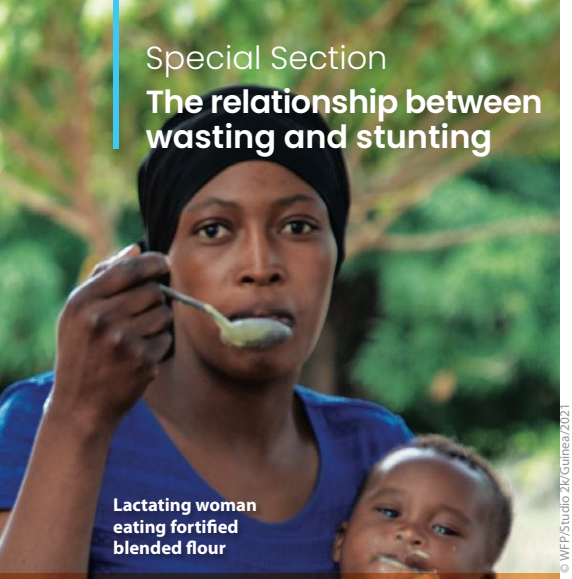

Lactating woman eating fortified blended flour

A reflection on the 2021 *Lancet* Maternal & Child Nutrition Series through a WaSt lens

This article provides a summary of the *Lancet* Maternal & Child Nutrition Series to date, reflecting upon the 2021 series from the perspective of the Wasting and Stunting Technical Interest Group

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Key messages:

- In the earlier two Lancet Maternal & Child Nutrition Series in 2008 and 2013, stunting and wasting were discussed independently.
- In the latest Series in 2021, the overlap between these two forms of undernutrition was considered which strongly aligns with research done by the Wasting and Stunting Technical Interest Group.
- The new focus on the interrelationships between wasting and stunting provides further rationale for more programmes and policies to consider joint programming across the different manifestations of undernutrition.

The three *Lancet* Series on maternal and child undernutrition represent milestone publications for those working in public health and nutrition. They provided authoritative, influential collections of papers where current evidence was reviewed and the implications for programming outlined (see Box 1 for a summary of the evidence-based interventions recommended in each Series).[1]

Given the significant influence of these Series on practice and policy, it is an opportune time to explore what has been said about the relationship between wasting and stunting in the latest Series and what gaps remain. In this article we reflect on the 2021 Series' first paper (Victora et al) from the perspective of the Wasting and Stunting Technical Interest Group (WaSt TIG).[2]

The first paper by Victora et al (2021) describes analyses of national survey data from 50 low- and middle-income countries (LMICs) taken from two time periods which the authors broadly categorised into surveys from 2000 and those since 2015 (Victora et al, 2021). They summarise trends in nutrition indicators over the 15 years. Although associations between wasting and stunting are not referred to explicitly in the key messages panel, the topic is brought out clearly in the article summary and is covered in detail in the paper's narrative. Indeed, reference was made in this paper to an article written by members of the WaSt TIG that summarises many of the key concepts emerging from the group's research (Wells et al, 2019).

This marks an encouraging development since the first two *Lancet* Series where stunting and wasting were discussed independently and where the overlap between these two forms of undernutrition was not considered. The new focus on the interrelationships between wasting and stunting provides further rationale for more programmes and policies to consider joint programming and policies across the different manifestations of undernutrition.

Some of the key points from Victora et al are:

Increased mortality risk for children concurrently affected by wasting and stunting (WaSt):

Three studies (each of which was co-authored by members of the WaSt TIG) are used to back up this statement. The first (Garenne et al, 2019) looks at a historic cohort of children in Senegal. Concurrent WaSt was a strong predictor of mortality explaining 51% of the mortality in the cohort. The second study (McDonald et al, 2013) is a meta-analysis of 10 cohorts from LMICs. Children who were wasted, stunted and underweight had more than 12 times the mortality risk of children with no anthropometric deficits. The third is a pooled analysis of 35 longitudinal cohorts (Mertens et al, 2020). Concurrent WaSt at 18 months of age was strongly associated with later mortality in the cohorts (RR=4.8, 95% CI: 3.9, 5.9).

