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INFECTIONS IN HOSPITALIZED CHILDREN WITH SEVERE ACUTE MALNUTRITION (SAM): EXPERIENCE FROM A TERTIARY CARE TEACHING HOSPITAL.

Paediatrics

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ABSTRACT

Background: Severely malnourished children are predisposed to serious infections due to an altered immune pattern in them leading to increased morbidity and mortality. This study was done to identify the pattern of infections among hospitalized severe acute malnourished children. **Methods:** A retrospective study was conducted on admitted 102 children (6 months to 5 years) with severe acute malnutrition (as per WHO definition) during 1st April 2018 to 31st March 2020. Details about socio-demographic details, clinical profile and major infectious co morbidities were recorded. **Results:** A total of 102 children were included in the study. Out of these, 68.6% children were completely immunized. Major infections identified were acute gastroenteritis (27.5%), pneumonia (19.6%) and septicemia (14.7%). Among blood culture positive sepsis, staphylococcus aureus was the most common organism isolated. **Conclusions:** Infections form an important part in the morbidity profile of SAM children. In addition to nutritional rehabilitation, an aggressive approach towards early identification and treatment of infections is important so as to break the cycle of malnutrition-infectious disease-malnutrition and improve outcome in these children.

KEYWORDS

Infections, severe acute malnutrition, children.

INTRODUCTION

Malnutrition is defined as a state where the physiology of a child is impaired to the extent where he can no longer maintain adequate bodily performance like growth and recovery from disease.[1] Globally, Severe acute malnutrition (SAM) affects about 20 million under 5 children out of which 1 million die every year.[2] According to NFHS-4 survey, 7.5% children suffer from SAM in India.[3] Due to a relatively impaired immune status; these children are more vulnerable to infections like diarrhea, pneumonia, septicemia, tuberculosis, urinary tract infections and measles.[4] As per WHO, children suffering from SAM are at 5-20 times higher risk of death compared to well nourished children as SAM and infections form a potentially lethal vicious cycle of worsening illness and deteriorating nutritional status leading to increased severity and delayed recovery. So, an intensive and comprehensive approach must be adopted to reduce mortality due to infections and improve outcome in these children.

As there is paucity of systematic data regarding infectious diseases in SAM children from India, we therefore planned this study to identify major infectious co morbidities among children with SAM in a tertiary care teaching hospital.

MATERIAL AND METHODS

A retrospective descriptive study was conducted in the inpatient wards of department of Pediatrics, Kalpana Chawla Government Medical College, Karnal by retrieving the patient records in the department from 1st April 2018 to 31st March 2020 after obtaining approval from Institute's Ethics Committee. Detailed information about the demography, dietary pattern, nutritional status, anthropometry, clinical features, various associated infections, investigations and treatment and outcome was extracted from patient records and entered in a structured Performa. Data was retrieved for all children aged 6 months to 5 years who fulfilled WHO criteria for SAM [5] i.e.

a) weight for length/height < -3 SD of WHO growth standards and/or
b) Bilateral pitting pedal edema of nutritional origin and/ or
c) Mid upper arm circumference <115 mm and/or
d) Presence of visible severe wasting

between 1st April 2018 to 31st March 2020.[5] Children with gross congenital malformations, cerebral palsy, chronic medical disease, congenital heart disease, inborn error of metabolism, and non-nutritional causes of edema were excluded.

A total of 131 case records of children with severe PEM were screened and in final analysis, 102 of these who fulfilled the inclusion criteria were included. All children at admission underwent detailed clinical examination and were screened for any infection. Apart from the investigative work up for medical management of malnutrition, all children underwent a battery of investigations such as blood culture, complete blood count, C-reactive protein, chest radiographs, stool complete, urine culture and work up for tuberculosis at admission. Advanced investigations like lumbar puncture, MRI brain, CT scan and ultrasonography etc.was done whenever clinically indicated.

Medical and nutritional management of all children was done in 2 phases:

a) Stabilization phase
b) Rehabilitation phase as per WHO guidelines

In the stabilization phase (usually for first 3-7 days), the children were treated with the use of appropriate antibiotics, appropriate intravenous fluids, blood transfusions, symptomatic therapy etc. as per standard guidelines.[6] The patients were given WHO F75 diet during the stabilization phase usually through the oro-gastric route initially. After stabilization, when child showed improved appetite, more energy dense feeding (F-100 diet) was started orally. In addition to this, all children were given the required micronutrients in appropriate doses. All children were assessed daily for weight gain, improvement in appetite, any feeding problem, clinical improvement and loss of edema. Children were discharged on meeting the discharge criteria as per WHO guidelines i.e. when the child achieved:

- A good appetite (eating at least 120-130 kcal/kg/day) along with micronutrients;
- Lost edema;
- Shown consistent weight (>5g/kg/day) on three consecutive days;
- Completed antimicrobial treatment; and
- Appropriate immunization has been initiated,

Data analysis:

Data was recorded in Microsoft excel sheet. Demographic data, immunization status and infectious comorbidities were expressed in the form of percentage.

RESULTS:

A total of 102 children out of 131 screened fulfilled the inclusion criteria. The baseline characteristics and socio-demographic profile of all the children are as shown in Table 1. Most common age group affected was 6 months to 1 year (59.8%) and majority (92%) belonged to lower socioeconomic status. Out of 102 children, 70 (68.6%) were completely immunized, 30 (29.4%) incompletely immunized and 2 (1.9%) were unimmunized.

