

Post discharge morbidities and mortalities among children with severe acute malnutrition who did not undergo nutrition rehabilitation

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Abstract

Background: This prospective study evaluated the post discharge morbidities among children with severe acute malnutrition (SAM), including diarrhea and/or other acute illnesses, who did not agree to undergo the nutrition rehabilitation (NR) phase of management of SAM at Dhaka Hospital of icddr,b, Bangladesh. The probable causes of not undergoing NR were family and other unavoidable commitments.

Methods: We prospectively followed up 90 children aged 6–59 months of both sexes suffering from SAM with associated morbidities who presented at the Dhaka Hospital of icddr,b during the period of May to August 2014 and did not undergo NR following acute phase management. Three follow-up schedules were planned at two week intervals. For the second follow-up, caregivers brought their children to the follow-up unit, while the others were carried out over the phone.

Results: During the first follow-up, 37 of 70 (53%) reported different morbidities. Only 7 children came for the second follow-up and all of them required hospitalization for different morbidities. On third follow-up, 23 of 58 (40%) children reported morbidity. The odds of morbidities were 7.7 times higher (95% CI: 2.33–26.58, $p < 0.0001$) among the children who came from a poor family (monthly income < USD 127).

Conclusions: Children with SAM and diarrhea bypassing the NR frequently suffered from different types of morbidities. Nutrition rehabilitation is an important component of the management of SAM. As such, nutrition programs should consider the inclusion of the community-based management of acute malnutrition for the complete management of SAM in young children.

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Introduction

Malnutrition is the leading cause of death among children aged under five in developing countries [1, 2], and children suffering from severe acute malnutrition (SAM) are mostly vulnerable to death. According to the World Health Organization

(WHO), a child is considered to be suffering from SAM when the child has any one of the following conditions alone or in combination: weight-for-height Z score less than -3 (according to the WHO Multicentre Growth Reference Study standards), the presence of bilateral pitting, nutritional edema, or a mid-upper-arm circumference (MUAC) of less than

115 mm [3]. In 2014, 20 million children under five years of age suffered from SAM globally and every year, 0.5 to 2 million child deaths can be directly attributed to this serious condition [4]. Most of the children suffering from SAM live in developing countries in Asia and Africa [5].

In Bangladesh, over 450,000 children under five years suffer from SAM, which puts them at a 10 times greater risk of dying from different diseases [1]. In most cases, SAM is incidentally diagnosed when these children attend the hospital with associated co-morbidities. The WHO adopted a multi-step treatment protocol for SAM consists of three phases, the initial 'stabilization phase' or acute phase, the 'rehabilitation phase,' and the 'follow-up phase'[4]. The initial stabilization phase focuses on stabilizing the child as well as treating any associated co-morbidities, which usually takes about a week. This phase should be preferably followed in a facility setting. The rehabilitation phase is targeted to achieve the catch-up growth of the child, sustained thereafter. During the 'nutritional rehabilitation' (NR) phase, children are provided with energy-dense food to rebuild the body tissues and achieve catch-up growth, which usually takes approximately 2–4 weeks [6]. This phase can be carried out in a specialized Nutritional Rehabilitation Unit (NRU) or even at the community level depending on the availability of the necessary supplies and healthcare worker training.

The rehabilitation phase of the treatment protocol is of utmost importance and the availability of the facility based management of SAM should be ensured for optimal outcomes. In developing countries like Bangladesh, it is hard to accommodate the large number of children with SAM requiring management in the limited number of clinical facilities. Furthermore, NR is expensive and time-consuming. So, families with low socio-economic status find it extremely difficult to continue treatment, especially as in most instances the mothers/caregivers have commitments involving household chores and caring for other children. Hence, the rehabilitation phase is frequently bypassed during the facility-based management of SAM though it is offered to the patients as an integrated part of the child's recovery plan. This

predisposes the affected child to increased mortality if incompletely treated, as it has been shown that SAM is an important cause of post-discharge mortality in children treated for different childhood illnesses like diarrhea and pneumonia [7-10].

There are no data on mortality and morbidity patterns or the number of children undergoing treatment for SAM who do not complete the NR phase of the facility-based management of SAM. We followed a group of children suffering from SAM whose mothers or caregivers refused to stay at the NRU at Dhaka Hospital of the International Centre for Diarrhoeal Disease Research, Bangladesh (icddr,b), to undergo the NR phase of their recovery. The aim of this analysis was to observe the morbidity pattern and mortality of the children who bypassed the NR phase of the facility-based management of SAM.

