THE SEVERITY OF WASTING AND SEVERE WASTING IN INDIA

A Discussion Paper on Situation and Pathways towards Solutions

The Coalition for Food and Nutrition Security

1. BACKGROUND

Wasting, is considered an acute manifestation of undernutrition that has relatively rapid on set and resolution. Severe acute malnutrition (SAM) is defined by very low weight-for-height/length (Z- score below - 3SD from the median, WHO child growth standards), or the presence of nutritional oedema. SAM among children under the age of five years, significantly increases their risk of death often through increasing the case fatality rate in children suffering from common illnesses such as diarrhoea and pneumonia. Epidemiological evidence suggest a 5-20-fold increase in risk of mortality among those with deficits in weight for-height, weight-for-length or mid-upper arm circumference (1) Compared to a well-nourished child, the risk of mortality is nine times and four times for SAM and MAM children respectively (2).

Children become wasted when they lose weight rapidly, usually as a direct result or combination of onset of infection and inadequate diets that do not cover their nutritional needs. The main underlying causes of wasting are (3)

- Poor access to appropriate, timely and affordable health care.
- Frequent illnesses and infections leading to wasting
- Inadequate caring and feeding practices (e.g. no exclusive and effective exclusive breastfeeding for the first 6 months or low quantity and quality of complementary food and poor feeding practices).
- Poor food security characterized in many resource-poor settings by a monotonous diet with low nutrient density and
- Lack of a sanitary environment, including access to safe water, sanitation and hygiene services.

Globally, 2019 saw about 47 million children (6.9%)under the age of five with wasting and 14.3 million with severe wasting. The contributions were mostly from Asia with an estimated 25.2 million from south Asia alone: accounting for over half of the global burden (4, 5). India is at the epicentre of the global problem (UNICEF, WHO and World Bank, 2018) with higher average under five prevalence of wasting than most developing countries is home to four of five such wasted children in South Asia, with 22 million wasted and over eight million severely wasted children at any given time (6).

In a world, where over 45% of under five deaths are attributable to undernutrition (5). Wasting and Severe wasting each account for 12.6% and 7.4% deaths globally (7). In India, undernutrition contributes to 68% of under five deaths, 19.5% deaths among children below 5 years has been attributed to wasting alone (8). However, wasting receives less attention than stunting in India likely due to association to lower mortality in India than other countries.

This paper aims to provide the reader - especially the policy makers and the program managers an update on the magnitude of the problem of wasting. This paper focuses on the different aspects of the severity of wasting: starting with the numbers, the underlying risk factors, the consequences including mortality and the broader impact on development,

backed by global and local evidence on what is and is not known. Based on an agglomeration of the best available evidence and programmatic experiences from both India and abroad, key recommendations for evidence-based decision making have been suggested for policy makers and program managers.

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The paper aims to achieve the following objectives.

1. To summarise Global debate, concerns and bottlenecks faced around wasting and severe wasting
2. To synthesize learning(s) from global and in country evidences on the severity and effect of wasting and severe wasting
3. To recommend way(s) forward to design programs for care of children with severe wasting in India.

2. Prevalence of wasting and severe wasting

Wasting and severe wasting were at 21% and 7.5% in 2015-2016 (NFHS4) (9) and 17.3% and 4.9% respectively in 2018 (CNNS) in India.

The NFHS 5 data released for 22 states have also shown an increase in wasting and severe wasting – in 12 and 16 of the 22 states (10). However, newer evidence from a longitudinal study indicate that

the actual wasting prevalence may be far higher than what is captured through the national cross-sectional surveys (11)

Wasting is almost 30% in under 6 months old in India and the percentage rate decreases with age (NFHS-4). By age 24 months, the proportion of children who had ever experienced a wasting episode was 33%. This suggests that the wasting burden is likely to be more than 5-fold higher than reported prevalence 6%, in the cross-sectional surveys (11, 12). Additionally, the assumption in this study that 10% of the stunting prevalence may be due to wasting. This could be a very conservative estimation, and the burden may actually be much higher than what has been estimated (12).

Although the prevalence of under-five stunting, and underweight children reduced

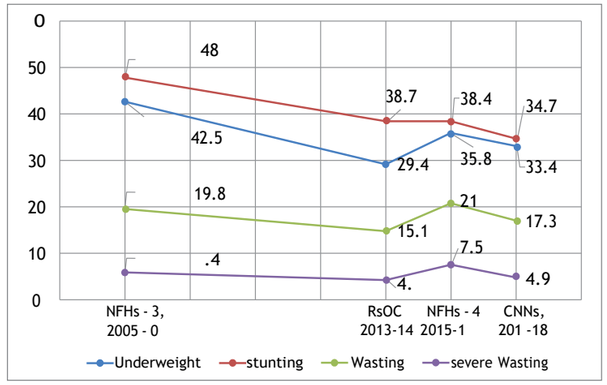

Figure 1: Prevalence of underweight, stunting, wasting and severe wasting among children aged below 5 years in India

significantly (48.0% to 34.7% and 42.5% to 33.4% respectively) between 2006-2018, little change was seen in wasting (19.8% to 17.3%) and severe wasting (6.4% to 4.9%) during the corresponding period (10, 13) as indicated by Figure 1.

