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Perception of caregivers about the management of severe acute malnutrition children at Malnutrition Treatment Center (MTC) and prospects of children after rehabilitation in Jharkhand

Summary Report

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Executive summary

Severe acute malnutrition (SAM) among children remains a major cause of morbidity and mortality in the state of Jharkhand. To address this problem, Government of Jharkhand (GoJ) has established MTCs for inpatient management of SAM children which remains the dominant strategy of Government to treat SAM children in the state. However what remains unknown is the status of children when they return to community and their short and long term growth prospects. For the state of Jharkhand, this study is first of its kind to review the growth and nutritional status of children after discharge and generate evidence and suggestions for policy makers to improve management of malnourished children at their home after discharge. By carrying out nutritional and morbidity assessment in children the study helps in identification of risk factors that have implications on the health and nutritional status of children in the post rehabilitation period.

The goal of this study was to assess the nutritional status of children after their discharge from malnutrition treatment centers. The study has also tried to understand and measure children's dietary intake and their consumption pattern after discharge, understand morbidity pattern after and identify barriers and challenges in accessing the health and nutrition services at community level.

Methodology

The study was conducted in two phases involving both cross-sectional and prospective follow up design. To understand progress just immediately after MTC program duration (2 months after discharge) a cohort of 100 children was followed since admission till next two months and were contacted at three time points namely at enrollment, official discharge from the MTC and lastly at 2-3 months after leaving the MTCs. Apart from detailed quantitative survey, focused group discussion and in-depth interviews were also conducted with caregivers to understand their perception of services provided at MTC and adoption of MTC promoted health and care practices at home. Similarly to understand and measure outcomes beyond the two months of MTC program period, nutritional status of children who were treated and discharged three, six and nine back was assessed through cross sectional survey of 150 children by visiting 50 children each from three groups. Development of study questionnaire and other tools were standardized and pretested. Robust training of the investigators with field experience was done prior to initiation of the study. Approval for the study was obtained from Institutional Ethics Committee.



Results

The results from the two studies show poor nutritional status of children during admission. Around 90 and 65 percent out of 250 children were severely underweight and wasted at admission. The care and treatment at MTC brought perceptible change in wasting status of children and by discharge the percentage of severe wasting in children dropped from 65 to 29 percent. The stay at MTC is of generally 14 days which was insufficient to make any noticeable impact on underweight and stunting status of children. The gain in weight in MTC which pushed children out of severe wasting category does not seem to have sustained after discharge and as observed high proportion of children relapsed from moderate and normal categories into severe SAM category. The proportion of children in severe wasting category at different time interval shows that high proportion of children (52 percent) dip into severe category within two months after discharge. The low weight-for-height status remained a cause of concern for children throughout nine months as almost 4 out of 10 children were found in severe category after nine months of discharge from the MTC. At the time of survey 71 children (28.4 percent) out of 250 children were suffering from all the three severe forms of malnutrition.

The treatment protocol at MTC is very intensive involving treatment of infections and frequent feeding of energy dense diet. As observed from the results from in-depth interview many caregivers could not sustain frequent high energy and protein diet which severely affected the rehabilitation of children in the community. The likely reason for poor catch up growth seen in children is due to the compromised triad of food, care, and morbidity in children after discharge. The food intake of children was not even equivalent to meet the nutritional requirements of normal children. The calorie gap in the range of 300-500 Kcal/d was observed when comparing it with the RDAs of the normal child. The diets of these children were deprived not only of adequate calories but all other essential macro and micro nutrients. Caregivers also followed poor feeding practices and were feeding infrequently, were busy in farming related activities and did not have time to feed and provide care to children. Multiple morbidities were observed amongst the children in last three months preceding the survey. These morbidities were both cause and effect of the severe grades of malnutrition observed in the children.

The results from the study show that mean energy and protein intake amongst children of all age groups was much less when compared to the catch up growth requirement but also with the RDAs of normal children across all the age groups. The calorie gap amongst the children was highest immediately after two months of discharge. As per the recommendations provided for community rehabilitation of SAM children the diet for catch-up growth should be of high energy density and 11 percent of energy should come from proteins. The current protein intake of children was much below the recommendation and contributed less than 11 percent of the total calorie intake in majority of the cases.. The results show that food consumed by children on the day preceding the survey did not meet



the energy and protein requirements of majority of the children and majority of them consumed food that met less than 50 percent of the energy and protein requirements. The qualitative and quantitative analysis of dietary data carried out to understand reasons for low energy and protein adequacy among children shows likely reasons for the poor energy and protein adequacy to be (a) thin consistency of served food (b) small portion sizes and (c) less number of feeding episodes.

Children after discharge from MTCs remain vulnerable to repeated infections and growth faltering without continuity of adequate care. This could only be possible with the efforts of frontline health workers and access to community health and nutrition programs. The study shows that mean take home ration amounts received from Aanganwadis by children discharged from MTCs was less than those entitled for normal children. Rice which is the main staple food for children, daal and soyabean, which are good sources of protein, were all distributed in inadequate amounts to the children. Similarly, oil and sugar which are considered as dense and instant sources of energy were also found to be distributed in insufficient amounts. The results from the study show that nearly 75 percent of the received ration gets shared with other family members leaving only one third of ration for the targeted children.

The morbidity pattern of last three months in children show that morbidities like cold, fever and diarrhea was reported more by children discharged three months back than children who got discharged at six and nine months from other groups. More than two-third children reported incidences of cold while nearly half of them were affected by fever. The average duration of the illnesses studied was in the range of 4 to 8 days. For seeking treatment caregivers consulted trained health provides, primarily private practitioners than government hospitals or community health workers. The role of community workers like Sahiya, AWW and ANM was found to be very limited during episodes of illness in children after discharge. The study shows that as the grade of malnutrition deteriorates the number of multiple morbidities also gets increased in children. The burden of multiple morbidities is much higher in severe malnourished category children than in moderate or normal categories.

The understanding and attitude of caregivers about child feeding, care during feeding and hygiene practices have important bearing on the health and nutritional outcomes of the children. The knowledge, attitude and practice about feeding episodes, diet modification, portion size and food consistency which was discussed by nurses in MTC was assessed during the study. The result shows caregivers had a positive outlook towards frequent feeding of children but were not correctly aware of the correct number of feeding episodes. Poor knowledge is thus leading to a situation where caregivers are feeding less than optimal number of feeds to their children. Caregivers had relatively better awareness about consistency of food than diet modification and portion size. The understanding about



amount of food to be given in a meal was found to be very low among all caregivers. Majority of the caregivers had knowledge and right attitude about ways to modify diet to make it more nutritious but this did not translate into practice as seen from low fat intake of the children. This could be attributed to time constraint of caregivers and financial burden of buying extra oil and vegetables for modifying the food

The nine focus group discussions conducted with 59 caregivers in 8 districts of Jharkhand who had stayed in MTC with their children shows that majority of the caregivers were referred to treatment centers by frontline community workers; Anganwadi workers and Sahiya and were informed about duration of stay and monetary compensation by them prior to their visit to MTCs. Pre admission period was worrisome for caregivers as they had to make alternative arrangements for the care of remaining siblings, members of the households and livestock. Many caregivers had to undergo a lot of psychological commotion as they were constantly anxious about being away from house at night, security of remaining children and the condition of the house in their absence.

Most of the women expressed satisfaction with the care and recovery observed in children during their stay in MTC. The response of doctors and nurses, timeliness towards services and personal care made a deep impact on mothers. Children were regularly fed in MTC after every two hours as quoted by many caregivers. Caregivers were satisfied with milk, food and medicines provided to children. Provisions to caregivers with items of daily use like bed sheets, mosquito net, pillows were liked by caregivers during their stay in MTC. The dissatisfaction of caregivers was generally found to be related to the cleanliness and lack of privacy while using bathing and toilet facilities. In some MTCs water was not available and women had to bring it from outside and store it for use at night.

