

**UNIVERSITY OF NAIROBI**  
**DEPARTMENT OF PAEDIATRICS AND CHILD HEALTH**

**AUDIT OF CARE OF SEVERELY ACUTE MALNOURISHED CHILDREN  
AGED 6-59 MONTHS ADMITTED AT ALSABAH CHILDREN HOSPITAL-  
JUBA (SOUTH SUDAN).**

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DEGREE OF MASTER OF MEDICINE IN PAEDIATRICS AND CHILD  
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## DECLARATION

This Dissertation is my original work and has not been submitted for a degree in any other university.

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**DEDICATION**

**TO THE CARE OF ALL MALNOURISHED CHILDREN AT ALSABAH  
CHILDREN' HOSPITAL.**

## **ACKNOWLEDGMENT**

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## **ABBREVIATIONS**

GOSS	Government of South Sudan
ACH	Al-Sabah Children Hospital
IVF	Intravenous fluid
IMCI	Integrated Management of Childhood Illnesses
MDGs	Millennium Development Goals
MOH	Ministry of Health
NCHS	National Centre for Health Statistics
NGT	Nasogastric Tube
ORS	Oral Rehydration Solution
RBS	Random Blood Sugar
ReSoMal	Rehydration solution for Malnourished
UNICEF	United Nations Children's Fund
WHO	World Health Organization
OPD	Outpatient department
GOS	Government of Sudan
SAM	Severe acute malnutrition
PHCCs	Primary Health Care Centres
OTP	Outpatient Treatment Program
SC	Stabilisation Centres
SPA	Service provision assessment
PHCU	Primary health care unit
PHCC	Primary health care centre

## **DEFINITIONS**

**Severe acute malnutrition** is defined by a very low weight for height (below -3z scores of the median WHO growth standards), by visible severe wasting, or by the presence of nutritional oedema, or a mid-upper arm circumference of less than 115mm.<sup>1,8</sup>

**Diarrhoea** is the passage of three or more loose or liquid stool per day.

## **ABSTRACT**

**Introduction:** Malnutrition is a critical public health concern in south Sudan where an estimated 200,000 children under five are at risk of being malnourished. With the ongoing conflict, the number is expected to rise due to displacement and food insecurity. Studies have shown that adequate and timely treatment of these children will lead to reduced mortality.

**Objectives:** The primary objective of the study was to determine the proportion of children appropriately managed for severe acute malnutrition (SAM) according to WHO guidelines at Al-Sabah Children Hospital, and to determine the availability of the inventory commodities necessary in the management of SAM.

**Study Design:** A hospital based longitudinal survey was conducted.

**Study area:** Al-Sabah Children Hospital (ACH) Outpatient department and Malnutrition wards.

**Study Population and duration:** Children admitted with diagnosis of severe acute malnutrition aged 6-59 months from 4<sup>th</sup> February to 4<sup>th</sup> April 2015.

**Data collection procedure:** The principal investigator visited the outpatient Department and malnutrition ward daily to recruit patients. The nutritional status of the child was assessed, this included measuring the height, weight and mid upper arm circumference. A data pro forma sheet was prepared according to steps in the WHO guidelines and applied to each patient thus assessing care provided during hospitalization. Information collected was supplemented with information obtained through a structured interview with the care givers and direct, daily observations on the wards.

An inventory of commodities necessary in the management of severe malnutrition, availability and reliability of supplies was done using a self-administered questionnaire with the nurses and nutritionist.

**Results:**

Overall, 49% of children had Marasmus and tended to be older than those who had kwashiorkor. Common co-morbidities at admission were malaria (42%) and gastroenteritis (39%). Of the eight steps of care evaluated, five steps were correctly followed in more than 70 % of cases. The proportion of children appropriately managed were 77% in step 1, 59% in step 2, 85.4% in step 3, 98% in step 4, 58 % in step 5 and 6. 97% in step 7 and 86% in step 8. There was lack of some essential commodities necessary for the management of severely malnourished children at ACH.

**Conclusion:**

Quality of care for children admitted with severe malnutrition at Al-Sabah children's hospital was with more than 50% of children appropriately managed in all eight steps.

## **1.0 BACKGROUND AND LITERATURE REVIEW**

### **1. INTRODUCTION**

#### **1.1 BURDEN OF MALNUTRITION**

Every year 10.6 million children die worldwide due to preventable conditions such as pneumonia, diarrhoea, malnutrition and measles. Of these deaths, malnutrition accounts for approximately 2.2 million deaths annually in children under the age of five <sup>2</sup>. Globally, severe acute malnutrition is the most important risk factor for illness and death. It is the direct cause of about 300,000 death per year and indirectly responsible for about half of all deaths in young children<sup>3,9</sup>.

