

Severe Acute Malnutrition with Anemia and Vitamin Deficiency in Hospitalized Children: Two Centres Cross Sectional Study

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Abstract

Context: Severe acute malnutrition (SAM) is a major cause of morbidity and mortality in children under 5 years of age, especially in developing countries. Co-morbid conditions such as infections, micronutrient deficiencies and parasitic infestation are mainly responsible for this high mortality in SAM. *Aims:* To describe anemia and vitamin deficiency in children admitted with SAM at two tertiary level hospitals. *Settings and Design:* Observational cross sectional study, conducted at two centers. One centre is the Department of Pediatrics, Institute of Medical Sciences, Banaras Hindu University, and Varanasi and another is Department of Pediatrics, Shyam Shah Medical College Rewa MP. *Methods and Material:* Children between 6-60 months fulfilling the WHO criteria of SAM were enrolled. Cases were divided into edematous and non edematous groups. We collected data on demography, anthropometry, history and clinical examination including sign of vitamin deficiency. Investigations included CBC, general blood picture, serum electrolytes and calcium, serum albumin, blood sugar. Children were managed as per WHO SAM protocol. *Statistical analysis used:* The SPSS version 18 was used for data analysis. A p value <0.05 was considered significant. *Results:* Hundred four patients from MP group and 109 patients from UP group were finally enrolled in the study in which 98 (94.2%) patient out of 104 from MP and 77 (60%) patients out of 109 from UP less than 36 months. In this study male are more affected than female in UP group, male to female ratio is 1.79:1 as (64.2% verse 35.7%). In MP group SAM is more prevalent in lower middle class 51% as compared to upper lower class 31.7%. However in UP groups under nutrition is more common in upper lower 34.8% than lower middle 28.4%. We found out that, Vitamin B deficiency was most common (45.87%) followed by Vitamin A (16.5%) and most common deficiency sign were cheliosis, angular stomatitis and conjunctival xerosis in UP group while in MP group also most common Vitamin B deficiency (18.2%) followed Vitamin A deficiency (8.6%). *Conclusions:* Anemia and dermatitis are significantly coexist with edematous SAM children at both centers and vitamin deficiencies was frequently seen in edematous SAM children in UP.

Keywords: Severe Acute Malnutrition; Anemia; Vitamin Deficiency.

Introduction

Severe acute malnutrition is a major cause of morbidity and mortality in children under 5 years of age, especially in developing countries. It often has an intercurrent illness, and these co morbidities may have direct effects on cardiovascular physiology and carry a high risk of mortality in themselves It is supposed to be responsible for more than one million child death yearly worldwide [1]. Co-morbid conditions such as infections, micronutrient deficiencies and parasitic infestation

are mainly responsible for this high mortality in SAM [2]. It results in the various path physiological changes in the body systems including significant changes in haematological parameters. Low red cell counts resulting in anemia has always been a constant feature of protein energy malnutrition and may be normochromic normocytic, microcytic hypochromic or macrocytic [3,4]. White cell changes demonstrate the synergistic relationship which SAM has with infections and thymic atrophy [5]. So, we are comparing the prevalence of anemia and multivitamin deficiency at two centre child admitted with SAM.

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Materials and Methods

This is an observational cross sectional study, conducted at two centers. One from September 2016 to May 2018 in the Department of Pediatrics, Institute of Medical Sciences, Banaras Hindu University, and Varanasi and another at Department of Pediatrics, Shyam Shah Medical college Rewa MP. Inclusion criteria were children fulfilling the WHO criteria of SAM. Cases were divided into edematous and non edematous groups. We collected data on demography, anthropometry, history and clinical examination including sign of vitamin deficiency. Investigations included CBC, general blood picture, serum electrolytes and calcium, serum albumin, blood sugar. Children were managed as per WHO SAM protocol. The SPSS version 18 was used for data analysis. A p value <0.05 was considered significant.

Results

Demographical data as shown in table 1 there were 109 children with SAM from UP and 104 from MP. Out of these, 28 (26.9%) children had edema in MP group which is almost one third in comparison to non edematous group although there is equal incidence of edema (50%) in case of UP group children.

There is no any significant difference was found in age group, gender in both the centers although little higher incidence was found in lower middle class than upper lower class in both the groups but data was comparable socioeconomic status incidence.

Table 2 depicts there is high incidence of severe anemia (Hb<7g/dl) was found in UP (p=0.01). In MP out of 28 edematous children 42.8% had anemia and 30.2% in case of non edematous group. In UP out of 55 edematous children 52.7% had anemia in comparison to nonedematous children 31.4%. In both the group edematous children had more anaemia. It was also found that anemia is more common in non edematous children in MP and more in edematous children in UP.

Table 3 show there is 61 (55.9%) children had skin changes in UP out of 109 in comparison to UP 24% (25 children out of 104) that is significant difference in skin changes (p=<0.001) in both the group.

In multivitamin deficiency, both B complex and vitamin A is more deficient in UP group in edematous and nonedematous patient although data is comparable except that there is higher zinc deficiency was found in MP group in both edematous and nonedematous patients.

