

The co-morbidities associated with protein energy malnutrition in children

¹Dr. Arun Katti, ²Dr. Keludeppa Talawar, ³Dr. Manoj Kadlimatti, ⁴Dr. Vinayakumar

^{1,3}Assistant Professor, Department of Paediatrics, S. Nijalingappa Medical College, Bagalkot, Karnataka, India

^{2,4}Associate Professor, Department of Paediatrics, S. Nijalingappa Medical College, Bagalkot, Karnataka, India

Corresponding Author: Dr. Vinayakumar

Abstract

Malnutrition in children continues to dominate the health scenario in India and other developing countries especially in South East Asia. More than one fourth of under 5 children worldwide (150 million) are under weight. 27% (182 million) are stunted, while 10% are wasted. Of all children under the age of five years in developing countries about 31% are under weight, 38% have stunted growth and 9% have wasting. All Children of age 6 months to 60 months admitted to the Paediatric ward, fulfilling the inclusion criteria, during the study period, was included in the study. In our study, ARI with 44.08% is the most common co-morbidity affected, followed by acute gastroenteritis with 27.96%, followed by sepsis with 8.53% followed by UTI with 8.06%, followed by meningitis with 4.27%, followed by malaria with 2.84%, Tuberculosis with 2.84% and skin infection with 1.42%.

Keywords: Co-morbidities, protein energy malnutrition, children

Introduction

There is no other time in life when the provision of appropriate nutrition is of greater importance than during infancy and childhood. During this phase of life characterized by rapid growth and development an adequate amount and composition of substrate both in health and disease are of key importance for growth, functional outcomes such as cognitive and immune response and long term well-being. Inadequate diet may produce several forms of undernutrition in children, the most important being Protein Energy Malnutrition^[1].

Protein Energy Malnutrition (PEM) is a clinical syndrome characterised by multiple progressively worsening deficiencies of nutrient. Different clinical forms of PEM constitute a continuous spectrum of the manifestations of malnutrition with common features of growth failure, impaired tissue repair, and energy shortage^[2].

The term protein energy malnutrition applies to a group of related disorders that include marasmus, kwashiorkor and intermediate states of marasmic kwashiorkor. Marasmus involves inadequate intake of protein and calories and is termed “the sickness of the weaning” with no oedema. Kwashiorkor including marasmic kwashiorkor is characterized by massive oedema of the hands and feet, profound irritability, anorexia and desquamative rash, hair discolorations and a large fatty liver^[3].

Malnutrition in children continues to dominate the health scenario in India and other developing countries especially in South East Asia. More than one fourth of under 5 children worldwide (150 million) are under weight. 27% (182 million) are stunted, while 10% are wasted. Of all children under the age of five years in developing countries about 31% are under weight, 38% have stunted growth and 9% have wasting. SAM (Severe Acute Malnutrition) affects nearly 20 million children less than 5 years and contributes to 1 million child deaths yearly. Over the last few decades, its prevalence came down rather slowly and to an unsatisfactory level only. In India, more than 5 million die of every yearly as a direct

cause^[4]. This high mortality rate in children especially in less developed countries like India with complicated SAM is because of comorbid conditions namely infections and micronutrient deficiencies. Anticipation and early detection of some of these comorbid conditions along with preventive measures may bring down this unacceptably high mortality statistics. There is a lack of systematic reporting of clinical and laboratory data on admission or during hospital stay to identify baseline risk factors that allow comparative studies of the burden, spectrum and outcome of comorbidities of severe malnutrition so we have taken this study^[5, 6].

Methodology

Study design: Hospital based observational study.

Study population: All Children of age 6 months to 60 months admitted to the Paediatric ward.

Sample size: All Children of age 6 months to 60 months admitted to the Paediatric ward, fulfilling the inclusion criteria, during the study period, was included in the study.

Inclusion criteria

- All the children of 6 months to 60 months having protein energy malnutrition according to WHO criteria.

Exclusion criteria

- Children of age < 6 months and >60 months.
- Children suspected to have congenital malformation.
- Children with genetic disorder including thalassemia.
- Patient party not giving consent for examination.

Ethical clearance

Necessary ethical clearances was obtained from the Institutional Ethics Committee (H), Assam Medical College & Hospital, Dibrugarh.

Case definition

WHO recommendation of malnutrition will be used as case definition. WHO recommends the use of z scores or standard deviation scores (SDS) for evaluating anthropometric data.

$$\text{SD score} = \frac{\text{Observed value} - \text{Median reference value}}{\text{Standard deviation of reference population}}$$

A score of -2 to -3 indicates moderate malnutrition and a score of less than -3SDS indicates severe malnutrition. The assessment of nutritional status was done according to weight for height (or length), height (or length) for age and presence of edema.

