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AUDIT OF CARE FOR CHILDREN AGED 6 TO 59 MONTHS ADMITTED WITH SEVERE MALNUTRITION AT KENYATTA NATIONAL HOSPITAL, KENYA

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Summary

We conducted a prospective audit of 101 children with severe malnutrition aged 6 to 59 months admitted to Kenyatta National Hospital, Kenya's largest tertiary level health facility, from February-April 2008. A structured tool was prepared to capture data to allow assessment of implementation of the WHO guidelines steps 1-8. Overall, 58% of children had marasmus and 47% of children were younger than one year old. Common co-morbidities at admission were diarrhoea (70.3%) and pneumonia (51.4%). The highest degree of implementation was observed for Step 5, treatment of potentially severe infections (90%, (95% CI 85.1-96.9)). Only 55% of the patients had F75 prescribed although this starter formula was available in this hospital. There was a delay in initiating feeds with a median time of 14.7 hours from the time of admission. There was modest implementation of Step 2, ensuring warmth (46.5%, 36.8-56.2), Step 3, treat dehydration (54.9%, 43.3-66.5) and Step 4, correct electrolyte imbalance, (45.5%, 35.6-55.8%). There was least implementation of Step 8, transition to catch-up feeding (23.8%, 13.6-34.0). We conclude that quality of care for children admitted with severe malnutrition at KNH is inadequate and often does not follow the WHO guidelines. Improving care will require a holistic and not simply medical approach.

Keywords

Severe malnutrition; Process of care; Treatment; Adherence; Audit; WHO guidelines

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Conflict of interest: None

Ethical approval: The study was approved by KNH Ethics and Research Committee. A written consent was obtained from the parent/guardian for any child to be enrolled into the study.

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Introduction

Malnutrition is a common cause of preventable morbidity and mortality among children in developing countries and is a risk factor for illness and death in an estimated 60% of the almost 10 million deaths from preventable causes for children aged below five years.1-4 Clinically severe malnutrition is also an important problem in hospitals in economically poor countries and is associated with very poor outcomes.6,7 Despite an improved understanding in the pathophysiology of this condition over the last five decades, hospital mortality rates of severe malnutrition have remained high, with rates of up to 50% being reported.3,8-10 Much of this high inpatient mortality has been attributed to outdated and inappropriate clinical care.3,11-13

In an effort to improve the quality of hospital care for severely malnourished children and reduce case fatality rates, the World Health Organization (WHO) developed clinical guidelines with 10 steps that need to be followed in the inpatient care of severe malnutrition.1 The guidelines have been adopted by the Ministry of Health in Kenya and incorporated into their Basic Pediatric Protocols.14 The rationale for following these 10 steps is based on studies that provide evidence that their use results in improvement of care and a decline in case fatality.13,15-18 In a review of 140 studies on management of severe malnutrition in developing countries, Bhan et al, found evidence that careful assessment and appropriate treatment using WHO standardized protocols reduced morbidity and mortality from rates as high as 40-50% to some as low as 6%.12

As mortality from severe malnutrition remains a significant problem in Kenya's largest teaching and referral hospital we carried out a prospective audit of care for patients aged 6-59 months admitted with severe malnutrition a) To determine the current practices in inpatient care of severely malnourished children at KNH b) To determine the proportion of children appropriately managed according to the WHO's first eight steps of care.

Materials and methods

Study design, study site and subjects

The study was a hospital-based prospective audit for patients admitted with severe malnutrition in general pediatric wards of Kenyatta National Hospital (KNH). KNH is an 1800 bed hospital that serves both as a teaching hospital and a national, tertiary referral health facility. Clinical care was provided by Consultant Pediatricians, Resident Pediatricians (paediatricians-in-training), Medical Officers, Clinical Officers (diploma-level clinicians), nurses, and nutritionists. Sick children were first triaged, assessed and provided with immediate care in a walk-in paediatric filter clinic (PFC). The resident Pediatricians and Medical Officers were responsible for the definitive initial evaluation and management of patients. Most of the clinicians but very few of the nurses had undergone training in Emergency Triage Assessment and Treatment PLUS (ETAT+) which incorporates inpatient care for severe malnutrition.19

We studied children aged 6-59 months admitted with severe malnutrition as defined in the WHO guidelines.1 To provide moderate precision (95% confidence intervals +/− 10%) around estimates of the proportion of children receiving care representing adherence to the guidelines we aimed to study 100 children.

Data collection

The principal investigator (CN) visited the general pediatric wards daily between 8 am and 9 pm and recruited consecutive eligible patients. Case records were reviewed on day 7 and on death or discharge. Relevant information was abstracted and entered in a pro-forma sheet.

Information collected was supplemented with information obtained through a structured interview with care givers and direct, daily observations on the wards.

