

ORIGINAL ARTICLE

Poor adherence to the World Health Organisation guidelines of management of severe acute malnutrition in children 6 to 59 months of age at Kalakla Turkish Hospital in Khartoum, Sudan

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ABSTRACT

Severe acute malnutrition (SAM) constitutes about a third of the estimated 8 million deaths in under 5-year-old children, and the World Health Organisation (WHO) protocol of management is used in hospital management. The present study aims to assess adherence to the WHO guidelines of management of SAM in children aged 6–59 months at Kalakla Turkish Hospital in Khartoum, Sudan. Medical records/files of 169 children, mean (standard deviation) age was 18.5 (10.4) months with a range of 6–54 months, admitted to the hospital were reviewed. The male/female ratio was 1.5:1. No records of history and the proportion of missing examination information were >5%. Weight-for-height Z-score was not calculated for 61% of children and other anthropometric measurements were inadequately recorded. Seven classifications

of acute malnutrition were recorded instead of two. Oedema, mid-upper arm circumference and Z-score were neglected as tools of classification. Blood sugar, haemoglobin concentration and malaria film/rapid diagnostic tests were the only requested tests in 122 (72.2%), 14 (8.3%) and 49 (29%), respectively. Appropriate treatment was documented in 68 (40.2%) children for intravenous (IV) dextrose for hypoglycaemia, 25 (14.8%) for kangaroo technique, 32 (18.9%) covering with blanket for hypothermia, 106 (62.7%) for F75 milk formula and 115 (68%) for F100 milk formula feeding; and there were no records of receiving oral/IV rehydration. The case fatality rate was 5.9%. Quality of care can be improved by training. Improvement of hospital infrastructure with attention to specifying rooms for management of acute malnutrition will be of benefit to the application of the guidelines.

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Under five-year-old children; Malnutrition; Guidelines; WHO; Sudan.

INTRODUCTION

Malnutrition is a major cause of mortality in children under 5 years of age, as it constitutes about a third of the estimated 8 million deaths in this age group [1]. Severe acute malnutrition (SAM) affects approximately 20 million preschool children; the majority of them are from Africa and South-East Asia [2]. Severe malnutrition in children who are 6–59 months of age is expressed as weight-for-height/length less than -3 Z-score or less than 70% of the median National Center for Health Statistics/World Health Organization (WHO) reference values, or the presence of oedema [1]. Worldwide, 19 million children under 5 years of age are suffering from SAM [3]. The WHO protocol of management of severe malnutrition for hospital setting has been so far partially assessed by studies in African and Asian settings [4–7]. Partial adherence to the guidelines was documented, however, adherence to the classification of SAM was acceptable in these settings [4,5]. Malnutrition constitutes more than 20% of the causes of admission of under 5-year-old children to a referral hospital in the capital city of Sudan, Khartoum [6]. SAM constituted approximately 30% of causes of admissions with a case fatality rate (CFR) of almost 6% in hospitalised children in a rural area in eastern Sudan [7]. Out of the eighteen states of Sudan, 11 have a prevalence of malnutrition above 15%, a figure recognised by the WHO standards as above the emergency threshold [8]. One of the strategies to reduce mortality and morbidity of acute malnutrition in children in Sudan is the implementation of the standard protocols of management [9]. The Sudan Ministry of Health and the Sudan Association of Paediatricians recommend the use of the WHO guidelines for management of malnutrition in hospital settings [10,11]. The endorsement of the guidelines aims, among other strategies, to reduce mortality and morbidity of malnutrition in children below 5 years of age. Since then, however, there is no published data on assessment of adherence to the guidelines. This study aimed to assess adherence

to the WHO guidelines of management of SAM in children 6–59 months of age at Kalakla Turkish Hospital in Khartoum, Sudan.

METHODS**Study type, site and population**

This retrospective hospital-based study was conducted in Kalakla Turkish Hospital in Khartoum, Sudan. After taking the permission from the hospital administration, the medical records/files were reviewed for children with SAM admitted during the period from June to November 2016. Paediatricians, residents and general practitioners are managing children at different levels of care at the hospital. The hospital is equipped with a laboratory performing routine investigations. Data were collected from the medical records/files of a population of children within the age range 6–59 months who were admitted with SAM. Physicians examine and admit children with SAM to the paediatric ward and manage them following the WHO guidelines of management of SAM in children [12].

Sampling and sample size

As 15% of the population were children below 5 years of age [13], the population was calculated from the total population of the state. In a nearby region, the prevalence of SAM in this age group was recorded to be 27.3% [7]. Using online OpenEpi, Version 3, the sample size was calculated as equal to 131 acutely malnourished children at the power level of 80%.