In the developing countries, 50.6 million children under the age of 5 years are malnourished <sup>2</sup>. In Sub –Saharan Africa, the number of malnourished people has increased from 90 million in 1970 to 225 million in 2008.

#### **1.2 MALNUTRITION IN SOUTH SUDAN**

One in seven south Sudanese children die before their fifth birthday, mainly from preventable diseases such as diarrhoea and malaria. Malnutrition is another killer in South Sudan with malnutrition rate exceeding WHO emergency threshold of fifteen percent.<sup>4,5</sup>

According to Sudan Household Survey 2010, thirty one percent of South Sudanese children less than five years are stunted, twenty three percent wasted and twenty eight percent underweight with wide variation across the state. <sup>4,5</sup>

South Sudan ranks 15<sup>th</sup> highest in the world in term of mortality rates for children aged less than five years.<sup>7</sup>

The number of children affected by malnutrition and its long term consequences place it among the greatest public health problems facing the world today.

## **1.3 SEVERE ACUTE MALNUTRITION CAUSES, PATHOPHYSIOLOGY AND COMPLICATIONS**

### **CAUSES OF MALNUTRITION**

Result from range of causes closely related to poverty, which include: maternal under-nutrition, low birth weight, deficiencies of specific nutrients (iodine, vitamin A, Iron, Zinc), diarrhoea, inadequate infant and child feeding practice, low exclusive breastfeeding practices for six month, lack of access to vaccination, lack of safe drinking water and sanitation and limited household income.<sup>9</sup>

### **PATHOPHYSIOLOGY**

Many of the manifestation of severe acute malnutrition represent adoptive response to inadequate energy and protein intake. When there is inadequate intake, activity and energy expenditure decreases. Despite this adoptive response, fat stores are mobilized to meet the ongoing energy requirement and once the fat stores are depleted, protein catabolism must provide the substrate for maintaining basal metabolism.

It is unknown why some malnourished children develop oedema and others do not. But there are some suggestions of factors related to this like variability among infants in nutrient requirement and body composition at time the deficit occurred. Also it has been suggested that giving excess carbohydrate to a non-oedematous child reverses the adoptive response to low protein intake, resulting in mobilization of body protein stores. This process eventually leads to decrease in albumin synthesis resulting in hypalbuminaemia with oedema. Fatty liver also develops secondary to lipogenesis from excess carbohydrate intake and reduced apolipoprotein synthesis.

Finally free radical damage has been proposed as an important factor in the development of oedema in severe acute malnutrition. This proposal is supported by low plasma concentration of methionine, which is a precursor of cysteine, which is needed for synthesis of the major antioxidant glutathione.<sup>9</sup>



## COMPLICATIONS OF MALNURITION

In addition to increasing mortality rate, effects of malnutrition include physical and developmental manifestations. Poor weight gain and slowing of linear growth occur, that may persist beyond adolescence and adulthood with implications to the work capacity of both men and women and to women's reproductive performance, impairment of immunological function predisposing them to opportunistic infections.

It also has long term effect on cognitive and social development, physical work capacity, productivity and economic growth.<sup>9</sup>

### 1.4 MALNUTRITION CASE MANAGEMENT:

The World Health Organization (WHO) developed a manual that describes Case Management Practices for children with severe acute malnutrition entitled: "*Management of Severe Malnutrition: a manual for physicians and other senior health workers*", to improve case management for the severely malnourished <sup>19</sup>. The guidelines (the ten step protocol) offer practical help to health workers and aim to improve the quality of hospital care for these children.

The WHO ten-step management guideline(Appendix V ), includes a stabilization phase where life-threatening hypoglycaemia, hypothermia and sepsis are identified and treated, a cautious introduction of milk-based nutritional rehabilitation, micronutrient and vitamin supplementation, and empiric use of antimicrobial and anti-helminthic treatment <sup>20</sup>.

To reduce malnutrition mortality among children in South Sudan, the Government of South Sudan (GOS) adopted a manual, the Community- based Management of Severe Acute Malnutrition in children 6-59 months and includes community outreach, outpatient care and inpatient care.

The manual seeks to improve the management of SAM in children 6-59 months with medical complications such as severe oedema, poor appetite (failed the appetite test) or present with one or more IMCI danger signs (unable to drink or breastfeed, vomits everything, has had convulsion more than one or prolonged > 15 minutes), lethargic or

unconscious should be treated in inpatient care and those without medical complication in outpatient care .<sup>23, 28</sup>

Despite the efforts of the government, donors, international and national non-governmental organisation, South Sudan still faces numerous challenges. Decades of conflict have led to collapse of basic infrastructure across the country including health facilities, schools, roads, water and sanitation. The lack of infrastructure is associated with a range of acute crises resulting from renewed localised and international conflicts resulting in large population movement and displacement.