Care givers of living children were interviewed at the end of the first week using an open ended, structured questionnaire on the care given to the child in the early phase of treatment.

An inventory of commodities necessary for the management of severe malnutrition was completed by the principal investigator and the availability and reliability of supplies was explored using a self administered questionnaire completed by ward-based nurses and nutritionists. The latter asked staff to rate availability of items on a four point scale as: never available, rarely available, usually available or always available.

Data management

Data were cross checked for completeness, accuracy, and consistency prior to analysis with SPPS version 14 software. Weight for height (WH) Z scores were calculated using EPINUT. Chi square or Fisher's Exact tests were used for comparing categorical data, and student's t test and analysis of variance (ANOVA) for continuous data. Simple summaries of inventory findings, views on availability of supplies, staff and care giver perceptions were prepared.

RESULTS

We recruited 101 children over a period of 3 months from 1st February to 28th April 2008. Out of these, 58 (57%) were boys and 43 (43 %) were girls giving a male: female ratio 1.4:1.

The most frequent type of severe malnutrition was marasmus (58%), followed by marasmic-kwashiorkor (27%) and kwashiorkor (15%). Sex was not associated with a specific form of severe malnutrition ($p = 0.085$.) The median age was 13.0 months with a range of 6 to 59 months, 85.1% 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 children with marasmus was 14.4 months (SD ± 8.5), kwashiorkor 21.9 months (SD ± 13.8) and marasmic- kwashiorkor 18.7 months (SD ± 10.6) (ANOVA $p = 0.019$). The median WHZ score was −3.5 with no significant difference between the clinical groups. Common co-morbid clinical conditions documented at admission were diarrhea (70.3%) and pneumonia (51.5%).

Thirty eight patients died, a case fatality rate of 38% during the study period, half of the deaths occurred in the first 48 hours of admission on the ward. Commercially prepared F75 and F100 and ReSoMal were largely available during the study (Table 1) and in fact most resources required were present (Table 1) with the exception of Zinc or WHO combined mineral-vitamin mix. However no ward had wall chart guidelines on the management of severe malnutrition.

Audit Of The Process Of Care

We describe the audit of the process of care given to the patients recruited in the study in regard to steps 1-8. Steps 1 and 3 are primarily initiated in the Paediatric Filter Clinic while other steps relate solely to management provided on the paediatric wards. The results are collectively summarized in table 2.

Triage

Over 90% of children were appropriately triaged for emergency or priority care in the Paediatric Filter Clinic.

Step 1: Treat/prevent hypoglycemia

Diagnosis, treatment and prevention of hypoglycemia were inadequately done at both PFC and on the wards. A total of 30 (29.9%) children had random blood sugar (RBS) done in either PFC or the wards though glucometers and glucose strips were largely available throughout the study period (Table 1). Two children had RBS less than 3 mmol/l and were appropriately managed with 10% dextrose. No feeding or presumptive treatment for hypoglycemia was documented at PFC. There was a long delay in initiating feeds on the wards with median waiting time of 14.7 hours. Only six of the 30 (20%) children who did not have diarrhea were fed within the first hour of arrival on the ward. Overall 34% of the patients received their initial feed after 19 hours of admission on the ward.

Step 2: Treat /prevent hypothermia

All wards had separate malnutrition rooms with electric heaters but only 47 children were kept warm with the rest nursed together with well nourished children. Children were admitted with their mothers. However only 14% of mothers were given instructions on how to keep their children warm through proper clothing and minimal washing and exposure. Monitoring of temperature was rarely done at admission or during hospitalization.

Step 3: Treat / prevent dehydration

PFC—Sixty four children were documented to have diarrhea, and fourteen of them were in hypovolemic shock. Most children in hypovolemic shock were treated with normal saline contrary to the guidelines. Indiscriminate use of intravenous fluids in children not in shock was common. Twenty one children not in shock were appropriately rehydrated with ReSoMal, but only 13 (62%) of them received the correct volume.

Ward care—Management of shock was better than in PFC with half of the children appropriately managed. Indiscriminate use of IVF for children not in shock was, however, still documented. Forty children were rehydrated with ReSoMal, out of whom 92.5% got the correct volume. Monitoring for signs of over hydration and deterioration was rarely done.

Blood Transfusion Practices—Twelve (11.9%) children were transfused during the study period. Four of them had hemoglobin (Hb) of less than 5gm/dl. Another four had Hb more than 5gm/dl and the remaining four had no documented Hb results and were transfused based on clinical judgment. Out of the twelve only one child had correct volume of blood transfused.

Step 4: Correct electrolyte imbalance

Approximately 56(55%) of children were prescribed commercially prepared F75 and thus should have received appropriate potassium supplementation, minerals and trace elements. However only 46 (46%) had the correct volume prescribed. Children not prescribed F75 were also not prescribed supplemental potassium. Four children with edematous malnutrition were erroneously given furosemide for their edema.