Table 1: General characteristics of study population

Variable	Shyam Shah Medical College, MP (n=104)				IMS BHU, UP (n=109)		p value
	Edematous (n=28)	Non Edematous (n=76)		Edematous (n=55)	Non Edematous (n=54)		
Age groups (months)	6-12	14	48	P=0.325	12	19	p=0.07
	13-36	13	23		29	17	
	37-60	1	4		14	18	
Gender	Male	10	36	P=0.20	36	34	p=0.94
	Female	18	40		19	20	
Socioeconomic status	Upper lower (IV)	16	17	P=0.59	15	23	p=0.06
	Lower middle (v)	29	22		5	26	

Table 2: Comparative analysis of anemia in study populations

Haemoglobin (Hb) (g/dl)	MP (n=104)		UP (n=109)		p value
	Edematous (n=28)	Non Edematous (n=76)	Edematous (n=55)	Non Edematous (n=54)	
<or= 7	12	23	29	17	0.01
7.1 to 11	15	51	20	13	0.005
>11	1	3	6	14	1

Table 3: Comparative analysis of vitamins and Skin changes in study populations

Clinical signs	MP (n=104)		UP (n=109)		P value
	Edematous (n=28)	Non Edematous (n=76)	Edematous (n=55)	Non Edematous (n=54)	
B complex	6	13	28	22	0.06
Vitamin A	4	5	11	7	0.447
Zinc	5	11	3	7	1
Skin changes	8	17	49	12	<0.001

Discussion

Hundred four patients from MP group and 109 patients from UP group were finally enrolled in the study in which 98 (94.2%) patient out of 104 from MP and 77 (60%) patients out of 109 from UP less than 36 months. Sharma [6] in their study also reported that prevalence of malnutrition is significantly high in children less than 24 months of age. Similarly, Mamidi et al. [7] in their study on hospital based treatment of severe malnutrition reported that 71.1% of children were below 24 months of age. It is mainly due to rapid growth pattern and increased requirement of substrates for energy and building of tissue in initial 2-3 year age, thus deficiency of protein, energy and other micronutrients in these year results in malnutrition.

In this study male are more affected than female in UP group, male to female ratio is 1.79:1 as (64.2% verse 35.7%). Similar to this, Ashraf et al. [8] reported that malnutrition is relatively more common in males as compared to that of females (53.7% v/s 46.3%) and also Aneja et al. [9] found similar finding in their study on malnutrition observed that 55.5% of children were males as compared to females (44.5%). However in MP group we found female were more than male (55.7% v/s 44.2%) with a ratio of 1.26:1. Almost similar finding to Joshi et al. [10] observed that incidence of malnutrition was higher in females (78%) as compared to that in males (22%). Singh et al. [11] and Rao et al. [12] reported that extent of malnutrition was significantly higher in girls than boys.

In MP group SAM is more prevalent in lower middle class 51% as compared to upper lower class 31.7% as similar to Ashraf et al. [12] in their studies reported that majority of malnourished children belonged to lower socioeconomic status (IV and V) i.e. 72.8% and 90% respectively. However in UP groups under nutrition is more common in upper lower 34.8% than lower middle 28.4%. This is similar to Wagstaff and Watanabe [13] found inverse relation between underweight and socioeconomic inequality

In present study anemia was found in 97.1% in MP group and 72.4% in case of UP group which is higher than 51% from Columbia as reported by Bernal C et al. 2008 [14]. It was further observed that children with SAM was having 29.1% severe anemia UP group and 23.1% MP group in present study which is contrary to the study from Delhi as reported by Thakur et al. [15]. This can be contributed to nutritional deficiency as majority of the patients had dietary deficiency.

We found out that, Vitamin B deficiency was most common (45.87%) followed by Vitamin A (16.5%) and most common deficiency sign were cheliosis, angular stomatitis and conjunctival xerosis in UP group while in MP group also most common Vitamin B deficiency (18.2%) followed Vitamin A deficiency (8.6%). Soni et al. [16] compared different vitamin deficiency between malnourished and normally nourished children and observed prevalence of vitamin A deficiency in (15.7% v/s 1.8%), vitamin B in (7.6% v/s 0.4%), vitamin D in (11.9% v/s 2%) and vitamin C in (1.1% v/s 0%) children. The different vitamins deficiency seen in SAM patients is because of lack of adequate nutritious food intake and the food which is taken have very low amount of vitamins and minerals making them deficient in the required vitamins. Incidence of zinc deficiency is more in MP (15.3%) than in UP (9.1%). Limitation of present study is we could not estimate the serum level of vitamins and zinc.

Conclusion

Anemia and dermatitis are significantly coexist with edematous SAM children at both centers and vitamin deficiencies was frequently seen in edematous SAM children in UP.

Key Messages

Edematous SAM children have more vulnerable for vitamins deficiencies and skin manifestations. Hence we recommend skin, mucosa and eye care has integral part of management of SAM.

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Conflict of Interest: Nil

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