Potentials, Experiences and Outcomes of a Comprehensive Community Based Programme to Address Malnutrition in Tribal India

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Abstract: This paper demonstrates the effect of an innovative community-based management programme on acute malnutrition among children under three years of age, through an observational longitudinal cohort study in tribal blocks in central-eastern India.

The key components of the programme include child care through crèches, community mobilisation and systems strengthening to ensure better child feeding and caring practices and delivery of public health and nutrition services.

For a cohort of 587 children, the increase in children in the non-wasting category is from 72% to 80% (p<0.001) and the reduction in Severe Acute Malnutrition (SAM) from 8% to 4% (p<0.005), a reduction of 46.6%. Normalcy is fairly well maintained at 89%. Among the severely wasted, 16% show no improvement, 49% moved into a moderate wasting category and 36% to normalcy over 4-6 months. Among the moderately wasted, 26% showed no improvement and 7% declined to a severely wasted category, and 67% moved to normalcy. The average Weight for Height Z-score (WHZ) for the cohort improved from -1.41 in the initial period to -1.13 in November (p<0.0001).

This study suggests that this medium term strategy using a rights-based participatory approach for community based management of malnutrition may be comparatively effective by current WHO guidelines and other known community based interventions in terms of mortality, cost, degree and pace of improvements.

INTRODUCTION

Despite rapid economic progress, malnutrition in India remains a big challenge. According to the latest available data from the National Family Health Survey (NFHS 3 2005-06), 48% of children under five years of age are stunted, 43% are underweight and 20% are wasted. Of these, 24% children are severely stunted, 16% are severely underweight and 6.4% severely wasted [1]. Citing more recent but unofficial data, the Global Hunger Report [2] finds that the percentage of children in India who are underweight has reduced to 30.3% and the Global Nutrition Report reports a stunting prevalence of 38% [3]. Although there are a number of government programmes to address malnutrition, significant gaps remain. The Integrated Child Development Services (ICDS) programme aims to provide health, nutrition and education services to all children under six years of age but has failed to effectively reach children under two even though it is widely recognised that this is the most critical age group for interventions on malnutrition [4-6]. In this context, 'Universalisation [of ICDS] with Quality', along with support services for maternity entitlements and crèches have been advocated for the protection of rights of young children, as well as for prevention and management of malnutrition [4, 5, 7].

It has been argued that given the high level of malnutrition in the country, strategies need to be universal, addressing the needs of each child in a manner such that those who are malnourished are treated and others are prevented from falling into a state of malnutrition. Further, such interventions must also locate themselves in the context of the underlying conditions affecting malnutrition such as poverty, food insecurity, access to livelihoods and gender inequality. However, interventions have largely been focussed on medical management of Severe Acute Malnutrition (SAM), with an inadequate supplementary nutrition programme (SNP) through the ICDS being the only intervention for all other children. Even though one of the services of the ICDS is growth monitoring, there are protocols in place to arrest deteriorating trends in growth of children in the normal, mild and moderate categories. Meanwhile, severely underweight children are referred to Nutrition Rehabilitation Centres (NRCs), in the absence of community-based interventions. However, it has been shown that inconsistencies between the ICDS and NRCs in protocols for referral

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and admission keep out a large number of SAM children from even being identified [8, 9].

While NRCs play a vital and important role in the management of SAM, they do not offer any comprehensive system for prevention, 'cure' or even continuity of care. Internationally, there is evidence showing the limitations of facility-based strategies and the efficacy of community based management of acute malnutrition [10-13]. Experience has also shown that community-based strategies that involve supplementary feeding along with nutrition education can be very effective [14, 15]. The efficacy of the usual NRC (facility) based strategies in the context of very high prevalence of stunting has also been questioned [9]. However, little published evidence has emerged from community-based programmes amongst the rural poor in India to substantiate their potential. The Government of India has been drafting guidelines for community management of malnutrition but these are yet to see the light of day. Additionally, while the UNICEF conceptual framework for causes of malnutrition highlights three vital factors affecting malnutrition, namely care, nutrition and health, the component of care has not been adequately explored [16]. This becomes especially relevant in a context where women's time and energy is limited by the circumstances of a 'triple-burden' of work, namely wage work, housework and childcare [17].