The Annual Average Rate of Reduction (AARR) is the average relative percent decrease per year in prevalence or rate and a positive AARR indicates reduction or downward trend, while a negative an increase, or upward trend. Astonishingly over 50% states of India have shown a negative AARR of wasting between NFHS 3 and (NFHS 4) (9, 13). A similar trend is seen in the recently released NFHS 5data of 22 states (10).The large-scale persistence of wasting is a threat to development as it impairs children's ability to withstand shock and contribute productively.

3. Geographical Distribution of Wasting and Severe Wasting in India

An analysis of NFHS 4 data was conducted by CFNS as a precursor to this discussion to understand the percentage presence of severe wasting and moderate wasting in India's districts and its combinations. The findings revealed that western and central parts of India have shown high wasting and severe wasting with district level variations in prevalence. **Similarly, severe wasting in tribal and non-tribal population of India stand at 10.02% and 7.26 % respectively**. A deeper analysis of the distribution of wasting revealed that there is a strong positive correlation between total district level wasting with total moderate wasting (MAM) and total severe wasting (SAM) in India. ***So, an increase in district level moderate wasting and severe wasting would result in an increase in total wasting in India. However, the correlation between total MAM and total SAM was found to be weak, so an increase in MAM may or may not contribute to an increase in the prevalence of SAM in a district.***

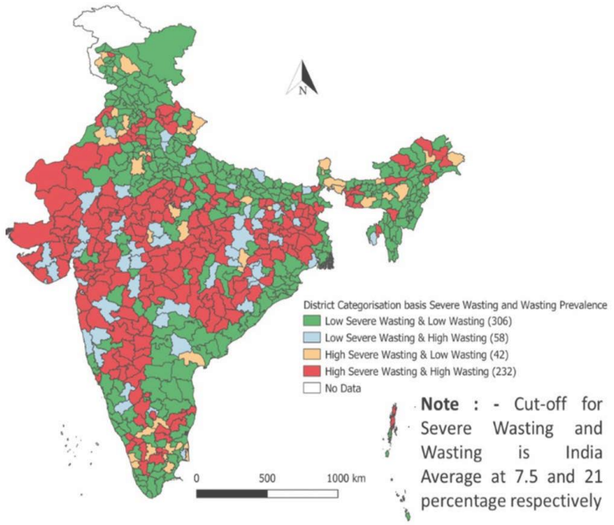

Figure 2 - District Categorization basis Severe Wasting and Wasting Prevalence in India. Source: - NFHS - 4, 2015-16

Based on the data analysis, districts with 50% or more of total severe wasting to total wasting were identified. A total of 63 districts out of 639 were noted to be in this category. ***When most districts (255 districts including 32 tribal districts) have total severe wasting to total wasting prevalence within the range of 30-40%, considerable intrastate variations in total severe wasting to total wasting among districts is seen.*** Seven states fall into the more than 40% category while others like; Telangana and Andhra Pradesh fall into the below 30% category.

Several clusters of high severe wasting and wasting were observed (Figure 2)when districts were spatially classified on basis of severe wasting and wasting as follows.

(i) high severe wasting – high wasting
(ii) high severe wasting – low wasting
(iii) low severe wasting – high wasting
(iv) low severe wasting – low wasting

The clusters of high severe wasting and high wasting districts were more prominent in central and the north-west parts of India and the clusters formed are continuous. Some clusters identified with high (50% and above) severe wasting to wasting percentage were in the states of Arunachal Pradesh, Uttarakhand, Chhattishgarh, Madhya Pradesh, Gujarat, Karnataka, Meghalaya, Tamil Nadu and Kerala.

The districts segregated as per the percentage presence of severe wasting and moderate wasting can be studied for further inferences. Several probable research questions arise from the present analysis e.g. "What is happening in the districts where severe wasting to wasting percentage is more than 50?" "Are all the moderately wasted children regressing to the severe acute state or are they becoming severe acute malnourished more quickly?","In districts with high wasting and low severe wasting, which interventions are helping to better identify the malnourished children early and preventing severe wasting?""Can the inferences or learnings from the districts with low severe wasting to wasting percentage be replicated in the districts with high severe wasting to wasting percentage?"The answers to all these questions will help policy makers and program managers in formulating more district specific Multi-Sectoral Nutrition Planning (MSNP), which has been envisaged to accommodate the district specific concerns under POSHAN Abhiyaan. The present analysis creates the rationale for studying the reasons behind the varying severe wasting to wasting percentage in the districts of India and leveraging it to mitigate the high increasing severe wasting in India.

