PERSPECTIVE

Programmatic Response to Malnutrition in India: Room for More Than One Elephant?

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Programming platforms need to recognize the diversity of malnutrition epidemiology in India and choose appropriate implementation designs. With severe chronic malnutrition as the dominant epidemiologic entity, the net needs to be cast wide, focusing on: food security, health care, agriculture, water and sanitation, livelihoods and women's empowerment. Community-based malnutrition treatment and prevention programs need to collaborate to complement treatment with socioeconomic and preventive interventions. Expansion of nutrition rehabilitation centers should be limited to areas/districts with high wasting. Pediatric services with nested nutrition services (including counseling) requires urgent strengthening. Continuum of Care is a weak link and requires strengthening to make both hospital and community-based models meaningful.

Keywords: *Nutrition, Prevention, Protein energy malnutrition, Rehabilitation*.

The modest decline of undernutrition levels between the last two rounds of the National Family Health Survey is well known and India continues to remain off-track from the Millennium Development Goal (MDG-1) target. The third National Family Health Survey (NFHS-3) reported 6.4% under-five children in India as severely wasted and 19.8% as wasted, translating to about 8.1 million children with severe acute malnutrition (SAM) [1]. The efficacy of WHO guidelines and regimens for reduction of mortality through hospitalized management of SAM children in Africa (compared with conventional treatment) is well established [2-4]. This led to Nutritional Rehabilitation Centers (NRC) / Malnutrition Treatment Centers (MTC) emerging as the strategy of choice in India for institutionalized management of malnourished children. More recently, the global consensus is shifting towards community-based management of acute malnutrition for uncomplicated cases of SAM (estimated to be about 85% of all SAM cases). This is also based on African experiences of treating acute malnutrition by large scale use of ready to use therapeutic foods (RUTF) in community settings [5,6]. Efforts are ongoing in India to frame guidelines for community-based management of acute malnutrition [7].

Severe Chronic Malnutrition: Saying the Unsaid

Examination of SAM management in India through NRCs draws attention to three key issues: (*i*) need for community based strategies that take a continuum of care approach addressing all children [8]; (*ii*) inappropriateness of current cut-offs of mid upper arm circumference (MUAC) measurement as a screening tool for identification [9]; and (*iii*) poor treatment outcomes at NRCs in terms of recovery, cure, defaulter and secondary failure rates [10]. We have argued that stunting levels in India are higher than African children and exceedingly so among chronically poor populations. Put differently, there is a uniquely high prevalence of both stunting and wasting; both SAM and Severe Chronic Malnutrition (SCM) co-exist, and, SCM is the dominant epidemiologic entity.

In the light of the emerging evidence, this paper pursues two specific objectives: (*i*) re-examine national level data to deconstruct the distribution of SAM/SCM scenario – this is relevant for a layered understanding of the inter-state distribution of wasting and stunting; and (*ii*) examine whether programmatic responses are consistent with epidemiologic realities.

Bergeron and Castleman examined the phenomenon of acute and chronic malnutrition often coexisting in same locations [11,12]. They established that the type and severity of malnutrition vary within countries, and responses at sub-national levels ought to depend on the specific nutrition situation and other factors such as health system capacity, food availability, enabling environment and resource availability. India, along with D R Congo, Ethiopia, Nepal, Nicaragua, and Niger were found to have high rates of both stunting and wasting.

Following their methodology, we have undertaken an analysis of the Indian NFHS-3 data to map inter-state distribution of acute and chronic malnutrition by computing terciles for wasting and stunting.

DISTRIBUTION OF WASTING AND STUNTING

Distribution of wasting *vs*. stunting across states is uneven. The results presented (***Table* I**) is the distribution for rural areas while that for the 'total' is closely similar. Large states, with high levels of chronic poverty – Bihar, Jharkhand and Madhya Pradesh – also have high levels of both stunting and wasting. States with high levels of stunting (including large states such as Assam, Uttar Pradesh, West Bengal, Chhattisgarh, Gujarat, Karnataka and Maharashtra) are evenly spread among low, medium and high wasting terciles. However, there are no states that show high wasting but low stunting. While there are a large number of states with high or medium stunting, only a few have high wasting and these are the ones with concomitant high stunting. On the other hand, states with medium prevalence of wasting are spread across low, medium and high stunting prevalence. It thus becomes fairly apparent that stunting and SCM is the dominant epidemiologic entity. Consequently, the phenomenon of wasting, typically an acute phenomenon in terms of weight loss due to short term causes merits clarity in the Indian context.

