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Original Research Article

A Hospital-Based Study Assessing the Range of Co-Morbidities Observed in Pediatric Patients with Severe Acute Malnutrition with Unexpected Dyselectrolytemia with Diarrhea

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Abstract

Aim: The aim of the study was to evaluate the spectrum of co-morbidities in severe acute malnutrition with unexpected dyselectrolytemia in diarrhea.

Methods: The observational study was carried out in the Department of Pediatrics for the period of 12 months. Total 100 Children upto 5 years aged, admitted in Nutritional Rehabilitation Centre of Department of Paediatrics, were include in this study. Various co morbid conditions in study population were identified. All the laboratory examination was done with standard method.

Results: Majority of children with SAM were having co-morbidity in the form of Anaemia (88%), Diarrhoea (65%) followed by pneumonia (30%), Rickets (26%), Tuberculosis (15%), Otitis media (15%), UTI (10%), Celiac (7%), Hypothyroidism (5%), & HIV (3%). 65 (65%) SAM children presented with diarrhea out of which Hyponatremia was in 43 cases & Hypernatremia was in 2 cases. No statistically significant difference was found with hyponatremia in diarrheal or non-diarrheal cases of SAM (P value of 0.07). Potassium levels of children with diarrheal & non diarrheal children with SAM. Serum Potassium levels of 100 SAM children were analysed. It was found that 25% SAM children were having hypokalemia. Hypokalemia was found in 15 diarrheal cases & 10 in non- diarrheal cases. A statistically significant difference was found with hypokalemia in SAM (P value of 0.025) between Diarrheal & Non diarrheal cases.

Conclusion: We concluded that dyselectrolytemia is high in complicated SAM and mainly sodium disturbances in form of hyponatremia are common in different co-morbid conditions. Hence, we recommend that due care is to be given for management of dyselectrolytemia in complicated SAM children.

Keywords: Co-morbidities, Dyselectrolytemia, Potassium, Severe acute malnutrition, Sodium

Introduction

As per National Family Health Survey (NFHS)-4, the prevalence of severe acute malnutrition (SAM) has increased from 6.45 to 7.5% in children under 5 years of age in India. [1] Malnutrition is believed to contribute 61% of diarrheal deaths and 53% of pneumonia deaths in India. [2] Electrolyte imbalance is one of the prognostic factors in severe malnutrition.3 In malnourished children, excess body sodium and chloride exists (although plasma sodium and chloride may be low) and deficiency of potassium and magnesium exists which require supplementation over weeks. [3,4] Children with SAM are categorized into "complicated and uncomplicated cases" based on clinical criteria. SAM children with complications require inpatient management and those without complications can be treated on a community basis. World Health Organization (WHO) states this as a strong recommendation with low-quality evidence. [5]

As per the WHO, serum electrolytes are measured and supplemented (potassium and magnesium) only in SAM children with complications. SAM children without complications are managed in community with Ready to Use Therapeutic Food (RUTF) which is enriched with minerals and micronutrients. [6] In our country, as RUTF is not available, children are advised home-based energy dense food along with micronutrient supplements. Hence, their diet may still be deficient in minerals. Diarrhea and pneumonia accounts for approximately half the under-five deaths in India and malnutrition is believed to contribute to 61% of diarrheal deaths and 53% pneumonia deaths.

3Malnutrition increases the risk and worsens the severity of infections. [7] SAM children are more prone to severe infections that culminates into different co-morbid conditions and consequentially leads to electrolyte derangement due to reductive adaptation Na+, K+, ATPase systems of the body begin to 'shut down'. [8]

Malnourished hospitalized children have a higher rate of complications, increased mortality, longer length of hospital stay and increased hospital costs. Lack of infrastructure for growth monitoring and regular institutional assessments are responsible for the persistence and delayed detection of malnutrition in these children. A better nutritional status is associated with better survival and better outcomes. After clinical improvement, aggressive nutritional management is the mainstay in the care of these children and is a more promising strategy to improve outcome.

The aim of the study was to evaluate the spectrum of co-morbidities in severe acute malnutrition with unexpected dyselectrolytemia in diarrhea.

Materials and Methods

The observational study was carried out in the Department of Pediatrics, SKMCH, Muzaffarpur, Bihar, India for the period of 12 months. Total 100 Children upto 5 years aged, admitted in Nutritional Rehabilitation Centre of Department of Paediatrics, were include in this study. Various co morbid conditions in study population were identified. All the laboratory examination was done with standard method.

Study Procedure: Complete history and systemic examination were. Various co morbid conditions in study population were identified and managed accordingly. Laboratory examination was done.

- Hemoglobin by Lab Life 3D hematological autoanalyzer & anaemia was defined as per WHO guidelines.
- Total leucocyte count by Lab Life 3D hematological autoanalyzer.

Data Analysis

Statistical analysis was done, using the statistical package for social science (SPSS 25.0) for Windows Software. Continuous variables were expressed as means, standard deviation (SD), confidence intervals (95%CI), frequency and range. Chi-square was applied and P value of < 0.05 was considered significant.