4. Risk Factors leading to Wasting & Severe Wasting

Drivers of persistently high levels of endemic wasting within development settings are less understood, and appropriate strategies to effectively address this are not well defined. Scientific literature and expert opinions reflect some knowledge on risk factors for wasting while one needs to acknowledge that this hasn't advanced, and further work is ongoing. Moreover, reports from some countries indicate a reduction in stunting rates whilst wasting has remained static (e.g. Vietnam, Sri Lanka) (14). Such findings reveal that different drivers are possibly at play needing for focused intervention approaches. Therefore, a situational analysis and an understanding of the levels of attribution to the various drivers of wasting within a specific context and across different seasons is thus critical.

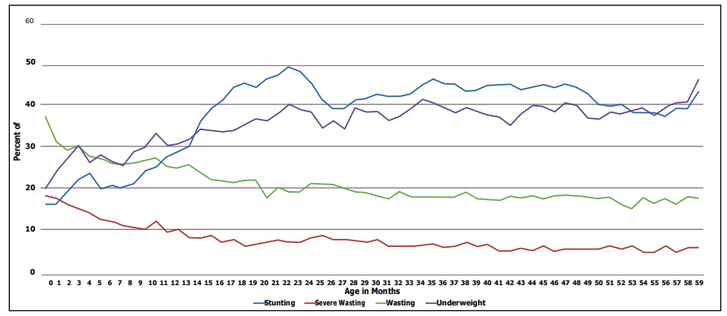

Figure 3. Nutritional Status of Children under age of 5 (All India)-NFHS 4

4.1 COVID-19 Pandemic: Impact

The current situation, with the rapid increase in COVID-19 cases, and the measures adopted to contain the spread have put many families at risk by adversely impacting the food security, livelihoods, and access to critical services for health and nutrition. According to Lancet (15) the widespread disruption to health systems and reduced access to food, secondary to the pandemic, low- and middle-income countries (LMICs) can expect large increase in maternal and child deaths and increase in childhood wasting accounting for 18-23% additional child deaths (15)

4.2 Age

Onset of wasting may be earlier in children in Asian contexts, where a high percentage of children have been observed to be close to -2SD WFL) by the first three months of life (16).More importantly, all measures of early growth failure are significantly associated with higher risk of death by age 24 months, and those most strongly associated with severe underweight before the age 6 months, concurrent wasting and stunting, and persistent wasting under 6 months(11). An analysis of the NFHS 4 data demonstrates that while the prevalence of stunting and underweight increase with age, peaking in later infancy and young childhood, the rate of wasting is higher specifically between birth and first year(Figure

3). The prevalence of wasting is highest (34.3%) between birth and 2 months of age in India indicating the in-utero origins of infant undernutrition (9, 13). By three months, a third of infants are wasted and a fifth by 24 months.

A pooled analysis of 35 longitudinal cohorts in 15 LMICs shows that child wasting is a highly dynamic process of incident, onset and recovery, with peak incidence being between birth and 3 months. Wasting and stunting incidence was highest before age 6 months and occurrence of the same peaked at 18 months (12). A study also found that those children ever wasted in the first 6 months were 1.8 times more likely to be both wasted and stunted between ages 18-24 months (12). Children with linear growth deficits run higher risks of repeated relapse to wasting (17) and wasting in turn make children 3 times more susceptible to stunting (18). Persistent wasting from birth to 6 months (defined as > 50% of measurements wasted) was found to be most strongly associated with stunting at older ages (12).

Though the rates of stunting in children aged 6-12 months in India has reduced marginally (29.7% to 23.95%) between 2005 and 2015, the prevalence of wasting under 6 months remains at 31.9%;a marginal increase from 30.3% in 2005 (9, 13). Research on management of at-risk mothers and infants have shown that infants are more likely to have repeated bouts of wasting and infants under six months of age have a higher relative risk of death despite a better nutritional profile at admission, suggesting that there are other factors at play (19). The possible scenarios proposed: one episode of wasting leaves a child more vulnerable to a relapse or that the original risk factors which caused wasting in the first place, continue to act on the child's nutritional status (19).The potential recovery from wasting and its consequences is higher in the first 6 months of life compared to wasting at older ages, with few exceptions like in South Asia (12).

4.3 Seasonality

Wasting varies considerably over time (across seasons) both within individual and within populations, with seasonal changes in food insecurity or disease. An analysis of various national nutritional surveys done at different times found seasonal trends in 3 out of 4 surveys (NFHS 3 & 4, RSOC and CNNS). Analysis of wasting from these four national surveys controlling for socio-demographic variation in data collection showed that wasting prevalence ranged between 12% and peaking at 24% (20).The relation between season and wasting showed that wasting rates were highest during monsoon season, reflecting the effects of food scarcity and poor development of child. Seasonal trends were found in WHZ scores in longitudinal studies conducted in South Asia. The longitudinal analysis (12) shows that the burden is likely far larger than can be quantified with prevailing methods based on cross – sectional, prevalence survey. An evidence pooled from various studies account as many as 13 times the number of children with wasting at one point in time (prevalence) may experience a period of being wasted within a year (incidence) (12).

