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Original research article

An analytical assessment of the severity of malnutrition among children with pneumonia and diarrhoea: Moderate acute malnutrition

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Abstract

Aim: This study was undertaken to find the proportion of moderate acute malnutrition among children with pneumonia and diarrhoea.

Methods: The present study was conducted over a period of 6 months and 100 children were included in the study. Ethical clearance: obtained from the institutional ethics committee.

Results: More number of females were malnourished, and a greater number of males were well-nourished, which was statistically significant (p = 0.017). There was no statistically significant association between age and severity of malnutrition. (p-value 0.060). There was no significant association between the severity of pneumonia and malnutrition. Therefore the prevalence of pneumonia was the same among both MAM and SAM children. More children with MAM had anaemia than SAM and normal groups. Fewer children with normal anthropometry had comorbidities. The data were statistically significant (p = 0.020).

Conclusion: Complications and morbidities in MAM are similar to SAM, hence, it is important to diagnose MAM and treat it vigilantly as in SAM. It is important to recognize and monitor MAM which may often go neglected.

Keywords: Moderate acute malnutrition, severe acute malnutrition, diarrhoea, pneumonia

Introduction

Pneumonia and diarrhea together account for more than 3 million child deaths each year or nearly one in three child deaths worldwide [1]. Both conditions have long been linked to a reciprocal cycle of malnutrition and infection among vulnerable children in low-income and middle-income countries; hence, the global burden of these diseases may extend beyond their staggering toll on child survival to include long-term adverse outcomes for child growth and neurodevelopment.

Acute malnutrition is a major global health problem [2, 3]. According to the World Health report, 52 million children under 5 years around the world, were classified as having acute malnutrition in 2012, of which 33 million children had moderate acute malnutrition (MAM). Hence, MAM affects one in ten children under 5 years of age in underdeveloped and developing countries. According to NFHS- 4, in India, 38% of under-5 children are stunted, suggestive of chronic undernutrition, 21% are wasted, which is a sign of acute undernutrition, while 36% are underweight [4].

Diarrhea is one of the leading causes of childhood morbidity and mortality [5] in developing countries, [6, 7] where an estimated 1.5 million young children annually die of diarrhea.[8] Although mortality caused by diarrheal illnesses has been reduced globally, diarrhea-associated morbidity has changed very little [4]. The association between malnutrition and diarrheal mortality is bidirectional and has been reported for decades [8-10] as an association between diarrhea and poor growth and development of young children [5, 12]. Malnutrition after diarrheal illness stems from anorexia, reduced absorptive function, and mucosal damage as well as nutrient exhaustion associated with each episode of diarrhea. A significant proportion of global malnutrition is caused by enteric infections [11].

Both SAM and MAM have serious consequences, contributing to increased morbidity and mortality and also impaired intellectual development, suboptimal adult work capacity and increased risk of disease in adulthood. Interventions to address undernutrition should, therefore, include a strong component of MAM management which is often neglected. As the present national programmes are focussed more on children with SAM, hence this study was undertaken to find the proportion of moderate acute malnutrition among children with pneumonia and diarrhoea.

Materials and Methods

The present study was conducted over a period of 6 months and 100 children were included in the study. Ethical clearance: obtained from the institutional ethics committee.

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Inclusion criteria: Children between 1 month and 5 years of age with community-acquired pneumonia or diarrhoea

Exclusion criteria: Children with obvious secondary causes for malnutrition such as chronic illness or global developmental delay

Data collection procedure: A cross-sectional study of children between the age group of 1 month and 5 years who were admitted with community-acquired pneumonia or acute diarrhoea was done. Anthropometry at the time of admission, treatment details and complications were recorded in a pre-designed study proforma.

Data analysis: On the basis of WHO guidelines the following were defined

- Diagnosis of 'Pneumonia' (fast breathing and/or chest indrawing) and 'severe pneumonia' (pneumonia with any danger sign) [12]. Diagnosis of diarrhoea: the passage of >3 loose stools/ day (or more frequent passage than is normal for the individual).
- Diagnosis of SAM: 6 mon- 5 years: Weightfor- height (length) < -3 SD or Bilateral pitting pedal edema or MUAC <11.5 cm. 0 -6 mon: weight-for-length < -3SD or Bilateral pitting pedal edema [13].
- Diagnosis of MAM: weight-for-height (length) between -2 to -3 SD or MUAC between 11.5- 12.5 cm [14].
- Anthropometry: Length was measured for <2-year age group using infantometer, height for 2-5year age group using a stadiometer, weight using electronic weighing scale (sensitive up-to 10g), (MUAC) Mid upper arm circumference (6mon -5 year) using the cross-tape method in the nondominant arm.
- Weight-for-height used for diagnosis of SAM (< -3SD) and MAM (-2 to -3 SD) was plotted as per WHO growth charts. Descriptive statistics like Frequency, Percent, Mean, Standard deviation and inferential statistics like Chi-square test, ANOVA test was used.

Results

Table 1: Patient details

		Gender		**Total**
		Male	**Female**	
Normal		42	16	58 (58)
MAM		10	12	22 (22)
SAM		10	10	20 (20)
Age				
	< 6 months	6-12 months	>12 months	Total
Normal	8	30	20	58 (58)
MAM	0	10	12	22 (22)
SAM	0	8	10	20 (20)
	Severe pneumonia	**Pneumonia**	**No pneumonia**	**Total**
Normal	2	36	20	58 (58)
MAM	1	14	7	22 (22)
SAM	1	14	5	20 (20)

More number of females were malnourished, and a greater number of males were well-nourished, which was statistically significant (p = 0.017). There was no statistically significant association between age and severity of malnutrition. (p-value 0.060). There was no significant association between the severity of pneumonia and malnutrition. Therefore the prevalence of pneumonia was the same among both MAM and SAM children.