The monetary compensation received by caregivers has helped them in covering incidental costs during their stay in MTCs as well as in some cases acted as buffer against debt trap or loss of assets as in its absence they would have incurred debt from moneylenders. The study reflects that overall there was general positive perception of MTC services among caregivers and a high level of satisfaction among them regarding the improvement they have witnessed in the health of their children. The caregivers agreed that child looked healthy and there were visible improvements in the child's appearance by discharge. According to caregivers sustaining this improvement still remains a challenge for them



REPORT



Background

SAM among children remains a major cause of morbidity and mortality in the state of Jharkhand. And as per estimates from NFHS-3, 11.8 percent of children below 5 years are wasted below -3SD, which approximately translates into 300,000 children being severely malnourished in the state. Presently, MTCs have been established in most of the district hospitals of the state to provide inpatient management of severe acute malnourished children. It has been demonstrated that with an appropriate medical and dietary management SAM children can be rehabilitated successfully in few weeks in the treatment centers. However, there exists very limited information about the health and growth prospects of children after discharge. The study is an attempt to provide information about the nutritional status of the children after their discharge from MTCs and identify factors that have implications on the health and nutritional status of children in the post rehabilitation period. This study is a first of its kind in Jharkhand to review the progress made in MTCs after discharge and helps to generate evidence and suggestions to improve management of malnourished children both at center and at their home after discharge.

Methodology

The study was conducted in two phases involving both cross-sectional and prospective follow up design. To understand progress after program duration (2 months after discharge) a cohort of 100 children was followed since admission into MTC till next two months and were contacted at three time points at enrollment, during discharge from the MTC facility, and lastly 2-3 months at home after discharge(figure 1). Apart from detailed quantitative survey, none focused group discussion and 25 in-depth interviews were also conducted with caregivers to understand their perception of services provided at MTC and adoption of MTC promoted health and care practices at home. Subsequently to understand and measure outcomes beyond the program, nutritional status of children who were treated and discharged three, six and nine back was assessed through cross sectional survey of 150 children by visiting 50 children each from three groups (figure 2). Development of study questionnaire and other tools were standardized and pretested. Robust training of the investigators with field experience was done prior to initiation of the study. Approval for the study was obtained from Institutional Ethics Committee.

Figure 1: Cross sectionaol design for the assessment of children

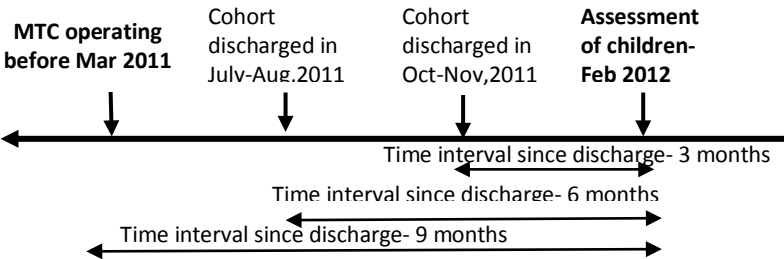
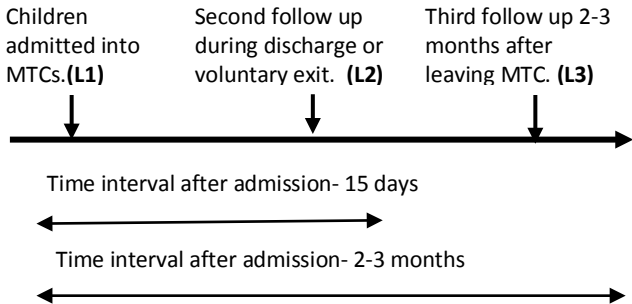


Figure 2: Prospective design for the assessment of children



Study Results

The result of all three studies are being presented in the below sections. The current growth status of children and their anthropometric scores are presented under anthropometric status of children. The section follows the progress of children from admission to their current status. The current food consumption pattern and dietary intake of children on the day preceding the survey is discussed in the next section that highlights the mean macro and micro nutrient intakes and energy and protein adequacy among children with respect to the dietary recommendations. Access and utilization of ICDS services, take home ration and supplementary food as well as growth monitoring facility utilized by index children has been discussed in section on access and utilization of ICDS and health services. The subsequent section on morbidity describes the morbidity history of children during last three months and health seeking behavior of caregivers during episodes of illnesses. Last two sections; follow up visits to MTC, and knowledge, attitude and practice of caregivers show results of visits by caregivers to MTC after discharge for follow up of their children, and their current knowledge, attitude and practice regarding MTC promoted child care practices.

Anthropometric status of children

Results from the prospective and cross sectional study reveal the present status of children discharged at different point of time from MTCs. A consolidated results are bring presented from both studies for which data have been pooled together to show status of 250 children at admission in MTC (n=250), during time of discharge from MTCs (n=250), two months after discharge from MTC (n=100), three months after discharge (n=50), six months after discharge (n=49) and nine months after discharge (n=51).

Data was collected for anthropometric variables like weight, height and Mid Upper Arm Circumference (MUAC) of children. Weight was taken with the help of electronic weighing scale nearest to 0.1 Kg and height was taken with the help of infantometer. All the measurements were taken by two researchers and the mean value was considered for the purpose of analysis.

Table 1 shows status of children since admission into MTCs. The status of children at admission shows high prevalence of severe acute malnutrition among children. About 64.4, 67.6 and 89.2 percent children were in the severe wasted, stunted and underweight categories at the time of admission. The determinants for wasting may differ in different environments; the present study however has shown



its significant association with morbidity and low food intake in children. One of the main characteristics of wasting is that under favorable condition it can be restored rapidly which is seen during the status at discharge. The care and therapeutic diet received by children at MTC reduces the number of children with severe wasting to 29.2, a drop by 54 percent.