Wasting incidence and recovery would provide new insights into the timing and burden of wasting and that incidence-based summaries of wasting could differ from summaries based on prevalence. The Longitudinal analysis could provide new, crucial information about the optimal timing of intervention delivery to prevent seasonal peaks. Therefore, there is a need to have longitudinal studies/surveys to get the real numbers. Surveys related to wasting and severe wasting needs to consider the variations of seasonality related to it. Considering the relation of wasting peaks to seasonality, it is also important that the programs designed to address wasting contemplate interventions to mitigate the effect of seasonality on wasting.

4.4 Co - Morbidities

The risk of mortality associated with both diarrhoea (21) and acute respiratory tract infections (22) in hospitalized malnourished Indian children, increases by six fold (22). Iron deficiency resulting in anaemia followed by vitamin A deficiency are reported to be the most common nutritional deficiencies across many studies (23-26). Congruently SAM and severe anaemia are very common in the Indian paediatric population and often present concomitantly. Co-morbid conditions such as infections, micronutrient deficiencies and parasitic infestation are mainly responsible for high mortality in SAM (27). It has been found that pneumonia, diarrhoea and rickets in under five children were co-morbidities which prevented the nutritional recovery of wasted children (28).

4.5 Co - existence of multiple forms of undernutrition & concurrent growth failure

Co-existence of acute and acute-on-chronic malnutrition cannot be denied in the developing world as observed in many studies (29-32). Bergeron and Castleman examined the phenomenon of acute(wasting) and chronic malnutrition (stunting) often coexisting in same locations (33, 34),Similarly, an analysis of stunting and wasting data from NFHS 4 underlined that almost 42% of districts with very high prevalence rate of wasting (>15%) also had very high stunting (>40%) as per WHO classification (9).Evidence suggest that multiple forms of undernutrition can co-exist within the same child in India and the prevalence appears to be uniquely high for both stunting and wasting.

Many studies have found the co-existence/ overlap of wasting, stunting and underweight in children through the measured Composite Index of Anthropometric Failure (CIAF). In addition to height for age (HFA) and weight for height (WFH), the CIAF classification uses weight for age (WFA) — a measure that does not differentiate acute, chronic, and past (recent or remote) undernutrition.

The national CNNS data of 2016-18 based on the CIAF in children under five in India further confirms the overlap or co-existence of different forms of undernutrition in almost 30% to 55% of children across different age groups (20). The relationship is two way as new episode of morbidity puts the child at higher risk of multiple anthropometric failure. Children experiencing triple failure (underweight + wasting +stunting) are reported to have the greatest morbidity risk (35). Studies have shown that wasted children who were simultaneously stunted were at substantially higher risk of mortality than all other individual anthropometric measures (36). Children with wasting are at a higher risk of morbidity and mortality, and some may eventually end up being stunted (37-39) and children ever wasted in the first 6 months were 1.8 times more likely to be both wasted and stunted between ages 18-24 months (12).

Analysis of pooled cohort (12) from LMICs including South Asia found that concurrent wasting and stunting was most common in South Asia, with peak prevalence in the ages of 12-18 months. Additionally, the assumption in this study that 10% of the stunting prevalence may be due to wasting.

4.6 Social norms and suboptimal nutrition practices

4.6.1 Maternal nutrition : The onset of wasting may occur earlier on in children in Asian contexts with etiological linkages to maternal undernutrition and prenatal conditions (16). Data from longitudinal cohorts and modelling studies, found that around 20% to 30% cases of stunting and wasting are often attributable to foetal growth restriction, which in turn highlights the poor nutritional status of mothers before and during pregnancy (36, 40-42).Maternal anthropometric status can influence child Z

scores by affecting foetal growth and birth size (43, 44). Maternal weight and Body Mass Index (BMI) could directly affect postnatal health of the child through breast milk quality, or reflect family poverty, genetics, undernutrition, food insecurity, or family lifestyle and diet (45, 46).The average birth weight reported of an Indian baby is 2700 grams (47) and the incidence of low birth weight babies (<2500 grams) is as high as 18% (9). These new-born have a very poor start to life and are at higher risk of falling prey to infections, disease and repeated insults of malnutrition.

4.6.2 Infant and Young Child Feeding Practices: In the first year of life, effective breastfeeding and appropriate complementary feeding play the most crucial roles in promoting optimum growth of an infant. It is well established by Lancet that 10% of wasting burden is attributable to suboptimal breastfeeding practices, in particular lack of exclusive breastfeeding (EBF) between birth and six months of age (48).

