

ORIGINAL ARTICLE

How do the new WHO discharge criteria for the treatment of severe acute malnutrition affect the performance of therapeutic feeding programmes? New evidence from India

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BACKGROUND/OBJECTIVES: To assess how the introduction of new WHO discharge criteria for the treatment of severe acute malnutrition (SAM) may affect the performance of therapeutic feeding programmes in India.

SUBJECTS/METHODS: The analysis concerns 6041 children admitted to Nutrition Rehabilitation Centers (NRCs) in Jharkhand, Madhya Pradesh and Uttar Pradesh between 1 July 2009 and 31 December 2011.

RESULTS: A total of 217 children (3.6%) had bilateral pitting oedema, 1803 (29.8%) had severe wasting with medical complications, 4021 (66.6%) had uncomplicated severe wasting and 4810 (79.7%) were in the age group 6–23 months old. The programme has high survival (>99%), default ($\geq 15\%$) and discharge (>75%) rates. The use of weight gain $\geq 15\%$ as recovery criteria (old criteria) translates into recovery rates in NRCs that range from 33.6% for children admitted with weight-for-height z-score (WHZ) ≤ -3 to 35.2% for children admitted with mid-upper-arm circumference (MUAC) < 115 mm. The use of WHZ ≥ -2 as recovery criteria reduces recovery rates by ~2-fold (17.5%) while the use of MUAC ≥ 125 mm as recovery criteria reduces recovery rates by 3.5-fold (10%). The new criteria tends to keep longer in the programme children who are younger and/or have poorer anthropometry at admission (that is, more vulnerable).

CONCLUSIONS: The new WHO discharge criteria reduce the recovery rates currently reported by programmes for the treatment of children with SAM in India. However, their introduction in the programme practice will increase programme impact—particularly if accompanied by a general improvement in the strategy and protocols currently used—as they prioritize the most vulnerable children.

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INTRODUCTION

Severe acute malnutrition (SAM) is a threat to child survival as mortality rates in children with severe wasting are nine times higher.¹ Globally, about 19 million children are severely wasted.² With some eight million under fives severely wasted, India is at the epicenter of this crisis despite the country's recent economic growth.^{3–4}

India's response to SAM relies on a facility-based approach that provides care for children with SAM through a network of Nutrition Rehabilitation Centers (NRCs). In addition, a few states are piloting programmes where children with SAM are admitted to NRCs and later are transitioned to a community phase.

Children 6–59 months are admitted to these programmes, if they have (a) bilateral oedema; or (b) a weight-for-height z-score (WHZ) ≤ -3 ; or (c) a mid-upper-arm circumference (MUAC) < 115 mm. Once admitted, children receive therapeutic care following the national guidelines by Ministry of Health,⁵ on the basis of those by the Indian Academy of Pediatrics⁶ and WHO.⁷

In line with national and international guidance, recovery rates in these programmes have been defined as the proportion of children gaining $\geq 15\%$ of their initial weight. However, analyses have reported that while these programmes achieve good survival outcomes, only a moderate proportion of children have recovered by the time of discharge.^{8–10}

In 2013, WHO issued new global guidance indicating that percentage weight gain should not be used as discharge criterion. The revised guidance advises that children with SAM should be discharged when they have: (a) WHZ ≥ -2 and no oedema for at least 2 weeks; or (b) MUAC ≥ 125 mm and no oedema for at least 2 weeks. The anthropometric indicator (MUAC or WHZ) used to confirm SAM at admission should be used to assess nutritional recovery.¹¹

The objective of this analysis is to assess how the introduction of the new WHO discharge criteria for the treatment of SAM may affect the performance of therapeutic feeding programmes in India.