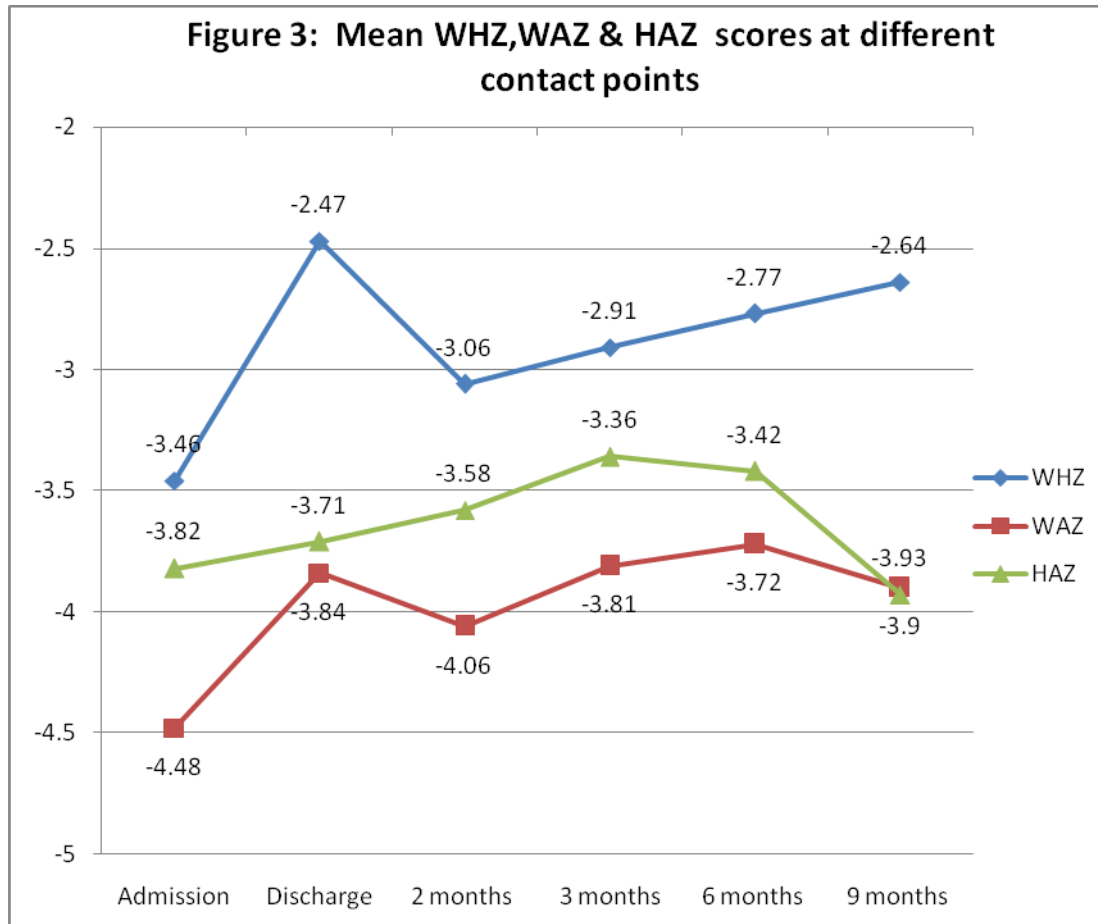
Parameters		Admission (%)	Discharge (%)	At 2 months (%)	At 3 months (%)	At 6 months (%)	At 9 months (%)
Weight for Height Z score(Wasting)	Severe	64.4	29.2	52.0	48.0	42.9	37.3
	Moderate	25.6	37.2	27.0	32.0	34.7	33.3
	Normal	10.0	33.6	21.0	20.0	22.4	29.4
Height for age Z score (Stunting)	Severe	67.6	65.6	63.0	56.0	53.1	62.7
	Moderate	19.6	19.2	22.0	26.0	30.6	27.5
	Normal	12.8	15.2	15.0	18.0	16.3	9.8
Weight for age Z score (Underweight)	Severe	89.2	72.8	83.0	74.0	69.4	76.5
	Moderate	8.8	23.6	14.0	22.0	24.5	17.6
	Normal	2.0	3.6	3.0	4.0	6.1	5.9
Total children		250	250	100	50	49	51

The stay at MTC is of generally 14 days which is insufficient to make any noticeable impact on underweight and height status of children. As observed no noticeable change is observed in the underweight and stunting status of children during their stay in MTC as more than 72 and 65 percent of children at the time of discharge were in severe underweight and stunting categories and majority of them remained in this category throughout the study span. The gain in weight in MTC which pushed majority of the children out of severe wasting category did not seem to have sustained after discharge and a high proportion of children relapsed from moderate and normal categories into severe SAM category (< -3 SD). The proportion of children in severe wasting category at different time interval shows that high proportion of children (52 percent) have dipped into severe category within two months after discharge. The high prevalence of wasting remained a cause of concern throughout nine months as almost 4 out of 10 children were found in severe category after nine months of discharge from the MTC.

The treatment protocol at MTC is very intensive involving treatment of infections and frequent feeding of energy dense diet. As observed from the results of in-depth interview many caregivers could not



sustain the frequent high energy and protein diet which could have severely affected the rehabilitation of children in community.



Mean Z scores of WHZ, WAZ and HAZ for the discharged children at different contact point is depicted in figure 3. The mean Z scores at admission and discharge shows significant improvement in wasting status ($P < 0.05$) as weight for height score improved to the moderate range of -2.47, due to feeding of therapeutic diet and close medical care at MTC. The gain in weight also led to improvement in weight for age score but remained in the severe category.

The stay at MTC is too short to see any improvement in height for age status but there was sufficient time for improvement between discharge and post discharge period (6 months or more). As has been observed in other situations catch up growth in height occurs only after children had achieved at least 85 percent recovery in their weigh-for-height deficit. The weight for height score of children throughout nine months after discharge remained below the score achieved at the time of discharge from MTC due to slow rate of weight gain which might not have let the children attain height-for-age comparable with that of peers in the community.



As could be seen from the figure, a decline in children’s nutritional status was observed after discharge. The transient gain observed in MTC gets negated immediately after discharge and this decline was found to be steepest during first two months. Infection, poor appetite and non adherence to the dietary advice affected the weight gain at home. Children at MTC were frequently administered high energy therapeutic diet which was suddenly discontinued after discharge leading to drastic decline in weight of children. The mean weight for height score after two months showed improvement but is more likely due to the natural growth during the course than any home based intervention.

To understand severity of malnutrition burden in children a sub analysis was done to identify children with reportedly all three or two forms of severe malnutrition; severely wasted, severely underweight and severely stunted after discharge. As mentioned previously data from both studies were pooled to analyze burden of malnutrition. Table 2 shows that 71 children (28.4 percent) were suffering from all the three severe forms of malnutrition. All the three forms of severe malnutrition were observed in more percentage of children as compared to two or single form of malnutrition.

Categories	N (%)
Children with severe wasting, severe stunting and severe underweight	71 (28.4)
Children only with severe wasting and severe stunting	0 (0.0)
Children only with severe stunting and severe underweight	62 (24.8)
Children only with severe wasting and severe underweight	42 (16.8)
Children with only severe wasting	3 (1.2)
Children with only severe stunting	16 (6.4)
Children with only severe underweight	18 (7.2)

The reason for poor catch up growth seen in children, as described in subsequent sections, is likely due to compromised triad of food, care, and morbidity in children after discharge. The food intake of children was not even equivalent to meet the nutritional requirements of normal children and the calorie gap in the range of 300-500 Kcal/d was observed compared to RDAs of the normal child. The diet of these children was deprived not only of adequate calories but all other essential macro and micro nutrients. Caregivers were also found to be following poor feeding practices and were feeding infrequently, were busy in farming related activities and did not have time to feed and provide appropriate care to children. Also, frequent episodes of illnesses were reported from the children which were both cause and effect of the severe grades of malnutrition observed in the children.



Food consumption pattern and dietary intake after discharge

The information on the consumption of various food groups by children was collected from caregivers using food frequency questionnaire (FFQ). For analysis, all daily or weekly consumption of 5-6 days have been merged as 'daily', weekly consumption from 3-4 to twice a month have been taken as 'often', and consumption reported once in two months or beyond was treated as 'rarely' (Table 3).

The trend from the data revealed that almost all children consumed cereals daily whereas pulse and protein considered as rich source of protein was consumed only by one in four children daily. A high proportion of the children, more than 70 percent, also cited rare consumption of milk and milk based products.

Food Group	Frequency	Time since discharge from MTCs			
		2 months	3 months	6 months	9 months
Cereal	Daily	97.9	98.0	95.9	98.0
	Often	1.0	2.0	2.0	0.0
	Rarely	1.0	0.0	2.0	2.0
Pulse	Daily	32.9	32.0	40.8	25.5
	Often	58.5	58.0	53.1	70.6
	Rarely	8.5	10.0	6.1	3.9
Milk and milk products	Daily	22.9	24.0	40.8	19.6
	Often	20.9	12.0	12.2	9.8
	Rarely	56.3	64.0	46.9	70.6
Meat and Poultry	Daily	2.1	0.0	2.0	0.0
	Often	58.4	60.0	61.2	70.6
	Rarely	39.6	40.0	36.7	29.4
Green leafy vegetable	Daily	13.5	24.0	18.4	31.4
	Often	65.6	54.0	67.3	56.8
	Rarely	20.8	22.0	14.3	11.8
Other vegetable	Daily	44.8	38.0	53.1	54.9
	Often	40.6	38.0	38.8	29.5
	Rarely	14.6	24.0	8.2	15.7
Snacks	Daily	55.4	51.0	57.1	56.9
	Often	36.9	42.9	36.7	33.3
	Rarely	7.6	6.1	6.1	9.8

Daily consumption of green leafy vegetables was observed in lesser percentage of children. Interestingly caregivers relied more on snacks than on home cooked food as fillers for the children, being consumed daily by majority of the children. The snacks consumed were mainly fried or made from refined flour like biscuits, *nimki* (local fried snack prepared from refined flour), *papad*, rusk etc. highlighting the fact that caregivers provided finger foods to children which they could eat by themselves without caregivers involvement. These foods provided some energy, but nutritionally they are not considered as balanced snacks which is the need of these children. From in-depth interview it was assessed that lack of time



and involvement with other household chores by the mothers were the major factors for this type of practice.