Data collection

The medical files of the children were reviewed anonymously. The expected information was as per WHO manual of management of children with SAM [12]. It included the patients and parents' identification, family information, medical, dietary and immunisation history. In addition, it incorporated the physical examination including the demographic data [weight, height, weight-for-height Z-score, mid-upper arm circumference (MUAC), bilateral lower limb oedema and temperature]. Malnutrition classification and diagnostic signs (number of episodes of vomiting

and stools per day; signs of dehydration, volume of urine passed/day, cough, anaemia pulse and respiratory rates) were also included. Treatment offered and its outcome were recorded as well as it was labelled in the records. In the hospital, the general practitioners usually admit children with SAM to the paediatric ward. Children are then reexamined by a paediatrician who provides care as it is expected to be according to WHO guidelines [12]. The medical care included stabilisation of complicated cases, and feeding using F70 and F100 special formulas. Children were discharged when criteria for discharge were satisfied according to the protocol guidelines.

Statistics

Data were double checked and entered into computer using SPSS software, version 22 (SPSS Inc., Chicago, IL). Frequency distribution was calculated for qualitative data (nominal or ordinal). For numerical data, mean and standard deviation (SD) were calculated. Percentage and proportion were calculated and the Fisher's exact test was used to compare groups. Statistical tests were considered significant at a $p < 0.05$.

RESULTS

Materials

The data consisted of 160 medical files of children labelled as SAM. Their mean \pm SD age was 18.5 (10.4) months with a range of 6–54 months. However, the age of nine children was not recorded. Males were 101 (60.1%) and females were 67 (39.9%) with a male/female ratio of 1.5:1. Nevertheless, gender was not recorded for one child.

Adherence to guidelines on taking history and physical examination

Health personnel did not record the personal history or family information, and in the medical history the information on child appetite, vomiting, diarrhoea, intestinal parasite, hair changes and weight loss were missing in all files. Furthermore, the dietary and immunisation history were not recorded.

The proportion of missing information of the clinical characteristics in the records of children with SAM ranged from 2% to >5% (Table 1). Table 2 illustrates that the weight-for-height Z-score, among other parameters, was not calculated for almost 61% of children with SAM. No diagnostic symptoms/signs (number of episodes of vomiting and stools per day; signs of dehydration, volume of urine passed/day, cough, anaemia, pulse and respiratory rates) were recorded for any of the children with SAM.

Adherence to classification of SAM

The classification of SAM was incompatible with the WHO guidelines as seven classifications were recovered from records whereas the guidelines recommend only two, moderate or severe malnutrition. These incongruent classifications are illustrated in Figure 1. Table 3 further illustrates the deviation from the WHO classification of SAM; where 45 (26.6%) of SAM children had oedema and 30 (17.7%) had -2 weight-for-height Z-score were otherwise classified as seven different types, 22 (13.1%) would be classified as moderate malnutrition. However, the information on either classification or weight-for-height Z-score was missing in the majority of records, 117 (69.2%). No record was found mentioning oedematous or non-oedematous SAM as per guidelines [12]. Based on low MUAC (MUAC defined as less than 115 mm), SAM could have been diagnosed in 11 (84.6) out of 13 cases who were otherwise classified as nonspecific.

Adherence to recommended laboratory tests

Blood sugar, haemoglobin concentration and blood film or rapid diagnostic test for malaria were done for 122 (72.2%), 14 (8.3%) and 49 (29%), respectively (Table 2). The remaining of the "tests that may be useful" was not requested in all records.

Adherence to treatment

Intravenous dextrose was administered to 68 (40.2%) children and the rest did not receive dextrose or the status was unknown. Blood sugar

Table 1- Recorded clinical characteristics of children with acute severe malnutrition admitted to Kalakla Turkish Hospital in Khartoum, Sudan (N = 169).

Variable	Information recorded as present/absent	Information not recorded
	Frequency (%)	Frequency (%)
Bilateral lower limb oedema	165 (97.6)	4 (2.4)
Clinical evidence of major infection	160 (94.7)	9 (5.3)
Pallor	165 (97.6)	4 (2.4)
Signs of vitamin A deficiency	163 (96.4.2)	6 (3.6)

Table 2 - Recorded performance and documentation of the anthropometric measurements and laboratory values of children with acute severe malnutrition admitted to Kalakla Turkish Hospital in Khartoum, Sudan (N = 169).