Step 5: Treat infections routinely

Children were routinely given antibiotics with 90% of children receiving broad spectrum antibiotics as per WHO recommendations.

Step 6: Correct micronutrient deficiencies

A total of 56 children (55%) received high dose vitamin A on day one, out of whom 72% received the correct dose for age. There was no documentation in the medical notes on

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previous Vitamin A administration prior to the admission. Iron was appropriately not prescribed in the acute phase but neither was it prescribed later in the rehabilitation phase.

Step 7: Initial feeding

Only 55% of children were fed with F75 in the initial phase though premixed formula was available. This was mainly due to failure of doctors to prescribe it. The rest were fed on ward 'special milk' (a relatively high calorie / high protein milk), whole cow's milk and a few on routine ward diet. Children continued with breast feeding where applicable. The average volume of F75 where prescribed was 125 ml/ kg per day and 82% of those started on F75 received more than 80% of calculated needs. Mothers were mainly responsible for administration of feeds and the majority reported giving three hourly feeds. Feed supervision by the professional staff was poor and feed charts were poorly filled.

Step 8: Catch-up feeds

The acute phase lasted on average six days. A total of 43 children had a transition to F100, representing 64.2% of those who were alive by the end of one week. Feed volumes were rarely increased, however, after the transition period. This was due to failure of doctors to adjust feed volumes accordingly.

Care Giver's Knowledge and Practices

Mothers were responsible for feed administration often with minimal supervision. Nutritionists were responsible for provision of feeds and the training of caregivers on how to give feeds. Sixty one caregivers were interviewed on the 7th day of admission to assess knowledge and actual practices in care. Nineteen caregivers (31%) understood that starter milk F75 was a component of the treatment regime for children with severe malnutrition. However, most (69%) caregivers reported giving the correct 3 hourly feeds day and night.

DISCUSSION

According to this study management of severe malnutrition remains a challenge at KNH, the national referral hospital of the Republic of Kenya, with critical deficiencies in care being observed in a majority of steps. Major shortfalls in care include treatment and prevention of hypoglycemia and hypothermia, delay in prompt start of therapy, especially initial re-feeding of children, and inadequate and erratic nursing care, in particular monitoring of feeds and fluids. However supplies of major commodities were generally good in contrast to the findings of Chopra and colleagues in South Africa.13 Triage was appropriately performed and better than in other reports.19

Children with severe malnutrition and diarrhea were not nursed in "malnutrition rooms" but in non-warmed diarrhea rooms, together with well nourished children with diarrhea. Thus, despite the availability of heaters, (unlike the situation reported by Ashworth, *et al13*) children did not benefit from them and although mothers were admitted with their children only 14% were instructed on how to keep children warm.

Because of the difficulty in diagnosis of dehydration in severe malnutrition and estimation of its severity, rehydration fluid should only be given intravenously if children are in shock. Severely malnourished children not in shock should be rehydrated orally using ReSoMal which has low sodium and high potassium. These guidelines were not adequately followed and a large number of children not documented to be in shock were indiscriminately given intravenous fluids, both at PFC and on the wards. Monitoring for over-hydration was not done and neither were volumes of fluids given properly recorded. Poor management of

dehydration could be due to lack of knowledge about the dangers of over-hydration and also the limited number of nursing staff.

Infections are very common in malnourished children but can be difficult to diagnose because common signs, such as fever, inflammation and crepitations are often missing.20 Broad spectrum antibiotics are, therefore, routinely administered to hospitalized, severely malnourished children. In this study 99% of children received antibiotics and 90% got appropriate broad spectrum antibiotics including gram negative cover.

Children with severe malnutrition should be given small frequent feeds of starter formula (F75) and continue breastfeeding where applicable. In this study 55.4% of children were fed with F75 with the rest being fed on porridge, cow's milk and some on routine ward diet. Ashworth et al also found children being fed on full strength milk and adult meals.13 Feeding should be started immediately on admission. In this study there was a long delay before the first feeding and in particular children admitted at night were normally not fed until 9 am the following day. This was despite the presence of starter formula F75 on the ward. This could be attributed to the perception by nurses that provision of feeds was solely the duty of the nutritionist and lack of awareness of the risk of hypoglycemia in severe malnutrition. Monitoring and computing daily feed requirements was rarely done in keeping with studies that have shown that activities that require frequent bedside decisions by physician and nursing staff are often poorly done.21 In our setting this failure to change feeds or increase volumes was mainly due to a lack of clear feed prescriptions on feed charts and failure of communication to the nutritionist and care giver by the clinicians.