Dietary intake of children

For assessing the adequacy in consumption of various nutrients, the diet details collected through 24 hour recall instrument were converted into raw food ingredients and were analysed using DIET SOFT software for estimating nutrient consumption of foods. The Recommended Dietary Allowances (RDAs) provided by Indian Council of Medical Research (ICMR), 2010 were used as standards for comparison.

Nutrients	Age group (Months)	Estimated needs	Time since discharge from MTCs			
			2 months	3 months	6 months	9 months
Energy (Kcal)	6-11	650	224	619	796	471
	12-23	894	444	594	633	589
	24-36	1060	471	558	664	690
	Above 36	1240	456	765	898	862
Protein (g)	6-11	14.2	6.5	13.9	20.9	12.6
	12-23	16.7	11.4	14.9	17.6	13.9
	24-36	16.7	12.2	14.1	13.7	18.9
	Above 36	22	11.9	18.0	24.3	19.9
Vitamin A (µg)	6-11	350	51.1	603.8	46.9	0.0
	12-23	400	23.7	34.9	84.7	37.6
	24-36	400	12.9	21.2	52.3	3.8
	Above 36	400	30.6	187.3	21.2	63.9
Iron (mg)	6-11	3.9	2.4	3.0	4.6	2.9
	12-23	9.0	2.4	3.6	4.0	4.2
	24-36	9.0	3.5	3.1	6.3	3.0
	Above 36	12.0	3.5	9.9	4.6	8.1

Any strategy that promotes successful rehabilitation after discharge from the facility should focus on achieving high energy and protein intake by children. Data from energy protein intake reveals that mean energy and protein intake amongst children of all age groups was much less when compared to the catch up growth requirement but also with the RDAs of normal children across all the age groups. The calorie gap amongst the children was highest immediately after two months of discharge. As per the recommendations provided for community rehabilitation of SAM children the diet for catch-up growth should be of high energy density and 11 percent of energy should come from proteins. The current protein intake of children however falls short of this requirement and in majority of the cases protein contributed less than 11 percent of the total calorie intake. The low protein in the diet was not just confined during previous day of the survey but was being inadequately given in last three months



as seen from the results of food frequency questionnaire. The milk and milk products and pulses, the major sources of protein were being consumed intermittently by children.

Data on iron intake shows that mean intake of iron amongst children across all age was much below than corresponding RDAs for normal children. Similarly the mean intake of vitamin A was found to be much lower than the corresponding RDA for children across all the groups. As mentioned above the children are consuming less than optimal amount of proteins and thus their calcium intake is also below the recommended requirements. The mean intake of other micro-nutrients was also much less when compared with the RDAs of the normal children. The poor consumption of micronutrients from diet highlights the fact that present diet of children are deficient in almost all essential micronutrients and children are being fed with foods that neither promotes catch up growth nor improves immune function.

Energy and Protein adequacy among children

To achieve catch up growth and improve immune function it has been recommended to provide a diet that gives at least 150 Kcal/Kg bodyweight/day energy and 4g/Kg body weight/day protein to children. The nutrient adequacy ratio (NAR) was computed for energy and protein based on the above recommendations for SAM children during their rehabilitation

Percent adequacy	Time since discharge from MTCs			
	2 months	3 months	6 months	9 months
Less than 50 percent	65.2	37.8	33.3	46.0
50-<66percent	23.9	26.7	29.2	34.0
66-100percent	9.8	31.1	33.3	20.0
More than 100percent	1.1	4.4	4.2	0.0
Total	95	45	48	50

Percent adequacy	Time since discharge from MTCs			
	2 months	3 months	6 months	9 months
Less than 50 percent	62.2	54.2	42.2	58.3
50-<66percent	19.4	14.6	17.8	18.8
66-100percent	17.3	18.8	26.7	18.8
More than 100percent	1.0	12.5	13.3	4.2
Total	95	45	48	50

The results from the tables 5 & 6 show that food consumed by children on the day preceding the survey did not meet the energy and protein requirements of majority of the children. The figures from the tables show that majority of the children consumed food that met less than 50 percent of the energy and protein requirements. The result shows that none of the children consumed food in the amount



that could provide energy more than the stipulated energy value as per their body weight. Relationship of energy and protein adequacy with gender and age of the children was also analyzed but no significant association was observed between them.

Both qualitative and quantitative analysis of dietary data was carried out to understand reasons for low energy and protein adequacy among children. Some of the likely reasons that emerged for the poor adequacy of energy and protein were: (a) thin consistency of served food (b) small portion sizes and (c) less number of feeding episodes.

The analysis of the main meals showed that very few children were served with balanced meals as meals served predominantly constituted of only cereals (rice with either daal) or some thin gravy vegetables. The analysis of the food preparation of staple foods like daal (lentil) and vegetables showed that caregivers prepared them with thin consistency which reduces their nutrient effectiveness. The preparation of lentils (high source of protein) showed that the final cooked amount to raw amount was in the ratio of 7: 1 which would have mitigated the benefits of proteins. Likewise the vegetables that were served as side dish with rice were also found to be of very thin consistency. Similarly the analysis of the portion size showed that caregivers fed children with less than the required amounts. The size of the meal calculated using standardized bowls showed that children generally consumed food in the range of only 1 small to 1 medium bowl (125-200 ml) in main meals.

Children in younger age groups have relatively small stomach and require frequent feeds more than 5-6 times to augment their energy intake. The analysis of frequency of foods between main meals showed that about quarter of children were not provided any meals/snacks between the main meals. About 52 and 68 percent children in the age groups of 12-23 and 24-36 months reported eating only 1-2 snacks between meals. Considering the current status of children the provision of 2 main meals looks insufficient for catch up growth.

The in-depth interviews with sub set of caregivers reveals that although caregivers are conscious of the need to feed the child on time and frequently but still large number of them are not able to practice it due to other impending household chores and resource constraints. Engagement in work like collection of fuel wood, manual labor and competing demands from other siblings are making frequent feeding cumbersome for caregivers. While many caregivers stated that they had started to feed vegetables, fruits, milk to their child, in many cases, mothers said they could ill afford such expenses, and continued to feed as before. Apart from resource constraint and poverty inadequate knowledge about right diet also prevented caregivers giving right mix of food. Majority of the caregivers had limited knowledge and understanding about frequent feeding food to children, modification of local or home food and portion size to be fed to children.



Energy and Protein intakes in wasted and underweight children

The distribution of mean energy and protein intakes by wasting and underweight status of children (table 7) shows that energy and protein intake by normal children were comparatively higher than children from moderate and severe categories. The results of the dietary data shows that severely wasted children during follow up survey were on a very low energy and protein diet as suggested by their mean intake values of 478.3 kcal and 11.8 grams respectively. Although the energy intake is based on one day diet the results are in concurrence with the overall food consumption pattern of normal and severely wasted children. Among the children who were severely underweight (WAZ) the intake of protein among them was almost half when compared with normal category children.