Thus; understanding the need for comprehensive programmes to address malnutrition on the one hand, and the absence of such a model in practice on the other, the 'Action Against Malnutrition (AAM)' programme was initiated in six tribal blocks covering three states in the country[1]. The key components of the programme include childcare (crèches) for under-threes, community mobilisation (participatory learning and action) and systems-strengthening as described subsequently. This paper presents some experiences from the programme and findings of an observational, retrospective study using data related to a cohort of 587 children attending the crèches. The aim of this paper is to describe the intervention, place it in the context of the current debates around strategies for addressing malnutrition and use the initial data available to substantiate some of the arguments being made. While a comprehensive evaluation of the entire programme is being conducted (the end line survey is in December 2015), this study presents preliminary

results of the outcomes on wasting and underweight from available programme data. Further programme data are now available which are being analysed for understating seasonality in malnutrition trends as well as sustainability of the initial results.

OVERVIEW OF THE INTERVENTION

The Action Against Malnutrition (AAM) programme is being implemented in some of the most under-served parts of the country selected on the basis of poor socio-economic, health and nutrition indicators. The selection of areas was further based on vulnerability- mapping through indicators such as the presence of large tribal or/and SC population, low accessibility to services due to difficult terrain and involvement of women in wage work as well as the presence of experienced local partner organizations. Preliminary analysis through a formal baseline survey in the programme areas confirmed high prevalence of wasting and stunting.

The intervention design includes three broad components – the running of day care centres/crèches, mobilizing the community by holding structured Participatory Learning and Action (PLA) meetings, and systems-strengthening (SS) and policy advocacy to strengthen and support health and ICDS services. The target population is children in the age group of birth to three years.

The programme design seeks to demarcate 3 areas of nested intervention in the selected blocks. These are – [AREA 1] with Systems-Strengthening only, [AREA 2] with Systems-Strengthening and Participatory Learning and Action and [AREA 3] with Systems-Strengthening, Participatory Learning and Action and Crèches. Area 3 is saturated with all the three interventions and the current paper presents data only from this area.

The AAM programme is being implemented by a consortium of organisations whose members include Public Health Resource Society (PHRS), Ekjut, Child in Need Institute (CINI), CHAUPAL and IDEA. An ethical approval for the entire programme; including anthropometry, data analysis and research, was taken from the Institutional Ethics Committees of PHRS and Ekjut.

The Crèche Component

It is well known that women in developing countries; especially from rural areas, have to work hard in order to support the household economy; leaving little time to

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[1]Odisha, Jharkhand and Chhattisgarh

take care of their children. In such situations, it was hypothesised; day care centres could play a significant role as a vehicle for health and nutrition interventions for impoverished children while allowing poor mothers to work [18]. [2]Crèches potentially enable interventions that lay foundations for growth and development and help fight malnutrition; they provide a framework for overall child care, for delivery of appropriate food supplementation through a day-long period of time and for referral and access to health care. Thus they satisfy many of the requirements for adequate prevention and management of malnutrition.

The AAMcrèche programme is based on the principles stated above and attempts to provide comprehensive interventions for growth and development. The programme is available to every child in the village irrespective of their status of malnutrition. Within this 'universe', however, a special focus is provided to children who are exhibiting growth faltering, regardless of their baseline nutritional status, in order to prevent severe malnutrition. The programme is also expected to adequately manage those children who are already in severe malnutrition. The model attempts to ensure continuity of care including facilitating access to NRCs for those who need it.

The other mainstay of the programme is that it stresses upon community processes and participation. The crèche programme was therefore started with the consent of the village community which also exerts influence on crèche worker selection, situation of crèches, crèche timings and menus (with nutritional inputs from the programme team). A village crèche committee was formed to help govern the crèche and manage the logistics and materials for the crèches. The crèche worker herself (2: 15 children) belongs to the village.

The crèche programme takes care to introduce and maintain technical rigour in identification and management of malnutrition while allowing for decentralisation, flexibility and genuine community participation. Thus, protocols for dealing with various nutritional situations, and capacitation and monitoring processes to enable them have been established.

Growth faltering has been given due focus as a trigger for simple actions such as increasing the frequency and oil content of feeds. Calorie-dense protein-rich ready-to-eat foods are produced and used at the level of the crèche as per protocols through simple processes of roasting and grinding of combinations of cereals and pulses. Eggs are provided twice a week, and wherever possible, if decided by the community, milk and non-vegetarian foods as well. Attempts have been made to ensure local fruits and vegetables in the routine menu. The daily cost of food at the crèche amounts to approximately Rs.12 per child per day (0.20$).

The programme depends upon government systems for health checks, treatment of illnesses and micronutrient supplementation. However, these have been difficult to access given the lack of robust child health systems in general and in tribal areas in particular. Greater success has been achieved in referrals to NRCs for eligible children and 78 children have been referred successfully to NRCs over a period of one and a half years, of a total of 2473 registered with the crèches.