According to NFHS 4 data of India, although institutional delivery was 78.9% and health personnel assisted 81.4% deliveries at birth, initiation of breastfeeding within one hour of birth was only 41.6% and exclusive breastfeeding at 55%. (9). Based on assessment reports conducted by the World Breastfeeding Trends Initiative (WBTi)[1] India scores a mere 45/100which is much lower than other south Asian countries; Sri Lanka (91/100),Bangladesh (86/100), Afghanistan (80/100), Maldives (69.5/100), Bhutan (55/100) and Nepal (55/100) (49).

Delay in timely and appropriate initiation of complementary foods at 6 months was noted to remain a major problem. According to NFHS 3 and 4 findings, the percentage of children aged 6-8 months in India that received solid or semi solid food along with continuation of breast milk declined from 52.6% in 2005 to 42.7% in 2015 (9, 13). At the all India level, NFHS 4 reported that dietary diversity (among children below 2 years) mostly improved when infant turned a year old. The minimum dietary diversity observed in children in age group of 6-8 months (6.8%) and 9-11 months (14.3%) was relatively lower compared to 12-17 months (25%) and 18-23 months (31.8%) (9).

Introduction of semi-solid or complementary feeding, was noted to be either too early or much later than 6 months completion (50). An anthropological study understanding perceptions and care practices in Jharkhand, found that the community demonstrates a strong dependence on traditional and cultural practices for health care and nutrition for newborns, infants and young children (51).Some cultural beliefs included feeding children only thin watery foods (e.g. watery dal/pulse, watery porridge of grain, and pulses monotonously)because of the perception of the inability to swallow thicker food, feeding junk food like biscuits at 4 months of age, avoidance of non-vegetarian food and egg till the age of one, feeding predominantly starchy food and vegetables (50).

4.6.3 Social norms related to nutritional practices : Community often has a traditional or emic understanding of wasting as generalized “weakness” among children or an effect of “evil eye”. Furthermore, the community relies on alternative systems of medicine for treatment of childhood illnesses, including malnutrition. Mothers often lack understanding and rationale of appropriate dietary practices, early childcare and responsive feeding, and access to health care. The prevailing food practices for pregnant and breastfeeding mothers were found to be not conducive to prevent malnutrition among mothers and children (44). There are strict norms in the communities as to what and how much food a woman can eat during pregnancy. Based on a report on ‘Best Practices and Innovations from POSHAN Abhiyaan’ covering Northern states of India, including studies conducted in Bihar and Jharkhand, reflect that the choice of healthcare provider varies depending on the illness and perceived credibility. With frequent bouts of fever, chills, diarrhoea, or loss of appetite, preference towards traditional health practitioners or faith healer to ward off the ‘evil eye’s was higher (44, 52).

[1] World Breastfeeding Trends Initiative (WBTi) assists countries to assess and analyze gaps in policies and programs related to breastfeeding and infant and young child feeding

5. Consequences of wasting & severe wasting

5.1 Slower recovery and poor cognitive abilities

Recent evidences have shown longer recovery periods among Indian children who are wasted compared to the average eight weeks in African countries (53-56). A study in rural eastern India found that over 40% children with wasting (severe and moderate wasting)remained acutely malnourished for over 3 months and around 41.4% and 43.5% SAM and MAM children diagnosed at the age of six months, continued to be in the same nutritional status for a year (57). A pooled analysis of data from LMIC revealed that persistent wasting was highest in South Asia, with 6.9% persistently wasted over the first 24 months of life (12).

The longer durations of wasting or slower recovery have implications on development milestones. Several studies have shown a strong correlation between SAM in children and reduced cognitive abilities (58, 59). SAM hinders motor, adaptive, language and social development of a child (60, 61). Studies also indicate that SAM children showed poor performance in tests of higher cognitive function like cognitive flexibility, attention, verbal comprehension and memory (62, 63). A longitudinal study reports that SAM children showed poorer school performance even at later stages of life, in comparison to control groups (64). SAM increases mortality, morbidity, impairs physical and mental capabilities of child.

5.2 Mortality risk associated with wasting and severe wasting

Different estimates find that severely wasted 6 to 59 month old children are 9 to 12 times more likely to die than their healthier counterparts (39, 65) and when also stunted, this becomes 12.3 fold (66).Black RE, 2013 (7) analysing data from 40 countries, stated that wasting accounted for 875,000 deaths or 12.6% of all deaths due to wasting among 0-59 months old children, while severe wasting accounted for 7.4% of such deaths. A recent (2019) evidence from India revealed that wasting (including severe wasting) attributed to 19.5% deaths among children aged 0-59 months, while stunting accounted for 4.38% of all deaths within the age group (8) .