Parameters	WHZ categories			WAZ categories		
	Severe	Moderate	Normal	Severe	Moderate	Normal
Mean Energy Intake (Kcal)	478.3±285.8	555.8±286.3	630.4±342.2	518.8±291.1	545.1±297.4	819.5±427.2
Mean Protein Intake (g)	11.8±8.2	14.3±8.5	16.3±9.5	13.1±8.3	13.6±8.7	22.5±11.7

The results show that current home diet is highly inadequate to meet energy and protein requirements for catch up growth in children. It is well documented that as energy and protein intake increases the grade of malnutrition also improves for better. Similar trend is observed in the present study also. The results reinforce the importance of providing modified calorie dense and protein rich foods to children after discharge from MTCs so that weight gains observed in MTC can be sustained and further improved at domiciliary level.

Access and Utilization of ICDS and Health services after discharge from MTCs

There is much evidence to support that children after discharge from MTCs remain vulnerable to repeated infections and growth faltering without continuity of adequate care. The result from the previous sections show that majority of the children after reaching their respective homes relapsed back to the severe category of malnutrition. An efficient mechanism is required to sustain the gain in growth status of the children after reaching the community which could only be possible with the efforts of frontline health workers. As per the guidelines for the MTC program, the frontline workers are to make home visits every second day in the first two weeks after discharge, once every week from



third to eighth week and once every month thereafter. It also recommends frontline workers to measure weight and evaluate the diet and health of child during these contacts. Table 8 shows that contact of Anganwadi worker (AWW) and Sahiya with caregivers after discharge are less than optimal within first two months after discharge.

Mean number of contact	Time since discharge from MTCs			
	2 months	3 months	6 months	9 months
AWW	2.3±1.9	2.4±1.4	2.3±1.2	2.3±1.6
Sahiya	1.1±1.0	1.98±1.3	2.14±1.3	2.1±1.3
ANM	2.2±3.3	1.94±1.2	1.9±1.2	1.7±1.2
Total	100	50	49	51

Access and consumption of Take Home Ration

The state Government under the ICDS program supplies raw rice, daal, sugar, soyabean and oil as take home rations to all children under three years in the state. This amount of ration is provided to meet calorie and protein requirements of 500 calories and 12-15 grams of protein per day among the children of 6-36 months of age. Children who are severely malnourished or have been discharged from malnutrition treatment centers are recommended to be provided double quantity of the food supplement which amounts to 600 calories and 16-20 grams of protein per day.

Name of food item	Entitled amount	Time since discharge from MTCs			
		2 months	3 months	6 months	9 months
Rice (g/month)	1500	1129±362.5	1130±436.9	1206±427.0	1033±240.8
Dal (g/month)	375	269±92.5	258±98.2	283±156.9	257±105.6
Soyabean (g/month)	250	172±94.6	219±169.5	203±112.1	173±109.1
Sugar (g/month)	950	249±104.1	266±187.6	271±144.1	247±161.4
Oil (g/month)	125	123±66.1	Information not available		

Majority of the children as could be seen from table 9 received less than the stipulated ration in the previous months of study. Rice which is the main staple food for children, daal and soyabean, which are good sources of protein, were all distributed in inadequate amounts to the children. Similarly, both oil and sugar which are considered as dense and instant sources of energy were also found to be distributed in insufficient amounts. None of the surveyed children received double ration amounts under the ICDS program while the current amount being provided to caregivers are not in adequate amounts to make any substantial impact on children.



These results are also supported by the qualitative study where caregivers admitted receiving rations from AWC but not in the amounts stipulated in the guideline. Caregivers reported difference in the quantity of THR given to them and what Anganwadi Sevika notes in register. Although it is difficult to comment on the supply side issue of ration, the data from interview shows lack of clarity among AWWs and her Sevika about the distribution of ration to SAM children. Caregivers have highlighted many incidences where double ration being provided to caregivers was discontinued as children were “growing up”, through in reality they were still less than one year of age. The supply of double ration was also found to dependent on the demand by caregivers. Many caregivers shared that they received more ration only when they demanded it.

The supplementary food provided to caregivers is meant to be given to the child but invariably gets distributed with the other members of the family. As the ration supplied through ICDS is in a raw form, majority of the households use these food items to serve as a family pot. The data from indepth interview showed that take home ration received from Anganwadi is used to prepare regular rice and pulse, sometimes mixed together with soyabean and other vegetables to prepare khichdi; sometimes the sugar is used for making a sweet dish- Halwa for the child. In most cases, the THR is consumed by the entire family, in some cases, it is shared between the children, while adults don’t consume it. The main reason for sharing with other members as cited by caregivers is that no separate food is prepared for different family members.

Ration type	Ration size/day	Ration received/day	Ration shared	Ration available for child	
				Mean (gms)	Percentage
Rice	60 grams	38.2 grams (69 %)	31.8 grams	9.7	25
Daal	15 grams	9.8 grams (65.5%)	7.55 grams	2.3 grams	23.5
Soyabean	10 grams	6.8 grams (68.5%)	5.2 grams	1.7 grams	25
Sugar	38 grams	9.15 grams (24%)	7.1 grams	2.1 grams	23

Table 10 shows the stipulated amount of ration to be received, actual amount of ration received, the extent of sharing of this ration and the net availability of ration for the targeted child. The ration amount actually received from the AWCs shows that amount received itself by caregivers is much below the stipulated amounts. For example amount of rice and daal received from AWC was only 69 and 65.5 percent of the recommended quota amount. This amount is further reduced due to sharing with other family members. As shown in the table, nearly 75 percent of the received ration gets shared with other family members leaving t only one third of ration for the targeted children.



Growth monitoring

The AWWs in the state are expected to monthly weigh all children discharged from MTCs. Growth Monitoring and Promotion (GMP) helps in identifying children falling under various grades of malnutrition, thus enabling

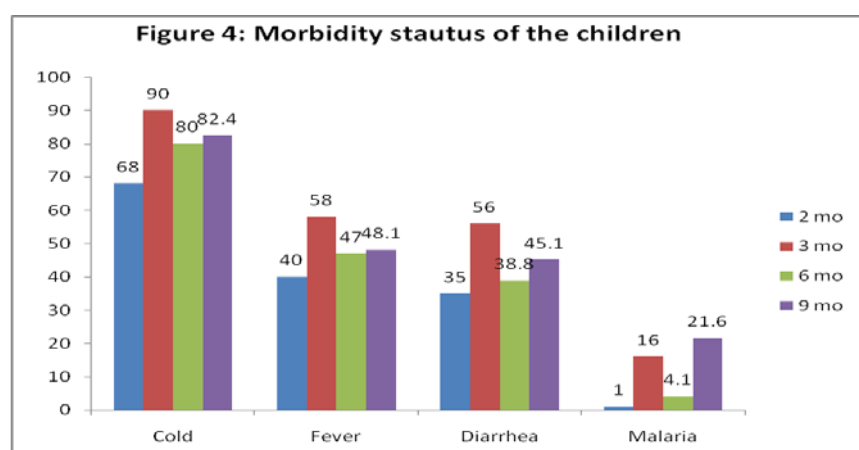
frontline workers and caregivers to take action before child's nutritional status is further compromised. For further analysis, the frequency of weight measurement was categorized into regular (3

	Time since discharge from MTCs			
	2 months	3 months	6 months	9 months
Regular weight measurements	10.0	38.0	40.8	45.0
Irregular weight measurements	59.0	44.0	38.8	27.5
Not weighed at all	31.0	18.0	20.4	27.5
Total	100	50	49	51

or more times in last 3 months), non-regular (one to two times) and no weight measurements. The data from table 11 shows that about 1/3 of the children were not weighed in the first two months after discharge, while only 10 percent were weighed three times or more. Surprisingly, the frequency of weight measurement increased with time. The result substantiates above finding that there is very little follow up by frontline workers after children are discharged from the MTC for weight monitoring and subsequent counseling.

Morbidity Status of the Children

During interview with caregivers morbidity status of children in last three months was also assessed. Through structured questions common illnesses like cough/cold, pneumonia, fever, measles, diarrhea, eye and ear infection etc. were studied. The results of common illnesses which affected the children is being presented for discussion.