MATERIALS AND METHODS

This paper analyzes programme data on 6041 children 6–59 months old admitted to NRCs in Jharkhand, Madhya Pradesh and Uttar Pradesh (1 July 2009 to 31 December 2011) for whom programme records were complete. SAM was defined by the presence of bilateral pitting oedema or the presence of severe wasting.¹² Severe wasting was defined as a MUAC < 115 mm and/or WHZ ≤ -3 of the median WHZ in WHO Child Growth Standards.¹³

At the NRC, a physician conducted a clinical examination to detect the presence/absence of medical complications using the criteria for the Integrated Management of Neonatal and Childhood Illnesses.¹⁴ Children with bilateral pitting oedema, and/or medical complications and/or poor

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appetite were fed locally prepared F-75 therapeutic milk every 2 h for 2 days (stabilization phase) while their medical complications were treated. After completion of the initial 48 h in the NRC, children were fed locally prepared F-100 therapeutic milk six times a day for 48 h to initiate rapid weight gain (rehabilitation phase). Children free of oedema and medical complications with normal appetite entered the rehabilitation phase from admission. After 4 days at the NRC, children were fed locally prepared F-100 alternated with locally prepared semi-solid foods until discharge. All the children admitted to the NRC were administered age-appropriate preventive vitamin A, folic acid, zinc, potassium and magnesium and broad-spectrum antibiotics. Feeding, supplementation and care protocols have been described in detail elsewhere.^{8–10}

Children were discharged when they met the following criteria: (1) the child was active and alert; (2) the child had no signs of oedema, fever and/or infection; (3) the child had completed all age-appropriate immunizations; (4) the child was fed at least 120–130 kcal/kg weight/day; (5) children had completed the prescribed 14-day stay in the NRC; and (6) the primary caregiver was informed about follow-up care.

In Madhya Pradesh, children were transitioned to the community phase of the programme where they were followed by the frontline workers of the state's Integrated Child Development Services and National Rural Health Mission, who ensured that children benefitted from Integrated Child Development Services Supplementary Nutrition Program and returned for four follow-up visits at the NRC every 15 days. At each follow-up visit, children's weight gain was assessed and mothers were counseled on child feeding and care.

Data collection procedures have been described in detail elsewhere.^{8–10} Analyses were performed using Stata Statistical Software, Release 12, 2011. Mean values are provided as mean \pm s.d. For all tests, $P < 0.05$ was considered significant.

FINDINGS

Of the children admitted, 3169 (52.5%) were girls, 3888 (64.3%) were from scheduled castes or scheduled tribes and 4810 (79.7%) were in the age group 6–23 months old. On admission, 217 (3.6%) had bilateral pitting oedema, 1803 (29.8%) had severe wasting with medical complications and 4021 (66.6%) had uncomplicated severe wasting (Table 1).

The following outcomes were recorded in the NRCs: Deaths: 30 children (0.5%) died after an average length of stay of 4.2 ± 2.7 days. Defaulters: 1413 children (23.4%) defaulted after an average length of stay of 8.0 ± 3.8 days. Discharged: 4598

children (76.1%) were discharged after an average length of stay of 15.3 ± 2.7 days. Children's average weight gain—determined as the total individual weight gain (after loss of oedema in the case of children who had oedema at admission) of all the children discharged divided by the total number of children discharged—was 9.3 ± 14.8 g/kg body weight/day (Table 1).

A total of 3494 oedema-free children were admitted to NRCs with a MUAC < 115 mm. At the time of discharge, 1229 (35.2%) had gained $\geq 15\%$ of their initial weight while only 349 (10%) had a MUAC ≥ 125 mm. Multivariable logistic regression analysis indicates that the odds of recovery on the basis of a minimum 15% weight gain were higher among younger children (6–23 months old; odd ratio (OR) = 1.36, 95% confidence interval (CI) = 1.08–1.72) and children with poorer anthropometry at admission (that is, MUAC < 115 mm and WHZ ≤ -3 ; OR = 1.73, 95% CI = 1.40–2.14) while the odds of recovery on the basis of an MUAC ≥ 125 mm were higher among older children (24–59 months old; OR = 1.44, 95% CI = 1.19–1.74) and children with better anthropometry at admission (WHZ > -3 ; OR = 1.85, 95% CI = 1.59–2.16; Table 2).

