

SYSTEMATIC ANALYSIS OF IN-PATIENTS' CARE OF SEVERELY MALNOURISHED CHILDREN AT HAYATABAD MEDICAL COMPLEX PESHAWAR: A TOOL TO IMPROVE QUALITY OF CARE

Muhammad Younas, Muhammad Aqeel Khan, Jehanzeb Khan, Faridullah Shah, Arshia Munir
Department of Pediatrics, Hayatabad Medical Complex, Peshawar, Pakistan

ABSTARCT

Background: Severe malnutrition has a high mortality rate among hospitalized children in developing countries. Much of this has been attributed to provision of inappropriate and poor quality clinical care. The aim of this study was to assess the implementation in our unit. **Methods:** Hospital-based prospective audit, to assess implementation of WHO guidelines for the treatment of severe malnutrition steps 1-8. Data was collected at admission and on daily basis, and case records were reviewed on day seven and/or on death or discharge. Participants were consecutive children aged 6 to 59 months admitted to Nutritional Rehabilitation Unit, Hayatabad Medical Complex, Peshawar, with severe malnutrition from 1st January to 31st August 2011. The care to these children was provided by a team trained under WHO guidelines. **Results:** Among 147 children, male: female ratio was 1.26:1 and median age was 11.7 months; majority (59.2%) was below 24 months. Children with marasmus were significantly younger than those with kwashiorkor and marasmic-kwashiorkor. The highest degree of implementation was observed for Steps 5, 6 and 8 but initial steps (steps 1, 2 and 3) of stabilization, which were essential for the survival of these children, were poorly implemented and inappropriately provided. **Conclusion:** Present study demonstrated the gaps in care of severely malnourished children in this unit. Improving care will require a holistic and not simply medical approach.

KEY WORDS: Malnutrition; Marasmus, Kwashiorkor.

INTRODUCTION

Malnutrition is a major risk factor for death in children in developing countries,¹ and the risk is higher in children when they present with severe form of it.² Severe malnutrition contributes to ~ 54% of deaths in children under 5 years of age.³ Hospital management of severe malnutrition is an important component of a comprehensive approach to the problem. Early and effective management of severely malnourished children is essential to achieve a significant reduction in mortality.

In 1999 the World Health Organization published a set of guidelines for the treatment of severe malnutrition in children.⁴ With implementation of this protocol, mortality was reduced from 30% to 5% in nutritional centers around the world.⁵ Proper care for hospitalized malnourished children is a priority issue across the globe.⁶ Centers that improved their treatment of malnutrition have successfully reduced the death rate to <10%.³ However, in Pakistan mortality in this group is often at least 20% in the hospital settings.⁷ Much of this high inpatient mortality has been attributed to provision of inappropriate and poor quality clinical care.⁸

The aim of this study was to assess the implementation in our unit.

MATERIAL AND METHODS

This descriptive study was a hospital-based prospective audit of consecutive children admitted with severe malnutrition in Nutritional Rehabilitation Unit of Pediatric A unit of Hayatabad Medical Complex, Peshawar between 1st January to August 31st, 2011. This stabilization center for malnourished children was established in December, 2008 with the collaboration of UNICEF.

This center consists of 6 beds exclusively for the treatment of malnourished children, supported (technically and financially) by UNICEF. Therapeutic foods to these children were also provided by UNICEF. The center followed WHO guidelines i.e., 10 steps for inpatient care of severe malnutrition. The center was run by a Pediatric consultant, a medical officer, and three nutritional assistants. This team was trained, under WHO guidelines, to provide care to these children. An activity report of this center was provided to UNICEF fortnightly.

Inclusion criteria were children with age 6 to 59 months, and severe malnutrition. Severe malnutrition was defined according to WHO guidelines, as either (1) visible, severe wasting plus weight-for-height z-score (WHZ) less than 3, or (2) symmetrical edema involving at least the feet to define edematous malnutrition (kwashiorkor), irrespective of weight-for-height z-score or mid-upper arm circumference. Children who died or left the unit before 72 hours of admission were excluded.

