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Research Article

Treatment outcome in patients with severe acute malnutrition managed with protocolised care at malnutrition treatment corner in Rajasthan, India: a prospective observational study (quasi-experimental)

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ABSTRACT

Background: Malnutrition is rampant in paediatric age group. It is responsible for high morbidity, mortality and serious long term sequelae. In addition to critical care, a nutritional therapy followed by nutritional rehabilitation is a very important aspect for these children. Optimal management of these acutely ill children and a good outcome depends on an evidence based regimen of care.
Methods: Total 75 cases were enrolled in the study and nursed in malnutrition treatment corner and were fed in appropriate composition and quantity as per Indian academy of pediatrics guidelines (initial and rehabilitation phase; F75, F100 and staple food). All children were assessed daily for weight gain, improvement in clinical status, feeding problem, compliance with the treatment and improvement in the appetite.
Results: Out of 75 patients 63 (84%) patients were discharged. Dropout rate and mortality rate was 16% and 1.3% respectively. Majority patients were admitted for two weeks with mean duration of stay being 14.13 ± 9.1 days. Weight gain was good in 45, moderate in 22 and poor in 4 patients while 4 patients had weight loss during malnutrition treatment corner stay. Rate of weight gain was good in initial two weeks but as stay increased, rate of weight gain decreased in 3rd and 4th week with mean weight gain of 12.12±7.67 gm/kg/day. Twenty nine patients came for follow up after discharge and among them, 15(51.7%) patients had poor rate of weight gain, 9(31%) had moderate and 2 (6.89%) patients had good rate of weight gain whereas 3 patients had weight loss on follow up.
Conclusions: Severely malnourished children have a better weight gain and improvement in nutritional status while receiving protocolised care in malnutrition treatment corner, which results in faster recovery because it is well accepted and better tolerated. Hospital based management of these children in specialised feeding centre is very important for regaining lost weight.

Keywords: Severe acute malnutrition, F75, F100, Staple food, protocolled care

INTRODUCTION

Childhood malnutrition is a significant crisis caused by combination of factors like inadequate and inappropriate food intake, childhood diseases, harmful childcare practices, illiteracy, poverty, overpopulation, gender inequality; inaccessible medical care etc., all contributing to poor health and millions of death annually. India is home to greatest population of severely malnourished children in the world and accounts for over 20% of under-five childhood death every year and 2.1 million children in India do not survive to celebrate their fifth birthday[1]. National family health survey estimates reveal that 45.9% of India's children under 3 years are

underweight, 39% are stunted and 23% are wasted and about 8 million (6.4%) children suffer from acute severe malnutrition and these children have high mortality rate ranging from 20% to 30%.[2] Severely malnourished children have a high mortality rate; almost 56% of childhood death is attributed to malnutrition. Among these 83% of these are attributed to mild to moderate as opposed to severe malnutrition.[3] Even in 1990's, mortality rate as high as 49% have been reported for malnourished children in hospitals.[4]

Optimal management of these acutely ill children and a good outcome depends on an evidence based regimen of care. Despite concerted efforts in recent years involving policy makers, health care providers and social organisations, morbidity and mortality of malnutrition remains a challenge.

The treatment of severe malnutrition has been dominated by concepts of its aetiology. Recently, these concepts have changed dramatically. Instead of administering abundant protein and energy and treating the complications as one would do in a normal child, the pathophysiological changes and detailed studies of the metabolism of individual nutrients have been used to formulate diets and guidelines for the management of severe malnutrition and its complications.

Management of children having malnutrition in nutrition rehabilitation centres has given promising results and can reduce mortality by 55% (95% CI 0.32-0.62) compared with conventional treatment protocolled care with family involvement in a supervised manner could be the key to proper management of malnutrition.[5]

The present study was, therefore, undertaken to identify factors affecting management outcome of severe acute malnutrition.

METHODS

This was an observational study conducted in the malnutrition treatment corner of the tertiary care hospital in Rajasthan over a period of one year on severe acute malnutrition patients admitted to malnutrition treatment corner.

