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Original Research Article

Descriptive Observational Research to Assess the Severity of Malnutrition among Children with Pneumonia and Diarrhoea: Moderate Acute Malnutrition

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Abstract

Aim: The severity of malnutrition among children with pneumonia and diarrhoea: moderate acute malnutrition

Methods: This Descriptive observational study conducted in the Department of Paediatrics, Darbhanga Medical College and Hospital, Laheriasarai, Darbhanga, Bihar, India for 10 months. Total 100 Children between 1 month and 5 years of age with community-acquired pneumonia or diarrhoea. Diagnosis of 'Pneumonia' (fast breathing and/or chest in drawing) and 'severe pneumonia' (pneumonia with any danger sign). Diagnosis of diarrhoea: the passage of >3 loose stools/ day (or more frequent passage than is normal for the individual).

Results: More number of females were malnourished, and a greater number of males were well-nourished which was statistically significant (p = 0.021). There was no statistically significant association between age and severity of malnutrition. (p=0.061). There was no statistically significant association between the severity of diarrhoea and malnutrition. (p=0.52). Therefore, the prevalence of diarrhoea was the same among both MAM and SAM children. 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. 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 0.029). More children with MAM had anaemia (15%) than SAM and normal groups. Fewer children with normal anthropometry had comorbidities. These data were statistically significant (p = 0.022). In the present study, there was no mortality and 65% of SAM children had pneumonia, 20% had diarrhoea, while in the MAM group, 73.33% had pneumonia and 26.67% had diarrhoea.

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.

Keywords: diarrhoea, pneumonia, malnutrition

Introduction

Diarrhea is one of the leading causes of childhood morbidity and mortality [1] in developing countries [2,3], where an estimated 1.5 million young children annually die of diarrhea [4]. Although mortality caused by diarrheal illnesses has been reduced glob- ally, diarrhea-associated morbidity has changed very little [3]. The association between malnutrition and diarrheal mortality is bidirectional and has been reported for decades [4,6] as an association between diarrhea and poor growth and development of young children [1,7]. Malnutrition after diarrheal illness stems from anorexia, reduced absorptive function, and mucosal damage as well as nutrient exhaustion associated with each episode of diarrhea [6]. A significant proportion of global malnutrition is caused by enteric infections. Diarrheal illnesses affect weight as well as height gains, with the most dramatic effects observed in cases of recurrent illnesses [8]. Malnutrition can lead to reduced human performance and inadequate physical growth and cognitive development [1,9], and it is associated with increased frequency, duration, and severity of diarrheal episodes [8].

There are several enteric pathogenic agents with which mal- nourished children are commonly infected, and these agents often vary by nutritional status; for example, shigellosis and cholera are more common in severely malnourished children [10], whereas rotavirus is the predominant cause of diarrhea in well- nourished children [11,12].Moreover, several studies have indicated that children who suffer from shigellosis and cholera may become more severely malnourished after the recovery from disease [6,8,13].Individuals who live in deprived areas with poor sanitation, inadequate hygiene, and unsafe drinking water have greater exposure to enteric pathogens and an increased risk of morbidity and severity of diarrheal illnesses [14].

Material and Methods

This Descriptive observational study conducted in the Department of Paediatrics, Darbhanga Medical College and Hospital, Laheriasarai, Darbhanga, Bihar, India for 10 months

Inclusion criteria:

Total 100 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 analysis: On the basis of WHO guidelines the following were defined:

Diagnosis of ‘Pneumonia’ (fast breathing and/or chest in drawing) and ‘severe pneumonia’ (pneumonia with any danger sign) [15]. 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: Weight- for-height (length) < -3 SD or Bilateral pitting pedal edema or MUAC <11.5cm. 0 -6 mon: weight-for-length < -3SD or Bilateral pitting pedal edema [16].

Diagnosis of MAM: weight-for-height (length) between -2 to -3 SD or MUAC between 11.5- 12.5 cm [17].

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 non- dominant arm Weight-for-height used for diagnosis of SAM

Results

Table 1: Gender distribution among the severity of malnutrition

	Gender		Total
	Male	Female	
Normal	38	12	50
MAM	13	17	30
SAM	9	11	20
Total	60	40	100

More number of females were malnourished, and a greater number of males were well-nourished which was statistically significant (p = 0.021)

Table 2: Age distribution among the severity of malnutrition

	AGE			Total
	< 6 months	6-12 months	>12 months	
Normal	10	25	15	50
MAM	0	14	16	30
SAM	0	11	9	20
Total	10	50	40	100

There was no statistically significant association between age and severity of malnutrition. (p=0.061).