Methods

Study design

The study enrolled children aged 6–59 months of either sex who were admitted to Dhaka Hospital of icddr,b, Bangladesh, with common childhood illness(es) and who were consequently diagnosed as a case of SAM according to WHO guidelines (11). The inclusion criteria included that the child did not undergo the nutritional rehabilitation phase following acute phase stabilization. During admission, the child's parent/caregiver answered a pretested, structured questionnaire to provide baseline information on the child's socio-demographic status. The children were initially stabilized as per the standardized WHO management protocol for SAM (6). Following the stabilization phase, the parents were invited to move to the Nutritional Rehabilitation Unit (NRU) for NR. A follow-up plan was prepared for the children who did not undergo the rehabilitation phase due to refusal by their parents during the period of May through August 2014. All families included in the study had to have a valid contact address and be contactable via phone.

Follow-up schedule

Three follow-ups were planned to evaluate the progress of the included children after leaving the hospital. The first follow-up was made over the phone two weeks after discharge, and the parents were asked if the child had had any type of illness over the past two weeks. One month after discharge (and two weeks after the first follow-up) the parents were asked to visit the NRU with their children. Anthropometric measurements and history of illnesses over the past two weeks were obtained from the parents. The third follow-up was conducted over the phone six weeks after discharge (and two weeks after the second follow-up) where similar information was requested as in the first follow-up.

Anthropometric measurements

Anthropometric measurements included body weight and height, which was measured for the participating children at the second follow-up. Measurements were performed by two trained research assistants. Body weight was measured with minimal clothing using a body weighing scale sensitive to 2 gm (Seca, Model no.7281321009, Hamburg, Germany) and height was measured using an infantometer sensitive to 0.1 cm (Seca, Model no. 4161721009, Hamburg, Germany).

Statistical analysis

All data were entered into SPSS for Windows (Version 20.0; SPSS Inc, Chicago, USA) and Epi-Info (Version 6.0, USD, Stone Mountain, Georgia, USA). The sample size used for this analysis was the number of participants who refused to undergo nutritional treatment at NRU during the period of May through August 2014. Differences between the two groups (the group with and the group without a history of morbidities) were compared by the Chi-squared test. Differences of means were compared by Student's t-test for normally distributed variables and by the Mann Whitney U test for variables that were not normally distributed. The strength of associations were determined by calculating the odds ratio (OR) and 95% confidence intervals (CIs).

Results

Over the four-month study period, a total of 133/336 (~40%) children aged 6–59 months of both sexes were diagnosed as cases of SAM at the time of admission at the hospital and did not undergo the NR phase of their treatment plan. Of them, 90 (68%) children consented to enrollment in this follow-up study and 43 (32%) were excluded because they did not provide a valid address or contact phone number. Seventy (78%) of the listed families were reached over phone for the first follow-up. Only 7 (10%) families attended the hospital for the second follow-up, and 58 (83%) families were successfully contacted by phone during the third follow-up (Figure 1).

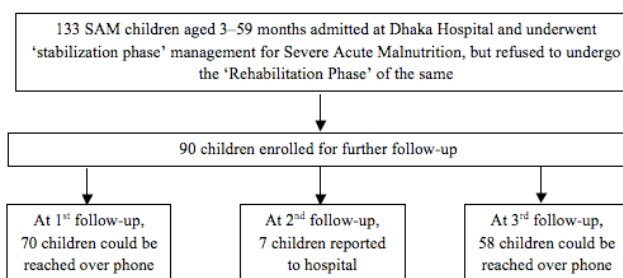


Figure 1. Follow-up responses

Among the children enlisted for the study, 33 (47%) were male. The children's mean age was 15 ± 4.2 (mean \pm SD) months. The mothers' mean age was 17.4 ± 5.3 years. Only 23 (32%) of the children's mothers reported that the child had been exclusively breast-fed up to six months of age, and 57 (81%) had completed the recommended immunizations for their age group. During admission, 51 (73%) children presented with diarrhea and 29 (27%) with respiratory illness. All of the children were suffering from SAM, which was categorized as marasmic (87% of cases) or marasmic kwashiorkor (13% of cases).

