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Spectrum of co-morbidities in severe acute malnutrition with unexpected dyselectrolytemia in diarrhea

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Abstract

Background: Co-morbidities are the reason behind high morbidity and mortality in SAM children. There is lack of literature regarding co morbidity pattern in SAM children.

Objective: To study the co morbidities in severe acute malnourishment children admitted in NRC.

Methods: SAM was diagnosed as per WHO protocol. Total of 299 SAM children were included. Co-morbidities were identified and were investigated further and managed accordingly.

Results: 90% SAM children had anaemia.61% had diarrhea and 30% had pneumonia, Vitamin D deficiency features were found in 30% cases. 10% had UTI & 10% Otitis Media. Tuberculosis was diagnosed in 13% of cases. Celiac disease, Hypothyroidism and HIV were not found to be major co morbid conditions.

Conclusions: Co-morbidities identification and treatment in SAM children is key step in reducing morbidity and mortality associated with SAM.

Keywords: Co-morbidities, NRC, Severe Acute Malnutrition, Hypothyroidism, Celiac disease, Diarrhea, HIV

Introduction

Severe Acute malnutrition is a major challenge to achieve the millennium development goals.[(1)] A recent assessment showed that efforts to prevent child deaths need to be stepped up in order to meet that target.[(2)] One of the most daunting task in the field of nutrition and child health is how to reduce morbidity and mortality associated with severe acute malnutrition.[(3,4)]

According to National Family Health Survey-III in India 6.4% of children below 60 months of age were suffering from severe acute malnutrition. With the current estimated total population of India as 1100 million, it is expected that about 8.1 million are likely to be suffering from SAM.

There is a lack of data on co-morbidities found to be associated with severe malnutrition. We are presenting a description of co-morbid findings in children admitted to a Nutritional Rehabilitation Centre in Northern India.

Materials & Methods

Study design: This was a hospital-based observational study.

Setting: The study was conducted in Nutritional Rehabilitation Centre of Department of Pediatrics, Jawaharlal Nehru Medical College, Aligarh Muslim University, Aligarh

Study subject: Children aged 1 to 60 months, admitted in Nutritional Rehabilitation Centre of Department of Paediatrics, Jawaharlal Nehru Medical College, Aligarh Muslim University, Aligarh

Study Period: Study was conducted from January 2013 to October 2014.

Ethical considerations: Study was approved by Ethical committee of JNMCH, AMU, Aligarh.

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

- Hemoglobin by Lab Life 3D hematological autoanalyzer & anaemia was defined as per WHO guidelines.
- Total leucocyte count by Lab Life 3D hematological autoanalyzer.
- TLC < 4,000 cells as leucopenia & TLC > 16,000 was taken as leucocytosis.
- Random Blood glucose by Accu-Check® Active (Roche Diagnostics GmbH 68298 Mannheim, Germany).
- < 54 mg% was taken hypoglycemia
- Hyperglycemia cut off of > 120 mg/dl was taken
- Urea with values >40 mmol/l as deranged & creatinine with values >0.90 as deranged
- Serum sodium of < 135mEq/l & >145 as hyponatremia, & hypernatremia respectively
- Serum potassium <3.5 as hypokalemia & > 5.5 as hyperkalemia respectively was taken in our study.
- HIV ELISA for
- Mantoux test in which > 10mm was taken as positive
- CX Ray was done.
- Urine microscopy & culture done for diagnosing urinary tract infections
- ttG & TSH done in suspected cases with clinical symptoms and history suggestive of Celiac Disease & hypothyroidism respectively
- Ear swab culture was done in SAM children with ear discharge.

Data Analysis: Statistical analysis was done, using the statistical package for social science (SPSS 17) 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

Co-morbidites in SAM: Total 299 cases were included in study of which 95% were associated co-morbid conditions in SAM. Table 1 showed that majority of children with SAM were having co-morbidity in the form of Anaemia (90%), Diarrhoea (61%) followed by pneumonia (30%), Rickets (30%), Tuberculosis (13%), Otitis media (10%), UTI (10%), Celiac (3%), Hypothyroidism (2%), & HIV (1%).