Table 2: Severity of diarrhoea versus severity of malnutrition

	Diarrhoea	**No dehydration**	**Some dehydration**	**Severe dehydration**	**Total**
Normal	38	4	16	0	58 (58)
MAM	14	2	4	2	22 (22)
SAM	14	-	6	0	20 (20)

There was no statistically significant association between the severity of diarrhoea and malnutrition. (p-value 0.550). Therefore the prevalence of diarrhoea was the same among both MAM and SAM children.

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Table 3: Comorbidities among classification of malnutrition

	Anaemia	No co-morbidities
Normal	6	48
MAM	4	14
SAM	2	10

More children with MAM had anaemia than SAM and normal groups. Fewer children with normal anthropometry had comorbidities. These data were statistically significant (p = 0.020).

Table 4: Complications among severity of malnutrition

	No complications	Empyema	Sepsis	Tuberculosis	Total
Normal	57	1	0	0	58 (58)
MAM	20	0	2	0	22 (22)
SAM	16	0	2	2	20 (20)

There is a statistically significant association between complications and severity of malnutrition [more complications are noted in the SAM group and MAM group (p-value 0.020)].

Table 5: Duration of hospital stay among the classification of malnutrition

	Number	Mean	SD	Std. Error	Minimum	Maximum
Normal	58 (58)	6.4828	3.02180	0.39678	1.00	18.00
MAM	22 (22)	8.2381	5.40282	1.17899	3.00	24.00
SAM	20 (20)	13.388	4.85240	1.14372	3.00	21.00

P-value was 0.005 showing a statistically significant association between the severity of malnutrition and duration of hospital stay being maximum in SAM followed by MAM and then the normal group. No statistically significant difference in the duration of stay in ICU.

Discussion

There are several enteric pathogenic agents with which malnourished children are commonly infected, and these agents often vary by nutritional status; for example, shigellosis and cholera are more common in severely malnourished children, [15] whereas rotavirus is the predominant cause of diarrhea in well-nourished children [16, 17].

Diarrhoea and pneumonia contribute to a third of worldwide childhood mortality. Both the infections are part of a vicious cycle of malnutrition and infection. Children who are undernourished are more prone to infections and have a higher morbidity and mortality rate [18]. A study by Christi MJ *et al* showed an association between complications, morbidities and severity of malnutrition [19]. Even in the present study, the statistically significant association between complications and severity of malnutrition was noted. In a study by Isanaka *et al*, it was concluded that on the basis of prevalence of undernutrition, the current global projections of mortality associated with SAM and MAM could be underestimated [20]. Programmes for the management of MAM have not been revised for the past 3 decades unlike those with respect to SAM, and hence needs appropriate and urgent amendments [21]. Nutrition care in children and mother will essentially contribute to national development. According to The Global Nutrition Report, the benefit-to-cost ratio is 16:1 for investment in nutrition among 40 middle and low -income countries. Preventing undernutrition at the earliest and throughout life is important [22].

Diarrhoea has short-term effects on nutrition and long-term consequences on the growth of the child [23]. In the present study, the prevalence of diarrhoea was same in SAM and MAM group. In a study by Brown KH *et al*, among 100 children admitted for SAM, 90% had evidence of infection at the time of admission, 75% had pneumonia, 43% had diarrhoea and death rate was 21%, the most frequent cause being infections. Mortality was more in younger children [24].

In the present study, the complications like sepsis and duration of stay were more in SAM children. SAM significantly increases the risk of under-5 mortality and also indirectly increases mortality by increasing the case fatality rate in infections like diarrhoea and pneumonia. Mortality in children with SAM is essentially the effect of infection [25]. Christi MJ *et al*, in their study on post-discharge mortality in children with severe malnutrition and pneumonia in Bangladesh among 405 children admitted for SAM and pneumonia, 8.7% had mortality within 3 months of discharge, among which new respiratory and gastro-intestinal symptoms were common. Hence, follow-up of the children after discharge from the hospital has a role in early recognition of complications and reducing mortality [26]. In another study by Christi MJ *et al*, demographic and socioeconomic status, including over-crowding and smoking were contributory factors to pneumonia related deaths. Education and increasing public awareness are necessary means to reduce these risks [27].

In a study by Tickell KD *et al*, children with a MUAC of < 12.5cm had more severe diarrhoea and danger signs when compared to better-nourished counterparts. Diarrhoeal pathogens such as cryptosporidium, virulent E.coli, Entamoeba histolytica, Shigella, Salmonella, Campylobacter,

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Pleisiomonas shigelloides have been associated with acute malnutrition. However, the higher disease severity is more likely to be due to socio-economic constraints and increased vulnerability associated with acute malnutrition, than due to different pathogenic flora [28]. In a study by Manary MJ, on the management of acute moderate and severe malnutrition, the adverse consequences of pneumonia and diarrhea on physical and intellectual development, and the importance of appropriate timely management to prevent these complications have been reviewed [29]. Hence, if MAM children are neglected, they may later land up in SAM and lead to more mortality due to complications and also prolonged hospital stay leading to a financial burden to the family and nation. Integrated management of MAM and SAM helps in the better recovery rate and good community coverage [30].

Conclusion

The prevalence of diarrhoea and pneumonia, which are the leading causes of under-five mortalities, were found to be same in both children with Moderate Acute Malnutrition and Severe Acute Malnutrition. Complications and morbidities in MAM are similar to SAM, hence, it is important to diagnose MAM and treat it vigilantly as in SAM. It is important to recognize and monitor MAM which may often go neglected.

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