The mothers/caregivers of the 70 children could be reached over the phone for the first follow-up and 37 (53%) of them reported that the child had suffered a morbidity during the initial two-week follow-up period. Commonly reported morbidities were fever (21 children, 30%), diarrhea (15

children, 21%), cough and cold (15 children, 21%) and other morbidities like skin diseases, earache, etc. (20 children, 28%) (Figure 2).

At the second follow-up, only 7 (10%) families came to the hospital and all of them needed hospitalization due to some morbidity, like diarrhea with dehydration or severe pneumonia. The child's nutritional status was measured as the WLZ-score. The WLZ-score had deteriorated for 3 children during the second follow-up period in an alarming way while the remainder of the children showed a minor improvement or only slightly deteriorated WLZ-score although they were still suffering from SAM (Figure 3).

At the third follow-up, a total of 58 (83%) families could be reached over the phone and 23 (40%) of them reported some morbidity. Commonly reported morbidities were diarrhea (13 children, 57%), cough and cold (8 children, 38%), and others (2 children, 8%) (Figure 4). Among the 23 children with some comorbidity during the third follow-up period, 8 children required hospitalization due to acute illness. One child included in the study died from severe pneumonia while receiving treatment at the hospital. The factors most commonly associated with morbidities were poor socioeconomic status (monthly family income of < USD 127), working mothers, and mothers who had never attended school (Table 1).