We followed WHO Guidelines. Children with hypothermia (axillary temperature, 35.8°C) were placed under a blanket plus a radiant light; hypoglycemia (blood glucose, 54mg/dl) was treated with 5 ml/kg of 10% dextrose intravenously followed by 50 ml of 10% dextrose via nasogastric tube. Malnutrition oral rehydration solution (ReSoMal) was given to children with significant diarrhea (more than three watery stools/day). Intravenous fluids were reserved for children showing evidence of decompensated shock, defined as weak/impalpable pulses with impaired consciousness. Blood transfusions, 10 ml/kg whole blood given slowly over 3–4 h, were reserved for children with symptomatic severe anemia (hemoglobin \leq 5) and those with decompensated shock. Vitamin A, multivitamin supplements, potassium chloride, and folic acid were given daily until discharge. Iron supplements were given to children after clinical improvement and resolution of edema. All children received intravenous ampicillin (50 mg/kg four times a day) and amikacin (15 mg/kg once daily) for at least 5 days. Amikacin and ceftriaxone were used as second-line antimicrobials or when indicated by microbiological results. In addition, children received mebendazole 100 mg 12-hourly for 3 days and metronidazole 5 mg/kg 8-hourly for 5 days.

For children reluctant to take feeds, a nasogastric tube was fixed for milk feeding. F75 and F100 milk formulae were prepared according to the standard protocols. Initially, F75 was given at a rate of 130 ml/kg/d (every 3–4 hour). It was gradually replaced by F100 (in accordance with WHO guidelines) as soon as the appetite returned and edema started to resolve. Thereafter, the volume of milk was calculated based on daily weights.

Data was collected on daily basis and case records were reviewed on day seven and on death or discharge. A specifically designed proforma was used to collect the data. Caregivers of living children were interviewed at the end of the first week about the care given to the child in the early phase of treatment.

Treatment charts of all children included in this study were reviewed and data checked

by two different medical officers for completeness, accuracy, and consistency prior to analysis.

Data collected was analysed using SPSS version 13.0. Weight for height Z-scores were calculated using EPINUT. Chi square tests were used for comparing categorical data, and t test and analysis of variance (ANOVA) for continuous data.

RESULTS

During the study period, 241 children were admitted in this unit, but only 147 (61%) fulfilled the inclusion criteria. Sample characteristics are depicted in Table 1.

Gender was not associated with a specific form of severe malnutrition ($p = 0.07$). The median age was 11.7 months with a range of 6-59 months; 59.2% (87/147) of the children were aged below 24 months. Children with marasmus were significantly younger than those with kwashiorkor and marasmic-kwashiorkor. The mean age for chil-

Table 1: Sample characteristics of the study population (n=147).

Characteristics		Number of cases (Percentage)
Gender	Male	82 (55.8)
	Female	65 (44.2)
Malnutrition	Marasmus	59 (40.1)
	Kwashiorkor	52 (35.4)
	Marasmus-kwashiorkor	36 (24.5)
Co-morbidities	Gastroenteritis	99 (67.4)
	Pneumonia/ chest infection	85 (57.8)
	Clinical sepsis	28 (19.0)
	Osteomyelitis	2 (1.4)
	Tuberculosis	54 (36.5)
	Urinary tract infection	47 (32.0)
	Malaria	13 (08.8)
	Meningitis	5 (3.5)
	HIV	1 (<1.0)

dren with marasmus was 12.9±7.4 months, kwashiorkor 23.9±11.9 and marasmic-kwashiorkor 19.4±9.7 months (ANOVA $p=0.01 \times 7$). The median WHZ score was "3.4 with no significant difference between the clinical groups. The audit of care stepwise is given below:

Step 1: Treatment and prevention of hypoglycemia:

- Only 38 (38/147, 25.9%) children were investigated for hypoglycemia at admission
- Only 16 children were treated for hypoglycemia within 30 minutes after admission whereas median waiting time when treatment instituted was 9.8 hour
- Accurate and on time treatment was provided to only 16 children (16/147, 10.9%, 95% CI 7.3-15.7)

Step 2: Treatment and prevention of hypothermia:

- Correct management of hypothermia was noted in only 36 children (36/147, 24.5%, 95% CI 13.4—33.9)
- First body temperature was recorded in 47 (47/147, 32%), 52 (52/147, 35.4%) and 12 (12/147, 8.1%) children after 4, 8 and 24 hours of admission respectively.