PROGRAMMATIC RESPONSES TO SEVERE MALNUTRITION

The main strategy for treatment of severe malnutrition (all such cases being *assumed and labelled* as 'SAM') in India has primarily been facility-based; a number of Nutrition Rehabilitation Centers (NRC) / Malnutrition Treatment Centers (MTC) have been set up across the country, especially in high priority states under the National Rural Health Mission (NRHM). There is emerging evidence of these models meeting with poor success in these states. Outcome data from hospital-based treatment centers in countries (such as Burkina Faso) with high levels of both stunting and wasting have revealed that a small proportion actually qualify for admission, implying that the dominant epidemiologic entity is SCM; low recovery rates also complement this thesis [10,13-15]. It is no coincidence that these poorest Indian states by the UNDP's Multi-dimensional Poverty Index (MPI) have both high stunting and wasting and are comparable to the African countries in terms of high stunting and wasting, MPI scores as well as poor SAM treatment outcomes [10,11,16]. It has been argued that poor treatment outcomes are pathognomonic of a basic flaw in the approach itself (failure to recognize SCM as an epidemiological entity) and not a marker of poor implementation [10].

TOWARDS COMMUNITY-BASED MANAGEMENT OF ACUTE MALNUTRITION

There is renewed thinking on facility-based treatment, with opinion gradually veering towards Community-Based Management of Acute Nutrition (CMAM) as a cost-effective high-impact model. Hospital-based management of SAM lasts for 2-3 weeks (plus follow-up) and involve substantial burden including opportunity costs and social dislocation; CMAM offers an attractive alternative to these challenges. CMAM comprises of three key elements: (*i*) ready-to-use therapeutic food (RUTF), (*ii*) community engagement and mobilization, and (*iii*) screening for malnutrition in communities [17,18]. There are three treatment modalities: (*i*) inpatient management at the stabilization center established near target communities, (*ii*) outpatient management, and (*iii*) supplementary feeding; the appropriate choice is dependent on the severity of malnutrition and its associated complications. In India, Bihar has initiated a CMAM program with technical support from *Médecins Sans Frontières;* children are given take-home ready-to-use therapeutic food (RUTF), following a model similar to that the organization pursues in Africa [19].

Drawing upon the WHO UNICEF Joint Statement, the Indian Academy of Pediatrics (IAP) Consensus Statement 2013 also advocated that children with SAM who do not have any criterion for inpatient-care can be managed under an Outpatient therapeutic program (OTP)

TABLE I INTER-STATE DISTRIBUTION OF WASTING AND STUNTING AMONG CHILDREN UNDER 5 YEARS

Stunting (-2HAZ) [Tercile]	*Wasting (-2WHZ)[Tercile]*		
	Low	*Medium*	*High*
Low	Goa, Jammu & Kashmir,	Kerala, Tamil Nadu, Tripura	–
Med	Andhra Pradesh, AP Manipur, Nagaland, Punjab, Sikkim	HP, Orissa, Rajasthan	–
High	Assam, Delhi, Mizoram, UP, West Bengal	Chhattisgarh, Gujarat, Haryana, Karnataka, Maharashtra, Uttaranchal	Bihar, Jharkhand, MP, Meghalaya

Data source: [1]; MP: Madhya Pradesh; UP: Uttar Pradesh; HP: Himachal Pradesh; AP: Arunachal Pradesh.

center close to the child's home and that such a program needs to be a part of the current health service system, *viz*. Integrated Child Development Scheme (ICDS) and the National Rural Health Mission (NRHM) and involve frontline health worker cadres such as the *Anganwadi* Worker (AWW), Accredited Social Health Activist (ASHA) and the Auxiliary Nurse Midwife (ANM) [20, 21]. The National Guidelines of Bangladesh are also pursuing a similar line [22]. DFID-UK, adapting from the African models, is providing technical support for piloting CMAM in Madhya Pradesh and Odisha [23].

The Rajmata Jijau Mother-Child Health and Nutrition Mission in Maharashtra has adopted a three tier system: (*i*) Village Child Development Center (VCDC) for community-based management of SAM, (*ii*) Child Treatment Centre (CTC) for facility-based management of SAM/MAM children (at PHC level), and (*iii*) Nutrition Rehabilitation Centre (NRC) for facility-based management of SAM/MAM children (at the level of Rural/District Hospital). Analysis of the program data revealed relapse "due to lack of adequate training of mothers". The program thus decided to switch to a 'Home-based VCDC model' [24].