Only forty four percent of South Sudan's population stay within a five kilometre radius of a functional health facility. There is in addition lack of human resource and qualified health personnel, shortage of drugs and medical supplies, cultural and financial barriers, long distance to health facility with poor roads and transport, resulting in low use of health facility.<sup>12</sup>

### **1.5 SEVERE ACUTE MALNUTRITION CASE FATALITY.**

Malnutrition is a cause of profound physiological and metabolic changes. A malnourished child responds poorly to treatment and is therefore, more likely to die when compared to the well-nourished<sup>2</sup>. Even in a hospital set up, a severely malnourished child has a 30-50% chance of dying<sup>10</sup>. The levels of reported mortalities could be higher, as in Africa, most parents still take home a severely ill or dying child<sup>11</sup>. Malnutrition is linked to increased risk of deaths from diarrhoea, pneumonia, malaria and measles<sup>10</sup>. SAM contributes to more than sixty percent of hospital deaths from an infectious disease<sup>12</sup> and poor hospital care of severely malnourished children is responsible for the high case fatality rate of 50% or more<sup>13</sup>.

Global studies have shown that lack of knowledge and faulty practices in management of severe malnutrition were responsible for the high case fatalities<sup>10</sup>. A Study in South Africa has shown that inadequate knowledge among the health care workers was responsible for between twenty eight and fifty percent of the deaths and that inadequate supervision and lack of proper support were other factors that compromised quality of care in the two hospitals<sup>13</sup>.

Ashworth et al., (2003) noted that in many hospitals dangerous practices including: the use of intravenous (IV) fluids to correct dehydration, aggressive measures to promote weight gain, prescription of high protein diet for children with kwashiorkor, prescription of diuretics to get rid of oedema and iron to treat anaemia in the initial phase were the norm in treating malnutrition <sup>2</sup>.

In Kenya, Nzioki et al., (2009) found adherence to the first 8 steps in management of children with severe malnutrition was inadequate in Kenya's National Referral and Teaching Hospital. Only 30% and 47% of children who were severely malnourished were appropriately managed for hypoglycaemia and hypothermia respectively. The death rate was a high of thirty eight percent for children admitted for severe malnutrition despite the availability of major supplies <sup>15</sup>.

According to Maitland et al., in their study at Kilifi District Hospital, Kenya, case fatality rate was high because of inappropriate management of sepsis, hypoglycaemia and hypothermia <sup>16</sup>. At Mapulaneng Hospital in Ghana, the mortality was at 36% <sup>14</sup> while in Bangladesh, Bhan et al., (2003) found out that majority of the hospitals recorded mortality rates of 20 % or more <sup>17</sup>.

In 2000, mortality rate for Colombia's Antioquia was reported as 20% among severely malnourished children younger than 5 years old while the rate was nearly 3 times in Turbo, a town in Antigua<sup>18</sup>.

Ashworth et al., (2003) reported that severe malnutrition is indeed a medical emergency and that urgent correction of hypoglycaemia, hypothermia and silent infections is required to minimize hospital deaths <sup>2</sup>.

In hospitals where the WHO guidelines have been introduced and implemented, studies have shown a reduction in mortalities, although not to the WHO target levels of five percent or lower <sup>19</sup>.

After analysing data sets from 67 studies, Bhan et al., (2003) indicated that low mortality from severe acute malnutrition is indeed feasible and achievable. In fifteen percent of the studies, the mortality levels were reduced to less than ten percent when WHO protocol was implemented <sup>17</sup>.

Studies at the International Centre for Diarrheal Disease Research, Bangladesh, showed that the use of WHO protocol had reduced deaths from 17% to 3.9% and from 40% to less than 15% in South Africa <sup>22</sup> A study by English et al., (2006) noted that an improvement in triage, diagnosis and use of guidelines can reduce the high hospital deaths in developing countries <sup>21</sup>.

Similarly, in South Africa, case fatality rates fell from 46% to 21% at Mary Theresa Hospital and from 25% to 18% at Sipetu Hospital. Other centres in South Africa recorded low mortality rates of 6% <sup>21</sup>. In Kenya's Kilifi District Hospital, the death rates were cut from 30% to 19% after implementation of WHO protocol <sup>13</sup>.

A study done in South Africa by Ashworth on the effect of implementation of WHO guidelines on case fatality and its influence on the operational factors showed quality of care improved and case fatality rate fell after implementation of WHO guidelines.<sup>13</sup>

Another study done in Turbo, Colombia by Bernal to evaluate the implementation of WHO guidelines for the treatment of severe malnutrition, showed significant reduction in mortality. <sup>21</sup>

There is therefore clear evidence that proper application of the protocol has reduced case fatality in different settings. Such reduction in mortality was attributable to the following modifications in case-management as outlined in the WHO's ten step protocol: proper management of hypoglycaemia and hypothermia; routine prescription of broad-spectrum antibiotics on admission; transfusion of packed cells for severe anaemia; replacement of micronutrients; supplementation of vitamins and minerals; withholding iron supplements in the first week of treatment; avoiding intravenous rehydration whenever possible; cautious re-feeding; use of a low sodium diet; and close monitoring for vital signs for fluid overload <sup>11</sup>.