Criteria for admission were (age group 6 month to 5 years):

1. Weight for height/ length -3 SD (WHO/NCHS median height).
2. Bilateral pedal edema
3. Grossly visible severe wasting

Informed consent was obtained from the parents of all children. Institutional ethical committee approval was obtained for the study. Children were managed in malnutrition treatment corner (MTC) medically and nutritionally. A total of 75 cases were enrolled in the study and a detailed history and physical examination findings and anthropometric measurements were recorded in pretested proforma at the time of admission. After admission, investigations like Haemoglobin, total and differential leucocytes count, ESR, urine and stool examination, Monteux test, HIV ELISA , chest X-Ray, electrolytes and other investigations were done as and when required.

Medical problems of admitted children were treated in Initial phase of treatment by means of intravenous fluid, antibiotics and symptomatic therapy. After the phase of initial stabilisation, rehabilitation phase was started. In this phase initially F75 diet was offered to the child either orally or by nasogastric tube. After 1-2 days when the child started to tolerate this feeding, then more energy dense diet F100 was given. In addition to F75 and F100 diet, child was offered staple food (Khichadi, Sooji, Bajra, Kheer, Chapati, Dal, etc.).

Children who were nursed in malnutrition treatment corner were fed in appropriate quantity as per guidelines. Initially nursing staff prepared the meal and subsequently the caretakers made it themselves under supervision. During this period care takers were taught about importance of safe and hygienic diet that they could prepare at home with available means.

All children were assessed daily for weight gain, improvement in clinical status, feeding problem, compliance with the treatment and improvement in the appetite. Rate of weight gain was considered good if > 10 gm/kg/day, moderate if 5 -10 gm/kg/day and poor if weight gain was <5 gm/kg/day.

Children were discharged from the hospital when:

- The child had good appetite.
- Gained weight at least for three consecutive days.
- Showed no evidence of any active infection.
- Mother or caretaker had learnt how to feed the child and were thought how to give complementary feeding at home with locally prepared food.
- Weight for height is >3SD

After discharge children were followed for weight, height and weight for height.

RESULTS

Out of all admitted patients, 72 (96 %) were below 2 yr of age and male to female ratio was (M: F) 2.9:1. The mean age of admitted patients was 14.92 ± 7.48 months (Table 1).

Table 1: Age and sex wise distribution.

Age (month)	No. of patient n (%)	Male n (%)	Female n (%)
6-12	39 (52)	28 (71.7)	11 (28.9)
12-24	33 (44)	26 (78.8)	07 (20.6)
24-36	2 (2.7)	01 (50)	01 (50)
36-48	00	00	00
48-60	01(1.3)	01 (100)	00
Total	075	56 (74.6)	19 (25.4)

Out of 75 patients 63 (84%) patients were discharged. Dropout rate and mortality rate was 16% and 1.3% respectively.

Fifteen (20%) patients remained admitted up to one week, 30 (40%) up to two week, 19 (25.3%) up to three week and 11 (14.7%) patients remained in MTC for more than three week. Mean duration of stay was 14.13 ± 9.1 days.

Rate of weight gain was good in 45 (60%), moderate in 22 (29.3%) and poor in 4 (5.3%) patients while 4 (5.3%) patients had weight loss during MTC stay. Mean weight gain of patients was 12.12 ± 7.67 gm/kg/day including these 04 patients who had weight loss during their stay in MTC.

Rate of weight gain was good in initial two weeks but as stay increased, rate of weight gain decreased in 3rd and 4th week with mean weight gain of 12.12±7.67 gm/kg/day. Weight gain during 2nd week was highest as compare to other weeks. In the 2nd week weight gain was more as compared to 3rd week and the difference was statistically highly significant (p<0.01) although weight gain in this week was also more as compared to 1st and 4th week but this difference was not statistically significant (p>0.05). Weight gain during 1st week was more as compared to 3rd and 4th week but the difference was not statistically significant (p>0.05) (Table 2).