Most of these CMAM projects are yet to be systematically evaluated, specifically for their impact in the context of high prevalence of stunting. We do not have adequate information on either proximate outcomes such as mortality and failure rates, or long term ones such as relapse rates.

Paradoxes and Dilemmas

SAM is precipitated by acute crises situations such as deprivation due to seasonal shortages, sudden catastrophes such as crop failure or civilian unrest, and acute episodic illnesses. SAM, associated with a high risk of mortality, constitutes both medical and humanitarian emergencies. SCM, in contrast, is an outcome of latent poverty, chronic food insecurity, poor feeding practices and protracted morbidities with long term implications for educability, future work capacity, earning capabilities and susceptibility to chronic diseases. ***Fig.* 1** captures the inter-relationship of the anthropometric indicators (from NFHS-3) and the Multi-Dimensional Poverty Index (MPI) scores for the major Indian states [16]. The size of the bubbles represents MPI scores and correlate well with the distribution expounded in ***Table* I**. SCM thus represents profound individual and societal deprivations but is rarely a direct cause of mortality (the *raison d'être* of facility-based treatment models) [10,11].

In situations of SAM with high probability of mortality, the treatment of choice is a clinical/facility-based approach [11,20] CMAM with its advantages over the NRC model is being increasingly propagated for SAM management in India. However, this is on account of a relatively small proportion of children who meet the admission criteria for NRCs, or are sick and at a high risk of mortality – largely because they are cases of SCM [10]. The current programmatic choices in India are limited to either the NRC/MTC approach or the CMAM approach, barring some isolated projects with multi-sectoral components. Thus, the questions arises: Are NRC/MTC and/or CMAM appropriate strategies for states/ population with high levels of chronic malnutrition? Put differently, to what extent and in what manner can these approaches (essentially designed to address acute malnutrition) deal with the epidemiologic reality of SCM?

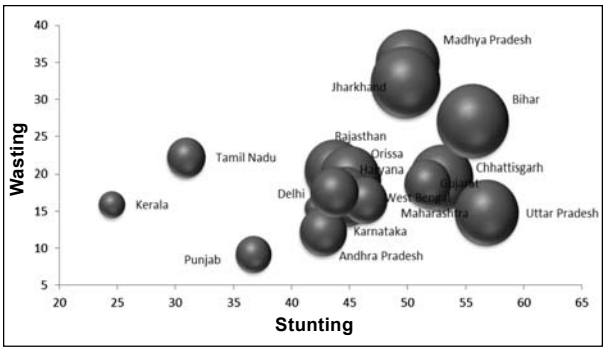

***Fig.* 1** *Anthropometric indicators and Multi-dimensional Poverty Index (MPI) scores for major Indian states.*

Programmatic interventions for SCM require a far wider spectrum of interventions beyond clinical management and need to focus on multi-sectoral actions (to combat multi-dimensional deprivations) for promoting adoption of practices to improve quality of local diets, improving child feeding practices, and reducing exposure to illnesses; these imply broad-based commitment of resources and local capacities and leaderships (requiring sustained nurturing) are critical [25].

The key indicator for SCM is height/age while those for SAM include weight/height or MUAC. The Integrated Child Development Services (ICDS), however, uses weight/age for identification of SAM which has been shown to be a poor proxy [8]. While correlation between weight/age and height/age is generally understood to be high, they measure different outcomes. Significantly, whether or not weight/age is a good screening method for stunting in chronically poor populations, and in the lack of pediatric body composition data, has not been convincingly tested [13]. SCM, therefore, lacks a good screening tool at the field level while calling for community based preventive and multi-sectoral programs.

THE WAY FORWARD

CMAM and prevention programs need to collaborate to complement treatment services with socio-economic and other preventive interventions. This is often hindered by strategic and technical divides between diverse departments and organizations that need to collaborate very closely. Further, there is evidence that donor priorities may choose one intervention over the other [25]. There is an urgent need for 'tailored' strategies for different states, and specifically districts, depending on their wasting and stunting profiles. This calls for investing in obtaining appropriate data (as a starting point) including regular nutrition surveillance at the district level.