Step 3: Treatment and prevention of dehydration:

- Hypovolemic shock was noted in 11 (11/99, 11.1%) children, only 7 (7/11, 63.6%) were correctly treated.
- Indiscriminate use of IV fluid was noted in 35 (35/136, 25.7%) children.
- Monitoring for signs of over hydration and deterioration was rarely done.
- Correct Step 3 was followed in 59 (59/147, 40.1%, 95% CI 30.6-48.9) of children.

Step 4: Correct electrolyte imbalance:

- 93 (63.3%) of children were investigated for electrolyte imbalance and only 12 (8.2%) had electrolyte imbalance. Only 5 children were treated for electrolyte imbalance and treatment was instituted after 6-9 hours after admission.
- 103 (70%) of children have received appropriate potassium supplementation, minerals and trace elements within 6 hours of admission.
- Six children with edematous malnutrition were erroneously given furosemide for their edema.

- Correct Step 4 was followed in 57 (57/147, 38.8%, 95% CI 48.4-72.5) of children.

Step 5: Treat infections routinely:

- All children received broad spectrum antibiotics at admission.
- 108 (73.5%) children received first line while 39 (26.5%) received second line antibiotics at admission, because they were considered to be in unstable/serious condition.
- 40 children who were treated initially with first line antibiotics were shifted to second line antibiotics later on.

Step 6: Correct micronutrient deficiencies:

- 127 children received micronutrients on day one, remaining 20 received these micronutrients on day two.
- Iron was inappropriately prescribed in 7 children in acute stabilization phase; however, it was not prescribed in 32 children later in the rehabilitation phase.

Step 7: Initial feeding:

- 77 children were fed with F75 in the initial phase at admission. The rest were fed on ward 'special milk' (a relatively high calorie/high protein milk), non-lactose milk, lactose-free and gluten-free milk and soya-based milk. Children continued with breast feeding where applicable.
- Delay in starting first feeding with F75 was noted in 48 children.
- Mothers/caregivers were mainly responsible for administration of feeds and the majority reported giving three-hourly feeds. nutritional assistants
- 84 mothers/caregivers were well educated about the administration of diet after 48 hours of admission. However, 51 children were receiving less than 60% of calculated needs after 72 hours of admission.
- Feed supervision by the professional staff was poor but feed charts were filled appropriately by 24 hour recall method.

Step 8: Catch-up feeds:

- Acute phase of stabilization was lasted on average six days.
- Feed volumes were rarely increased, however, after the transition period. This was due to failure of doctors to adjust feed volumes accordingly.

- 102 caregivers were interviewed on day 7 of admission to assess knowledge and actual practices in care. Most caregivers (84%) had correct knowledge and correctly giving diet and medicines to their children.

DISCUSSION

This detailed information regarding treatment given to the severely malnourished children in this unit not only enables us to determine the shortfalls but also helped us to improve the management of these children. According to this study, management of severe malnutrition remains a challenge with critical deficiencies in care being observed in the majority of steps. Major shortfalls in the care were observed in step 1, 2, 3, 4 and 7.

Hypoglycemia is a common complication in malnourished children which can lead to brain damage since glucose is the main fuel for the brain and ultimately death.⁹ Treating or preventing hypoglycemia is vital during the initial stabilization phase of the treatment.¹⁰ Late diagnosis and ineffectively treating this complication was observed in this study which was also documented by Berti A et al in his study.¹¹ Other shortfalls which we observed in this study that can prevent hypoglycemia were insufficient monitoring of the feedings by nutritional assistants, neglect of night feedings, and inadequacy of the meals provided. Ashworth et al. also documented that delay in prompt start of therapy, especially initial re-feeding of children, and inadequate and erratic nursing care, in particular monitoring of feeds mainly lead to improper management of this step.¹²