Weight gain was more in patients 24 to 36 months of age group as compare to others. During 1st week weight gain in patients of group C (24-36 months) was more as compared to patients of other groups but the difference was not statistically significant (p>0.05). There was significant weight gain in patients of group C (24-36 months) as compared to group A (6-12 months) and B (12-24 months) (p<0.05) in 2nd week. In the same week patients of group B (12-24 months) had more weight gain as compared to group A (6-12 months) but difference was not statistically significant (p>0.05). In 3rd and 4th week, group A (6-12 months) patients had more weight gain as compared to group B (12-24 months) but again the difference was not statistically significant (p>0.05). Overall weight gain of group C (24-36 months) patients was more as compared to group A (6-12 months) (p<0.01), which was highly significant statistically (Table 3).

Table 2: Week wise weight gain of patients.

Group	Week	No. of patients (n)	Weight gain (gm/kg/day)
A	1st week	75	11.23±9.40
B	2nd week	53	13.59±8.68
C	3rd week	19	07.23±9.23
D	≥4th week	08	09.09±9.18
	Total	75	12.12±7.67
Statistical analysis:			
1	A v/s B	p >0.1	1
2	A v/s C	p >0.09	2
3	A v/s D	p >0.5	3
4	B v/s C	p <0.01	4
5	B v/s D	p >0.2	5
6	C v/s D	p >0.5	6

P<0.05 was considered as statistically significant and p<0.01 as highly significant.

Weight gain of patients those had weight for height Z score (WHZ) >-4 SD was more as compared to patients who had WHZ >-3SD to <–4SD but the difference was not statistically significant (p>0.05) (Table 4).

Weight gain in each week was more in group having less morbidity score as compared to other groups. Weight gain during 1st week was more in patients those had less morbidity score compared to others and this difference in weight gain was statistically highly significant(p<0.01). There was significantly higher weight gain in group A (no morbidity) as compared to group C (2 or more morbidities) (P<0.001) and in group B (one morbidity) as compared to group C (2 or more morbidities) (p<0.001) in 2nd week. Group A (no morbidity) also had more weight gain as compared to group B (one morbidity) in 2nd week but difference was not statistically significant (p>0.05). There was significantly more weight gain in group A (no morbidity) as compared to group C (2 or more morbidity) in 3rd and 4th week (p<0.05). In the same weeks weight gain in group A (no morbidity) was more as compared to group B (one morbidity) and weight gain in group B (one morbidity) was more as compared to group C (2 or more morbidity) but the difference was not statistically significant (p>0.05) (Table 5).

Weight gain in non-oedematous patients was more as compared to oedematous patients during initial two week which was statistically significant (p<0.05). In third week oedematous patients had more weight gain but that was not statistically significant (p>0.05). The overall weight gain of non-oedematous patients was significantly more as compare to oedematous patients (p<0.05) (Table 6).

Weight gain of the patients those had gastrointestinal disturbance was 11.98±7.38 gm/kg/day, those had bronchopneumonia was 12.69±6.71 and patients those had tuberculosis was 7.41±7.73 gm/kg/day. Out of 75 patients, 3 patients were HIV positive and these patients

also had good weight gain (10.35±6.10) during MTC stay.

Out of 75 admitted patients, 4 patients had weight loss; among them 1(25%) had PEM grade II, 1 (25%) had PEM grade III and 2 (50%) had PEM grade IV. Out of four, 2 patients had low height for age.

Table 3: Age and week wise weight gain.