Table 1: Comorbid conditions in SAM

Co-morbidity	No. of cases	% Percentage cases
Diarrhea	183	61
Tuberculosis	39	13
Pneumonia	91	30
Otitis media	30	10
UTI	29	10
Rickets	90	30
Anaemia *	267	90
Celiac disease	9	3
Hypothyroidism	6	2
HIV	3	1

*Cutoff value for anaemia in children aged 6–60 months was a Hb level <11 g/dl.[5]

Due to the lack of diagnostic criteria of anaemia for children under 6 months, the same cutoff value, which is accepted in clinical practice[6] was adopted.

Comparison of serum sodium changes in Diarrheal & Nondiarrheal cases in Severe acute malnutrition: Mean age (SD) of the diarrheal cases was 24(6) months (95% C.I. 23.1- 24.8) of which 106 were male (55%). Mean age (SD) of non-diarrheal cases was 18(6).

(95% C.I. 16.8 – 19.1) of which 72% were male Table 2 & Fig. 1 shows that 183 (61%) SAM children presented with diarrhea of which 168 had dysnatremia in the form of Hyponatremia in 164 cases (56%) & Hypernatremia in 4 cases (1.4%).

No statistically significant difference was found with hyponatremia in diarrheal or non-diarrheal cases of SAM(P value of 0.09).

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

Serum Sodium	No diarrhea (%)	Diarrhea (%)	Total (% of the total cases)
Hyponatremia	52 (32%)	108 (68%)	164 (56%)
Normonatremia	54 (43%)	74 (57%)	125 (42.6%)
Hypernatremia	3 (1%)	1 (0.4%)	4 (1.4%)
Total cases	110	183	293

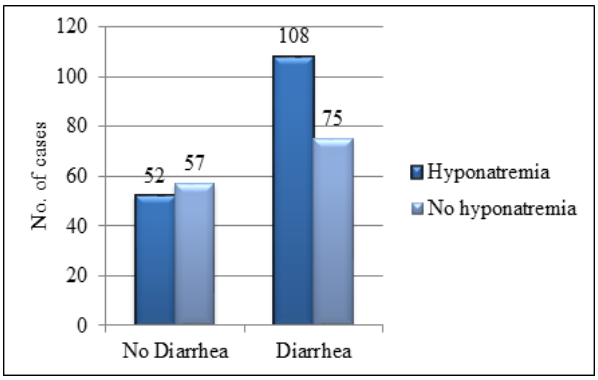

Fig. 1: Dysnatremia in both diarrheal and non-diarrheal cases in SAM

Comparison of serum Potassium changes in Diarrheal & Nondiarrheal cases in Severe acute malnutrition: Serum Potassium levels of 293 SAM children were analysed. It was found that 22.5% SAM children were having hypokalemia. Hypokalemia was found in 16.7% of diarrheal cases & 5.8% in non-diarrheal cases. Table 3 & Fig. 2 shows that Potassium levels of children with diarrheal & non diarrheal children with SAM.

A statistically significant difference was found with hypokalemia in SAM (P value of 0.022) between Diarrheal & Non diarrheal cases.

Table 3: Hypokalemia in SAM children

Serum Potassium	No diarrhea	Diarrhea	Total
Normokalemia	92	134	227
Hypokalemia	18	49	66
Total	110	183	293

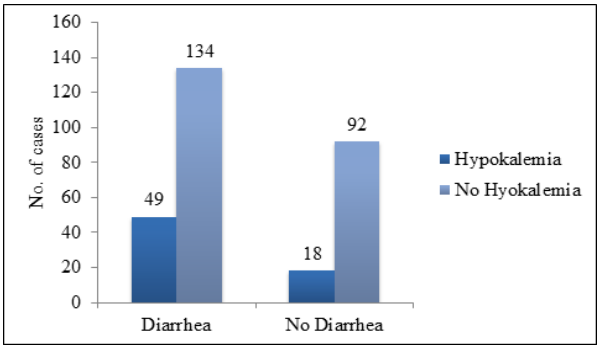

Fig. 2: Hypokalemia in SAM & its association with diarrhea

11 children (3.7%) of cases with SAM had hyperkalemia.

