associated with infection
Change in body composition in wasting and stunting

Wasting:
- decreased muscle mass+++ 
- decreased fat mass

Stunting:
- decreased muscle mass suspected
- fat mass decreased or increased

Change in body composition, a plausible common mechanism leading to increased mortality
The higher risk of death associated with wasting consistent with a role of muscle/fat

Mortality increase sharper with wasting

Olofin et al, 2013
Risk associated with wasting plus stunting: consistent with a common mechanism: low muscle mass

McDonald et al, Am J Clin Nutr, 2013
Implications of a common mechanism linking lower muscle (fat mass) to increased mortality

Young children (low muscle mass) more at risk

Young AND wasted AND stunted children should be the priority target of programmes aiming at decreasing malnutrition related mortality

Low MUAC children are young, wasted and stunted. Should be the priority target.
Wasted children grow poorly in height

Doherty et al, Br J Nutr 2001

Fig. 3. Mean change in height for age z score (HAZ) in the subsequent 30 d against initial weight for height z score (WHZ) for all time points ($r = 0.3$, $P < 0.001$).
Fat stores may regulate bone linear growth

Bone and fat are endocrine organs interacting with each other and with other organs, including the brain

Gat-Yablonski et al, 2008
Implications of fat mass regulating linear growth

Preventing / treating wasting will benefit children with associated stunting

But: wasting not the main cause of stunting
Conclusions

Many common characteristics between wasted and stunted children

No clear rationale for having different programmes for these two forms of malnutrition

Best approach: consider young children being wasted and stunted as priority

Exception: stunted children with adequate fat stores