Group	Age (month)	Weight gain (gm/kg/day)				
		1st week	2nd week	3rd week	≥4th week	Total
A	6-12	9.60±9.64 (39)	11.90±8.21(26)	9.83±8.87 (9)	12.11±2.71 (3)	10.68±7.08(39)
B	12-24	12.16±9.75 (33)	14.28±8.26(24)	3.93±9.41 (9)	7.52±13.31 (4)	13.34±8.27(33)
C	24-36	14.23±10.23 (2)	26.55±6.43 (2)	Nil	Nil	24.45±2.19 (2)
D	36-48	Nil	Nil	Nil	Nil	Nil
E	48-60	12.6 (1)	8.9(1)	13.4 (1)	6.3 (1)	9.05 (1)
Total		11.23±9.40(75)	13.59±8.68(53)	7.23±9.23 (19)	9.09±9.18 (8)	12.12±7.67(75)
Statistical analysis						
A v/s B	p>0.2	p>0.30	p>0.1	p>0.5	p>0.1	
A v/s C	p>0.50	P<0.02	-	-	p<0.001	
B v/s C	p>0.5	P<0.02	-	-	p>0.5	

p<0.05 was considered as statistically significant and p<0.01 as highly significant.

Table 4: Distribution according to WHZ and weight gain.

Group	Weight for height (WHZ)	Weight gain(gm/kg/day)				
		1st week	2nd week	3rd week	≥4th week	Total
A	-3 to -4	09.85±9.85(47*)	13.14±8.99(29*)	10.10±9.06 (6)	11.8 (1)	11.50± 7.75 (47*)
B	<-4	12.78±9.01 (27)	13.87±7.91(23)	05.90±9.36(13)	8.70±9.85(7)	13.21±7.56 (27)
	Total	11.23±9.40 (75)	13.59±8.68 (53)	7.23±9.23 (19)	9.09±9.18(8)	12.12± 7.67 (75)
Statistical analysis						
A v/s B	p >0.2	p>0.5	p>0.3	-	p>0.3	

*Patient had WHZ <2 SD and bilateral pedal edema; p<0.05 was considered as statistically significant and p<0.01 as highly significant.

Table 5: Morbidity score and week wise weight gain.

Group	Morbidity score	Weight gain(gm/kg/day)			
		1st week	2nd week	3rd week	≥4th week
A	0	21.96±7.99(11)	16.78±6.80 (26)	15.29±9.22 (4)	19.8±6.48 (2)
B	1	10.98±8.10(36)	15.46±8.05 (14)	06.33±8.96 (11)	11.3±0.70 (2)
C	≥ 2	05.42±6.75(28)	02.40±5.71 (13)	01.65±5.28 (4)	02.65±6.87 (4)
Total		11.23±9.40(75)	13.59±8.68 (53)	07.23±9.23 (19)	09.09±9.18 (8)
Statistical analysis					
A v/s B	p<0.0005	p>0.5	p>0.1	p>0.2	
A v/s C	p<0.0005	p<0.0005	P<0.05	P<0.04	
B v/s C	p<0.001	p<0.0005	p>0.3	p>0.1	

Major morbidity during MTC stay was fever, vomiting and diarrhoea; Score 0 – No morbidity; Score 1- fever or vomiting or diarrhoea (either of these); Score 2 or more – any two or three of above; p<0.05 was considered as statistically significant and p<0.01 as highly significant.

These 4 patients belonged to low socioeconomic status (III & IV) and none of them were started weaning at the time of admission. Average stay of these patients was 19±5.88 days. Three patients were anaemic and one had normal haemoglobin level. Out of 4 patients, 2 patients were on anti-tubercular therapy. All four patients had one or more morbidity in each week. The only patient who expired was 18 months male child with PEM grade IV and was on anti-tubercular therapy. This child was anaemic and had severe hypokalaemia, hypernatremia and septicaemia.

Table 6: Weight gain in oedematous and non-oedematous patients.

Group	Patients	Weight gain (gm/kg/day)				
		1st week	2nd week	3rd week	4th week	Total
A	Oedematous	5.97±9.89 (11)	8.09±8.35(11)	10.26±16.06(4)	Nil (0)	8.14±7.37 (11)
B	Non -oedematous	12.10±9.36 (64)	14.02±8.56(42)	6.43±7.11 (15)	9.09±9.18(8)	12.80±7.57 (64)
Total		11.23±9.40 (75)	13.59±8.68(53)	7.23±9.23 (19)	9.09±9.18 (8)	12.12±7.67 (75)
Statistical analysis						
A v/s B	P<0.04	P<0.03	p>0.4	-	p<0.05	

p<0.05 was considered as statistically significant and p<0.01 as highly significant.