There currently is no national-level data on the proportions of children with SAM who have been identified and treated and very limited data on mortality and rates following acute malnutrition in the community (67). Mortality due to wasting in India appears to be lower as compared to African countries. Recent Indian studies report low mortality rates in children suffering from wasting. The first one being an opportunistic follow-up study of SAM children in rural Meerut District of India. The study reported that the severely wasted children without treatment, but with referral for counselling and support, had a case fatality of 1.2% - 2.7%. Around 25-30% of children with SAM recovered without treatment (68). Although the study highlights high spontaneous recovery, it fails to emphasize that over 70% children did not recover from SAM without treatment even after long term follow up. These children remained at a significantly increased risk of reduced physical and intellectual development and of being associated with long-term complications. The second one, in rural eastern India, found the incidence of acute

malnutrition among children older than 6 months was high, but case fatality following SAM was 1.2%. However, the adjusted Hazard Ratio (HR) using all anthropometric indicators was 2.56 for SAM. Both WLZ < −3 (SAM) and MUAC >11.5 and < 12.5 were associated with increased mortality risk (57). Also, those identified as SAM at the age of 6 months continued to be in the SAM state until they turned 18 months, again pointing to the fact that though the mortality in SAM maybe low but the child is at an increased risk of dying or developing complications. Although the mortality rates in India appear to be low compared to other countries, the estimated 'low' rates when extrapolated, may account for a larger number of deaths of children aged 6 to 59 months with SAM each year. Another study, a multi-centric trial on the effectiveness of different types of nutritional support for uncomplicated SAM management (Bhandari et al. 2016) (53) observed that, clinical outcomes in uncomplicated SAM children identified with WHZ<-3 showed a very clear vulnerability profile and high morbidity risk. More than half of SAM children had fever or diarrhoea or cough or fast breathing in previous 2 weeks before admission, around 40% had a mother with BMI<18.5kg/m². During treatment phase around 10% such SAM children were hospitalized, and 41.5%, 13.3% and 61.6% developed diarrhoea, ALRI, and fever, respectively (53). These findings havefar-reaching implications for child survival policy and programs, suggesting that greater attention should be paid to nutritional improvement in children suffering from SAM (57).

5.3 Economic effects of wasting & severe wasting

The primary outcome of wasting is morbidity and mortality. However, emerging evidences also show that repeated episodes of wasting at early age may lead to stunting (12). Small size at birth and at 2 years of age (particularly height) are associated with reduced human capital: shorter adult height, less schooling, reduced economic productivity, and for women, lower offspring birth weight. The Coalition Food & Nutrition Security (CFNS) through a study have assessed the health and economic impact of childhood wasting situation in the country for the period of 2006-2018 (69). The study estimated mortality due to wasting and wasting induced stunting and DALY loss based on years of life lived with disability as well as years of life lost prematurely due to wasting and wasting induced stunting. The economic losses were estimated as share of the annual GDP of the respective years.

The study estimated that India lost an average of 60 million DALYs in the period 2006-18 due to untreated childhood wasting (69). A major share (84%-96%) of DALYs lost was due to years of life lived with disability (YLD). The economic loss estimated in terms of per capita GDP ranged between 58 billion to 116 billion USD between 2006-18, with an average of 83.4 billion USD; with an average of 4.7% GDP annually. The study also assessed the societal cost of wasting [sum of loss incurred at individual level (mortality or disability adjusted life years) and losses incurred by the society at large due to lower cognitive abilities, compromised productivity, lost opportunity costs due to wasting and other intangible costs like loss of leisure etc.]. These costs incurred, were above the loss due to childhood wasting due to mortality or economic losses due to ill health, loss of human resources and productivity. Cost to society averaged at 250.3 billion USD (ranged between 174 billion and 348 billion USD), and an average of 14.2% of annual GDP (69).

6. Management of severe wasting

Nationally, following IMNCI, the focus has been primarily on institutional based treatment of SAM cases at Nutrition Rehabilitation Centres (NRCs)/Malnutrition Treatment Centres (MTCs) managed by the health system. The country currently has 1151 NRCs and MTCs, with an approximate capacity of 15 beds per unit. The 2011 National protocol (70) on Facility based management of children with SAM allow these children to be treated. Management includes medical treatment and therapeutic treatment in form of therapeutic milks. However, with a caseload of about 8 million children being severely wasted at any point of time (6), the current capacity of NRC or MTC is not enough to treat the entire caseload. Again, facility based treatment at NRCs are only required for a small proportion (20%) of children with SAM who have medical complications (71).However, due to the absence of community-based programs in India, all children identified as SAM are referred to NRCs or MTCs regardless of whether they need medical attention or not. This is also a very expensive proposition as treatment of children in a facility is costlier compared to community based care (72-74).

Studies have shown that, about 80% of children with SAM who are without medical complications can be treated at home or the community level under community management of SAM (CSAM). Evidence across the globe suggest that community based management of children with SAM with no medical complications complemented by facility based treatment for those SAM children with medical complications is feasible and cost effective, and can prevent premature deaths and associated disabilities (75).