Similarly, of the 3820 oedema-free children admitted with WHZ ≤ -3 , 1282 (33.6%) had gained $\geq 15\%$ of their initial weight at discharge from the NRC while only 670 (17.5%) had a WHZ ≥ -2 . The odds of recovery on the basis of a minimum 15% weight gain were higher among younger children (6–23 months old; OR = 1.20, 95% CI = 1.02–1.43) and children with poorer anthropometry at admission (WHZ ≤ -3 and MUAC < 115 mm; OR = 4.25, 95% CI = 3.58–5.06), while the odds of recovery on the basis of WHZ ≥ -2 were higher among children with better anthropometry at admission (MUAC ≥ 115 mm; OR = 2.38, 95% CI = 1.91–2.96; Table 2).

In Madhya Pradesh, 1914 children (72%) were discharged from the NRC after an average stay of 14.2 ± 1.2 days and were transitioned to the community phase of the programme (Table 3). During the community phase, eight children (0.42%) died, 286 children (14.9%) defaulted and 1620 children (84.6%) were discharged after an average length of stay of 60 ± 15.5 days with an average weight gain of 1.60 ± 2.03 g/kg body weight/day.

A total of 1781 oedema-free children were admitted to the NRCs in Madhya Pradesh with a MUAC < 115 mm. By the time

Table 1. Admissions and programme outcomes among children admitted with severe acute malnutrition to the Nutrition Rehabilitation Centers in Jharkhand, Madhya Pradesh and Uttar Pradesh, India 2009–2011

	Admissions		Deaths			Defaulters			Discharged		
	n	%	n	%	Rate	n	%	Rate	n	%	Rate
Total	6041	100	30	100.0	0.50	1413	100.0	23.4	4598	100.0	76.1
Girls	3169	52.5	12	40.0	0.38	693	49.0	21.9	2464	53.6	77.8
Boys	2872	47.5	18	60.0	0.63	720	51.0	25.1	2134	46.4	74.3
6–11 Months old	2082	34.5	10	33.3	0.48	499	35.3	24.0	1573	34.2	75.6
12–23 Months old	2728	45.2	12	40.0	0.44	639	45.2	23.4	2077	45.2	76.1
24–59 Months old	1231	20.4	8	26.7	0.65	275	19.5	22.3	948	20.6	77.0
Scheduled caste (SC)	1313	21.7	4	13.3	0.30	321	22.7	24.4	988	21.5	75.2
Scheduled tribe (ST)	2575	42.6	15	50.0	0.58	477	33.8	18.5	2083	45.3	80.9
Non SC-ST	2153	35.6	11	36.7	0.51	615	43.5	28.6	1527	33.2	70.9
Jharkhand	2671	44.2	17	56.7	0.64	546	38.6	20.4	2108	45.8	78.9
Madhya Pradesh	2376	39.3	2	6.7	0.08	460	32.6	19.4	1914	41.6	80.6
Uttar Pradesh	994	16.5	11	36.7	1.11	407	26.0	36.9	576	12.5	57.9
With bilateral pitting oedema	217	3.6	10	33.3	4.61	61	4.3	28.1	146	3.2	67.3
With severe wasting	5824	96.4	20	66.7	0.34	1352	95.7	23.2	4452	96.8	76.4
MUAC < 115 and WHZ > -3	823	13.6	1	3.3	0.12	190	13.4	23.1	632	13.7	76.8
WHZ ≤ -3 and MUAC ≥ 115	1259	20.8	1	3.3	0.08	300	21.2	23.8	958	20.8	76.1
MUAC < 115 and WHZ ≤ -3	3742	61.9	18	60.0	0.48	862	61.0	23.0	2862	62.2	76.5
Complicated severe wasting	1803	29.8	10	33.3	0.55	357	25.3	19.8	1436	31.2	79.6
Uncomplicated severe wasting	4021	66.6	10	33.3	0.25	995	70.4	24.7	3016	65.6	75.0

Abbreviations: MUAC, mid-upper-arm circumference; WHZ, weight-for-height z-score.