Table 3: Severity of diarrhoea versus severity of malnutrition.

	No diarrhoea	No dehydration	Some dehydration	Severe dehydration	Total
Normal	32	3	15	0	50
MAM	22	2	5	1	30
SAM	16	-	4	0	20
Total	70	5	24	1	100

There was no statistically significant association between the severity of diarrhoea and malnutrition. (p=0.52). Therefore, the prevalence of diarrhoea was the same among both MAM and SAM children.

Table 4: Severity of pneumonia versus severity of malnutrition

	Severe pneumonia	Pneumonia	No pneumonia	Total
Normal	3	32	15	50
MAM	1	21	8	30
SAM	1	12	7	20
Total	5	65	30	100

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 5: Complications among severity of malnutrition

	No complications	Empyema	Sepsis	Tuberculosis	Total
Normal	49	1	0	0	50
MAM	29	0	1	0	30
SAM	17	0	2	1	20
Total	95	1	3	1	100

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 0.029)]

Table 6: Comorbidities among classification of malnutrition

	Anaemia	No co-morbidities
Normal	5	45
MAM	8	22
SAM	2	18
Total	15	85

More children with MAM had anaemia (15%) than SAM and normal groups. Fewer children with normal anthropometry had comorbidities. These data were statistically significant (p = 0.022).

Table 7: Duration of hospital stay among the classification of malnutrition

	Number	Mean	SD
Normal	50	6.5	2.01
MAM	30	8.3	4.31
SAM	20	13.4	5.36
Total	100	8.2	5.69

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

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 under nutrition, 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 under nutrition at the earliest and throughout life is important [22].

In a study in Bangladesh, among 209 boys and 191 girls with pneumonia and diarrhoea, 17% were found to have SAM. high prevalence of pneumonia (62.72%) and diarrhoea were found in infancy, and in 1-2-year age group [23]. In the present study, SAM was found in 20%, which is comparable, even the prevalence of pneumonia (70%) was comparable. In the present study, a greater number of girls were undernourished. A positive association was noted between the duration of hospital stay and severity of malnutrition.

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, there was no mortality and 65% of SAM children had pneumonia, 20% had diarrhoea, while in the MAM group, 73.33% had pneumonia and 26.67% had diarrhoea.

Terri J Ballard et al, in their study, concluded that underweight and stunting were positively associated with acute lower respiratory infections and improving nutrition contributed to lowering the incidence of acute lower respiratory infections [25].Tupasi TE et al, in their study, concluded that the relative risks for morbidity and mortality for both acute upper and lower respiratory tract infections were higher in children with malnutrition compared to normal children [26].

Chisti MJ et al, in their study, concluded that malnutrition was associated with a significant increase in mortality risk in children with pneumonia. Also, the odds ratio and relative risk were higher for children with SAM than MAM [19]. In the present study, there was no mortality though morbidities were comparable in SAM and MAM group. Anaemia was noted to be more in the MAM group.

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 [27].

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 [28]. 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 [29].

In a study conducted in South Africa, Bamford et al, analysed the improvements in case fatality rates in under-5 children. Required measures to reduce under-5 mortality include a reduction in mother-to-child HIV transmission, improvement in infant and young child feeding, better immunization coverage, earlier and easier access to health care, the betterment of

social and community health as a whole [30].

Jones DK, et al, in their study concluded that along with nutrition, addressing the infection and inflammation plays a key role; along with anthropometric measurements, it is important to assess the child's health in-toto [31]. 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, 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 [32]. According to Williams PCM and Berkley JA, in their study in 2018, it was suggested that irrespective of uncomplicated or complicated SAM, a broad- spectrum antibiotic should be used, namely, amoxicillin via oral and parenteral route respectively. All the children in the present study were similarly started with Amoxicillin by parenteral route as per the WHO guidelines [33].

In a systematic review and meta-analysis in 2020, F100 was similar in effect to Ready-to-use therapeutic food, prophylactic antibiotic usage had better recovery in terms of disease as well as weight gain; high and low dose vitamin A supplementation were comparable in terms of mortality and gain in weight [34]. In a study in Afghanistan, it was concluded that parental education and income status, availability of safe drinking water, sanitary latrines, hygiene all play a key role in reducing the prevalence of acute nutrition among under-5 children [35]. Hence, in improving the nutritional status in children, national programs, programmatic policies in the betterment of the community in entirety are necessary.

In a study by Manary MJ, on the management of acute moderate and severe malnutrition, the adverse consequences of pneumonia and diarrhoea on physical and intellectual development, and the importance of appropriate timely management to prevent these complications have been reviewed [36].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 [37].

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.

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