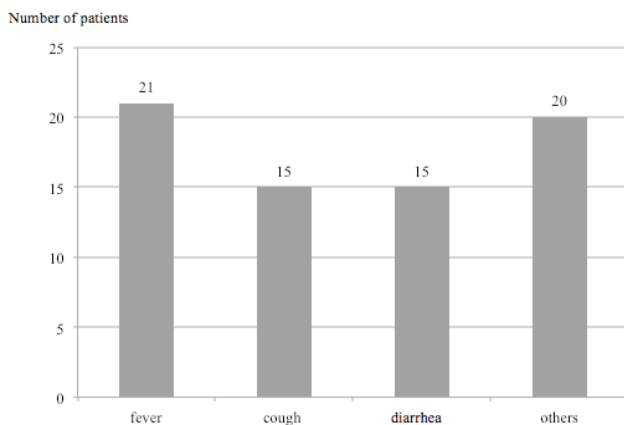


Figure 2. Different morbidities during first follow-up

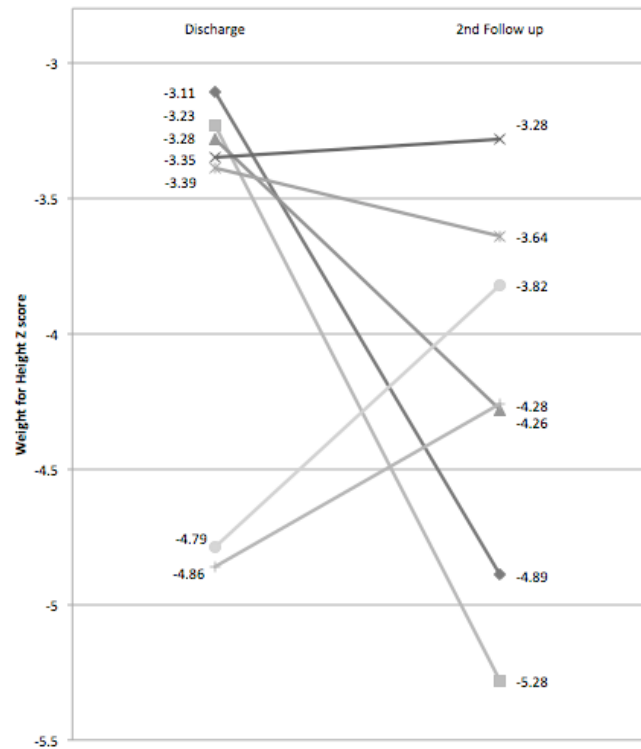


Figure 3. Change in weight-for-height Z score from discharge to second follow up

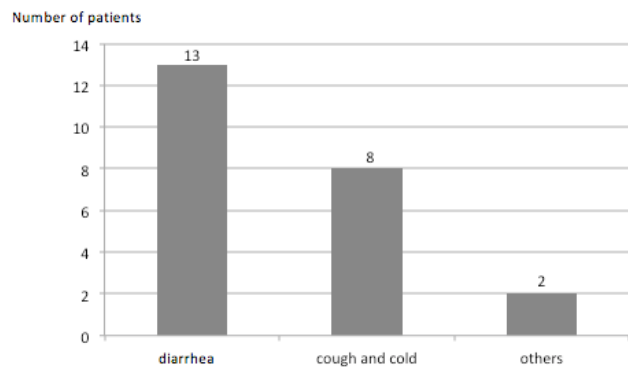


Figure 4. Different morbidities during third follow-up

Table 1. Factors associated with morbidities (first follow-up)

Factors	Children with morbidities n (%) N=37	Children without morbidities n (%) N=33	OR (95% CI)	P value
Monthly income < 127 USD	25 (67.5)	7 (21.2)	7.7 (2.62–22.83)	0.0001
Working mother	31 (83.8)	09 (27.2)	13.8 (4.30–44.05)	<0.001
Mothers education (ever attended school)	15 (40.5)	24 (72.7)	0.25 (0.09–0.70)	0.003
Toilet sharing	20 (54.0)	33 (100.0)	0.00 (0.00–0.13)	<0.001
Hand washing	26 (70.2)	27 (81.8)	0.52 (0.16–1.63)	0.13
Home distance (living within city)	23 (62.1)	24 (72.7)	0.61 (0.22–1.69)	0.18

CI: confidence interval; USD: United States Dollars

Discussion

In the absence of any data regarding post-discharge morbidity patterns among children with SAM who bypass the nutritional rehabilitation phase, we collected and analyzed data from our NRU in Dhaka, Bangladesh. This study shows that more than half of the children who did not undergo NR suffered from some kind of morbidity within six weeks of discharge from the health facility. The nutritional status of these children also deteriorated during the follow-up period, as revealed by anthropometric measurements at the second follow-up. Hospital admission was necessary for some children due to serious morbidities, and one case of mortality was reported after hospitalization.

The mortality rate found in our study is considerably lower than previously reported rates of mortality following discharge from hospital after complete treatment of SAM [8, 12, 13]. Even though the children included in our study did not undergo the nutritional treatment phase, this low mortality rate could be due to the exclusion of families who did not have an active phone number and/or to the large number of children who were lost during follow-up. Two studies of SAM among Bangladeshi children found mortality rates of 2.3% [13] and 2.8% [12] and both the studies followed-up children after complete recovery from SAM

following facility-based management. Chisti et al. reported an even higher post-discharge mortality rate of 8.7% among children within 90 days of discharge following treatment for SAM and pneumonia [8]. Khanum et al. [13] studied the mortality rates of children receiving facility-based rehabilitation compared with those of children receiving community-based rehabilitation. The mortality rate for children receiving community-based rehabilitation was similar to the current study’s rate (1.6%). A few studies on SAM among children in Africa [14, 15] compared the post-discharge mortality of children who received treatment for SAM with that of children who left the facility against medical advice. These studies found that the latter group had a two-fold higher mortality rate than the group of children who completed the treatment for SAM. Bahwere et al. [14] observed that death was 2.3–24.3 times higher for children who absconded from the feeding program while Perra et al. showed that the mortality risk was reduced when children underwent nutritional rehabilitation after completion of the stabilization phase [15]. In the FuSAM study, Kerac et al. found a post-discharge mortality rate of 10.4% after 90 days following the treatment for SAM [16]. In Tanzania, Von Roosmalen and Kusin found the mortality rate to be 9% and 8% during short-term

and long-term follow-up, respectively, following facility based treatment for SAM [17, 18].

The primary objective of this analysis was to observe the morbidity pattern among children who bypassed nutritional rehabilitation. We found that the morbidity rate was 53% and 40% in the first (within 2 weeks) and third follow-up (within 6 weeks), respectively; for both follow-ups, participants were contacted by phone. We did not find any similar study so were unable to compare previously reported morbidity rates with that found in the current study. We also explored common morbidities and found that fever was the most common form of morbidity followed by cough and diarrhea. This finding is similar to previous mortality related studies carried out in Bangladesh that collected data on morbidity rates and patterns [12, 13].