Prevalence of concurrent WaSt:

The authors calculated the prevalence of concurrent WaSt in the 50 countries at both survey time points. This is some-thing that is not yet routinely done with survey data, or in global estimates, despite the heightened mortality risk of those with concurrent WaSt and the fact that prevalence of concurrent WaSt can be similar, if not higher, than the prevalence of severe wasting. For example, the 2021 Joint Child Malnutrition Estimates (UNICEF, the WHO, World Bank Group, 2021) describe that wasting and stunting can co-exist but do not provide estimates for concurrent WaSt. In the *Lancet* article, the prevalence of concurrent WaSt is portrayed graphically and then described within its own narrative section.

Concurrent WaSt prevalence was 7.0% in the surveys from 2000, reducing to 4.7% in the 2015 surveys (low-income countries only; prevalence of concurrent WaSt was very low in middle-income countries). The authors put this into the context of other estimates produced by members of the WaSt TIG, quoting Khara et al's (2018) meta-analysis of survey data from 84 countries where the pooled prevalence of concurrent WaSt was 3.0%, 95% CI [2.97, 3.06] with peak timing of WaSt concurrence at 12-35 months of age. They also highlighted recent analyses of regional differences from Mertens et al (2020) which showed

[1] A brief summary of the *Lancet* 2021 Series papers' themes can be found in a recent FEX snapshot article: https://www.ennonline.net/fex/65/lancetundernutritionseries

[2] More information can be found on the work of the WaSt TIG in the accompanying article and online at https://www.ennonline.net/ourwork/reviews/wastingstunting

that concurrent WaSt prevalence was particularly high in South Asia (8%) with peak prevalence at age 12-18 months.

Wasting increases the risk of subsequent stunting:

Two studies were referenced to support the observation that wasting increases the risk of later stunting although neither of the study findings was elaborated upon. The first study (Schoenbuchner et al, 2019) used four decades of longitudinal growth data from The Gambia. The authors found that being wasted increased the odds of being stunted later (OR: 3.2; 95% CI: 2.7, 3.9). The second study (Richard et al, 2012) was an analysis of eight cohort studies which suggested a lagged effect between an episode of wasting and subsequent linear growth with the strongest adverse effect on linear growth found when the episode of wasting occurred in the precedingsix months.

A more recent study (Mertens et al, 2020) (not referenced by Victora et al) also provides robust longitudinal data to bolster evidence on this topic. The analysis of 18 longitudinal cohorts suggested that children who were ever wasted in the first six months of life were 1.8 (95% CI: 1.5, 2.3) times more likely to be concurrently WaSt between ages 18-24 months. Given the size of the datasets in this analysis, it is an important paper that underscores the associations between prior episodes of wasting and later vulnerability to growth failure (both wasting and stunting).

Other important points that Victora et al touched on have also been noted by the WaSt TIG as important lessons and concepts for the design of research related to wasting and stunting. These include:

The importance of screening for those at highest risk of mortality:

The authors highlighted that low mid-upper arm circumference (MUAC) could be used to identify children at risk of death and, furthermore, was a preferred screening tool due to its simplicity of use. Linking this to the conversation on concurrent WaSt, Myatt et al (2018) analysed 51 cross- sectional survey datasets and found that a MUAC <133mm had a sensitivity of detecting concurrent WaSt cases of 81.0% using ROC analysis.[3] However, low weight-for-age z-scores (WAZ) had an even better sensitivity and specificity for capturing WaSt cases (as discussed below).