The crèches began in a phased manner in December 2012 and by March 2013, 136 crèches were in place with over 1500 children attending. It took some time for every block to put the system in place for taking height/length and thus, every block has entry data for different time frames. According to the growth monitoring protocols decided upon for the crèches, every child's weight is to be recorded monthly and height once in six months. In April 2013, it was decided that for the purpose of uniformity across crèches, heights would be measured in the months of May and November each year for all children irrespective of their date of admission.

PLA and Systems Strengthening

One of the key strategies of this programme is to improve the delivery mechanism of government programmes through building capacities of communities and service providers for addressing malnutrition. The systems-strengthening component aims to provide sustainable solutions to the gaps and implementation bottlenecks of government interventions by working with frontline workers, and block and State level officials to ensure that the relevant health and nutrition services reach their rightful beneficiaries.

Under the PLA component regular meetings are held in the community on malnutrition, child care, child

[2]Mobile Crèches and Jan Swasthya Sahyog are two civil society organisations that have done significant work in this regard. For details visit www.mobilecreches.org and www.jssbilaspur.org

health and related issues in order to facilitate community action, including finding local solutions outside the current schemes and programmes. Each meeting sees participation of 15-20 women. Front line health workers and local elected representatives also participate in these meetings.

METHODS

An MIS was specifically designed to collect, monitor and analyse data for the purpose of demonstrating outcomes as well as taking action on behalf of specific children. Analysis was done using the statistical package Stata (Version 11) and the "igrowup" macro provided by WHO Anthro. Equinox digital weighing scales with 100g graduations, calibrated regularly were used to measure weight. Infantometers (Seca 210 with 0.5cm graduation) and Stadiometers (Seca213 with 0.01cm graduation) were used to measure heights. Heights and weights were taken only by the trained supervisory cadre during the period under study. The standard WHO definitions for Wasted (WHZ is <-2 SD), Moderately Wasted (WHZ is <-2SD and >-3SD) and Severely Wasted (WHZ is <-3SD) are used. Severe Acute Malnutrition (SAM) is defined as being severely wasted (WHZ is <-3SD).

As mentioned above, lengths/heights of all children were to be recorded in May 2013, this was not achieved in the field. Children who were left out in May were then covered in June and July. Over these three months, the lengths/heights of about 80% of the children in the crèches were recorded. With more streamlining and effort, most children had heights taken in November (88%). The heights and weights of May/June/July (2013) are taken as the baseline status and the change that has occurred from this time to November (2013) is analysed.

The cohortfinally comprises of 587 children in the age group of 6 - 36 months for whom *complete data* is available for the period of analysis. Children whose weight-for-height/length Z-scores are less than -5SD or greater than 5SD have not been included on grounds of biological implausibility [using standard WHO cut-offs]. The children not in this cohort included drop outs, those who were not in the crèche on the days on which height was measured, children who crossed 36 months of age and 4 children who died during this period. Of the four children who died three were in the SAM category and one was in the moderately wasted category. The weight for age data for these children is also presented.

Of the 587 children, 285 are female and 302 male. In November 2013, 20 (3.4%) children were in the age group of 10 to 12 months, 285 (48.6%) between 13 months and 24 months and 282 (48.0%) between 25 and 36 months of age. 92% of the children belonged to tribal communities.

RESULTS

Trends in Wasting Status of a Cohort

In this cohort of 587 children, there was an increase in children in the non-wasted category from 72% to 80% (p<0.001). There was a reduction in SAM from 8% to 4% (from 45 SAM children in the initial period to 24 in November - a reduction of 46.6%), which is also statistically significant (p<0.005). Of the 45 SAM children in the cohort, 5 also received some treatment from the NRC. The disaggregation of this data based on the different initial months shows that a slightly higher change is seen over 6 months (May to November) compared to over 4 months (July to November). Prevalence of SAM among children for whom we have data with a four month gap, came down from 8% (17) in July to 4% (8) in November (53% reduction) whereas the prevalence over a six month period came down from 21 SAM children in May to 9 SAM children in November (57% reduction). Further, overall wasting came down from 28% to 20% (p<0.001).