Table 2. Number and proportion of children discharged recovered among those admitted to Nutrition Rehabilitation Centers in Jharkhand, Madhya Pradesh and Uttar Pradesh, India 2009–2011

	Children with MUAC < 115 at admission					Children with WHZ ≤ -3 at admission				
	Children with MUAC < 115 at admission	Children with MUAC < 115 at admission and weight gain ≥ 15% at discharge		Children with MUAC < 115 at admission and MUAC ≥ 125 at discharge		Children with WHZ ≤ -3 at admission	Children with WHZ ≤ -3 at admission and weight gain ≥ 15% at discharge		Children with WHZ ≤ -3 at admission and WHZ ≥ -2 at discharge	
		n	n	%	n		%	n	n	%
Total	3494	1229	35.2	349	10.0	3820	1282	33.6	670	17.5
Girls	1799	623	34.6	172	9.6	2203	690	31.3	343	15.6
Boys	1695	606	35.8	177	10.4	1617	592	36.6	327	20.2
6–11 Months old	1368	553	40.4	129	9.4	1324	535	40.4	271	20.5
12–23 Months old	1561	496	31.8	151	9.7	1722	537	31.2	280	16.3
24–59 Months old	565	180	31.9	69	12.2	774	210	27.1	119	15.4
Scheduled caste (SC)	755	261	34.6	72	9.5	821	274	33.4	143	17.4
Scheduled tribe (ST)	1617	629	38.9	157	9.7	1752	648	37.0	324	18.5
Non SC-ST (all the rest)	1122	339	30.2	120	10.7	1247	360	28.9	203	16.3
Jharkhand	1567	734	46.8	295	18.8	1810	783	43.3	422	23.3
Madhya Pradesh	1451	308	21.2	38	2.6	1561	320	20.5	178	11.4
Uttar Pradesh	476	187	39.3	16	3.4	449	179	39.9	70	15.6
MUAC < 115 and WHZ > -3	632	149	23.6	65	10.3	NA	NA	NA	NA	NA
WHZ ≤ -3 and MUAC ≥ 115	NA	NA	NA	NA	NA	958	202	21.1	193	20.1
MUAC < 115 and WHZ ≤ -3	2862	1080	37.7	284	9.9	2862	1080	37.7	477	16.7
Complicated severe wasting	1185	443	37.4	185	15.6	1262	450	35.7	208	16.5
Uncomplicated severe wasting	2309	786	34.0	164	7.1	2558	832	32.5	462	18.1

Abbreviations: MUAC, mid-upper-arm circumference; NA, not applicable; WHZ, weight-for-height z-score.

Table 3. Programme outcomes among children admitted to the community phase of the programme for the management of severe acute malnutrition in Madhya Pradesh, India 2009–2011