Hypoglycemia and hypothermia usually occur together and are signs of infection.¹³ Malnourished children are susceptible to hypothermia because they have a lower metabolic rate and a larger body surface area per kilogram and fat losses resulting in less insulation and more heat loss and infections which lead to insufficient energy available for thermoregulation.¹⁴ Main reasons for not following this step properly in this study were the lack of instructions provision for the mother to keep her child warm and inability to recognize and to feel the importance of this step. Ashworth A, et al also stated in their study the importance of educating accompanying caregiver to warm their child, as mother could play a pivotal role in carrying this step.⁸ A number of studies had emphasized to train mothers and health personnel in order to allow for a successful adoption of simple interventions that prevent/treat hypothermia and that was reported to decrease case fatality.¹⁵

Because of difficulty in diagnosis of dehydration in severe malnutrition and estimation of its

severity, re-hydration fluid should only be given intravenously if children are in shock. More than half of the children suffered diarrhea at admission and others developed diarrhea during therapy. Karaolis N found that 60% of acutely malnourished children have diarrhea, supporting the association between diarrhea and malnutrition.¹⁶ However, severely malnourished children not in shock should be hydrated orally using ReSoMal which has low sodium and high potassium. These guidelines were not adequately followed and a large number of children not in shock were indiscriminately given intravenous fluids. Monitoring for over-hydration was not done and neither were volumes of fluids given properly recorded. Poor management of dehydration and correction of electrolytes imbalance could be due to lack of knowledge about the dangers of over-hydration and electrolytes imbalance and also the limited number of nursing staff.¹⁷

Consistent with findings from other studies, antibiotics were routinely administered to these malnourished children because they might not present with signs or symptoms of infection. Bhan et al suggested that there was insufficient evidence to support this recommendation.¹⁸ In the hospital, all children received antibiotics, but only 53 presented with either fever or hypothermia.

Early feedings were essential in severely malnourished children to prevent hypoglycemia and hypothermia.¹⁹ Children with severe malnutrition should be given small frequent feeds of starter formula (F75) and continue breast-feeding where applicable. In this study there was a long delay before the first feeding and in particular children admitted at night were normally not fed until 8:00 AM the following day, though starter formula F75 was available in the ward. This could be attributed to the perception by nurses and nutritionist that feedings at night might be dangerous and the child, because of lack of continuous monitoring, might aspirate the feed. Monitoring and computing amount of feed taken was rarely done regularly but re-call method was used. Timely bedside decisions were not taken by supervising clinical staff in the majority of cases.

In this study, caregivers were mainly responsible for feeding and oral rehydration. Despite the fact that majority of caregivers were uneducated, we observed that most children's caregivers developed the ability to feed their children competently. This suggested that training of caregivers in basic duties such as feeding and identifying danger signs may be a useful way to relieve pressure on nurses and improve care.²⁰

CONCLUSION

The present study demonstrated gaps in the care of severely malnourished children in this unit. It was clear that many health workers (including nutritionists) had a limited understanding of the needs of these high-dependency children and where expertise was available it might not be effectively used. Strategies that might provide improvement in care might include the establishment of a specialized malnutrition unit or a specialized malnutrition team to co-ordinate care and educate health workers and caregivers. Refresher courses or workshops must be arranged on regular basis to improve and update the knowledge of the team involved in the care of these children.