Tracking Individual Children – Grade Shifts in Wasting

As seen in Figure **2**, 89% categorised as 'normal' in the initial period retained normalcy. Among the
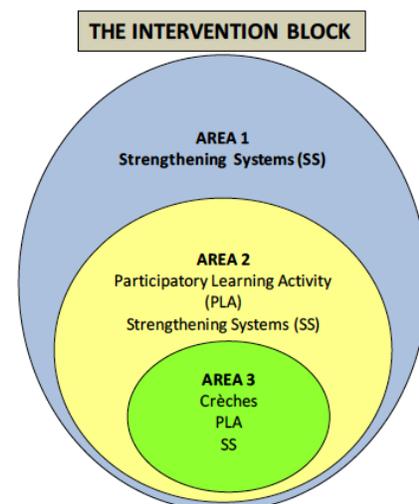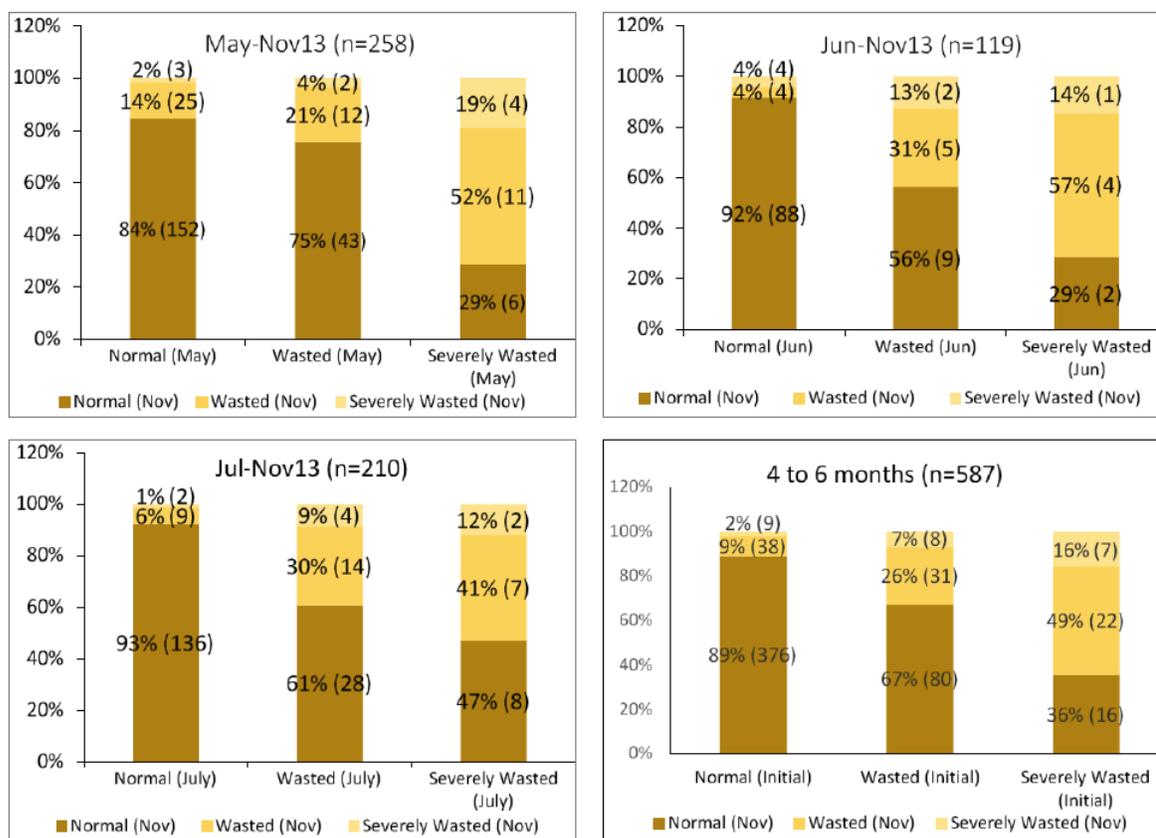

Figure 1:

Figure 2: Tracking Individual Children – Grade Shifts in Weight for Height Status.

severely wasted, while 16% showed no improvement, 49% moved into a moderate wasting category and 36% to normalcy (WHZ>-2SD) over a 4-6 month intervention period. Thus, 85% showed a positive shift of grade. Among the moderately wasted, 26% showed no improved and 7% declined to a severely wasted category, whereas 67% moved to normalcy. Overall, 84% children (494 of 587) showed either an improvement in grade or maintained normalcy over this period.

Trends in Underweight Status

In this cohort there is an increase in non-underweight status from 43% to 49% and reduction in severely underweight from 24% to 17% (both statistically significant, p<0.005) (Table **1**). As seen in Figure **3**, 84% categorised as 'normal' in the initial period retained normalcy. Among the severely underweight, while 54% showed no improvement, 38% moved into a moderately underweight category and 8% to normalcy (WAZ>-2SD) over a 4-6 month intervention period. Among the moderately underweight, 56% showed no improved and 9% declined to a severely underweight category, whereas 35% moved to normalcy.