What is already known?
Co-morbidities associated with SAM are responsible for high morbidity and mortality in these children. Dyselectrolytemia exists in diarrhea in SAM.
What this study adds?
Anaemia, Diarrhoea, Pneumonia, Tuberculosis, UTI, Otitis media were major co-morbid conditions associated with SAM in this region. Hypokalemia was found associated while hyponatremia was not found associated with diarrhea in SAM.

Discussion

Majority of children with SAM were admitted with co morbidity in the form of Anaemia 90%, Diarrhea 61%, Pneumonia 30%, Tuberculosis 13%, UTI 10% and Otitis media 10% in the present study.

In present study anaemia was found in 90% which is higher than 51% from Columbia as reported by Bernal C et al 2008.[7] It was further observed that children with SAM was having 54% moderate anaemia followed by 33% severe anaemia in present study which is contrary to the study from Delhi as reported by Thakur et. al.[8] This can be contributed to nutritional deficiency as majority of the patients had dietary deficiency.

61% 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 1998[9] but lower than 67% from Zambia as reported by Irena et. al 2011,[10] 68% from Columbia as reported by Bernal C. et al 2008,[7] 70% from Kenya as reported by Nzioki et. al 2009[11] which may be due to geographical factor while higher than 54% from Madhya Pradesh as reported by Kumar et al 2013,[12] 49% from Kenya as reported by Talbert et.al 2005[13] and 11% from Bangladesh as reported by Hossain et.al 2009.[14] It may be because of low socioeconomic status, bottle feeding & unhygienic feeding can be contributed to this high prevalence of diarrhea in present study.

In our study hypokalemia was found associated with diarrhea and hyponatremia was found not associated which is comparable to other studies.[15,16,17] This dyselectrolytemia may present with significant neurological outcomes.[15,18,19] Further studies are needed establish the exact understanding of electrolyte changes in SAM.

30% of children with SAM in present study was admitted as a pneumonia based on the clinical findings & Chest X Ray which is higher than 10% in Ethopia as reported by Berti et. al 2008[20] which may be because of late admission in NRC. However it is lower than 33% and 58% from Bangladesh as reported by Hossain et al[14] and Kahnum et al 1998[9] respectively.

13% 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,[21] Gangaraj 2013,[22] Berti et al 2008,[20] Hossain M et al,[14] & Kumar et al[23] respectively. The high prevalence tuberculosis in present study may be because of children with SAM are belonging to low socio economic class. The high prevalence can be contributed to the more cases having history of contact positive. So screening of all SAM children with Tuberculosis is a must to find the actual disease burden in SAM.

10% of children with SAM were diagnosed UTI in present study which is lower than 11%, 17%, 30%, 31% from Nigeria, Delhi, Turkey and Mexico as reported by Rabasa et al 2002,[26] Bagga et al 2003,[27] Caksen et al 2000,[25] Berkowitz et al 1983[24] respectively.

3% of children with SAM were diagnosed with Celiac disease in the present study based on clinical features suggestive of celiac disease, which is lower than 13% from Delhi as reported by Kumar et al 2012.[23]

30% SAM children in our study had ricketic features, and this is comparable with the previous reports.[28] This can be contributed to dietary deficiency and Vitamin D supplementation in early period of life.

2% 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.

0.4% of children with SAM were diagnosed HIV positive in the present study which is lower than found in previous studies.[23,29] 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. HIV/AIDS has a significant impact on food security in affected households. Under-nutrition, on the other hand, influences HIV disease progression, increases morbidity and lowers survival of HIV infected persons.

Conclusion

Burden of co-morbid conditions is very high in SAM children. In order to break disease – under nutrition cycle, not only nutritional management but early detection of co- morbid conditions is a must. Co-morbidities identification and treatment in SAM children is key step in reducing morbidity and mortality associated with SAM.

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