	Admissions		Deaths			Defaulters			Discharged		
	n	n	%	Rate	n	%	Rate	n	%	Rate	
Total	1914	8	100.0	0.42	286	100.0	14.9	1620	100.0	84.6	
Girls	1174	4	50.0	0.34	162	56.6	13.8	1008	62.2	85.9	
Boys	740	4	50.0	0.54	124	43.4	16.8	612	37.8	82.7	
6–11 Months old	666	5	62.5	0.75	108	37.8	16.2	553	34.1	83.0	
12–23 Months old	858	2	25.0	0.23	125	43.7	14.6	731	45.1	85.2	
24–59 Months old	390	1	12.5	0.26	53	18.5	13.6	336	20.7	86.2	
Scheduled caste (SC)	466	0	0.0	0.00	59	20.6	12.7	407	25.1	87.3	
Scheduled tribe (ST)	775	5	62.5	0.65	141	49.3	18.2	629	38.8	81.2	
Non SC-ST	673	3	37.5	0.45	86	30.1	12.8	584	36.0	86.8	
MUAC < 115 and WHZ > -3	658	1	12.5	0.15	90	31.5	13.7	567	35.0	86.2	
WHZ ≤ -3 and MUAC ≥ 115	167	0	0.0	0.00	21	7.3	12.6	146	9.0	87.4	
MUAC < 115 and WHZ ≤ -3	629	7	87.5	1.11	124	43.4	19.7	498	30.7	79.2	
MUAC ≥ 115 and WHZ ≥ -3	460	0	0.0	0.00	51	17.8	11.1	409	25.2	88.9	

Abbreviations: MUAC, mid-upper-arm circumference; WHZ, weight-for-height z-score.

they were discharged from the community phase, 1240 (69.6%) had gained ≥ 15% of their initial weight whereas only 796 (44.7%) had an MUAC ≥ 125 mm. The odds of recovery on the basis of a weight gain ≥ 15% were higher among younger children (6–23 months old; OR = 1.60, 95% CI = 1.22–2.11) and children with poorer anthropometry at admission (MUAC < 115 mm and WHZ ≤ -3) (OR = 2.22, 95% CI = 1.73–2.24) whereas the odds of recovery on the basis of MUAC ≥ 125 mm were higher among children with better anthropometry at admission (WHZ > -3; OR = 1.72, 95% CI = 1.41–2.10; Table 4).

Similarly, of the 1941 oedema-free children admitted to the NRCs in Madhya Pradesh with WHZ ≤ -3, 1315 (67.7%) had gained ≥ 15% of their initial weight when they were discharged from the community phase whereas only 1108 (57.1%) had a WHZ

≥ -2. The odds of recovery on the basis of a weight gain ≥ 15% were higher among children with poorer anthropometry at admission (WHZ ≤ -3 and MUAC < 115; OR = 1.91, 95% CI = 1.54–2.38). Recovery rates were not significantly different among children with poorer or better anthropometry at admission when the criteria used was WHZ ≥ -2 (Table 4).

DISCUSSION

We used programme data on 6041 children 6–59 months old admitted to NRCs in Jharkhand, Madhya Pradesh and Uttar Pradesh to assess how the introduction of the new WHO discharge criteria for the treatment of SAM may affect the performance of therapeutic feeding programmes in India.

Table 4. Number and proportion of children discharged recovered among those admitted to Nutrition Rehabilitation Centers in Madhya Pradesh, India 2009–2011

	Children with MUAC < 115 at admission					Children with WHZ ≤ -3 at admission					
	Children with MUAC < 115 at admission		Children with MUAC < 115 at admission and weight gain ≥ 15% at discharge		Children with MUAC < 115 at admission and MUAC ≥ 125 at discharge	Children with WHZ ≤ -3 at admission		Children with WHZ ≤ -3 at admission and weight gain ≥ 15% at discharge		Children with WHZ ≤ -3 at admission and WHZ ≥ -2 at discharge	
	n	%	n	%		n	%	n	%	n	%
Total	1781	69.6	1,240	44.7	796	1941	67.7	1315	67.7	1108	57.1
Girls	1017	51.7	526	43.4	441	1296	65.5	849	65.5	673	51.9
Boys	764	73.5	714	46.5	355	645	72.2	466	72.2	435	67.4
6–11 Months old	721	75.2	542	46.6	336	686	76.1	522	76.1	447	65.2
12–23 Months old	803	67.5	542	43.2	347	852	68.0	579	68.0	463	54.3
24–59 Months old	257	60.7	156	44.0	113	403	53.1	214	53.1	198	49.1
Scheduled caste (SC)	415	74.2	308	42.4	176.0	454	71.1	323	71.1	276	60.8
Scheduled tribe (ST)	779	68.0	530	48.9	381.0	795	68.9	548	68.9	458	57.6
Non SC-ST (all the rest)	587	68.5	402	40.7	239.0	692	64.2	444	64.2	374	54.0
MUAC < 115 and WHZ > -3	383	56.4	216	46.0	176	NA	NA	NA	NA	NA	NA
WHZ ≤ -3 and MUAC ≥ 115	NA	NA	NA	NA	NA	543	53.6	291	53.6	289	53.2
MUAC < 115 and WHZ ≤ -3	1398	73.2	1024	44.3	620	1398	73.2	1024	73.2	819	58.6
Complicated severe wasting	454	72.5	329	46.0	209	498	72.9	363	72.9	310	62.2
Uncomplicated severe wasting	1327	68.7	911	44.2	587	1443	66.0	952	66.0	798	55.3