Extent of Z-Score Shifts

Looking at the extent of shifts in Z-scores, of the 587 children, 66.6% of the children saw an improvement in Z-scores over this 4 to 6 month period. On the other hand 33.4% of the children saw a decline in the Z-scores over the same period. About 45% of this decline was of less than -0.5. Overall, 18.1% showed a decline of over -0.5 with 10.4% of the children showing a decline in Z-scores of more than -1.

The average weight for height Z-score (WHZ) for the cohort improved from -1.41 in the initial period to -1.13 in November (p<0.0001). The average weight for height z-score for the sub-set of children who were initially in the SAM category showed a greater improvement from -3.44 to -2.20 (p<0.0001). The average weight for age Z-score (WAZ) for the cohort improved from -2.16 in the initial period to -2.03 in November (p<001).
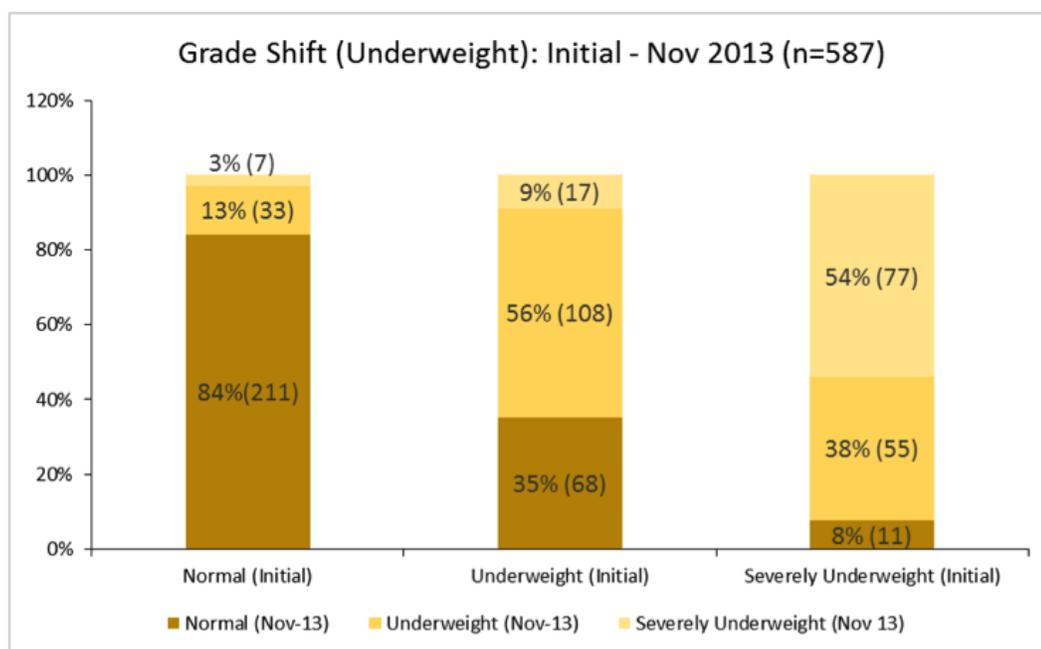
As expected, there were no changes in the status of stunting during this period.

Other Spin-Offs

Meanwhile, the programme has the potential positive spin-off towards increase in women's earnings

Table 1:   Trends in Wasting and Underweight Status

	Children (n)	Normal, n (%)	Moderately Wasted, n (%)	Severely Wasted, n (%)
Cohort of May 2013 to November 2013				
May-13	258	180 (69.8)	57 (22.1)	21 (8.1)
Nov-13		201 (77.9)	48 (18.6)	9 (3.5)
Cohort of June 2013 to November 2013				
Jun-13	119	96 (80.7)	16 (13.4)	7 (5.9)
Nov-13		99 (83.2)	13 (10.9)	7 (5.9)
Cohort of July 2013 to November 2013 (May + June + July)				
Jul-13	210	147 (70.0)	46 (21.9)	17 (8.1)
Nov-13		172 (81.9)	30 (14.3)	8 (3.8)
Total: Cohort of Initial Period				
Initial	587	423 (72.1)	119 (20.3)	45 (7.7)
Nov-13		472 (80.4)	91 (15.5)	24 (4.1)
Total Cohort Weight for Age status	Children (n)	Normal, n (%)	Moderately Underweight, n (%)	Severely Underweight, n (%)
Initial	587	251 (42.8)	193 (32.9)	143 (24.4)
Nov-13		290 (49.4)	196 (33.4)	101 (17.2)