Most of the children were accompanied by care givers who were responsible for feeding and oral rehydration of their children. Due to a shortage of nursing staff it was also noted that care givers were responsible for monitoring and charting feeds, although this task was often poorly done and there was no proper supervision system in place. Despite this we observed that most of children's caregivers developed the ability to feed their children competently during the period of admission. This suggests that training of care givers in basic duties such as feeding and documenting feeds, and identifying danger signs may be a useful way to relieve pressure on nurses and improve care.

Correcting the deficiencies in care observed to improve quality of care at KNH will require efforts to improve health system infrastructure and management. The “malnutrition rooms” set aside for severe malnutrition are small and usually highly congested, with a single bed accommodating six children at times, making it hard to maintain adequate standards of hygiene. This explains in part why severely malnourished children are often admitted to the open wards where they cannot be kept warm. Shortages of nurses and nutritionists also exacerbate the problems of caring for these high-dependency children. However, it is also clear that many health workers (including nutritionists) have a limited understanding of the needs of these patients and where expertise is available it may not be effectively used. Strategies that might provide considerable improvements in care might include the establishment of a specialized malnutrition unit or at least a specialized malnutrition team to coordinate care and educate health workers and care givers.

This study demonstrates the gaps in care of the severely malnourished child in a national hospital. The results cannot be generalized to lower level hospitals, because KNH is a referral hospital, but previous reports indicate that in smaller hospitals the problems may be at least as bad.23 The findings are of concern given that the hospital is a major teaching centre. While some deficiencies are linked to inadequate infra-structure, crowding and low numbers of nurses care might be usefully improved with a greater focus on establishing a coordinated system for care for these highly vulnerable children.

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Table 1

Availability of essential supplies for management of severely malnourished child in KNH reported by ward-based health workers (n=50).

	Always available	Available most times	Rarely available	Never available
Glucometer and glucostix	44(88%)	6 (12%)	-	-
ReSolMal(premixed sachets)	36(72%)	14 (28%)	-	-
F75(pre-mixed bags)	40 (80%)	10 (20%)	-	-
F100(pre-mixed bags)	40 (80%)	10 (20%)	-	-
Potassium chloride	28 (56%)	20 (40%)	2(4%)	-

Table 2

Interventions given in steps 1-8 for the management of severely malnourished child.

Interventions done in each step	Frequency (%)	95% CI
Step 1 (Treatment and prevention of hypoglycemia)		
Random blood sugar done on in PFC or on admission	30/101	
Feeding within 1 hr of ward admission (excludes 71 patients with diarrhoea)	6/30	
Median waiting time from the time of admission on the ward to initial feeding (n=101)	14.7 hours	
Step 2 (Treatment and prevention of hypothermia)		
Correct management of hypothermia	**47 (46.5%)**	**36.8-56.2**
Step 3 (Treatment and prevention of dehydration)		
Documented history of diarrhoea in PFC	64/101	
Hypovolemic shock in PFC	14 /64	
Correctly managed for shock in PFC	2/14	
Inappropriate use of IVF in patients not in shock in PFC	15/50	
Correctly managed for diarrhoea (no shock) in PFC	13/50	
Correct step 3 in the PFC	**15/64 (23.4%)**	**13.8-35.7**
Documented history of diarrhoea on the ward	71/101	
Hypovolemic shock on the ward	4/71	
Inappropriate use of IVF in patients not in shock on the ward	19/67	
Correctly managed for shock on the ward	2/4	
Correctly managed for diarrhoea no shock	37/67	
Correct step 3 on the wards	**39/71(54.9%)**	**43.3-66.5**
Step 4 (Correct of electrolyte imbalance)		
Prescribed correct volume of F75	46/101	
Given furosemide	4/101	
Correct step 4	**46/101 (45.5%)**	**35.6-55.8**
Step 5 (Treatment infections routinely)		
Prescribed penicillin only	3/101	
No antibiotics at all	2/101	
Correct dose of penicillin and (gentamycin or chloramphenicol *)	91/101	
Correct step 5. Choice of antibiotics and dosage	**91/101 (90%)**	**85.1-96.9**
Step 6 (Correct micronutrient deficiencies)		
Vitamin A correctly prescribed	49/101	
Step 7 (Initial re-feeding)		
Prescribed F75	56/101	
Prescribed correct volume of F75	46/101	
Route of feeding specified	37/56	
Feed intake monitored	18/56	

Interventions done in each step	Frequency (%)	95% CI
Step 8 (Catch-up feeding)		
Proportion started on F100	43/67	
Correct F100 volume	27/43	
Feed volume increased after transition period	16/43 (37.2%)	
Correct step 8	**16/67 (23.8%)**	**13.6-34.0**

*Chloramphenicol was used for children suspected to have meningitis.

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