Variable	Value reported as done		Measurement not done
	Frequency (%)		Frequency (%)
	Measured and documented	Measured not documented	
Weight (kg)	163 (96.4)	6 (3.6)	0.0
Height/length (cm)	137 (81.1)	11 (6.5)	21 (12.4)
Weight-for-height Z-score	52 (30.8)	14 (8.3)	103 (60.9)
Mid-arm circumference (in cm)	69 (40.8)	12 (7.1)	88 (52.1)
Random blood sugar (mg/dl)	34 (20.1)	13 (7.7)	122 (72.2)
Haemoglobin concentration	145 (85.8)	10 (5.9)	14 (8.3)
Blood film/RDT for malaria	104 (61.5)	16 (9.5)	49 (29.0)

RDT – rapid diagnostic test.

Table 3 - Recorded classification of SAM in relation to weight-for-height Z-score and lower limb oedema.

Classification	Weight-for-height Z score		Total	Bilateral lower limb oedema frequency (%)		Total
	≤ -3 frequency (%)			Present	Absent	
	≤ -3	≥ -3				
Protein energy Malnut	12 (46.2)	14(53.8)	26 (15.4)	20 (50)	20 (50)	40 (23.7)
SAM	9 (75.0)	3 (25.0)	12 (7.1)	8 (18.2)	36 (81.8)	44 (26)
Nonspecific	6 (66.7%)	3 (33.3%)	9 (5.3)	7 (23.3)	23 (67.7)	30 (17.8)
Marasmus	2 (50.0)	0 (0.0)	2 (1.2)	1 (7.1)	13 (92.9)	14 (8.3)
Marasmic kwashiorkor	1 (100.0)	0 (0.0)	1 (0.6)	6 (75.0)	2 (25.0)	8 (4.7)
Kwashiorkor	0 (0.0)	2 (100.0)	2 (1.2)	3 (60.0)	2 (40.0)	5 (2.9)
Underweight	0	0 (0.0)	0 (0.0)	0 (0.0)	4 (100.0)	4 (2.4)
Information missing	0	0	117 (69.2)	0	0	24 (14.2)
Total	30 (17.8)	22 (13.0)	169 (100.0)	45 (26.6)	100 (59.2)	169 (100)

Malnut – malnutrition.

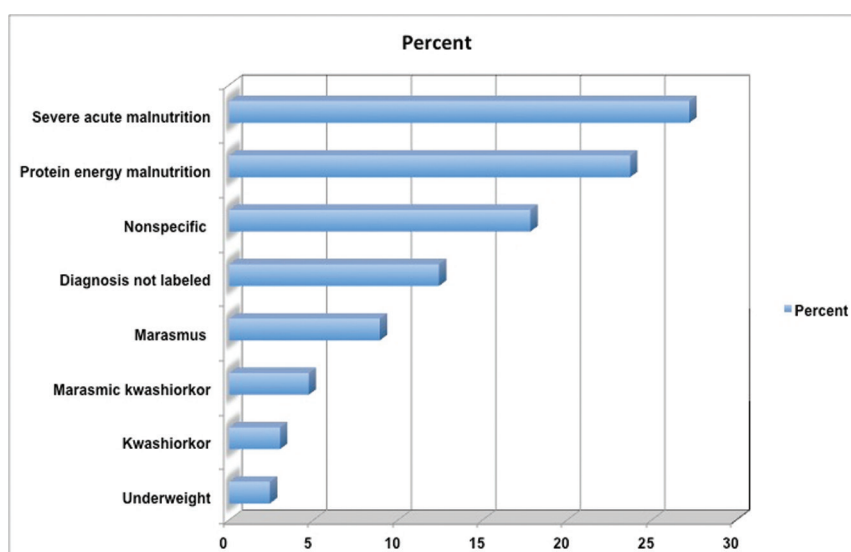


Figure 1 - Documented classification of children with SAM admitted to Kalakla Turkish Hospital in Khartoum, Sudan ($N = 169$).

was measured in only 34 (20.1%) children. More or less similar values were observed for the treatment received for hypothermia in the form of kangaroo technique and covering using blankets. There were no records of any child receiving rehydration solution for malnutrition (ReSoMal). However, the majority of SAM children received F70 and F100 formulas (Table 4).

Treatment outcome of children admitted with SAM

The number of treated and discharged children with SAM was 97 (57.4%), 41 (24.3) were still under treatment when the study was ongoing. Ten died making an inpatient CFR of 5.9%, 10 (5.9%) left the hospital against medical advice and only two (1.2%) were referred to further treatment. Records of treatment outcome of nine (5.3%) SAM children could not be traced (Figure 2).

Length of hospital admission

The average (SD) length of hospital stay (ALOS) was 11.0 ± 8.6 days with a mode of 7, a median of 9 and a range of 59 days. Nine (5.3%) SAM children have a duration of hospital stay of >4 weeks. Being more or less than 7 days, ALOS was insignificantly associated with treatment outcome, $p = 0.075$.

