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Ashok E
Post Graduate, Department of
Pediatrics, Rajah Muthiah
Medical College,
Chidambaram, Tamil Nadu,
India

Dr. S Ramesh
Professor, Department of
Pediatrics, Rajah Muthiah
Medical College,
Chidambaram, Tamil Nadu,
India

Dr. R Surya Prakash
Assistant Professor,
Department of Pediatrics,
Rajah Muthiah Medical
College, Chidambaram, Tamil
Nadu, India

Corresponding Author:
Dr. R Surya Prakash
Assistant Professor,
Department of Pediatrics,
Rajah Muthiah Medical
College, Chidambaram, Tamil
Nadu, India

Biochemical profile of children with severe acute malnutrition

Ashok E, Dr. S Ramesh and Dr. R Surya Prakash

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Abstract

Background: Malnutrition in children is widely prevalent in developing countries including India. More than 33% of the deaths in 0-5 years are associated with malnutrition. Children with severe acute malnutrition (SAM) are in danger of death from hypoglycemia, hypothermia, fluid overload, electrolyte imbalances. Hence, biochemical profile in these children is important for management.

Objectives: The aim of this study is to describe the biochemical profile of children with severe acute malnutrition.

Methods: This hospital based observational study was conducted on children with Severe Acute Malnutrition. Children were tested for biochemical parameters like complete blood counts with peripheral smear, C-Reactive protein, Blood glucose, renal function tests, serum electrolytes, calcium.

Results: Among the study participants, 35 (46.7%) were anemic. CRP was Positive in 37, (49.3%) of the study population, Peripheral Smear showing Microcytic picture was present in 33, (44.0%) of the study population. Hypocalcaemia was present in 15, (20.0%), Hypokalaemia in 21, (28.0%) and Hyponatremia in 3, (4.0%). Elevated Urea was present in 34, (44.0%) and Elevated Creatinine in 30, (40.0%). Random Blood Sugar showed Hypoglycemia among 19, (25.3%).

Conclusion: The observations in this study confirm a significant association between severe acute malnutrition and abnormalities in biochemical parameters. Many of these children had abnormal biochemical parameters like anemia, hypocalcemia, hypokalemia, hyponatremia, hypoglycaemia.

Keywords: Severe acute malnutrition, hypoglycemia, hypocalcemia, hyponatremia, hypokalemia

Introduction

Malnutrition is a general term and it most often refers to undernutrition resulting from inadequate consumption, poor absorption or excessive loss of nutrients.

Malnutrition in children is widely prevalent in developing countries including India. More than 33% of deaths in 0-5 years are associated with malnutrition ^[1, 2]. Severe acute malnutrition (SAM) is defined by very low weight for height/length (z score below $-3SD$ of the median WHO child growth standards), or a mid-upper arm circumference <115 mm, or by the presence of nutritional edema.

Lack of exclusive breastfeeding, late introduction of complementary feeds, feeding diluted feeds containing less amount of nutrients, repeated enteric and repeated respiratory tract infections, ignorance, and poverty are some of the factors responsible for SAM ^[1].

Children with SAM are in danger of death from hypoglycemia, hypothermia, fluid overload, electrolyte mismanagement, and undetected infections. They cannot be treated like other children. Their feeds, fluids, and micronutrients must be carefully controlled to avoid complications during management ^[2]. Hence, biochemical parameters in these children are important for management. They guide us to prevent mishappenings in the management of SAM children ^[3, 4]. Our study tried to find out variations in the biochemical parameters in these children.

Methodology

This hospital based observational study was conducted after obtaining approval from the Institutional Ethics Committee. Study was conducted on children aged 6 to 60 months fulfilling the WHO criteria for Severe Acute Malnutrition, admitted in the Department of Paediatrics, Rajah Muthiah Medical College Hospital during 2019-2020. Children were tested for biochemical parameters like complete blood picture with peripheral smear, Blood glucose, renal function tests, serum electrolytes, calcium and C-reactive protein.