Dropout rate was 16% (12). Out of these 12 absconded patients, 3 (25%) stayed for less than 7 days, 3 (25%) for 7-14 days and 6 (50%) patients were stayed for more than 2 weeks. Mean duration of stay of these patients was 14.25±7.65 days. Out of these 12 patients, 3 (25%) patients had good weight gain, 4 (33.3%) moderate and 1 (8.3%) patients had poor weight gain while 4 (33.3%) patients had weight loss. Mean weight gain of dropout patients was 6.26±9.68 gm/kg/day. Among these 12 patients, 10 (83.3%) were from rural area and caretaker in all cases were illiterate. Ten (83.3%) patients belong to socioeconomic status IV and V. In case of 6 (50%) patients there were 3 or more children in their family including index case. Father of 10 (83.3%) patients were labourers and 2 (16.7%) were farmer.

Table 7: Age wise distributions of patients and their mean weight gain on follow up.

Age group (months)	No. of patients	Weight gain (gm/kg/day)
6-12	12	5.22±3.58
12-24	15	4.18±3.30
24-36	1	3.7
36-48	0	-
48-60	1	4.5
	29	4.60±3.28

Out of 75 patients, 29 patients came for follow up among them, 15 (51.7%) patients had weight gain <5 gm/kg/day, 9 (31%) between 5-10 gm/kg/day and 2 (6.89%) patients above 10 gm/kg/day. Out of 29 patients, 3 (10.34%) patients loss weight on follow up and belonged to socioeconomic status IV. All caretaker were illiterate and having >3 children in their families. Out of 29 patients, 22 (75.86%) were male and 7 (24.14%) were female and mean weight gain on follow up in male and female was 5.19±3.38 and 2.78±2.30 gm/kg/day respectively (Table 7).

DISCUSSION

Severe acute malnutrition is a global burden. SAM is the leading cause of death in developing countries. Prompt and proper management of complications associated with SAM and then after rehabilitation by using proper feeding protocol in hospital setting and at home is the key to success. Thus, present study was conducted in malnutrition treatment corner (MTC) of tertiary care hospital to find out the factor affecting weight gain in a case of severe acute malnutrition.

In our study, out of 75 patients, 11 (14.7%) patients stayed in MTC for more than three weeks and the mean duration of stay was 14.13 ±9.1 days. Out of 75 patients, 60% had weight gain more than 10 gm/kg/day and 5.3% children had weight loss during MTC stay. Weight gain was moderate (5-10 gm/kg/day) in 29.3% and poor (<5 gm/kg/day) in 5.3% patients. Mean weight gain of patients during admission in MTC was 12.12±7.67gm/kg/day. Mamidi et al [6] also reported in their study that mean duration of stay of non-oedematous patients was 26 ± 20 days and mean weight gain of admitted patients was 5gm/kg/day. Eight percent children did not gain weight, 44% children had poor catch up growth (<5g/kg/day), 35% children had moderate catch up growth (5-10g/kg/day) and 12% had rapid catch-up growth (>10g/kg/day). Likewise, in another studies by Savadogo et al, Patel et al and Iqbal et al, it was observed that mean weight gain was 10.18, 9.0 and 10.6 gm/kg/day respectively.[7-9] Iqbal et al also reported that during nutritional rehabilitation centre (NRC) stay 14.7% of the children demonstrated poor gain in weight (<5 gm/kg/day), 30.9% moderate (5-10 gm/kg/day), and the

remaining 30.9% demonstrated good gain in weight (>10 gm/kg/day).[9]