DISCUSSION

This study is the first to assess adherence to WHO guidelines adopted by health authorities and academic bodies in a provincial general hospital in Sudan [12]. It documents the poor adherence to the guidelines in different steps and doubts the training outcomes using the Sudanese Federal Ministry of Health training module which was principally based on the WHO guidelines [14].

The major flaws were noted in the history information. Diagnostic signs were not recorded in all patients with SAM. The anthropometric parameters necessary for classification of SAM were inadequate. Classification of malnutrition was totally diverging from the guidelines classifications. The main defects were noted in the recommended laboratory tests and in the following necessary steps of treatment: intravenous dextrose, treatment of hypothermia and, to some extent, ready-to-use-therapeutic food (F70 and F100). No records were traced for any child with SAM receiving ReSoMal. Follow-up information in all records was lacking.

Studies have demonstrated the possibility to attain low CFR using the WHO protocol for inpatient management of SAM [15]. Unlike the practice in this cohort, studies from Africa and Asia have

Table 4 - Treatment offered to children with SAM in Kalakla Turkish Hospital in Khartoum, Sudan.

Variable	Treatment administered		Treatment not administered or unknown
	Frequency (%)		
	Yes	No	Frequency (%)
Intravenous dextrose	68 (40.2)	98 (58)	3 (1.8)
Kangaroo technique	25 (14.8)	129 (76.3)	15 (8.9)
Covering using blanket	32 (18.9)	133 (78.7)	4 (2.4)
F70 milk formula	106 (62.7)	58 (34.3)	5 (3.0)
F100 milk formula	115 (68)	51 (30.2)	3 (1.8)
Vitamin A	29 (17.1)	135 (79.9)	5 (3.0)
Antimalarial	10 (5.9)	155 (91.7)	4 (2.4)
Antibiotic	167 (98.8)	1 (0.6)	1 (0.6)

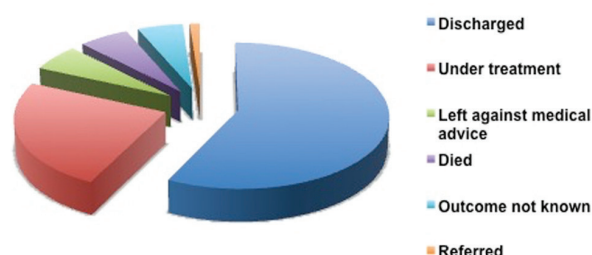


Figure 2 - Treatment outcome of children with SAM admitted to Kalakla Turkish Hospital in Khartoum, Sudan (N = 169).

demonstrated that classification of SAM was in accordance with the guidelines as moderate/severe and oedematous/non-oedematous SAM [4,16]. This can be attributed to documented training in these settings in comparison to this study setting where training coverage is unknown despite a well-constructed module of training [14]. Lack of supervision and training are highly likely explanation because even MUAC was not used to classify SAM in children labelled as nonspecific. However, classification terminologies for malnutrition such as kwashiorkor and marasmus are still reported in studies from different settings [15,16].

Prevention and treatment of hypoglycaemia in children with SAM in the present study are comparable to that reported in a similar Kenyan setting [4]. Likewise, measures to manage hypothermia (kangaroo technique and covering with blankets) were not satisfactory in this study and

children were managed in a general paediatric ward without any special rooms with heating facilities.

Treatment of dehydration using ReSoMal and or IV fluids was judged as inadequate in this study despite the fact that dehydration is a known complication in malnourished children. Nevertheless, most SAM children fed on ready-to-use therapeutic food (F70 and F100).

Albeit inconsistent application of the guidelines, a CFR of 5.9% was lower than a similar Kenyan provincial hospital which recorded 13.5% and the 10.8% rate of a tertiary centre in Bangladesh [4,16]. The rate in this study, according to WHO is considered moderate fatality (5%–10%) and the WHO objective is to achieve a rate of <5% [12]. Causes of death could not be traced in the records of children in this study. The ALOS was acceptable in comparison with other settings and lower than comparable low-resources setting in Asia [4,16,19]. However, the maximum duration of hospital stay of 60 days in this study was too long compared to the recommended sphere standards of <4 weeks [20].

This study has several limitations. The retrospective nature of the study is an inherent shortcoming that limits generalisation of the results. Being the first in the country to assess adherence to the guidelines, results comparison could only be made with regional and worldwide studies. In addition, training of the health personnel, hospital setting and equipment were not assessed to determine level of flaws.

CONCLUSION AND RECOMMENDATION

This study documents the poor adherence to the WHO guidelines of management of acute severe malnutrition in children <5 years of age in Kalakla Turkish Hospital, Khartoum, Sudan. Quality of care can be improved by training. Improvement of hospital infrastructure with attention to specifying rooms for management of acute malnutrition will be of benefit to the application of the guidelines.

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