The results from figure 4 show morbidities like cold, fever and diarrhea was reported more by children discharged three months back than children who got discharged two, six and nine months back. More than two-third children reported incidences of cold while nearly half of them were affected by fever. Among the four groups of children morbidity incidences were reported relatively less from group discharged two months back. This decreased illness episodes can be associated with medical treatment received in MTC which helped children to gain immunity.

Every episode of illness comes with its own complications and longer the duration of the illness the higher are probability of its adverse implication on health and nutritional status of children. The average duration of the illnesses studied was in the range of 4 to 8 days. Maximum duration was observed for malaria episodes and minimum for diarrhea. Data on health seeking behavior of caretakers reveals that for common ailments like cold and fever, about 1/3 of the children were not taken for any medical help. For seeking treatment caregivers consulted trained health provides, primarily private practitioners than government hospitals or community health workers. The reasons cited by caregiver for visit to private practitioners were that as they could not wait for community health workers to visit their child, they took their child to private doctor to get immediate medical attention.

The data from in- depth interviews shows that caregivers perceived the quality of services by private practitioners to be better than those provided at Government hospitals. The distance of government hospitals was another deterring factor for caregivers. As shared by caregivers the money spent on transportation would be same as or more than what the local doctor would charge as consultation fees. In addition patients would be asked to come repeatedly for check up, which is difficult for caregivers since (a) transportation is expensive and (b) there is no time to spare, due to workload at home and outside.

The role of community workers like Sahiya, AWW and ANM was found to be very limited during episodes of illnesses of children after discharge. The interaction of majority of caregivers with community workers as reported during survey as well as during interviews showed that home visits made by Sahiya and Anganwadi worker were negligible. In most cases, the contact point were made at Anganwadi when they went to collect the Take Home Ration where weight was measured and caregivers were informed about change in weight but no advice on nutrition or feeding practice was given.

The caregivers of the affected children applied 'wait and watch' policy for all types of morbidities. The result shows that it takes at least 3-4 days for caregivers to seek treatment for the children. This period could be an opportunity for community workers to provide first line of treatment in incidences like diarrhea



Table 12: Percentage of malnourished children reporting multiple morbidity

Number of illnesses	Wasting (n=250)			Underweight (n=250)		
	Severe	Moderate	Normal	Severe	Moderate	Normal
Nil	44.1	38.2	17.6	79.4	14.7	5.9
1	39.5	31.6	28.9	71.1	26.3	2.6
2	53.6	28.6	17.9	82.1	14.3	3.6
3 & above	46.4	28.6	25.0	76.8	16.1	7.1

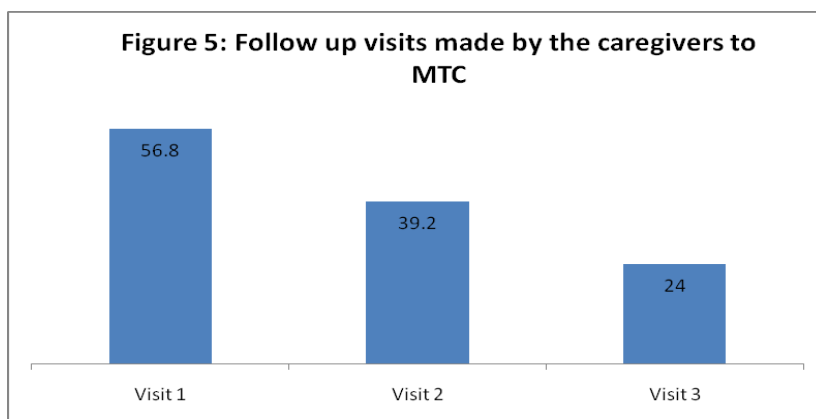
To study effect of multiple illness burden on children analysis was undertaken to understand its effect on growth status of children. The incidence of different illnesses was categorized as 1 illness, two illnesses and likewise. Two illnesses for example tell us that a child had 2 different morbidities in last three months and so forth. Table 12 shows occurrence of multiple illnesses amongst the different categories of wasted and underweight children. The results show that as the grade of malnutrition deteriorates the number of multiple morbidities also increases. The burden of multiple morbidity is much higher in severe malnourished category children than in moderate or normal categories children. Although a causal relationship is difficult to establish, whether compromised status causes frequent illness or vice versa, the results do however show that severity of illness after certain number of cases triggers an inflection point from where the malnutrition status further deteriorates.

Status of Follow up Visits to Malnutrition Treatment Center after Discharge

The MTC program guideline in the state recommends caregivers to fortnightly visit MTCs for health checkup of their children till two months of discharge. During their follow up visits, apart from health check-up, weight, height and mid upper arm circumference of the children are measured to assess their progress after discharge. The follow up visits by caregivers to MTC provide opportunity to service providers to measure the progress of children and take remedial measures if child manifests any danger signs or shows growth faltering.

As part of the discharge protocol all caregivers are informed about the importance of follow up visits and the dates for revisits. The study tried to assess the frequency of follow up visits by asking caregivers, how many revisits they had made to MTC after being discharged from the MTC. The results from the survey showed a declining trend after each subsequent visit to MTC. About 57 percent children visited MTC for the first follow up, 40 percent children visited for the second follow up, a drop by 17 percent, while for the third visit only 24 percent turned up at the MTC for check up.





The visit to MTC by caregivers was further analyzed to understand the uniformity of visits to MTC (only one visit, two visits and all three visits). The analysis from figure shows that out of 250 children discharged about 43.2 percent children never visited MTC once for check up, while only 24 percent visited MTC all three times. The caregivers of these children were asked about the

reasons for not visiting the MTC regularly. Amongst those who made less than three visits the major reason that emerged was the involvement of caregivers in other impending work. Lack of money and resources to travel was highlighted by many caregivers during the survey. The monetary and transportation issue was also prominently brought out in the in-depth interviews as travel expense to MTC was major deterrent for many caregivers.

No visit	43.2
Only one visit	17.6
Only two visits	15.2
All three visits	24.0
Total	250

Role of Front line health workers in MTC visits

Frontline workers like AWW and Sahiya play an important role in reminding and motivating caregivers to make follow up visits to MTC. The guideline also directs worker to intensively follow caregivers for making visits to MTC. It is hypothesized that reminder by frontline workers would encourage caregivers to visit MTC for their children's check up. The results from the study show that both Anganwadi worker and Sahiya were at forefront in the identification of SAM children and were active in accompanying caregivers to MTC for admission. However the role of frontline workers after discharge was found to be very limited. It is hypothesized that reminder by frontline workers would encourage caregivers to visit MTC for their children's check up, however the results shows that only 54 percent of the caregivers were reminded by workers about these revisits. The role of frontline working during follow up visits presents a different picture. As compared to initial high involvement during admission the role of frontline workers during follow up became quite subdued. Among the caregivers who visited MTC after discharge less than 15 percent were accompanied by any frontline workers. This low involvement of workers is likely to be attributed to the monetary reasons as health workers are entitled to receive



monetary incentive in lieu of bringing the SAM children for admission to MTC while no such incentives are provided during follow up visits.

Knowledge, Attitude and Practice (KAP) of caregivers

During interview with caregivers questions were asked related to their understanding and attitude about child feeding, care during feeding and hygiene practices. The attitude of caregivers on a related topic was captured through a set of three questions on a *four point likert scale*. To calculate the overall attitude of caregivers on a topic, a composite attitude score was derived using average of three variables. All caregivers during the interview were asked about frequency of feeding episodes, consistency of food, diet modification, food amount, care practices during feeding and personal hygiene.