In our study, weight gain in 2nd week was more as compared to other weeks. There was significant more weight gain in 2nd week as compared to 3rd week ($p<0.01$). It may be due to the fact that in 1st week, child had active disease and also had poor appetite so weight gain was less as compared to 2nd week when the child had recovered from active disease, and had good appetite and started eating semisolid and solid foods. In 3rd and 4th week as weight of child reaches toward median weight they had less weight gain as compared to initial weeks. Appetite is a measure of metabolic wellbeing. It is particularly disturbed during the metabolic response to infection and with deficiency of certain essential nutrients. During these conditions, loss of appetite is the main reason for weight loss or poor weight gain. During convalescence phase with a good diet there is an increased appetite and regain of lost weight. Hossain et al [10] in their study shows that average time for improvement in appetite was 7.2 and 7.9 days by using locally adapted and WHO protocol respectively.

In our study, during 1st week weight gain in patients of 24 to 36 months of age was more as compared to patients of other age groups but the difference was not statistically significant ($p>0.05$). However, there was significant weight gain in patients of 24 to 36 months of age as compared to patients of 6 to 12 months and 12 to 24 months of age group in 2nd week ($p<0.05$). Overall weight gain in patients of 24 to 36 months of age was significantly more as compared to patients of 6 to 12 months of age ($p<0.01$). This may be due to the fact that after 24 months of age most of children start eating semisolid and solid foods and can eat themselves thereby achieving good weight gain. Our study shows that with increasing age (above 2-3 years); there was decrease in weight gain. Similar to our study, Mamidi et al reported that rate of weight gain decreases with increasing age though it was statistically insignificant. Such pattern is expected since growth rates are much higher in the first two to three years of life compared to the next two years.[6]

Apart from the age factor, the severity of wasting is known to influence the rate of weight gain. In our study, overall weight gain of those patients who had weight for height Z score (WHZ) >-4 SD was more as compared to patients who had WHZ >-3SD to <–4SD but the difference was not statistically significant ($p>0.05$). Mamidi et al in their study draw a simple linear regression analysis with rate of weight gain for the total duration of the hospital stay as dependent variable and baseline WHZ score on day 1 as an independent variable and reported that baseline WHZ score was significant determinant ($P<0.001$) of weight gain.[6] Weight gain decelerated to zero when the child's baseline WHZ score approached the median.

The high prevalence of fever, diarrhoea, vomiting and presence of other morbidities is not entirely unexpected, as malnourished children are susceptible to infections due to poor immune status. Therefore, despite efforts to prevent infections, the morbidities such as fever, vomiting, diarrhoea were high. In our study, weight gain in each week progressively increased from morbidity score 0 to ≥2; more so in 1st week after admission. The weight gain related to morbidity score was significant statistically ($p<0.01$). Weight gain in 1st week was almost doubled when there was no morbidity as compared to total weight gain in 1st week (21.9 v/s 11.23 gm/kg/day). There was significantly higher weight gain in group having no morbidity as compared to group having 2 or more morbidity score ($P<0.001$) and in group having one morbidity score as compared to group having 2 or more morbidity score ($p<0.001$) in 2nd week. Similar to our study, Mamidi et al [6] reported that most of the children had 1-2 days of fever during admission and about 10 to 12 % children had diarrhoea. Higher morbidity score is associated with lower rate of weight gain. In above study weight gain was 7g/kg/ day when there was no morbidity, which was 40 % higher than the average weight gain of 5 g/kg/day.