7. Conclusion

Currently with no national-level data on mortality associated with SAM, one can assume that India specific information is very limited. This lack of mechanism to capture deaths due to malnutrition could be one of the many reasons for the low reporting of SAM related deaths. The reasons for deaths reported in hospitals is often attributed to associated morbidities like diarrhoea, pneumonia etc, thus implying that wasting works in synergy with various infectious diseases resulting in deaths which means if the wasting did not exist, the deaths would not have occurred. While the apparent mortality due to SAM seems lower in India than in many other countries, the risk remains elevated if left untreated, especially among 6-18-month-old children. Without treatment, about 60% of SAM cases may not recover and those children who show recovery without treatment may take longer time to recover. Subsequently, diminishing their physical, intellectual development and hampering growth, cognition, limiting learning experiences and compromised adult life productivity (76) as indicated by existing literature (58, 59). Those children who have previously suffered one or more bouts of wasting or who are at an anthropometric deficit have a predisposition to successive bouts as compared to those that had never been wasted. Thus, while prevention comes first; treatment is a must when prevention fails.

A large number of studies indicate that onset of wasting was higher in the early years and the younger children with wasting suffer a higher risk of death, with the risk being heightened further if the child suffers from both stunting and wasting (36). Maternal nutritional status, prenatal and at birth conditions including seasonality of birth month and food security status, have a strong bearing on wasting, with residual consequences persisting till 24 months of life (11). Moreover, children who were born with wasting but recovered were found to have higher cumulative incidences of wasting even after 6 months of age, and almost never catch up in weight-for- length Z scores in comparison to children born without wasting (12). A large amount of the brain's structure and capacity is formed early in life, before the age of 3 years (77). The repercussions are huge because of failure to optimize brain development especially in the early years of a child's life which has long term consequences in regards to education, job potential, and adult mental health, ultimately leading to the cost to society (78). Therefore,

management of wasting in children below 6 months is extremely important, not just to reduce mortality, but also to prevent the long-term consequences of wasting. Additionally, there is a need to intensify wasting treatment programs targeting children in the younger age group, more specifically special care of those below 6 months. There is also an indication for the need for special support to mothers for improving maternal nutritional status, adequate and effective exclusive breastfeeding for children below 6 months and also appropriate complementary feeding including better access to energy, protein and micronutrients rich foods after the 6th months.

The bi-directional association between stunting and wasting indicate that children with repeated episodes of wasting also falter in linear growth, and the linear growth deficits elevate the risk of relapse into wasting (12, 17); subsequently increasing the risk of becoming stunted. Stunting is in part a biological response to previous episodes of being wasted and that both share similar determining factors and should be seen and managed as a continuum. This information from a policy perspective is important as it

Severity of SAM

1. The prevalence of wasting in India exceeds the emergency threshold of 15% or more prevalence that constitutes a “critical public health problem” as suggested by WHO deserving immediate attention.
2. Although the mortality rates due to wasting in India appear to be low compared to other settings, actual estimated deaths - due to SAM would have larger share of deaths in the 6 to 59 months age group.
3. Recent evidence (2019) from India shows that 19.5% deaths among children aged 0-59 months can be attributed to wasting (including severe wasting)
4. In India, almost 30% children below 6 months are wasted with a very high risk for relapses.
5. Severe acute malnutrition leads to weakened immunity, susceptibility to long-term developmental delays and an increased risk of death, especially in its most severe form or when combined with stunting.
6. Wasting in synergy with other health conditions impose higher risks for severe morbidity, associated economic and societal losses, and even mortality. Thus, wasting cannot be side-lined as one of the smaller problems of public health consequence.
7. A strong correlation exists between severe acute malnutrition in children and their reduced cognitive abilities.
8. Wasting in early childhood makes children 3 times more likely to be stunted. Wasting increases the risk of subsequently becoming stunted. Wasted children who are simultaneously stunted are at substantially higher risk of mortality.
9. Children in India are ‘wasted’ for a relatively long period of time. Indian children who are wasted take longer time to recover.
10. The large-scale persistent wasting (both the prevalence and the episode of wasting) is a threat to the development process of Indian children as it impairs children’s ability to withstand shock and contribute productively.

suggests our failure to recognize the importance of wasting simply because it tends to be more acute and treatable.

Cases of severe wasting represent a failure in a preventive system that identify and manage wasting at an early stage and prevent deterioration to severe wasting. This should be prioritised, as the child may never fully recover physiologically from severe wasting and its lifelong implications. It is also important to invest in wasting prevention at times of crisis. Malnutrition, a preventable cause of mortality and morbidity among children, if prevented can have impressive economic benefits as high as $18 return from every $1 invested are noted in reducing wasting and stunting (79). In India, the yields are even better — three times more than the global average ($34.1-$38.6) (80). India has an impressive portfolio of programmes to cater to maternal-child health and nutrition. Management of SAM has been estimated to be the most important nutrition intervention that needs to be scaled up; at 90% coverage (81), this mediation could save between 285,000 and 482,000 lives (68).