The importance of moving away from a preoccupation with anthropometric cut-offs:

Victora et al guided readers to consider the distribution of height-for-age z-scores (HAZ) and weight-for-height z-scores (WHZ) curves from the surveys and where these fall relative to the World Health Organization (2006) standards. In this paper, the Demographic and Health Surveys (DHS) had HAZ and WHZ distributions that were both shifted to the left of the growth standard curves. Two important reflections on this include:

1. Populations represented by the DHS surveys not only had an increased proportion of stunted and wasted children compared to well-nourished populations, with their growth curves shifted to the left, the whole population had a lower WHZ or HAZ than if they had been well-nourished.
2. This reinforces the focus on the process of wasting and stunting and how many children grow below their potential. It is not only where a child ends up (whether that child becomes stunted or wasted) that is important. It also means under standing that a child may have started with a healthy WHZ of +2 but then lost weight to WHZ -1.5 which would still not be classified as being wasted but would potentially still have implications on later linear growth.

Common drivers of wasting and stunting:

The article underscores that wasting and stunting already manifest at birth and that therefore the in utero period is important to consider for the prevention of both processes. This messaging was also highlighted in previous *Lancet* Series where the determinants of stunting and wasting were looked at and common pathways for prevention included maternal nutrition, postnatal diet, disease management and nurturing care. Members of the WaSt TIG have recently released a briefing note on the prevention of child wasting which explores these themes further.[4]

Box 1 Evidence-based nutrition interventions recommended by the *Lancet* Series

First Series 2008: There was deemed sufficient evidence for the recommendation of the following interventions: iron folate supplementation, maternal multiple micronutrient supplementation, maternal calcium supplementation, interventions to reduce tobacco consumption or indoor air pollution, the promotion of breastfeeding (individual and group counselling), behaviour change communication for improved complementary feeding, zinc supplementation, zinc in the management of diarrhoea, vitamin A fortification or supplementation, universal salt iodisation, handwashing or hygiene interventions and the treatment of severe acute malnutrition.

Second Series 2013: Ten effective interventions were outlined: 1) periconceptual folic acid supplementation or fortification, 2) maternal calcium supplementation, 3) maternal balanced energy protein supplementation, 4) maternal multiple micronutrient or iron-folic acid supplementation, 5) vitamin A supplementation, 6) the promotion of breastfeeding, 7) complementary feeding education and food provision (food insecure); complementary feeding education (food secure), 8) preventive zinc supplementation, 9) the management of moderate acute malnutrition and the treatment of severe acute malnutrition, 10) zinc for the management of diarrhoea.

Third Series 2021: Eleven effective interventions were summarised: 1) large-scale food fortification for the prevention of micronutrient deficiencies, 2) maternal calcium supplementation in low intake populations, 3) maternal balanced energy protein supplementation in undernourished populations, 4) maternal multiple micronutrient supplementation, 5) vitamin A supplementation in deficient contexts, 6) breastfeeding promotion and counselling, 7) complementary feeding education and food provision (food insecure); complementary feeding education (food secure), 8) preventive zinc supplementation, 9) ready-to-use foods for the management of acute malnutrition, 10) therapeutic zinc supplementation for diarrhoea, 11) preventive small quantity lipid nutrient supplementation for optimising health and growth in children.

Conclusions

It was encouraging to see the prominence accorded to the links between wasting and stunting in the 2021 *Lancet* Series. Within an article that sought to capture so many themes, concurrent WaSt and the associations between wasting and stunting were given a lot of attention in both the summary and its own standalone section. Additional key messages not captured but important to consider are:

1. Boys tend to be at greater risk of concurrent WaSt than girls (Khara et al, 2018; Schoen buchner et al, 2019; Myatt et al, 2018).
2. Low WAZ captures almost all concurrent WaSt cases and it therefore represents a simple screening tool for identifying those at higher risk of mortality.[5] Myatt et al (2018) found that a WAZ <-2.8 had a 98.5% sensitivity and 91.1% specificity of identifying children with concurrent WaSt using ROC analysis. Using WAZ as a screening tool to identify children at highest risk is potentially simple to implement and scale up as growth monitoring programmes already monitor WAZ.