In our study, out of 75 patients, 14.7% had oedema; and weight gain in non-oedematous patients was more as compared to oedematous patients during initial two week which was statistically significant ($p<0.05$). In third week oedematous patients had more weight gain but that was not statistically significant ($p>0.05$). The overall weight gain of non-oedematous patients was significantly more as compare to oedematous patients ($p<0.05$). In oedematous patients as oedema subsided, they had either poor weight gain or weight loss in initial weeks and thereafter weight gain. Similar to our study, Mamidi et al reported that overall weight gain of non-oedematous patients was more as compared to oedematous patients but the difference was not statistically significant.[6] Likewise, Iqbal et al reported that mean weight gain of non-oedematous children and oedematous children was 10.6 and -1.9 gm/kg per day respectively in nutrition rehabilitation unit.[9]

In our study out of 75 patients, 7 patients had tuberculosis and 3 patients were HIV positive and weight gain of these patients was 7.41±7.73 gm/kg/day and 10.35±6.10 gm/kg/day respectively during MTC stay. This result indicates that even chronically ill and immunosupressed patients had weight gain if therapeutic nutrition is provided along with medical treatment in hospital based feeding centres. In our study, during MTC stay, out of 75 patients, 4 patients had weight loss. All four patients belonged to low socioeconomic status (III & IV) and none of them started weaning at the time of admission. Caretakers of all 4 patients were illiterate All patients had one or more morbidity in each week during hospitalisation. Out of 4 patients, 2 patients were on anti-tubercular therapy. Average stay of these patients was

19±5.88 days. Amongst these 4 patients, 3 absconded and one expired.

In our study total 75 patients were enrolled; dropout rate was 16%; mortality rate was 1.3% and 84% patients were discharged. Savadogo et al reported that dropout rate was 8.5% and mortality rate was 16% in rehabilitation centre.[7] Likewise, Gaboulaud et al reported that dropout rate was 28.1 and case fatality rate was 18.9%.[11] Ashworth et al conducted a study at two different hospitals and reported that case-fatality rates fell from 46% before implementation to 21% after implementation of protocolised care in one hospital and in another hospital; the rates fell from 25% pre implementation to 18%.[12] The recommendation that the success or failure of management of severely malnourished children should not primarily be assessed on basis of case fatality rate because mortality alone is not a good criteria for comparison between different medical institution.

In our study, the only patient who expired was 18 months male child with PEM grade IV and was on anti-tubercular therapy. This child was anaemic and had severe hypokalaemia, hypernatremia and septicaemia. Hossain et al in their study on comparison between WHO feeding protocol and locally adapted Institute of child and mother health (ICMH) protocol observed that mortality rate in both group was 6.7% (moderate) and expired children had hypoglycaemia, septicaemia, severe dehydration, heart failure and shock.[6] Ashworth et al conducted a study at two different hospital and reported that mortality in SAM patients was associated with less frequent prescribing of potassium (13% vs 77%, $p<0.0001$), antibiotics with gram-negative cover (15% vs 46%, $p=0.0003$), and vitamin A (76% vs 91%, $p=0.018$). Most deaths were attributed to sepsis.[12]

Out of 12 dropout patients, 83.3% were from rural area and caretakers in all cases were illiterate but father was literate in 50% cases. 83.3% patients belonged to socioeconomic status IV and V and 50% of these patients, there were 3 or more children in their family including index case. Fathers of 83.3% patients were labourers and 16.7% were farmer. Mean weight gain of dropout patients was 6.26±9.68 gm/kg/day and mean duration of stay of these patients was 14.25±7.65 days. Out of these 12 patients, 50% patients stayed for more than 2 weeks. The nutritional status of these children at entrance was not different from the nutritional status of the children who were discharged. Occupation of parents, illiteracy of caretaker, lower socioeconomic status and large family size were the main contributing factors for absconding these children. Consequently, treatment acceptability to the mother or other caretakers also has to be considered as a major factor. To improve the outcome in such centre, the most important aim is to reduce the rate of children who absconded. This can be done by educating the mothers about nutritional requirement for their children and let the mothers to know that all the problems of her children are due to faulty dietic habits that lead to malnutrition and make the child vulnerable for different diseases and infections. Benefits of therapeutic nutrition must be clear to caretakers that well balanced diet in hospital and at home is the key to good health of their children. We have to keep in mind the fact that keeping the mother and child longer in the MTC increases the risk of increasing absconding rate. The reduction of the duration of stay should also be balanced with possibility of preparing the mother to manage the recovery phase at home. At this point, it is very important to organize active follow up of these children in existing MCH services.