	Moderate Malnutrition	Severe Malnutrition
Symmetrical edema	No	Yes
Weight-for-height	SD score between -2 to -3	SD score <-3 (severe wasting)
Height-for-age	SD score between -2 to -3	SD score <-3 (severe stunting)

Results

Table 1: Grade of Malnutrition According to IAP

Grade	Number (n)	Percentage(%)
Grade I	135	63.98
Grade II	58	27.49
Grade III	17	8.06
Grade IV	1	0.47
Total	211	100.00

In our study, the children with grade I malnutrition is most commonly affected with 63.98% followed by grade II with 27.49% followed by grade III with 8.06% and grade IV with 0.47%.

Table 2: Different Comorbidities

Comorbidity	Number (n)	Percentage (%)
Acute Gastroenteritis	59	27.96
ARI	93	44.08
Sepsis	18	8.53
UTI	17	8.06
TB	6	2.84
Meningitis	9	4.27
Malaria	6	2.84
Skin Infection	3	1.42
TOTAL	211	100.00

In our study, ARI with 44.08% is the most common co-morbidity affected, followed by acute gastroenteritis with 27.96%, followed by sepsis with 8.53% followed by UTI with 8.06%, followed by meningitis with 4.27%, followed by malaria with 2.84%, Tuberculosis with 2.84% and skin infection with 1.42%.

Table 3: Comorbidity According to Age Group

Comorbidity	Total (n)	Age Group (in months)									
		6-12		13-23		24-35		36-47		48-60	
		n	%	n	%	n	%	n	%	n	%
Acute Gastroenteritis	59	6	10.17	24	40.68	7	11.86	13	22.03	9	15.25
ARI	93	8	8.60	32	34.41	16	17.20	17	18.28	20	21.51
Sepsis	18	7	38.89	7	38.89	2	11.11	2	11.11	0	0.00
UTI	17	1	5.88	4	23.53	7	41.18	1	5.88	4	23.53
TB	6	1	16.67	1	16.67	1	16.67	0	0.00	3	50.00
Meningitis	9	2	22.22	3	33.33	2	22.22	1	11.11	1	11.11
Malaria	6	0	0.00	1	16.67	2	33.33	1	16.67	1	16.67
Skin Infection	3	0	0.00	1	33.33	2	66.67	0	0.00	0	0.00
TOTAL	211	25	11.85	73	34.60	39	18.48	35	16.59	38	18.01

Table 4: Types of PEM

Types	Number (n = 211)	Percentage (%)
Stunting:		
♦ Moderate	145	68.72
♦ Severe	66	31.28
Under Weight:		
♦ Moderate	145	68.72
♦ Severe	66	31.28
Wasting:		
♦ Moderate	83	39.34
♦ Severe	41	19.43

In our study, most common type of protein energy malnutrition is moderate stunting with 68.72%, and moderate underweight with 68.72% followed by moderate wasting with 39.34% followed by severe stunting and severe underweight with 31.28% followed by severe wasting with 19.43%.

Discussion

In our study co morbidities like ARI and Acute gastro-enteritis are the common. ARI accounts for 44.08% and acute gastro-enteritis accounts for 27.96%. Which is comparable to study done by Choudhary M^[7] which shows the ARI distribution of 23% and acute gastroenteritis 29%. And Taran SJ^[8] which also shows the ARI (20%) and Acute gastroenteritis (8.2%) as the main co-morbid conditions.

In Indian scenario Bhaskaran explored relationship of infections with under nutrition^[9]. He postulated that infectious diseases and under nutrition are inter dependent.

Undernutrition leads to altered immunity which is responsible for higher rates of infection in under nourished children. Infections lead to physiological and metabolic alterations which further aggravates under nutrition. This relationship is affected by poverty as a social determinant of nutrition.

The malnutrition-infection complex can be viewed under two aspects, malnutrition compromising host defense or infection either aggravating a previously existing deficient nutritional status or triggering malnutrition through disease pathogenesis. Malnutrition can facilitate pathogen invasion and propagation; further, it can increase the probability of a secondary infection occurring, thus modifying both disease pathogenesis and prognosis.

Certain infectious diseases also cause malnutrition. It appears that there is a vicious cycle involved, where malnutrition increases disease susceptibility and disease causes a reduction in food intake. The relationships among malnutrition, immune suppression and infection are complicated by the severe effects that a number of infections exert on nutrition.

Examples of how infections can contribute to malnutrition include:

- 1) Gastrointestinal infection that lead to diarrhea.
- 2) Chronic infections that cause cachexia and anaemia.
- 3) Intestinal parasites that cause anaemia and nutrient deprivation.

Stimulation of an immune response by infection increases the demand for metabolically derived anabolic energy, leading to a synergistic vicious cycle of adverse nutritional status and increased susceptibility to infection itself can cause a loss of critical body stores of protein, energy, minerals and vitamins. During an immune response, energy expenditure increases at the same time that the infected host experiences a decrease in nutrient intake.

Children with severe malnutrition are more prone to infections than others. This is due to nutritionally acquired immune dysfunctions syndrome, in which a child becomes

immunocompromised and likely to suffer from bacterial, fungal and other infections^[10].

Conclusion

Co-morbidities like ARI and Acute gastro-enteritis are the most common. ARI accounts for 44.08% and acute gastro-enteritis accounts for 27.96%.

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