Figure 3: Tracking Individual Children – Grade Shifts in Weight for Age Status.

thanks to availability of child care. There has been a demonstration in the village not only of nutritional concepts and practices, but also hygiene (hand washing in particular), using play-way methods for stimulating child development, early identification of developmental delay and so on [19]. Experience has also been garnered on the operational elements of successful local production of protein-rich calorie dense foods (Community-RUTF) [20]. The growth in micro markets for eggs and other nutritional food stuff, and the potential of adding agricultural interventions have

been noted. Simultaneously, the programme has managed to avoid changes in local food culture and 'food-drug confusions' [21]; the notion that commercial packaged products are 'superior food'.

LIMITATIONS

This paper presents preliminary programme data to show some outcomes of the comprehensive programme described in sections above. These outcomes represent the net and 'best case' outcomes

Table 2:   Extent of Z-Score Shift in the 4 to 6 Month Period

Z-score change	Frequency	Percent
No difference	2	0.3%
0.01 to 0.50	120	20.4%
0.5 to 1.00	138	23.5%
1.01 to 2.00	111	18.9%
More than 2.01	20	3.4%
Total showing positive shift	391	66.6%
-0.01 to -0.50	90	15.3%
-0.51 to -1.00	45	7.7%
Less than -1.01	65	10.4%
Total showing negative shift	196	33.4%
Total	587	

Table 3:   Average Z-Scores among the Cohort

Weight for Height Z-Score (WHO WHZ)	N	Mean ± SD
Initial Period	587	-1.41 ± 1.09
November 2013		-1.13 ± 1.04
WHO WHZ for SAM children		
Initial Period	45	-3.44 ± 0.38
November		-2.20 ± 0.99
Weight for Age Z-Score (WHO WAZ)		
Initial Period	587	-2.16 ± 1.21
November 2013		-2.03 ± 1.03

of all three strategies of AAM and not just thecrèche programme. The contributions of the three different strategies of intervention are expected to be compared with each other in a formal independent evaluation which is also underway. The data shown here might suggest pathways only once it is correlated with attendance, feeding, background household characteristics and so on. We are presenting the overall change in *acute* malnutrition in this paper. Stunting does not show change as rapidly as wasting, and stunting data continues to be collected in the programme, to be shared later. The project was located in medically underserved areas and the incremental gain in health system strengthening was not sufficient to meet the many immediate medical needs of the children in crèches. The programme itself was not able to offer direct medical services or facility-based care and this was a limiting factor in nutritional outcomes and overall well-being of attending children.

While there could be a selection bias in the sample of children who are attending crèches, the analysis makes no attempt to generalise or translate findings to the population, which again would be done through the evaluation study. It merely seeks to describe outcomes amongst those children that partook of the intervention, as compared to their own previous nutritional status, as with any other observational study.

The findings are also likely to be affected by seasonality since the data corresponds to a period which is considered relatively safe for children in terms of food availability, diarrhoeal diseases and migration. The increasing age of the cohort, as well as secular trends may also confound the findings. However, documented secular trends in India have shown only small differences [1] and are unlikely to impact a short period of 4-6 months. Due to practical limitations, we were only able to take heights at fixed periods in the programme as described. This causes difficulty in accuracy with respect to time to recovery which would only be noted at the next height measurement which could be many weeks later.

Running a field programme with tribal women in 136 remote tribal villages and attempting to gather regular and accurate anthropometric data itself offers a host of challenges. The quality of data collected has been

monitored through a protocol of quality checks following rigorous capacity-building. However, as with most field and facility programmes on malnutrition, we did not formally analyse inter- and intra-observer reliability [22].

Thus, what is presented here is a factual description of the findings alongside their limitations in real-time contexts. The limitations and challenges, as well as steps taken to circumvent them, in itself, has learnings for large-scale universal programmes at village level in a country such as India

DISCUSSION

To our knowledge, there is no published data from a programme that provides a general care to children with the aim to prevent malnutrition as well as manage it, and attempts to involve the community in taking action on all the various determinants of malnutrition. Thus, this analysis contributes to a largely unexplored terrain; especially with respect to tribal India, from which, it is likely to be the first. As mentioned earlier, these are just initial results indicating the experiences of the programme and the formal evaluation results are due next year.

Prevention and Risk Aversion

While any programme for malnutrition must be effective in the management of severe acute malnutrition, if it does not include strategies for prevention, it would be akin to pouring water into a leaky bucket. This is also relevant from the point of view of sustainability of the intervention.

