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Original Research Article

A study of weight gain pattern and associated factors in the children with severe acute malnutrition in a hospital based nutritional rehabilitation ward

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Abstract

Introduction: Severe acute malnutrition is widely prevalent problem in developing countries and a major cause of morbidity and mortality in India. Nutritional rehabilitation of such patients is very important aspects of management and often inadequate. This study was planned to understand catch up growth in severe acute malnourished patients admitted to rehabilitation ward for providing nutrition.

Objectives: (1) To study the weight gain pattern of the patients with severe acute malnutrition admitted to hospital based nutritional rehabilitation centre. (2) To study the factors associated with good or poor weight gain in the patients with severe acute malnutrition admitted to nutrition rehabilitation centre.

Materials and methods: In this case record based retrospective study; records of severe acute malnourished patients admitted to nutritional rehabilitation ward during the period of February 2012 to December 2012 were included.

Results: A total of 98 patients were admitted during this period for nutrition rehabilitation. Mean baseline weight/ height z score (WHZ), weight/age z score (WAZ) and height/age z score (HAZ) was -1.67 (2.48), -4.19 (0.98) and -4.90 (2.50) respectively. 76 patients who stayed for more than 7 completed days were analysed for comparative statistics. Mean WHZ score of this 76 patients was -1.70 (2.25). Mean weight gain of these patients was 5.56 gm/kg/day. Patients age (p=0.03, OR=1.12, 95% CI: 1.040-1.211), educated mother (p=0.048, OR=1.29, 95% CI: 1.320-2.478) and recommended dietary intake of at least 80% (p=0.001, OR=7.94, 95%CI: 2.247-28.79) were the only statistically significant factors associated with good weight gain.

Conclusion: Our study highlighted the important role of nutritional rehabilitation of the severe acute malnourished children in hospital for early catch-up of the growth.

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Key words

Severe acute malnutrition, Nutrition, Nutritional Rehabilitation centre, Catch up growth.

Introduction

Severe acute malnutrition (SAM) is a major cause of mortality and morbidity in children less than 5 years of age in developing countries like India [1, 2]. World health organisation (WHO) has proposed guidelines for management of children with severe malnutrition which divides the management into 3 phases. (1) Initial stabilization (day 1 to day 7), (2) Rehabilitation (week 2 to week 6), and (3) Follow up (week 7 to week 26) [1, 2]. This includes both medical as well as nutritional management. However, in the context of busy practice, most of the pediatricians prefer to stabilize the patients with medical management in hospital and then to continue nutritional management at home after early discharge from hospital. This often results in inadequate and improper nutritional management of the child. The concept of nutritional rehabilitation centre, where patients are admitted in the hospital aimed at providing diet, has taken place to overcome above mentioned limitation. Nutrition rehabilitation of these children with generous amounts of energy and protein along with other nutrients is associated with rapid weight gain. These also facilitate education of mothers as well as monitoring of the children for any complications and catch up growth.

So, this study was planned to understand catch up growth pattern, nutritional and social factors associated with severely malnourished children. Our aim was to study clinical profile and weight gain pattern of severely malnourished children admitted to nutrition ward.

Material and methods

This retrospective study was planned in a tertiary care teaching hospital from February 2012 to December 2012. Study subjects were patients having severe acute malnutrition and admitted to a special ward of nutrition at department of Pediatrics. All patients, identified to have severe under nutrition, were initially managed in medical wards of department of Pediatrics based on WHO guidelines for management of severely malnourished children [1, 2].

After initial stabilization phase was over and nutritional rehabilitation phase was started, all patients were shifted to special ward which designated as child development and nutrition centre (CDNC). CDNC was a specially designed ward for nutritional supplementation for malnourished children where residential facilities were available for mother/care taker and child for staying up to 10 days. A qualified nutritionist was available throughout the day under whose supervision and guidance food was prepared and given to patient and mother. Food items, thus prepared, were according to local customs and contained calories and protein as per the WHO management guidelines for individual patients. Mothers/care takers were educated about child care and other important aspect of diet and nutritional practices for child growth. Definition of severe acute malnutrition included (1) Patient with severe visible wasting with or without edema, (2) WHO Z score for weight/height = < -3, (3) Mid upper arm circumference of less than 11.5 cm in 1-5 years [1, 2].

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Patients admitted to nutrition ward were examined every 12 hourly by Pediatrician and appropriate measures were taken for medical management whenever required. These patients were daily weighed, and their diet and daily intake analysed and recorded. Height and Length were measured on admission and daily then after. Immunisation gaps were met while patients were admitted, and parents were prepared for further home management of the child and advised for further follow up before they got discharged. Routine massive vitamin A administration was done as per the WHO guidelines [1, 2]. Children were also supplemented with multivitamins and minerals including zinc and calcium [1, 2]. Informed consent was obtained from parents for their children for staying at this ward.