REFERENCES

1. Faruque ASG, Ahmed AMS, Ahmed T, Islam MM, Hossain MI, Roy SK, et al. Nutrition: basis for healthy children and mothers in Bangladesh. *J Health Population Nutrition* 2008; 26: 325-39.
2. Naheed A, Saha SK, Breiman RF, Khatun F, Brooks WA, Arifeen SEI, et al. Multihospital surveillance of pneumonia burden among children aged <5 years hospitalized for pneumonia in Bangladesh. *Clin Infect Dis* 2009; 48: S82-S89.
3. Bejon P, Mohammed S, Mwangi I, Atkinson SH, Osier F, Peshu N, et al. Fraction of all hospital admissions and deaths attributable to malnutrition among children in rural Kenya. *Am J Clin Nutr* 2008, 88:1626-31.
4. Ashworth A, Khanum S, Jackson A, Schofield C. Guidelines for the inpatient treatment of severely malnourished children. World Health Organization 2003.
5. Maitland K, Berkley JA, Shebbe M, Peshu N, English M, Newton CR. Children with severe malnutrition: can those at highest risk of death be identified with the WHO protocol? *PLoS Med* 2006; 3:e500.
6. Bachou H, Tumwine JK, Mwachime RK, Tylleskar T. Risk factors in hospital deaths in severely malnourished children in Kampala, Uganda. *BMC Pediatr* 2006; 6:7.
7. Pakistan Institute of Development Economics, Micro-nutrient Laboratories Aga Khan University and Medical Centre Karachi. National nutrition survey 2001-2002. Islamabad, Pakistan: Planning Commission, Government of Pakistan and UNICEF, 2004.
8. Ashworth A, Chopra M, McCoy D, Sanders D, Jackson D, Karaolis N, et al. WHO guidelines for management of severe malnutrition in rural South African hospitals: effect on case fatality and the influence of operational factors. *Lancet* 2004, 363:1110-15.
9. Achoki R, Opiyo N, English M. Mini-review: Management of hypoglycaemia in children aged 0-59 months. *J Tropical Pediatrics*, 2010; 56: 227-34.
10. Molyneux E, Ahmad S, Robertson A. Improved triage and emergency care for children reduces inpatient mortality in resource constrained settings. *Bull World Health Organ* 2006, 84: 314-9.
11. Berti A, Bregani E.R, Manenti F, Pizzi C. Outcome of severely malnourished children treated according to UNICEF 2004 guidelines: a one-year experience in a zone hospital in rural Ethiopia. *Transactions of the Royal Society of Tropical Medicine and Hygiene* 2008; 102: 939-44.
12. Ashworth A, Jackson A, Uauy R. Focusing on malnutrition management to improve child survival in India. *Indian Pediatr* 2007; 44: 413-6.
13. Bachou H, Tumwine J.K, Mwachime R.K, Tylleskar T. Risk factors in hospital deaths in severely malnourished children in Kampala, Uganda. *BMC Pediatr* 2006; 6:7.
14. Jackson AA, Ashworth A, Khanum S. Improving child survival: Malnutrition Task Force and the paediatrician's responsibility. *Arch Dis Child* 2006; 91: 706-10.
15. Talbert A, Atkinson S, Karisa J, Ignas J, Chesaro C, Maitland K. Hypothermia in children with severe malnutrition: low prevalence on the tropical coast of Kenya. *Journal of Tropical Pediatrics*, 2009; 55: 413-6.
16. Karaolis N, Jackson D, Ashworth A, Sanders D, Sogaula N, McCoy D, et al. WHO guidelines for severe malnutrition: are they feasible in rural African hospitals? *Arch Dis Child* 2007; 92: 198-204.
17. Falbo AR, Alves JGB, Filho MB, Caminha MFC, Cabral-Filho JE. Decline in hospital mortality rate after the use of the World Health Organization protocol for management of severe malnutrition. *Trop Doct* 2009; 2: 71-2.
18. Bhan MK, Bhandari N, Bhal R. Management of the severely malnourished child: perspective from developing countries. *BMJ* 2003; 326: 146-51.
19. Giugliani C, Duncan BB, Harzheim E, Breyse S, Jarrige L. The impact of a short-term intervention using the WHO guidelines for the management of severe malnutrition at a rural facility in Angola. *Arch Dis Child* 2010; 95:198-202.
20. Bucens IK, MacLennan C. Survey of childhood malnutrition at Dili National Hospital, East Timor. *JPOCH* 2006; 42: 28-32.

Corresponding author:

Dr. Muhammad Younas Paracha
Assoc. Prof. Pediatrics HMC
House No: 253-A (Upper story)
Street 7, N-2, Phase 4
Hayatabad, Peshawar, Pakistan
E-mail: mahad_younas@yahoo.com