We also examined the associated factors possibly responsible for morbidities, although the data was limited. Low household income was found to be a significant risk factor for post discharge morbidities. Ample literature shows that a family's poor socio-economic status is a significant risk factor for SAM among children [9, 19-23]. Other morbidity risk factors include maternal education and maternal occupation. It can be assumed that an increase in maternal education leads to an increased maternal awareness of childhood malnutrition and thus would cause mothers to take the necessary measures to prevent child malnutrition and associated morbidities. Similarly, working mothers have less opportunity to exclusively breast feed during the first six months post-partum, which is an important protective factor against malnutrition [24].

Other key findings from our analysis was that very few families (only 10%) attended the follow-up examination in the facility unless the child was very sick. The percent of follow-up non-compliance in our study was much higher than that reported by other similar studies with a similar setup. For example, a study by Ashraf et al. in Bangladesh found that compliance dropped from 91%, at the first follow-up visit (a week after discharge) to 49%, at the tenth visit (around 6 months from discharge) [12]. Our analysis showed that a significant proportion of children had anthropometric

deterioration (57%) during the second follow-up as well as clinical relapse during both the second (100%) and third (15%) follow-up. Previous studies in Bangladesh reported a wide range (0.6%–17.8%) of relapse rates among children who received treatment for SAM [12, 13].

Due to long-term treatment, many families cannot afford to stay in hospital for the treatment of SAM and often bypass the rehabilitation phase, making the child even more vulnerable to repeated morbidities and mortality. However, the relapse rate of SAM was also high among those children who received complete treatment for SAM. An effective community-based rehabilitation and follow-up system could successfully identify, treat, and prevent relapse of SAM cases and thus reduce the prevalence of such cases. The WHO and UNICEF have both highlighted the potential role of community-based management for uncomplicated cases of SAM, suggesting that facility-based management is only necessary for complicated SAM [25]. For the success of SAM treatment, a ready-to-use energy-dense food is an important prerequisite. Such ready-to-use therapeutic foods (RUTF) are currently effectively used to treat malnutrition in the community in resource-poor settings in Asia and Africa [26-31]. This example could also be followed in south Asian countries like Bangladesh by using locally developed RUTF made from locally available and culturally acceptable ingredients. Thus, the community-based management of acute malnutrition (CMAM) has the potential to avoid SAM-associated morbidities and research is currently underway to explore the integration of SAM treatment into pre-existing community health worker programs such as the integrated community case management (iCCM) of malaria, pneumonia, and diarrhea [32]. To this end, more evidence is required on CMAM in a Bangladeshi setting.

The major limitation of the study was an inadequate number of participants, due to high drop-out rates, and a short duration of follow-up observation. Many enlisted participants were enrolled in the clinical trial but were excluded because they did not provide a valid phone number or permanent address. These patients may have come from more disadvantaged groups or had children with a poorer health status.

Another important limitation of our study may have been a lack of motivation for caregivers to attend the second follow-up visit at the hospital, possibly due to occupational or financial limitations. Further research is warranted to explore why some caregivers refuse to continue NR and complete the SAM management; identifying such barriers to compliance would help inform and improve future CMAM programs.

Conclusions

This study found that children with SAM who skipped the nutritional rehabilitation phase suffered more frequently from different types of morbidities. Gross deterioration of nutritional status was common among these SAM children. Factors such as poverty, limited maternal education, and maternal occupation were also associated with post discharge morbidities. To prevent these morbidities, children with SAM need appropriate nutritional rehabilitation, which is usually provided in a nutrition rehabilitation unit but could be done in a community setting if an appropriate therapeutic food were available. The preliminary findings of this study could help inform policymakers/researchers of the need for the establishment of CMAM in Bangladesh, and other countries where malnutrition is common, as well as a study with a large cohort to address the morbidity pattern and mortality associated with SAM.

Ethical approval

The protocol (Protocol no. PR14036) was approved by the institutional review board of icddr,b and informed written consent was obtained from each participant before enrolment into the study.

Author contribution

PM and MMI conceptualized the paper. PM, MMI and MIH did the statistical analysis. PM, SH and KMS wrote the manuscript with input from all authors. TA and MNHA reviewed the manuscript and provided critical inputs. All authors read and approved the final manuscript.

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