Analysis of Co-morbidities in Children with Severe Acute Malnutrition in Eastern Nepal

Thapa A[1], Shah GS[2], Mishra OP[3]

Abstract

Introduction: Malnutrition is a common problem in developing countries and often associated with co-morbidities. The present study was undertaken with objectives of to find out the co-morbidities in children with severe acute malnutrition (SAM). **Materials and Methods**: This was a hospital based study carried in 77 children with SAM, diagnosed on the basis of WHO criteria. **Results**: The age group of children was 1- 5 years (median age 23 months) with about 39% between 1- 2 years. There were 38 males (49.3%). Low maternal education (60%), overcrowding (60%), lower- middle socioeconomic status (87%) were some of the predisposing factors observed. Pneumonia (51%), acute gastroenteritis (21%) and bacterial meningitis (8%) were common co- morbidities found. Associated abnormal laboratory parameters found were anemia (60%), leucocytosis (38%), hyboalbuminemia (36%) hyponetremia (31%), and hypokalemia (17%). **Conclusion**: Presence of infections and biochemical abnormalities require urgent attention in SAM cases and appropriate treatment in a hospital setting to improve their survival.

Key words: Severe acute malnutrition, Co-morbidities, Laboratory abnormalities

Introduction

Globally, more than one- third of under-five deaths are attributed to under nutrition and of these, 10% are severely malnourished[1,2]. To our concern, Nepal also shares this burden of malnutrition with its 29% under 5 children being underweight and 11% severely wasted[3]. Due to lack of knowledge and health resources, malnutrition has been underlooked and most patients present at hospital with complications rather than malnutrition alone. The mortality rate of children with complicated, severe acute malnutrition (SAM) in hospitalized set-up has remained high[2]. Such high mortality has been attributed to co-morbidities such as infections and complications[4]. There are very reports on co-morbidities in SAM[5,6]. which has evaluated clinical and laboratory profile in these children especially from this region of the country, Therefore, we analyzed the presence of co-morbidities and complications in children with SAM so that appropriate treatment can be instituted promptly in order to improve their survival.

[1]Dr. A Thapa, [2]Dr. Gaurishankar Shah, Professor, Department of Paediatrics, B.P. Koirala Institute of Health Sciences, Dharan, Nepal, [3]Dr. OP Mishra, Professor, Department of Paediatrics, Institute of Medical Sciences, Banaras Hindu University, Varanasi, India

Address for correspondence:
Dr. Gauri S Shah
Professor & Head, Department of Paediatrics,
B.P. Koirala Institute of Health Sciences,
Dharan, Nepal.
Tel: +977- 9842415770, Fax: +977-25-520251
E-mail: gaurishankarshah@live.com

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Material and Methods

This was a descriptive cross-sectional study carried out at the Department of Paediatrics and Adolescent Medicine, B.P Koirala Institute of Health Sciences, Dharan, Nepal during February 2013 to January 2014. All Children of age 1 to 5 years were screened at admission for malnutrition using WHO criteria[7]. Among them, children with Severe Acute Malnutrition (SAM) were enrolled in the study. SAM was defined by using WHO criteria[8]. Children with suspected congenital malformation were excluded.

After admission, data were collected in a pre-tested questionnaire by interview technique. The parents of SAM children were informed about the study and each question was explained. The anthropometric parameters such as weight, height, and mid-arm circumference were recorded at admission using standard techniques[9]. Weight was recorded with weighing Secca scale with an accuracy of 50 g and crown to heel length in 1- 2 years with infantometer and height using stadiometer in 2-5 years age group, with an accuracy of 0.1 cm. Mid-arm circumference was measured with non-stretch measuring tape with sensitivity of 0.1 cm.

A detailed physical and systemic examination was performed. The investigations included haemoglobin, total and differential leukocyte counts, platelet counts, blood glucose, serum protein, albumin, urea, creatinine, sodium, potassium, X-ray chest and tuberculin test. Urine microscopy and culture were done, wherever required[7]. The disease classifications were used as per standard criteria. The children were treated with WHO criteria and followed for complications during the stay.