All information related to patient was noted including patient's clinical status, basic information regarding patient and parents, socio economic status, education of mother, occupation of father and mother, and family income. Mother received an amount of Rs. 100 per day against daily wage loss as per state government policy. Medical treatment including investigations were provided free of cost as per the government hospital policies. All financial expenditure, other than medication, such as salary of the dietician, cook, workers, ration, vegetables, milk, were provided by grant given by state government. Patients who did not stay more than 3 days were excluded from final analysis of data.

Present study was done by retrospective analysis of data collected from the case records and registers maintained at CDNC. This study was carried out after obtaining approval of Institutional Ethical Review Committee. All the information was recorded using Microsoft Excel sheet and analysed using SPSS version 16.0 and Epiinfo 7.

Results

Total 98 patients were admitted to CDNC ward during study period. Their baseline characteristics were as per **Table - 1.** Anthropometry profile of these patients, including mean weight for height Z (WHZ) score, weight for age (WAZ) score, height for age (HAZ) score and body mass index (BMI) z score, was as per **Table - 2.** History related to breastfeeding and other feeding practices was as per **Table - 3.** Twenty two patients dropped out within 3 days of admission. Remaining 76 patients, who stayed more than three days, were analysed for comparative statistics. Only 69 patients (70.40%) stayed for recommended duration of 10 days. Mean weight gain of this 76 patients was 5.56 gm/kg/day with a standard deviation (SD) of 5.95. Thirty one (40.79%) patients had weight gain of more than 5 gm/kg/day and considered to have moderate to good weight gain, while 45 (59.21%) patients had weight gain of less or equal to 5 gm/kg/day and considered to have poor weight gain [1, 2, 3]. Patients age (p=0.03, OR=1.12, 95% CI: 1.040-1.211), educated mother (p=0.048, OR=1.29, 95% CI: 1.320-2.478) and recommended dietary intake of at least 80% (p=0.001, OR=7.94, 95%CI: 2.247-28.79) were the only statistically significant factors associated with good weight gain. Other factors such as sex, per capita income, duration of stay, maternal age, continued breast feeding up to 2 years, exclusive breast feeding up to 6 months, and age of initiation of complementary feeding were not found to be statistically significant with pattern of weight gain as per **Table - 4.**

Discussion

In present study, sample size was 98 over a period of 11 months while in study of Radhakrishnan, et al., 45 boys and 35 girls in the study sample of 80 [4]. Sample sizes of the

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studies done by Shah, et al. [5], Taneja, et al. [6], and Mamidi, et al. [7] were comparable with our study with the number of patients 60, 100 and 309 respectively.

Present study had high drop out of patients (22%) within three days, 29% in 7 days and only 70% patient completed desired stay of 10 days. In a study by Savadago, et al., out of 1322 children, dropout rate was 8.5% [8].

Mean weight gain was 5.5 gm/kg/day in our study which was comparable with that of in a study of Radhakrishnan, et al., in which mean weight gain was about 6.1 gm/kg/day [4]. In the study by Mamidi, et al., the mean rate of weight gain calculated for the total duration of the hospital stay for the entire sample was 5 gm/kg/day [7]. The mean weight gain in studies by Gaboulaud, et al. [9] , Ashraf, et al. [10] and Khanum, et al. [11] were 9.7, 6, and 4 gm/kg/day respectively. A study by Patel, et al., which compared weight gain pattern in a hospital versus home set up, showed that average weight gain during hospital stay was 9.0 gm/kg/day and that of in home-based rehabilitation was 3.2 gm/kg/day [12]. Savadago, et al. in their study reported mean weight gain of 10.18 gm/kg/day [8]. Findings reported by studies in Bangladesh comparing inpatient, day care and home-based treatment for severe malnourished children observed an average weight gain of 11 gm/kg/day for the inpatient group [13, 14].

In our study, 41% patient had moderate to good weight gain while 59% patient had poor weight gain. In the study of Radhakrishanan, et al., 8% of the children did not gain weight, 44% of the children had poor catch up growth (<5 gm/kg/day), 35% of the children had moderate catch up growth (5-10 gm/kg/day) and 12% had rapid catch-up growth (>10 gm/kd/day) [4]. In the study of Patel, et al., during home based rehabilitation, only 3 (11.5%) children achieved weight gain of more than 5 gm/kg/day, while 26 (89.5%) children had weight gain of less than 5 gm/kg/day [12].