8. Recommendations

Some of the recommendations based on the review of literature on severity of wasting and severe wasting for children under the age of 5 years have been categorised based on the scope of action:

1. Short term recommendation for immediate actions -
    i. Prevention comes first, evidence has established the importance of focusing on the first 1000 days of life. Primarily actions required to be taken in the first year of life and emphasis must be on introduction and establishment of optimal breastfeeding and complementary feeding practices. Mothers must be informed of the effective breastfeeding technique, including cross cradle hold with cupping of breast. Use of WHO Breastfeeding Assessment Tools to monitor breastfeeding in mothers, to be used for the first 2 months to ascertain mothers are following the correct breastfeeding techniques. Nutrition before and during pregnancy also needs to be prioritised.
    ii. As a result of COVID-19 pandemic, India can expect large increase in wasting and severe wasting numbers. Therefore, a multi-sectoral community-based management of severe acute malnourished is needed and the interventions pertaining to management of SAM children needs to be Covid-19 sensitive.
    iii. As there is spatial variation in prevalence of wasting and severe wasting at district level in India and there can be varied reasons for high and low wasting levels in these districts that needs to be investigated. The interventions contributing to low wasting can be replicated and scaled in other districts. Accordingly, district specific Multi-Sectoral Nutrition Planning (MSNP) and resources allocated.
    iv. Prevalence of wasting is higher among children up to the age of 6 months and so is the mortality risk. Therefore, younger children should be priority for treatment, follow-up, and preventive efforts to not only to ensure survival but also to help these children grow better and thrive. Protocols for SAM management of children below 6 months at community should be rolled out urgently.
2. Long term recommendations
    A. Recommendations for preventing wasting
        i. An important complementary strategy to reduce the SAM treatment burden and to avoid lifelong consequences, is to improve the effectiveness of interventions to prevent relapse and to prevent moderate wasting from becoming severe. Preventing the deterioration from moderate to severe wasting with the launch of recent initiatives, such as MUAC for Mothers

(82). Also, the combined protocol approach–which treats both moderate and severe wasting in a continuum of care–like in the Combined Protocol for Acute Malnutrition Study (ComPAS) (83) can be explored.

ii. Wasting trends are closely associated to seasonality. Therefore, Interventions pertaining to community-based management of SAM child needs to be season specific with intense preparation and implementation during the hard seasons e.g. establishing nutri-gardens, grain banks, strengthening public distribution services (PDS) to ensure food security during lean seasons, also intensive focus on prevention and management of diarrhoea and other infections during rainy season .

iii. Surveys related to wasting and severe wasting need to consider the related variations of seasonality and considering longitudinal studies/surveys over cross- sectional to get the real numbers.

iv. It is important to undertake context-specific causal analysis based not only on assumptions but also on the use of longitudinal data to investigate existing pathways of wasting and severe wasting.

v. Co-morbidities are responsible for the high incidence of morbidity and mortality in children with severe acute malnutrition. With the postulated reciprocal relationship between diarrhoea and malnutrition in mind, It is recommended that access to quality health care, as well as treatment and control of infectious disease should be an integral part of any strategy to prevent severe wasting (SAM) and nutrition should be an integral component in the management of infectious diseases. As a combination of wasting and infectious disease increase the mortality risk, the prevention of this comorbidity should be prioritised.

vi. Although mortality from acute malnutrition may appear to be lower in India than in other settings. It has also been observed that the actual mortality risk from SAM in India along with risk from moderate and severe malnutrition is not apparent. So, there is a need for more detailed studies on causes and mortality risks associated with moderate and severe acute malnutrition in India.

B. Recommendations for re- designing of programs to address wasting

i. The Composite Index of Anthropometric Failure (CIAF) provides the total burden of under-nutrition in the community which would otherwise be underestimated if conventional indices were solely relied upon. The composite index can be an important indicator used to rank different states, which combine all the three anthropometric markers into one index. This will be useful in objectively allocating funds to different states based on the ranking.

ii. Measurement of height in addition to weight can be incorporated in routine growth monitoring activities in Integrated Child Development Services (ICDS) (it has been initiated in many states) and other nutrition programmes. It would be useful not only to assess wasting but also stunting. By prioritizing interventions for children with multiple failures, morbidity and mortality among under-fives can be further reduced.

iii. Considering the co-existence and bi-directional association between stunting and wasting, the outcomes of programs targeting wasting (SAM) in isolation would not be sustainable. Therefore, the nutrition programs should include preventive, promotive and curative approaches to address both wasting and stunting simultaneously.

iv. Approaches to prevention and treatment of wasting and severe wasting is equally important.

Yet, the process for practitioners of separating out and diversely responding to prevention and management within interventions could be complex. A single comprehensive integrated package of prevention and management of acute malnutrition at community level would be much simpler.

v. There must be an overarching strategy to prevent and manage undernutrition, the package of interventions provided within this approach must be tailored to respond to context-specific nutritional problems and their primary pathways. This includes responding to seasonal peaks in acute malnutrition and disease outbreaks through food assistance, agricultural/livestock interventions, vaccination drives and other appropriate public health interventions.

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