Various infections identified in SAM children are depicted in Table 2. Acute gastroenteritis (27.5%) was the most common infection followed by lower respiratory tract infections (19.6%) and sepsis (22.5%). Staphylococcus aureus (11.7%) was the most common organism isolated from blood culture.

Out of the total of 102 children, 89 (87.25%) children had a positive outcome (recovered) while 13 (12.75%) children had an adverse outcome (death/unrecovered

Table 1: Baseline data of children with SAM (n=102).

Variables		N
Age (in months)	6 -12	61
	13 -24	33
	25 -60	8
Gender	Male	50
	Female	52
Birth Order	First	28
	Second	37
	Third	17
	Fourth	10
	Fifth	8
	Sixth	2
Low birth weight (<2.5kg)	Yes	8
	No	94
Socio-Economic Status	Upper	1
	Upper Middle	1
	Lower Middle	5
	Upper Middle	1
	Lower	94
Immunization Status For Age	Complete	70
	Incomplete	30
	Unimmunized	2
Total	102	

co morbidities in hospitalized SAM children

S. No.	Infections	Frequency (n=102)	Percentages (%)
1.	Acute gastroenteritis	28	27.5
	a)Diarrhea	23	22.5
	b) Dysentery	05	5
2.	Lower respiratory tract infections:	20	19.6
3.	Blood culture positive sepsis:	15	14.7
	• Staphylococcus aureus	7	6.8
	• E. Coli	4	3.9
	• Klebsiella pneumoniae	2	1.9
	• Candida	2	1.9
4.	Skin infection:	10	9.8
	Scabies	6	5
	Skin Candidiasis	5	4.9
	Pyoderma	4	3.9
	Cellulitis	2	1.9
5.	Urinary tract infection	05	4.9
6.	Enteric fever	03	2.9
7.	Tuberculosis	04	3.9
8.	Meningitis	03	2.9
9.	HIV	01	0.9
10.	Viral hepatitis	02	1.9
11.	Measles	01	0.9

DISCUSSION

Most of the children with SAM were less than 24 months of age indicating a higher susceptibility of this age group towards SAM. These findings were similar to other studies in the past.[7-11] There was no significant sex predilection among males and females with respect to SAM which is similar to the findings of Jena and Mahgoub et al.[7,8] In our study, 80% of children belonged to lower socioeconomic according to modified Kuppuswami scale which explained poor purchasing capacity, inadequate food availability and ignorance about the importance of exclusive breastfeeding and timely initiation of appropriate complementary feeding.[12] These findings are similar to Kumar and Singh et al.[13,14]

In present study, 68.63% children were completely immunized for age, 29.41% had incomplete immunization while only 1.96% were unimmunized which is in contrast to the results of Das et al (2017), Jena et al (2018) and Sharma et al (2004) where lower immunization coverage is documented.[7, 15, 16] It could be due to better coverage and greater number of diseases covered in revised national immunization schedule (mission Indradhanush) in contrast to previous literature..

A total of 74.5% children were found to be exclusively breastfed in our study. Delayed complementary feeding was seen in 78.5% of SAM children which is similar to the findings of Jena and Devi et al.[7,17]

Most of the 102 children with SAM reported a minimum of one infectious co morbidity in our study. In the present study a maximum of 27.5% children were found suffering from acute gastroenteritis (22.5% had diarrhea while 5% had dysentery) and 19.6% had lower respiratory tract infections which is similar to the results from Kumar R, Kumar P, Das, Mathur, Bernal, Munthali and Dhanalakshmi et al.[10,13,15,18-21] However, in study by Derseh et al pneumonia was more common than diarrhea.[22] Blood culture positive sepsis was present in 14.7% (15/102) of children out of which Staphylococcus aureus was the most common organism isolated in 6.8% (7/102) of children followed by gram negative organisms like E. Coli and Klebsiella pneumoniae. These findings were similar to the results of Page and Isaack et al but in contrast to Nyamurenje et al who found E. coli to be the commonest organism responsible for sepsis in SAM children.[23-25] Staphylococcus aureus isolates in our study were mostly sensitive to either Vancomycin or Linezolid; E.coli isolates were sensitive to Amikacin, Piperacillin-Tazobactum and Carbapenem. Candida albicans was also isolated in blood cultures of 2 of the children, one of whom was also HIV positive. Skin and soft tissue infections were present in 9.8% of children. Only 1 case of measles was present in our study which is in contrast to the observations of Kumar et al which could be attributed to the increased immunization coverage for measles and periodic catch-up immunization drives against measles in recent years.[10] No malaria case was found in our study. It could be due to the fact ours being a referral centre and some children possibly had already received a course of ant malarial at local levels before reaching us.

Limitations of the study include its retrospective nature due to which follow up could not be done. Also, ours being a hospital based study, had a limited sample size of 102 children and might not completely represent all the infectious comorbidities prevalent among SAM children in general population. However, our study may serve as a pilot study on which further elaborated research work can be done in the community.

In conclusion, our study confirms that there exists a high incidence of infections among severe acute malnourished children. Also, malnourished children may not show overt clinical signs and symptoms of active infections and therefore investigations such as blood and urine cultures along with specific markers of infection must be performed routinely in such babies to identify hidden underlying infections. We conclude by reemphasizing that timely diagnosis and treatment of infections like diarrhea, pneumonia and sepsis is of utmost importance in breaking the vicious cycle of undernutrition-infection- undernutrition and for proper rehabilitation of SAM children as well its prevention in community.

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Conflict of Interest: None.

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