Results

Table 1: Co morbid conditions in SAM

Co-morbidity	No. of cases	% Percentage
Diarrhoea	65	65
Tuberculosis	15	15
Pneumonia	30	30
Otitis media	15	15
UTI	10	10
Rickets	26	26
Anaemia	88	88
Celiac disease	7	7
Hypothyroidism	5	5
HIV	3	3

Majority of children with SAM were having co-morbidity in the form of Anaemia (88%), Diarrhoea (65%) followed by pneumonia (30%), Rickets (26%), Tuberculosis (15%), Otitis media (15%), UTI (10%), Celiac (7%), Hypothyroidism (5%), & HIV (3%).

Table 2: Dysnatremia in SAM children in diarrheal & non diarrheal groups

Serum Sodium	No diarrhea	Diarrhea	Total (%)
Hyponatremia	20	43	63 (63%)
Normonatremia	15	20	35 (35%)
Hypernatremia	0	2	2 (2%)
Total cases	35	65	50

65 (65%) SAM children presented with diarrhea out of which Hyponatremia was in 43 cases & Hypernatremia was in 2 cases. No statistically significant difference was found with hyponatremia in diarrheal or non-diarrheal cases of SAM (P value of 0.07).

Table 3: Hypokalemia in SAM children

Serum Potassium	No diarrhea	Diarrhea	Total
Normokalemia	25	50	75
Hypokalemia	10	15	25
Total	35	65	100

Potassium levels of children with diarrheal & non diarrheal children with SAM. Serum Potassium levels of 100 SAM children were analysed. It was found that 25% SAM children were having hypokalemia. Hypokalemia was found in 15 diarrheal cases & 10 in non- diarrheal cases. A statistically significant difference was found with hypokalemia in SAM (P value of 0.025) between Diarrheal & Non diarrheal cases.

Discussion

Malnutrition is a major global problem [9] which interacts with diarrhea in a vicious cycle leading to high morbidity and mortality in children and it is as well as a complicating factor for other illness in developing countries. Malnourished children have long lasting, severe and recurrent diarrhea. The prevalence of diarrhea is 5-7 times more in malnourished as compared to normal children. [10] In malnutrition various abnormalities occur in body electrolytes which become more pronounced with diarrheal incidence since electrolytes conduct an electrical current, helps to balance pH and facilitate the passage of fluid between and within cells through process of osmosis imparting in regulation of the function of neuromuscular, endocrine and excretory systems. [11,12] Children with SAM are categorized into "complicated and uncomplicated cases" based on clinical criteria. SAM children with complications require inpatient management and those without complications can be treated on a community basis. World Health Organization (WHO) states this as a strong recommendation with low-quality evidence.

In present study anaemia was found in 88% which is higher than 51% from Columbia as reported by Bernal C et al 2008. [13] 65% of children with SAM in present study was admitted with diarrhea as a co-morbid state which is in accordance with 60% from Bangladesh as reported by Khanum et. Al [14] but lower than 67% from Zambia as reported by Irena et. Al [15] 68% from Columbia as reported by Bernal C. et al [13] 70% from Kenya as reported by Nzioki et al [16] which may be due to geographical factor while higher than 54% from Madhya Pradesh as reported by Kumar et al [17] 49% from Kenya as reported by Talbert et al [18] and 11% from Bangladesh as reported by Hossain et al [19] It may be because of low socioeconomic status, bottle feeding & unhygienic feeding can be contributed to this high prevalence of diarrhea in present study. 15% of Children with SAM were diagnosed as a Pulmonary tuberculosis in a present study which is higher than 2%, 5.6%, 6.6%, 9% and 9.3% from Karnataka, Madhya Pradesh, Ethiopia, Bangladesh and Uttar Pradesh as reported by Bhat et al [20] and Gangaraj. [21]

26% SAM children in our study had ricketic features, and this is comparable with the previous reports. [22] This can be contributed to dietary deficiency and Vitamin D supplementation in early period of life. 3% of children with SAM were diagnosed with hypothyroidism in the present study based on clinical features suggestive of hypothyroidism. Exact prevalence of hypothyroidism was not found because selected cases were investigated. 3% of children with SAM were diagnosed HIV positive in the present study which is lower than found in previous studies. [23] This may be because of low prevalence of HIV in present study. However high prevalence of HIV infection in children with SAM in African country may be associated with nutritional deficiencies secondary to decreased nutrient intake, impaired nutrient absorption, increased nutrient losses and increased nutrient demand. This is due to direct effect of HIV and the myriad of opportunistic infections precipitated by HIV induced immunodeficiency.

65 (65%) SAM children presented with diarrhea out of which Hyponatremia was in 43 cases & Hypernatremia was in 2 cases. No statistically significant difference was found with hyponatremia in diarrheal or non-diarrheal cases of SAM (P value of 0.07). Potassium levels of children with diarrheal & non diarrheal children with SAM. Serum Potassium levels of 100 SAM children were analysed. It was found that 25% SAM children were having hypokalemia. Hypokalemia was found in 15 diarrheal cases & 10 in non- diarrheal cases. A statistically significant difference was found with hypokalemia in SAM (P value of 0.025) between Diarrheal & Non diarrheal cases.

Conclusion

We concluded that dyselectrolytemia is high in complicated SAM and mainly sodium disturbances in form of hyponatremia are common in different co-morbid conditions. Hence, we recommend that due care is to be given for management of dyselectrolytemia in complicated SAM children.

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