Expansion of NRCs in states with low or medium wasting is unwarranted. Strengthening pediatric services and nesting nutrition services (including counseling) within such settings ought to be the preferred strategy. In states/districts with high wasting, there is a need to shift to more community-based strategies (including CMAM), while NRCs may take care of complicated cases. At the same time doctors and pediatricians need to move beyond their perception of NRCs as a 'feeding program' and engage more with treatment of sick children and minimize referral [10]. Continuum of care (CoC) is weak and fails to sustain weight gains made during the stay at the NRC. While shift to community based models is in general desirable, CoC requires considerable strengthening to make both hospital- and community-based interventions meaningful [26].

Emerging evidence from village studies in areas with chronic malnutrition indicate variation in availability, consumption and composition of food across households depending on their resource base – a constant struggle to produce, earn and procure food; as well as seasonal variation in food availability and dietary intake within households. Such populations suffer from chronic food insecurity, worsening during lean seasons that are marked additionally by higher levels of: (*i*) growth faltering; (*ii*) referrals for nutritional rehabilitation and illnesses; and (*iii*) mortality among children [27].

While chronic malnutrition during the rest of the year signifies children who are hungry and not sick, these lean seasons are periods of crisis that bring into focus episodes of wasting (acute malnutrition) over and above underlying stunting (chronic malnutrition). We propose that this phenomenon be recognized as an acute-on-chronic category of malnutrition; such acute-on-chronic entities (beyond the conventional dichotomous categories of acute and chronic) are increasingly recognized in other conditions such as acute-on-chronic liver failure and acute-on-chronic kidney disease.

These windows (of crisis) require not just nutrition rehabilitative services (CMAM or NRC) but, more importantly, have greater need for pediatric care too; shortfall of pediatricians range up to 90-95% in rural and tribal areas of states with high malnutrition.

Management of chronic malnutrition calls for sustained interventions addressing all children. Universal growth monitoring, protocols of addressing growth faltering with referrals for treatment of illnesses, prevention of infections, and feeding calorie-dense foods are essential direct interventions. Women's workforce participation (both paid and unpaid) is high and contributes to poor child care and feeding practices. With the Integrated Child Development Services (ICDS) continuing to lag in its quest for 'universalization with quality', the lack of adequate child care/ day-care/ crèche-based services for children under three years of age contributes to worsening chronic malnutrition.

A crèche program with components of community mobilization backed by systems strengthening and access to better food and livelihoods can help ameliorate the situation. The *Fulwari* Scheme in Chhattisgarh has been independently assessed to demonstrate improvement of anthropometric indicators through multi-sectoral actions: feeding and care of under-three children, pregnant and lactating women; day-care for children; promotion of household level production of diverse foods; and *panchayat*led strengthening of health, ICDS and agricultural sectors [28]. The Action Against Malnutrition (AAM) project being implemented by a consortium of NGOs in seven blocks of states with high SCM is also seeking to address these elements; results are awaited regarding its efficacy [29].

CONCLUDING THOUGHTS

Contemporary wisdom maintains that the distinction between acute and chronic malnutrition is blurred; and that mortality is high in chronic malnutrition as well [30]. Rigid and blinkered, such arguments are at best intuitive but oblivious to the epidemiology of chronic malnutrition in India. A reductionist zeal considers 'SAM' in India as 'a major public health issue', the proverbial elephant in the room; first offering NRCs as a solution and now CMAM, little realizing that the epidemiology is complex and the need to recognize other elephants too [21]. The international dogma of SAM is a powerful idea with a compelling logic for urgent technical and humanitarian action; the consequences for our context: they distract attention and resources away from the big picture. Seemingly obvious observations come with a caution: it

looks exactly the same whether the earth goes around the sun, or, had the sun been going around the earth!

Our previous analyses point to three clear conclusions: (*i*) differences in the anthropometric 'spread' of malnutrition across different states of India (and the need for tailored strategies); (*ii*) SCM and stunting (and not MAM/SAM) as an overwhelmingly large epidemiologic reality; and, (*iii*) episodes of wasting (acute malnutrition) as a seasonally nested entity within chronic malnutrition, what we term acute-on-chronic malnutrition. The challenge is to arrive at the common purpose of tackling SCM over and above sectoral priorities. Recognizing and addressing these complexities are both programmatic and ethical imperatives.

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