Ethical issues: The study was started after the approval of the Institutional Ethical Review Board. A written informed consent was obtained from each parent of study subjects. The participants had option to withdraw from the study anytime during their hospital stay.

Statistical analysis

Data were analysed with Statistical Package for Social Sciences (SPSS) version 20 (Chicago IL). Chi-square test was used to test the significance level for the data of proportions; with Yates correction when sample size was less than five. A *p*-value of < 0.05 was considered as significant.

Results

There were 446 children admitted in the hospital during the study period; of these 188 (42.2%) were malnourished as per WHO criteria[7]. Among them 77 (17.2%) were diagnosed as SAM. Out of the 188 malnourished children, 95 (85%) were wasted, 20 (10.6%) were stunted and 73 (38.8%) children had both wasting and stunting.

Thirty children (38.9%) of the study population were between 1- 2 years (17 males) and 47 (61%) in the age group of 2- 5 years (21 males) female. Overall mean age of children with SAM was 23.2 months. Of 77 SAM cases, 71 (92.2%) had their weight for height z-score below -3 SD with no evidence of oedema. The mean weight, height, mid-arm circumference were 8.7±1.6 Kg, (86.6 ±10.cm and 11.9 ±0.8 cm, respectively.

The characteristics of children with SAM are presented in Table 1. Median age of mothers was 26 years with age of marriage at 19 years and they had shorter birth spacing (median 1.6 years). About 60% of mothers were either illiterate or had basic education of primary school level. Around 87% families belonged to lower socio-economic status. Of whom, 46.7 % had joint family, median number of family members was 6 and 64.9% were staying in overcrowding situation. About 78% of all children were fed with colostrum. The median period of exclusive breastfeeding was 4 months. Nearly 90% children were completely immunized and the remaining 10% had partial immunization.

Table 1: Basic characteristics of children with severe acute malnutrition (n=77)

Maternal characteristics	
Mothers age (years, median, IQR)	26 (22, 29)
Live births (median, IQR)	2 (1, 3)
Age at marriage (years, median, IQR)	19 (16.5, 22)
Birth spacing (years mean ±SD)	1.7 ± 1.9
Maternal education (n=77)	
Illiterate	30 (38.9%)
Primary School Certificate	16 (20.7%)
Middle School Certificate	27 (35.1%)
Intermediate level	4 (5.3 %)
Household information	
No of family members (median, IQR)	6 (4,7)
Type of family (n= 77)	
Joint	41 (46.7%)
Nuclear	36 (53.3%)
Overcrowding (n=188)	
Present	50 (64.9%)
Absent	27 (35.1%)
Socioeconomic status (n= 77) Lower middle Lower/Upper lower	 67 (87 %) 10 (13%)
Child Feeding Information	
Colostrum feeding (n=77)	
Yes	60 (77.9%)
No	17 (22.1%)
Complementary feeding (months, mean ±SD)	5.6 ±2.0
Total breast feeding duration (years, mean ±SD)	1.7 ±0.8
Exclusive breast feeding (months, median, IQR)	4 (2,6)
Immunization status	
Completely immunized	69 (89.6%)
Partially immunized	08 (10.4%)

n= number of cases

Table 2: Co-morbidities in children with severe acute malnutrition (n= 77)

Type of disease	n (%)	Age groups		p-value*
		12-24 months (n=30)	24-60 months (n=47)	
Pneumonia	39 (50.6)	16 (41.0)	23 (59.0)	0.81
Acute gastroenteritis	16 (20.8)	4 (25.0)	12 (75.0)	0.25
Bacterial meningitis	6(7.8)	2 (33.3)	4 (66.7)	1.00
Congenital heart diseases	3(3.9)	2 (66.7)	1 (33.3)	0.55
Febrile convulsion	3 (3.9)	2 (66.7)	1 (33.3)	0.55
Urinary Tract Infection	3 (3.9)	0	3(100)	
Kalaazar	2 (2.6)	0	2 (100)	
Post-infectious glomerulonephritis	2 (2.6)	0	2(100)	
Tuberculosis	2 (2.6)	0	2(100)	
Cerebral palsy	1 (1.3)	0	1(100)	