Frequency of feeding to children

To assess the understanding on frequency of feeding, all caregivers were asked about number of meals a child has to be fed in a day. For understanding their attitude on frequent feeding episodes, caregivers were asked questions related to perceived importance of feeding snacks in between meals, perceived difficulty in frequently feeding the children, and perceived benefit of weight gain. For assessing caregiver's actual practice, information of children's previous day diet was collated to measure percentage of caregivers who fed their child as per the feeding norms.

Parameters	At admission into MTC	After two months of discharge	After two months of discharge	After three months of discharge	After six months of discharge	After nine months of discharge
Awareness about correct number of feeding episodes (%)	31	35	41	36	42.9	37.7
Mean Attitude score on frequent feeding (1-4 scale)	2.91	3.2	3.1	3.12	3.12	2.92
Caregivers practicing correct number of feeding episodes (%)	NA	NA	56	20.4	46.8	16
Total caregivers	100	100	100	50	49	51

The results from the table 14 show that stay at MTC was successful in improving attitude of caregivers on correct number of feeding episodes. However the improvement in awareness was not as significant as would be desired. The correct awareness about feeding frequency increased incrementally to 35 percent at the time of discharge and remained statistically in the same range till next 9 months. However, when it came to actual practice, a clear decreasing trend was observed with time. Fifty six



percent of the caregivers of children discharged recently (two months) were seen feeding 3-4 meals and 1-2 times snacks everyday to children while those discharged earlier were practicing less than optimal feeding episodes.

The result of the KAP shows that caregivers had a high positive outlook towards frequent feeding of children but were not correctly aware of the correct number of feeding episodes. The poor knowledge might thus be leading to a situation where caregivers are feeding less than optimal number of feeds to their children.

Food consistency, Diet modification and Feed amount

To achieve catch-up growth it is essential to provide children high energy foods through modified diets. Caregivers during the interview were asked about the consistency of food, the amount of food that should be fed in a meal, and ways to modify the food to make it calorie dense. The attitude of caregivers was also assessed on diet modification by set of four questions on *four point likert scale*. As previously mentioned, a composite attitude score was derived using average of four variables. As for caregiver’s practice, the analysis was carried out only for diet modification through a proxy indicator of ‘fat’ in the previous day’s diet of children. The rationale for using ‘fat’ was that using more oil or ghee in children’s meal make it more energy dense.

Parameters	At admission into MTC	At the time of discharge	After two months of discharge	After three months of discharge	After six months of discharge	After nine months of discharge
Awareness about correct consistency of food (%)	53.0	57.0	60.0	64.0	49.0	68.6
Awareness about diet modification (%)	21.0	52.0	56.0	78	89.8	80.3
Awareness about correct portion size (%)	19.0	17.0	21.0	26	24.5	37.3
Mean Attitude score on diet modification (1-4 scale)	3.12	3.3	3.23	3.28	3.18	3.12
Total caregivers	100	100	100	50	49	51

The results from table 15 show that caregivers had relatively better awareness about consistency of food than diet modification and portion size. The understanding about amount of food to be given in a meal was found to be very low among all caregivers. This result substantiates the earlier finding from dietary section where energy intakes of children revealed that majority of the children were being fed inadequate amount of food. One of the likely reasons for this shortfall in calories could be that



caregivers, as seen above, were not conscious about correct food amount which needs to given to children in a meal.

The understanding of caregivers about the diet modification reveals that majority of the caregivers knew about ways to modify diet to make it more nutritious at discharge and after two months of stay at MTC. However, high knowledge and favorable attitude on diet modification did not translate into practice as seen from low fat intake of the children. The fat consumption of children on the previous day shows that less than 10 percent caregivers were providing fat in adequate amounts in their children's diet with very few caregivers adding any extra oil on the main meals during feeding episodes of the children.

The dietary practices of caregivers show that in spite of awareness and favorable attitude caregivers were not modifying the diet of their children. The results from in- depth interview with caregivers show that caregivers are excessively busy in other work or have other children to take care of hence all members are fed from the common family pot. Modifying the food by addition of vegetables and oil etc are perceived as financial burden by caregivers and during interviews they have expressed inability to afford expenses on such add on items. To promote usage of oil in children's diet the government is presently distributing 125 grams of oil per month to the children/household under ICDS scheme. At the first level many caregivers are not aware about the optimal usage of this oil for children as they were not taught about usage of extra oil in children's food either at MTC or at AWC.

The results of the intra household distribution of food also shows that oil which was exclusively meant for children is widely shared with other members defeating its intended purpose. There was also issue of palatability of food after addition of top oil in it. During interview many caregivers expressed opinion that taste of food by addition of extra oil makes the food unpalatable for children and many of them stopped this practice after children refused or vomited after eating.

Personal and environmental hygiene

Counseling regarding personal and environmental hygiene was provided to all the caregivers of the affected child during their stay at MTC. The information on hygiene provided to caregivers at MTC comprises of maintaining personal hygiene of children, ways to wash and dry children's clothes, to cleanliness in and around the house. These messages are also enlisted in the MTC discharge form which is provided to each caregiver at the time of discharge. Caregiver's knowledge on hygiene practices promoted by MTC was rated from a total score of six points. The results shows the information and education discussion held at MTC with caregivers was able to raise awareness of caregivers on hygiene practices and by the time of discharge they were able to recall five out of six practices. This high awareness however after two months is diluted with caregivers recalling only three out six promoted



recommendations. The attitude of caregivers always remained favorable towards personal and environmental hygiene as seen from scores from admission onwards which if reinforced could be easily translated into practice if frontline community workers reinforce these messages during their contact with caregivers.

Parameters	At the time of discharge from MTC	After two months of discharge	After three months of discharge	After six months of discharge	After nine months of discharge
Awareness on MTC promoted hygiene practices (1-6 scale)	5.0	3.2	2.8	3.1	2.9
Mean Attitude score on hygiene (1-4 scale)	3.8±0.14	3.63	3.5	3.4	3.4
Status of current personal and environmental hygiene		Average	Average	Average	Average
Total caregivers	100	100	50	49	51

Perception of caregivers about MTCs

The discussion with caregivers about their stay at MTC revealed that pre admission period was worrisome due to ambiguity about the new place and the treatment of children. The feedback shared during discussion reveals that many caregivers had to undergo a lot of psychological commotion during the whole period as they were constantly anxious about being away from house at night, security of remaining children and the condition of the house in her absence.

General view among caregivers was that frontline workers had shared information about duration of stay and monetary compensation prior to their visit to MTCs. Some initial expenses were incurred by caregivers related to food items, clothes, fuel wood, soaps, oil etc as they brought these items with them to MTC. Caregivers whose villages were approachable and connected to the hospital had food delivered to them from home while others who lived far from MTC had to make their own arrangements.

Most of the women expressed satisfaction with the care provided during their stay in MTC. The response of doctors and nurses, timeliness towards services and personal care had impressed them most. As shared by caregivers weight measurement was done every day in the morning in most places and children were regularly fed after every two hours as quoted by many caregivers. Both weight measurements and therapeutic food were perceived to be beneficial by caregivers. The feeding was also regularly carried out at night and nurse would often wake caregivers for feeding children. Toys as required for the psychomotor development of children were available but not in adequate numbers.



Caregivers were satisfied with doctors and their handling of children. The nurses were available round the clock and were vigilant towards children's requirement. Although caregiver indicated satisfaction at the MTC arrangements there were however complaints regarding cleanliness and lack of privacy while using bathing and toilet at facilities. In some MTCs water was not available and women had to bring it from outside and store for use at night.

Caregivers are able to practice what had been advised in the MTCs but face difficulties at home due to excess workload, poverty, being away from home for work and demand for care from other children. Caregivers shared that while in MTC they had ample time to care for the child but at home they have other competing demands which compromise the time for the affected children. Along with this other factors like poverty and household food insufficiency were also mentioned as barriers for following MTC advice. The study reflects that overall there was general positive perception of MTC services among caregivers and a high level of satisfaction among them regarding the improvement they have witnessed in the health of their children. The caregivers agreed that child looked healthy and there were visible improvements in the child's appearance by discharge. According to caregivers sustaining this improvement still remains a challenge for them.