Results

Among the study participants, 35 children (46.7%) were anemic. C-Reactive Protein was Positive in 37, (49.3%) of the study population, Peripheral Smear showing Microcytic anaemia was present in 33, (44.0%) of the study population. Hypocalcemia was present in 15, (20.0%), Hypokalemia in 21, (28.0%) and Hyponatremia in 3, (4.0%). Elevated Urea was present in 34, (44.0%) and Elevated Creatinine in 30, (40.0%). Random Blood Sugar showed Hypoglycaemia among 19, (25.3%). The biochemical profile results of the study population is represented in the following table.

Table 1.

		Frequency	Percentage
Haemoglobin	Anemia	35	46.7
	Normal	40	53.3
C-Reactive Protein	Positive	37	49.3
	Negative	38	50.7
Peripheral Smear	Microcytic	33	44.0
	Normocytic	42	56.0
S.Calcium	Hypocalcemia	15	20.0
	Normal	60	80.0
Electrolyte Abnormalities	Hypokalemia	21	28.0
	Hyponatremia	3	4.0
	Normal	51	68.0
Urea	Elevated	34	44.0
	Normal	41	56.0
Creatinine	Elevated	30	40.0
	Normal	45	60.0
Random Blood Glucose	Hypoglycemia	19	25.3
	Normal	56	74.7

Discussion

Nutrition is essential for human development and the focal point of health and well-being. Nutrition during the first five years has an impact not only on growth and morbidity during childhood, but also acts as a determinant of nutritional status in adolescent and adult life.

SAM is a preventable and treatable cause of childhood mortality and morbidity.

In our study, the mean age of admitted patients was 2.23 ± 1.426 years. Majority of children (49(65.4%)) were within 24 months of age. Similarly, in the studies by Choudhary [5] & Mamidi [6], majority of patients (96% and 71% respectively) were below 24 months. In the first 2 years of life, rapid growth occurs and requirement of substrates for energy and building of tissues also increases, thus deficiency of energy, proteins and micronutrients often result in malnutrition.

In our study, 25.3% cases had hypoglycemia, and 28% cases had hypokalemia while hypocalcemia was seen in 20% cases, and hyponatremia in 4% cases. Tariq et al., in a similar study found hypoglycemia in 6.8%, hypokalemia in 9.5%, hypocalcemia in 10.12%, which was comparable to the findings of our study [7]. We had more cases of hypoglycemia as cases received to our hospital were very sick and referred late, and more cases of hypocalcemia due to early weaning and faulty feeding. RBG less than 54 mg/dl was taken as hypoglycemia as per WHO SAM protocol. Serum sodium less than 135mEq/l was taken as hyponatraemia. Serum potassium less than 3.5 mEq/l was taken as hypokalaemia.

In this study, 44% of the children had microcytic hypochromic blood picture and 56% normocytic blood picture. Thakur et al., in their study, found 27.7% cases with

normocytic blood picture and 38.6% with microcytic hypochromic blood picture which is comparable to our study [8]. We had more cases of microcytic hypochromic anemia which may be due to the fact that patients admitted to our hospital were from very low social economic classes and illiterate and they lack knowledge about feeding practices. A Hb level of less than 11 g/dl was the cut off value for anemia in children aged 6–60 months.

In our study, 44% cases showed elevated blood urea levels and 40% cases showed deranged creatinine levels. This is comparable to the study by Ali et al., in which 31.5% cases showed Uremia and 37% cases showed deranged creatinine levels [9, 10].

Conclusion

The observations in this study confirm a significant association between severe acute malnutrition and abnormalities in biochemical parameters. Many of these children had anemia, hypocalcemia, hypokalemia, hyponatremia, hypoglycaemia. So monitoring biochemical parameters is important in SAM children for proper correction of micronutrients and management.

Limitations

The study was done in a single hospital with a small sample size.

The study did not include micronutrient deficiencies.

The study was conducted as a Hospital based study in a tertiary care setting affiliated with the teaching hospital. The results are expected to be better in our study results compared to the real settings.

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Conflict of interest: None

Ethical approval: The study was approved by the Institutional Ethics Committee

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