*Ch- square test, n- number of cases

Pneumonia (50.6%) was the most common co- morbid illness with SAM followed by acute gastroenteritis (20.8%) and bacterial meningitis (7.8%). Children were sub-grouped between 12-24 months and 24-60 months, and it was found that there were no significant differences in distribution of illnesses between the two groups (Table 2).

The laboratory parameters are presented in Table 3. Anaemia, leucocytosis and leucopenia were observed in 59.7%, 37.7% and 7.8% of cases. Other abnormalities were hypalbuminaemia (36.4%), hyponatreamia (31.2%) and hypokalaemia (16.9%). Impaired renal function was seen in 3 (3.9%) and another 3 (3.9%) children had associated urinary tract infection. None of the children had hypoglycemia at presentation. There was no mortality in SAH children.

Table 3: Laboratory parameters in severe acute malnutrition (n=77)

Abnormalities	n (%)
Leukocytosis (Total leucocyte count > 11,000/mm^3)	29 (37.7)
Leukopenia (Total leucocyte count <4,000/mm^3)	6 (7.8)
Anaemia (Hemoglobin < 11g/dl)	46 (59.7)
Hypoalbuminemia (serum albumin< 2.5 g/dl)	28 (36.4)
Hyponatremia (serum Na < 120 meq/l)	24(31.2)
Hypokalemia (serum K < 2.5 meq/l)	13 (16.9)
Raised serum Urea (< 35 mg/dl)/ Creatinine (> 0.5 mg/dl)	3 (3.9)
Urine culture positivity	3 (3.9)

n=number of cases

Discussion

It appears that malnutrition is still a common problem in developing country like ours so much so that about 17% of the children belonged to SAM and about 92% had weight for height less than 3 SD. The global prevalence of 16.1% was reported by Casie et al[5]. In contrast, a study from South-East Nigeria reported lower incidence (4.4%) of SAM in their 616 children[6]. Relatively higher incidence of SAM in the present study could be because of multifactorial in origin such as younger age of mother and lower educational status not having enough awareness regarding feeding practices, lower socioeconomic status, lesser duration of exclusive and total breast feeding than recommended. Keerthiwansa et al [10] found a significant association of lower maternal education, lower paternal education, low family income and mother being a housewife in children with SAM. The gender distribution of cases was almost equal. The median age of children was 23 months, which was higher than the figure (14.3 months) reported by Kumar at al[11]. Further, authors also found that 75.8% of their SAM cases had weight for height Z score less than 3 SD, which was lower than ours finding. As such, it appears that the distribution of SAM patients may vary from region to region and accordingly nutritional rehabilitation should be planned for better recovery.

Regarding co-morbidities, pneumonia (50.6%) and acute gastroenteritis (20.8%) were the most common conditions at presentation in ore cases. Other studies[6,11,12,13] reported acute gastroenteritis being the most common co-morbid condition followed by respiratory tract infections in their cohort of SAM.

Kumar et al[11] reported other co-morbidities like tuberculosis, malaria, measles and HIV infection in their series. We did not find these conditions except tuberculosis that too in only 2.6% of patients. Instead other diseases like bacterial meningitis, congenital heart diseases, febrile convulsions, kalaazar, and urinary tract infections were present but in a small proportion

of cases. This shows that variation in spectrum of diseases in SAM can be found. However, two common morbidities associated with SAM such as pneumonia and acute gastroenteritis should be looked on a priority basis at hospitalization and managed appropriately. Sepsis is another severe condition, which has been found earlier[11,14] was not present in any of our patients.