Abbreviations: MUAC, mid-upper-arm circumference; NA, not applicable; WHZ, weight-for-height z-score.

The proportion of children discharged from the facility- and community-based programmes (76.1 and 84.6%, respectively) is above minimum national/international standards (>75%).^{5,15} The average weight gain while in the NRC (9.3 ± 14.8 g/kg body weight/day) is above the minimum 8 g/kg body weight/day recommended while the average weight gain while in the community phase (1.60 ± 2.03 g/kg body weight/day) is below that observed in other settings (4–5 g/kg body weight/day)¹⁶ possibly indicating that the nutrient density of the foods used is substandard to ensure appropriate weight gain and timely recovery.

The use of WHZ ≥ -2 as recovery criteria (new criteria) translates into an ~2-fold reduction in recovery rates while in the NRC (from 33.6–17.5%) and a 1.2-fold reduction by the end of the community phase in Madhya Pradesh (from 67.7–57.1%). Similarly, the use of MUAC > 125 mm as recovery criteria (new criteria) translates into a ~3.5 fold reduction in recovery rates while in the NRC (from 35.2–10.0%) and a 1.6-fold reduction by the end of the community phase in M. Pradesh (from 69.6–44.7%). Importantly, the old criteria tends to discharge sooner children who are younger (0–23 months old) and have poorer anthropometry at admission (i.e. more vulnerable) while the new criteria tends to keep them longer in the programme.

In conclusion, the new WHO discharge criteria reduce significantly the recovery rates currently reported by programmes for the treatment of children with SAM in India. However, their introduction in programme practice will increase programme impact as with the new WHO discharge criteria, the most vulnerable children (younger, with poorer anthropometry at admission, at a higher risk) tend to spend a longer time in the programme whereas the least vulnerable (older, with better anthropometry at admission, at a lower risk) tend to be discharged sooner.

The introduction of the new discharge criteria should be accompanied by improvements in the strategy and protocols currently used, with particular attention to: (1) Detecting children with SAM early—when they are young and less severely wasted, using MUAC < 115 mm;¹² (2) Admitting to NRCs only children with oedema/complicated wasting and keeping them in the NRC

until oedema/complications disappear and weight gain starts, no longer; (3) Providing care for all children with uncomplicated SAM in the community; over 50 countries have adopted this approach;¹⁷ (4) Using therapeutic foods that meet the nutrient composition recommended by WHO; appropriate therapeutic foods for the management of SAM in the community are manufactured to international standards in India, and there is emerging consensus on how they should be used;^{18–22} (5) Discharging children on the basis of a minimum MUAC (≥125 mm, for example) or minimum WHZ (> -2, for example), not on the basis of a minimum weight gain or minimum length of stay; and (6) Ensuring that children benefit from Integrated Child Development Services once they are discharged from the programme for the management of SAM.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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AUTHOR CONTRIBUTIONS

VMA designed the study, led data analysis and wrote the paper. NB led data management. KS contributed to data interpretation. All authors have read and approved the final manuscript.

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