Recommendations

The results from the study highlight the need to strengthen the community level services for the follow up of the children after discharge from MTC. As observed MTC was instrumental in improving the weight of children but the gain was lost after children were being rehabilitated in the community. For successful rehabilitation in community it is pertinent that both caregivers along with frontline workers work towards improving the triad of food, care, and morbidity in children after discharge. An analysis of quantitative and qualitative study reveal the positive scenario as well as gaps in MTC program that need to be addressed to accelerate and sustain the efforts of facility management of children at MTC. Taking the study findings into consideration, the following actions are recommended.

Provide diet that promotes catch up growth and improve immune function

1. To promote successful rehabilitation after discharge children should be provided with high energy and protein diets. For this caregivers awareness and capacity should be build to modify family foods so that energy and nutrient dense food can prepared and fed to children. For catch up growth intake of at least 150 kcal and 4g protein/kg/day are required which requires high energy diet of at least 100kcal/100grams. The stay at MTC is a good opportunity to sensitize and teach caregivers about preparation of quick high calorie recipes which should be feasible, low cost and culturally appropriate. These recipes should be documented pictorially and given to caregivers for reference at home.
2. The presence of ICDS structure in every village can be leveraged to provide third meals at ICDS exclusively for SAM children discharged from MTC. The AWW sahiyka can be taught to prepare high energy and protein rich food for children which could be taken either at center itself or carried as take home food by parents. This would require resource mobilization both in terms of money and human resource with emphasis on training.
3. A ready to use catch up food or medical nutrition therapy tested and available in many part of the country can be another complementing strategy for the rehabilitation phase. Ready to use foods are of high energy density and if consumed as per the guidelines have shown to improve the weight of malnourished children at a higher rate than that of children relying only on home based treatment. This strategy is part of the current protocol of community based management of SAM children that provides framework to treat severe malnutrition at home.



Improve education session at MTC and build capacities of frontline workers on feeding practices

4. The analysis of knowledge and practices of caregivers on MTC promoted practices show low recall about feeding episodes, portion size and food consistency. The application of knowledge for improved feeding practices was found to be even low among caregivers. Considering study results the nutrition education component in MTC need to be redesigned so that caregivers are taught about the dietary practices (feeding frequency, food consistency and diet modification) in a memorable way, using variety of teaching methods and providing opportunities to practice preparing children's meal. Customized utensils can be given to caregivers as a carry away to help them serve right portion size of food to children after discharge.

5. All frontline workers should be oriented on the care and dietary guidelines promoted at MTC so that it could be promoted, strengthened and sustained after discharge. Building capacities of frontline workers would help them promote and motivate caregivers to practice these guidelines and would give them confidence to negotiate and resolve problems. As the study data shows majority of the caregivers were accompanied by frontline workers during admission of the children. This visit of frontline workers to MTC should be used as an opportunity to orient them about the catch up diet and connect them with caregivers for improving the quality of home visits.

6. Promotion of MTC practices after discharge is critical for successful rehabilitation. This involves training on technical knowledge on catch up diet with explanation to support the rationale pertaining to this type of diet. It is critical that frontline workers internalize the reasons so that they are able to not only impart the messages but convince the caregivers to adopt the correct practices. Regarding feeding, besides right time and frequency of feeding, AWW need to make caregivers aware and convinced of right consistency of foods, methods for improving energy and nutrient density and range of food groups to be used.

7. As seen from the study the supplementary food provided to children as raw ration is often shared with other household members leaving only about 25 percent for the index children. Also food intended as a supplement often replace the usual diet resulting in a small net increase in energy. Both nutrition education sessions at MTC as well as home visits by frontline workers should promote use of these rations for making high energy dense foods for the children. The use of oil, provided to children from Anganwadi centers, should also be taught to caregivers to make the food calorie dense.



Closely monitor the progress and provide treatment to illnesses

8. As seen in the study the role of frontline workers like Sahiya, AWW and ANM was found to be very limited during episodes of illnesses of children after discharge. The average duration of the illnesses was in the range of 4 to 8 days while for common ailments like cold and fever, about 1/3 of the children were not taken for any medical help by caregivers. Every episode of illness has adverse implications on children and so the role of frontline workers during illnesses has to be clearly defined and shared with them. Provision of travel allowance can be given to caregivers to motivate them to visit CHCs or district hospital during episodes of illnesses.

9. The results of the study have highlighted the effect of morbidity on the growth status of children. As the results show grade of malnutrition deteriorates as the number of multiple morbidities increases. A synergistic interaction is often seen between ill health and dietary intake and a dietary intervention during and immediately after a disease episode can reduce the extent to which nutritional status deteriorates. Frontline workers should be sensitized to look nutrition as part of disease management and apart from first line of treatment like ORS in cases of diarrhea; the workers need to counsel caregivers during home visits to continue feeding the children to mitigate the adverse effect of interactions within the malnutrition-infection cycle.

10. The study also reveals that factors other than poverty and access to food play an important role in causing malnutrition. It is recommended that we ensure that interventions are in place to break the infection-malnutrition cycle. In this context, the underlying causes of malnutrition such as hygiene, water and sanitation situation needs to be addressed along with ensuring access to food.

11. Although a causal relationship is difficult to establish, whether compromised status causes frequent illness or vice versa, micronutrient deficiencies in children as observed in the study could have impaired immune function contributing to their increased susceptibility to infections. The high deficit in linear growth may also have been influenced by micronutrient deficiencies the most likely being zinc, iron, and calcium. Home diets as seen in the study are essentially vegetarian and no micronutrient supplement was provided during follow up, apart from vitamin A. The importance of micronutrients in physical and mental growth and in prevention of morbidities in children needs to be stressed by frontline workers during their home visits. Sprinklers, multivitamin tablets or syrups are some available options which could be provided to caregivers after discharge to address micronutrient deficiencies.



Improve coverage of ten evidence based nutrition and health interventions

12. Unlike improvement in wasting, there was no effect on stunting status of children and majority of them (65 percent) remained stunted throughout the study period. Studies have shown stunting in the first two years of life cause irreversible damage, resulting in shorter adult height, lower school attainment and lower offspring weight. Although MTC intervention is for too shorter duration to have any impact on stunting, maximizing coverage of evidence based nutrition interventions may be pivotal for improving linear growth in children .

13. For improving nutrition situation, ten selected evidence-based nutrition and health interventions are recommended to be given special attention to increase the coverage to at least 90 percent. Six out of these 10 interventions pertain to infant and young child feeding practices (early initiation of breastfeeding, exclusive breastfeeding 0-6 months, timely introduction of semi-solid food at 6 months, age appropriate food for children, hygienic feeding practices, appropriate feeding of children during and after illness, therapeutic feeding of children with severe acute malnutrition) and the remaining four interventions focus on interventions primarily managed by the health sector (immunization ,biannual vitamin A supplementation, adequate nutrition and support to adolescent girls and complete ANC including nutrition support for pregnant and lactating mothers). For improving coverage to 90 %, the programme design of these interventions is suggested to be revisited including defining objectives, conducting appropriate training, introducing modifications in the existing processes for increasing coverage through effective integrated plan of health and ICDS sectors, streamlining supply-logistics, monitoring etc.

14. For achieving coverage of these interventions, a high priority needs to be placed on home visits. Home visits to families with pregnant women or infants or a newly married woman is recommended to be accorded highest priority - families with “highest risk of malnutrition”. The frontline workers need to be responsible for frequent counseling of caregivers and family members for increasing coverage of the 10 selected evidence based interventions by influencing behavioral practices in families and creating demands for the services