Increased serum urea, creatinine and electrolyte disturbances are indicative of acute kidney injury with multiple complications of hospitalization. The situation is further aggravated by anaemia and hypoalbuminaemia, which can lead to, impaired immune status and thus increased chances of infections. Presence of leucocytosis and leucopaenia further supports its presence in these children.

These children are often complicated by respiratory and gastrointestinal infections along with biochemical abnormalities at hospitalization requiring urgent attention and therapy. Treatment of conditions as per WHO guidelines has been advocated for rapid normalization of conditions[15]. A recent report from India on a larger cohort of children with SAM demonstrated that one can achieve higher cure rates in uncomplicated SAM even with community based management of these cases[16]. This is essential to break the malnutrition-disease vicious cycle phenomenon and improved survival.

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References

1. Child Nutrition - UNICEF STATISTICS. *UNICEF-WHO-World Bank Child* Malnutrition. http://data.unicef.org/nutrition/malnutrition.html2013.
2. Collins S, Dent N, Binns P, Bahwere P, Sadler K, Hallam A. Management of severe acute malnutrition in children. *Lancet* 2006;368:1992–2000.
3. Population Division, Ministry of Health and Population, Government of Nepal, New ERA, Kathmandu, Nepal and ICF International, Calverton, Maryland USA. Nepal DHS, 2011.
4. Heikens GT, Bunn J, Amadi B et al. Case management of HIV-infected severely malnourished children: challenges in the area of highest prevalence. *Lancet* 2008; 371:1305-7.
5. Casie T, Ruwan R, Mark M: Measuring local determinants of acute malnutrition in Chad: a case-control study. *Lancet* 2013;381:144.
6. Talbert A, Thuo N, Karisa J, Chesaro C, Ohuma E, Ignas J, et al. Diarrhoea complicating severe acute malnutrition in Kenyan children: A prospective descriptive study of risk factors and outcome. *PLoS One* 2012;7:1.
7. WHO. Management of severe malnutrition: a manual for physicians and other senior health workers. 1999.
8. WHO Child Growth Standards and the Identification of Severe Acute Malnutrition in Infants and Children: A Joint Statement by the World Health Organization and the United Nations Children's Fund. WHO Guidelines Approved by the Guidelines Review Committee. Geneva: World Health Organization, 2009.
9. CDC. National Health And Nutritional Examination Survey: Anthropometry Procedures Manual. 2007.
10. Keerthiwansa J, Gajealan S, Sivaraja S, Subashini KY. Malnutrition and anaemia among hospitalised children in Vavuniya. *Ceylon Med J* 2014;59(4):141-3.
11. Kumar R, Singh J, Joshi K, Singh HP, Bijesh S. Co-morbidities in hospitalized children with severe acute malnutrition. *Indian Pediatr* 2014;51:125-27.
12. Sunguya BFP, Koola JI, Atkinson S. Infections associated with severe malnutrition among hospitalised children in East Africa. *Tanzan Health Res Bull* 2006;8(3):189–92.
13. Irena AH, Mwambazi M, Mulenga V. Diarrhea is a major killer of children with severe acute malnutrition admitted to inpatient set-up in Lusaka, Zambia. *Nutr J* 2011;10:110
14. Bachou H, Tylleskär T, Deogratias H, Mulindwa K, Tumwine JK. Bacteraemia among severely malnourished children infected and uninfected with the Human immunodeficiency virus-1 in Kampala, Uganda. *BMC Infect Dis* 2006;6:160.
15. Bernal C, Velásquez C, Alcaraz G, Botero J. Treatment of severe malnutrition in children: experience in implementing the World Health Organization guidelines in Turbo, Colombia. *J Pediatr Gastroenterol Nutr* 2008;46(3):322–28.
16. Burza S, Mahajan R, Marino E et al. Community-based management of severe acute malnutrition in India: new evidence from Bihar. *Am J Clin Nutr* 2015;101:847-59.