[3] In this context 'sensitivity' refers to the proportion of children with concurrent WaSt that a MUAC <133mm was correctly able to identify. ROC analysis refers to 'receiver operating characteristic' analysis that graphically represents sensitivity i.e., how well a certain diagnostic tool (e.g., low MUAC) correctly identifies the condition in question (e.g., concurrent WaSt) versus the ability to correctly exclude those without the condition (known as specificity).

[4] This brief can be found here: https://www.ennonline.net/attachments/4034/WaSt-Prevention-Brief.pdf

[5] However, it needs to be acknowledged that in some contexts collecting accurate age data can be challenging.

3. Thirdly, episodes of stunting also predict later wasting (Schoenbuchner et al, 2019) although the strength of association is not as strong as wasting predicting later stunting and the mechanisms are less clear. However, this observation still supports the consideration of both wasting and stunting prevention together in policy and practice.

With the publication of this *Lancet* Series, together with the rapidly expanding body of work arising from the WaSt TIG, we have a good foundation to maintain the focus on how concurrent WaSt is a marker of increased vulnerability to mortality, how wasting and stunting are interlinked and what should be done at the programmatic and policy levels to address these considerations.

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Research Summary

Exploring the relationships between wasting and stunting among a cohort of children under two years of age in Niger

This is a summary of the following paper:
Kohlmann K, Sudfeld C, Garba S, Guindo O, Grais R and Isanaka S (2021) Exploring the relationships between wasting and stunting among a cohort of children under two years of age in Niger. BMC Public Health 21, 1713.
https://doi.org/10.1186/s12889-021-11689-6

Childhood wasting and stunting continue to present a large public health burden globally with approximately 7% of children under-five years being wasted and 22% stunted in 2020. Wasting and stunting can co-exist within the same child (concurrent WaSt) and these two forms of undernutrition may share common risk factors. Despite the growing evidence highlighting the relationship between wasting and stunting and the increased risk of mortality for children with concurrent WaSt, the two forms of undernutrition continue to be treated separately in much research, programming and policymaking.

In this paper, the authors analysed data from a longitudinal birth cohort in Niger to explore the risk factors for wasting and stunting while also assessing the relationship between wasting and stunting over time. The study location was a rural area of south-central Niger with data coming from an existing vaccine trial. In total, 6,567 infants had growth monitoring every four weeks from early infancy until two years and birthweight was recorded.

The authors found the lowest prevalence of wasting in the cohort was in the first six months of life (5-10%) increasing to 14-16% from 9-18 months of age. Peak prevalence of concurrent WaSt (12.5%) was at 15 months, mirroring wasting prevalence trends. At 24 months of age, 14% of children were wasted, 80% were stunted and 12% had concurrent WaSt. Compared to normal birthweight infants, low birthweight infants had a higher prevalence of stunting throughout the study duration and they also experienced a higher prevalence of wasting and concurrent WaSt from 10 months of age onwards.

The risk factors common to wasting and stunting at six and 24 months of age included maternal short stature, male sex and low birthweight. Common protective factors included higher maternal body mass index and household wealth. Being wasted at age six and 24 months was predicted by earlier episodes of wasting, stunting and concurrent WaSt (between two to 21 months). Being stunted at age six and 24 months was similarly predicted by early experiences of stunting and concurrent WaSt but was only predicted by prior wasting episodes after six months of age.

Together, this data adds to the growing literature describing the bi-directional relationships between wasting and stunting over time. The findings further illustrate the importance of integrated programming to address both forms of undernutrition together. Of particular importance is the heightened risk of wasting, stunting and concurrent WaSt for those born low birthweight. To address this, the authors suggest an emphasis on pre-pregnancy and pregnancy interventions as well as a continued focus on women's nutrition across the life cycle to reduce the risk of maternal short stature and the subsequent risk of low birthweight.