Nonetheless, most programmes for malnutrition in India have focused exclusively on the treatment of children with SAM, and ignored others who may well be at risk of becoming severely malnourished. In this cohort, however, 84% children (494 of 587) showed either an improvement in grade (as per WHO definitions) or maintained normalcy over this period.

The nutritional outcomes of children in the AAM programme in a period of 4-6 months using the comprehensive strategies described above, compares well with other crèche programmes for malnutrition in terms of efficacy. A crèche programme in Brazil for instance, showed a decrease in *nutritional risk* (WHZ < -1) from 10.1% to 3.4% for wasting with maximal impact between 3-4 months, whereas the AAM programme shows a reduction from 66% to 54% using the same criterion [18]. In contrast, a systematic review

of evaluations of day care interventions for child nutrition found no change in wasting as a consequence of the programme [23].

Modelling for Acute Malnutrition and Outcomes

Even with respect to interventions that are limited to children with SAM, it is difficult to compare the outcomes of various nutrition programmes since they are modelled differently and terminologies and definitions (WHO and UNICEF) are also variously applied. For example, a large-scale programme by Medecins Sans Frontieres in Bihar (henceforth 'the MSF programme') [22] terms weekly outreach and distribution of therapeutic foods from a medical facility (1 medical centre with 5 ambulatory centres at approximately 286,000 populations) as 'conventional-setting' Community Management of Acute Malnutrition (CMAM)[3], whereas other implementers have called such programmes IMAM or IM-SAM [24, 25]. The AAM programme, in contrast, runs at hamletlevel without direct medical services and considers that a community-based programme for malnutrition must be located within communities and allow for community participation in its execution.

Outcomes in terms of rates of cure, default, non-response, mortality and time taken to response are all affected by the definition of the programme. Human resource requirements and costs may also vary significantly, depending on whether direct medical services are included or not, and the cost-benefit analysis of any programme must take into account these issues[4].

Comparability of outcomes is also hampered by the fact that programmes are using varying standards to define entry and exits from the programme and 'cure' itself. For instance, some available studies on CMAM have tended to describe gains using weight gain of 5g/kg/day for short periods of time [26] or a 15% weight gain as recovery [27][5]. UNICEF and WHO in their

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[3]WHO, in a statement on CMAM explains it as follows: "The community-based approach involves timely detection of severe acute malnutrition in the community and provision of treatment for those without medical complications with ready-to-use therapeutic foods or other nutrient-dense foods at home. If properly combined with a facility-based approach for those malnourished children with medical complications and implemented on a large scale, community-based management of severe acute malnutrition could prevent the deaths of hundreds of thousands of children" [10].
[4]Needless to say, partnerships with medical and facility-based programmes are an essential component of overall management of malnutrition.
[5]The authors have been arguing that the 15% weight gain criteria is not an appropriate discharge criterion for CMAM because such a gain in a severely malnourished child is hardly meaningful and frequently does not represent an exit from the SAM category [21].

recent guidelines of 2013 state, "Children with severe acute malnutrition should only be discharged from treatment when their: — weight-for-height/length is ≥–2 Z-score and they have had no oedema for at least 2 weeks, or — mid-upper-arm for circumference is ≥125 mm and they have had no oedema for at least 2 weeks" [28].

However, the MSF programme has shifted to using a definition of cure and criterion for discharge as 120 mm rather than 125 mm MUAC [22]. Given the fact that the management of a severely malnourished child in the community is really the last management option available for the child, the AAM programme believes that 'cure', for a *community*-based programme should be represented by 'normalcy', i.e. Z scores of over -2[6]. These differences also have implications on the analysis not only of programme outcomes but also on understanding costs and the time taken to achieve the desired result of cure.

Nonetheless, for the purpose of arriving at some assessment of the relative usefulness of housing a malnutrition programme at a community-based day care centre, we have tried to analyse it in terms of mortality, outcomes and time to recovery, and compare it to other available data.

Mortality

Our programme noted the deaths of 4 children during the period of this study, of the 1195 children who were in the programme at the initial period. 3 of these were in the SAM category (of 112). All the children died of an acute illness. The case fatality rate of 2.68% compares with the revised estimate presented by Black *et al.* (2008) of 2% [29]. Thus, the programme compares well with the global standard of care of mortality under 10% [31] and would be described by the WHO as 'low' (under 5%) [10]. In comparison, the MSF programme of CMAM for children under 5 years, which has a full-fledged health care programme including facility care, showed a mortality of 0.9% with 37.2% defaulters, the mortality data for whom was unknown. They also noted a mortality of 15.5% amongst 70 children admitted with oedema who were excluded from their analysis [22].