Out of 75 patients, 29 patients came for follow up. Among them, 15 (51.7%) patients had weight gain < 5 gm/kg/day, 9 (31%) between 5-10 gm/kg/day and 2 (6.89%) patients above 10 gm/kg/day. Mean weight gain of these patients was 4.60±3.28 gm/kg/day. Out of 29 patients, 22 were male and 7 were female and mean weight gain in male and female was 5.19±3.38 and 2.78±2.30 gm/kg/day respectively. Patel et al carried out a study to evaluate the feasibility and outcome of home based rehabilitation of severely malnourished children.[8] During hospital stay (n=19), children had weight gain of 9.0 ±5.3 gm/kg/day, while during home based follow up (n=29), weight gain was 3.2 ±1.5 gm/kg/day only. During home based rehabilitation, only 3 (11.5%) children had weight gain of more than 5 g/kg/d by the end of 16 weeks. Home based management using home prepared food is associated with sub-optimal and slower recovery. Likewise, the weight gains of patients at home after discharge from hospital also had poor weight gain. Poor weight gain at home is due to the fact that parents of most children are labourer and they cannot spend much time with children. Lower socioeconomic status, illiteracy and poor nutritional education are also responsible. Poor weight gain on follow up in our study also suggests that literacy status and socioeconomic status of community have to be improved. All these factors which were responsible to cause malnutrition at home again became operative. This indicates need of more intensive nutritional and health education to the caretakers during stay in MTC so that they can implement the feeding practices more efficiently and regularly after going home. Family members should understand the measure to combat the nutritional deficiency. We have tried our level best to make the parents aware that food deficiency is the most important factor in causation of malnutrition and hence proper diet given to the child will be the sole factor for their further recovery at home. However, due to the aforementioned factors, the parents could not provide the nutrition to their children as they were doing in hospital. The success of home-based treatment of severe malnutrition would require the provision of a nutrient-dense supplement which can be safely stored and administered without much preparation by the caregiver. Commercially available nutrient dense foods are expensive, and locally produced nutritious mixes have not been compared to the present standard of care for home based treatment. We conclude that home-based

management (directly or following discharge from hospital) using home prepared food is associated with sub-optimal and slow recovery. There should be effective monitoring system and mechanism for providing energy dense foods to strengthen the community based management of severely malnourished children. Effectiveness of community-based rehabilitation requires careful planning and additional resources, including nutrition educators.

The effectiveness of cheaper locally designed ready to use foods is encouraging, and should stimulate the scientific community to design appropriate food(s) which are culturally acceptable in various parts of our large country, as well as these food should be cost-effective. Most important is the need to communicate to the policy planners the urgency to address the problem of severe acute malnutrition.

CONCLUSION

In the current Indian population of 1100 million, there would be about 132 million under five children (~12% of population), of which 6.4% or roughly 8 million can be assumed to be suffering from SAM. Considering the serious biological consequences, particularly the extremely high risk of mortality, it is unethical to delay institution of urgent measures for prevention and treatment of SAM. The millennium development goal targets of under-five mortality also cannot be achieved without according a high priority to treatment of SAM children. Finally, optimally treated survivors of SAM recover without any residual Sequale and can achieve their full genetic potential; thus the likely returns on this intervention are immense. Despite the fact that severe malnutrition is often a co-morbidity in large proportion of avoidable child mortality, it does not get the attention what it deserves. It should be emphasized that the treatment of SAM is cost effective – in fact, even hospital based management of SAM is more cost effective in reducing less than five mortality.

Finally it can be concluded that mangament of patients with severe acute malnutrition is very much promisisng and mortality and morbidity of these patients can be reduced significantly if managed properly by nutritional and medical means in hospital especially in therapeutic feeding centre i.e. malnutrition treatment corner. Hospital based management of these children in specialised feeding centre is very important for regaining lost weight and recovery from active diseases.

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