A recovery rate of 53.76% (children with average weight gain of more than 8 gm/kg/day) was observed among the study group in the studies done in Bangladesh [13, 14]. Recovery rate of 52.7% using the above international standards was obtained by Gaboulaud, et al. in a study comparing therapeutic feeding centres (TFC) care, TFC plus home-based care, and only home-based care among 660 children in the TFC group [9].

In our study, the patients were kept for nutritional rehabilitation with a limit of 10 days. This might be the most important reason for failure to gain weight. Most of the guidelines and above mentioned studies suggested a 2-8 weeks nutritional rehabilitation for catch up growth. On the other hand a short duration of stay decreases costs and also minimizes the absence of mothers from their homes which has important implications at the society level. However, we didn't have any follow up details of these patients, so we couldn't actually comment upon weight gain pattern after discharge of the patients. There was a positive correlation of weight gain in terms of gm/kg/day versus duration of stay in all above mentioned study.

Child's age, maternal education, and recommended dietary intake per day is associated with good weight gain. Capacity to adjust to recommended food in older child may be a reason for good weight gain in older children. Maternal education by virtue of mother's involvement in care taking is associated with good weight gain. Recommended dietary intake is associated with good weight gain for obvious reasons. Factors

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such as sex, family income, have no correlation with acute weight gain in SAM patients.

One major limitation of our study was that it was a retrospective case record based study so we could not actually verify the reasons for good or poor weight gain. Events such as primary or secondary failure could not be identified and reasons could not be identified for variations in weight gain.

Conclusion

Our study highlighted the important role of nutritional rehabilitation of the severe acute malnourished children in hospital for early catch-up of the growth. It also emphasised on the role of maternal education on success of nutritional rehabilitation of the child. However, short term stays are not able to provide desired effects and longer duration of nutritional rehabilitation in hospital is recommended.

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Table - 1: Baseline characteristics of patients.

		N=98
Age in months: Mean (SD)		23.5 (12.7)
Weight (kg)on day 1, Mean (SD)		7.02 (1.88)
Sex:	M	50 (51.48%)
	F	48 (48.98%)
Per capita Income Rs.: Mean (SD)		1277 (790)
Father occupation	Labourer	82 (83.67%)
	Farmer	10 (10.20%)
	Others	6 (6.12%)
Mother Education	Illiterate	50 (51.02%)
	Primary	41 (41.84%)
	Secondary	6 (6.12%)
	Higher Secondary and above	1 (1.02%)
Edema		7 (7.14%)
Mean duration of stay		7.77 (3.47)
Drop out before 7 days	No	69 (70.40%)
	Yes	29 (29.60%)
Weight gain (gm/kg/day), (N=76): Mean(SD)		5.56 (5.95)
Weight gain (n=76)	Good (>5gm/kg/day)	31 (40.79%)
	Poor (≤5gm/kg/day)	45 (59.21%)

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Table - 2: Anthropometric profile of patients admitted to CDNC (n=98).

Anthropometric Indices	Mean (SD)
Weight/height z score	-1.67 (2.48)
Weight/age z score	-4.19 (0.98)
Weight/age percentages	58.63 (9.14)%
Height/age z score	-4.90 (2.15)
Height/age percentages	81.18 (15.56)%
BMI Z score	-1.68 (2.32)
Weight/height z score at discharge (n=76)	-1.20 (2.25)

Table - 3: Feeding practices in patients admitted in nutritional rehabilitation ward.

Feeding practices	N=98 (%)
Exclusive breast feeding up to 6 months	4 (4.12%)
Colostrum given	41 (41.84%)
Complementary feeding started at 6 months	36 (36.73%)
Duration of breast feeding (Months) {Mean (SD)}	15.7 (7.5)
Breast feeding Initiated within 1 hour	32 (32.65%)
Pre-lacteal feeds	39 (39.80%)

Table - 4: Factors associated with good /poor weight gain (n=76) (Multinomial Regression using SPSS version 16.0)

Factor	p-value	OR	95% CI
Age	0.030	1.12	1.040-1.211
Sex	0.438	1.62	0.480-5.457
Duration of stay	0.413	0.85	0.581-1.250
Recommended calorie intake per day	0.001	7.94	2.247-28.79
Per capita Income	0.760	1	0.999-1.001
Mother's Age	0.481	1.06	0.899-1.252
Literate Mother	0.05	1.29	1.320-2.478
Duration of breast feeding (months)	0.283	0.94	0.844-1.051

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