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[6]In Indian conditions, MUAC alone has been questioned as a method for screening and diagnosis though it has ease of application at scale and is accepted by WHO; the main concern being that many children might escape the net [30].

It is becoming increasingly clear that the mortality from SAM is globally lower than hitherto feared [29] and that this might be even more so amongst Indian children who have a high incidence of acute-on-chronic malnutrition [9]. The recent and significant MSF study further notes that morbidity amongst children with SAM in India is far lower than that of children in Africa [22]. This may suggest a slightly changed scenario of relative urgency where the choice of the (necessary) *immediate* interventions may be tempered by accommodating medium-term gains of allowing community to understand and practice corrective nutritional practices

Nutritional Outcomes for SAM

Since we have used the criterion for cure as over -2Z score, it would be difficult to directly compare results with other CMAM programmes which have used less stringent criteria. However, the same, large-scale MSF programme had earlier used the 'old' definition of cure as greater than -2 Z score. Their results have been published as per both 'old' and 'new' criteria and allow some reference point for the results of our programme [22].

The AAM programme had a small sample for children under three years with SAM since it intended to provide care to children irrespective of nutritional status at village level. In our study, 26 of 45 SAM children (57.8%) gained more than 15% of baseline weight compared to a similar improvement seen in 46.2% of the cases in another CMAM programme [27], and to 65% in a study of an integrated model for the management of SAM (IM-SAM) where facility-based care was also involved [32]. MSF 'old' data, with a sample of 3873 children (under five) with SAM shows 71% children had a 15% weight gain [22].

The MSF programme reported cure of 88.4% of children who completed the treatment offset by a substantial default rate (38.3% of admitted children) [22]. In the AAM programme 36% of SAM children met the same cure criterion of achieving a Z-score of more than -2. Another 49% shifted to the moderately wasted category with a total of 85% showing improved grades.

With respect to time taken to achieve 'cure', an Indian study found that 45% children recovered (achieved weight for length >80% of WHO reference) from malnutrition within 16 weeks using a mix of hospital-based and community-based management [33] as compared to our 36% to over -2 Z-score in 4-6

months. The mean length of stay in the MSF programme was reported to be 8.7 weeks ± 6.1 [22]. Anecdotally, it was observed that there was a lag phase before children started to gain weight in our programme and weight- gain was relatively slow as compared to programmes using commercial RUTF. A slower weight gain may hold some advantages against future health consequences such as metabolic syndrome [34] and needs further examination in the Indian context.

Our outcomes were seriously limited by lack of access to health care services in these areas, and are likely to be far better as health systems improve, especially with respect to availability of iron supplements, paediatric services for malaria and tuberculosis and general child health services.

The discussion with respect to children with SAM suggests that while a predominantly medicalized strategy may have a short-term advantage in the immediate management of the children with severe acute malnutrition who are able to access it, a complementarity with a participatory approach may provide better access, sustainability and continuity of care at possibly lower costs, without inviting dire consequences. Additionally, we note the wide-spread acceptance of the crèche in the village as a general caring and loving environment along with its usefulness as a highly suitable vehicle for direct nutritional interventions.

This potential has vast implications for public policy in India, especially in the context of the relatively recent programme of restructured ICDS [35] which includes the component of Anganwadi-cum-Crèches[7] in up to 5% of its centres. Unfortunately this scheme has not taken off and it is hoped that the positive impact of the AAM programme will provide some impetus to this strategy.

CONCLUSION

This observational study suggests that a medium-term strategy for preventing and managing acute malnutrition, involving primarily - mobilization of women's groups for action on nutrition, and direct services through a general village-based childcare

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[7]'Anganwadis' are early child care centres that function for 4-6 hours under the ICDS programme. All the ICDS services, including pre-school education, supplementary nutrition and growth monitoring are provided through these centres.

programme may be comparatively effective by current WHO standards and guidelines, and other known community-based interventions in terms of mortality and outcomes. This may be achieved at a slower pace but potentially at lower cost and with higher sustainability and adherence to principles of universality and child rights. Partnerships between community-based organisations and those providing direct medical services are likely to optimize the advantages of both in terms of nutritional outcomes and the survival, health and well- being of children. It is hoped that by putting out the experience from AAM in the public domain, more such programmes would be encouraged, that are borne out of a trust in people's capacities to nourish their children, given some information and support.However, further studies are awaited for a more rigorous evaluation of this set of strategies.

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