The use of these evidence-based guidelines has the potential to reduce South Sudan's high infant and under five mortality rates due to severe acute malnutrition. The implementation of the guidelines is a feasible and sustainable strategy for achieving the Millennium Development Goal 4 of reducing childhood mortality.

## **1.6 QUALITY OF CARE**

### **1.6.1 Assessment of quality of care**

Aspects of patient care or pillars of quality of care include, structure (facility level), process (health worker level) and outcomes (mortality, morbidity, and recovery, restoration cost, influenced by many factors outside health care). According to Donabedian, assessment of care involve assessment of outcome in terms of recovery, restoration and of survival, which has been frequently used as an indicator of the care given. There have been many advantages that are gained by using outcomes as the criteria of quality in medical care. Although outcomes may indicate good or bad care on the aggregate, they do not give an insight into the nature and location of the deficiencies or strengths to which an outcome may be attributed <sup>14</sup>.

Another approach to assessment is to examine the process of care itself, rather than its outcomes. The assessment of quality must rest on a conceptual and operational definition of what the quality of medical care means. Many problems are present at the fundamental level. Judgments are based on considerations such as the appropriateness, completeness of information obtained through clinical history, physical examination and diagnostic tests. Justification of diagnostic and therapeutic procedures, including: surgery; evidence of preventive management in health, illness; coordination and continuity of care <sup>14</sup>.

Another approach is the study of the setting in which the process of care takes place. It is concerned with the adequacy of the facility and equipment, the qualification of the medical staff and their organisation. The presumption is made that given the proper setting and instruments, good medical care will succeed. This will be more relevant to the question at hand; whether medicine is properly practiced, in this case whether diarrhoea management is per the diarrhoea case management guidelines available. This approach to the assessment is to study not the process of care itself, but the settings in which it takes place and the instrumentalities of which can be accepted at face value <sup>14</sup>.

A study was done in Bangladesh on the assessment of the quality of care, by Dewan and Muntasiru, which demonstrated that the overall quality of care provided in these hospitals

is poor with no triage system, no laboratory support and essential equipment was deficient<sup>15</sup>.

Another study was done in Tanzania by Nicholes D Walter and Thomas lyimo, on first level health workers failing to follow guideline, revealed that the health workers surveyed rarely adhered to IMCI treatment and referral guidelines for children with severe illness. They administered therapy based on narrow diagnoses rather than IMCI classifications, disagreed with referral guidelines and often considered referral unnecessary<sup>17</sup>.

The most comprehensive tool for evaluating quality of care is SPA (Service Provision Assessment). In addition to quality, it also measures the general functioning of a network of public and private facilities, and it provides an inventory of available equipment and supplies. The SPA provides a means of assessing strength and weaknesses in the service delivery environment, which may explain the impact of the services on the health behaviours in the catchment area, and may guide policy makers and program administrators in prioritising resources for better health outcomes.<sup>26</sup>

## **1.7 ORGANIZATION OF HEALTH CARE IN SOUTH SUDAN**

The South Sudan health system is organised into counties within 10 States and a central Ministry of Health. The central level is responsible for policy development and guidance, the state level is responsible for providing policy guidance and oversight to its counties. The county level is responsible for overseeing service delivery<sup>18</sup>.

Juba is the capital of South Sudan and lies in Central Equatorial State. There are currently six counties in the state. Available - information also indicates that there are a total of 284 health facilities (Hospitals, Primary Health Care Centres (PHCCs) and Primary Health Care Units (PHCUs) with over 2,968 health workers of all the different categories. There are several privately-owned health facilities in the city of Juba<sup>18</sup>.

The population of South Sudan is around 8 million. Many areas have less than one health worker per 1000 people and only about 30 percent of the population have access to health facilities<sup>18</sup>.

At the country level, there are currently 268 Outpatient Treatment Program ( OTP ) site providing treatment of children 6-59 months with uncomplicated severe acute malnutrition and 27 stabilization centres ( SC) providing inpatient treatment of children 6-59 month suffering from severe acute malnutrition with complications.<sup>24</sup>

Al-Sabah Children Hospital (ACH), established by the Kuwaiti government in 1983 is the only specialized children hospital in the country and referral hospital for malnourished children. It is managed by the state Ministry of Health.

Children suffering from SAM, malaria, pneumonia and diarrhoea, make up the majority of the patients. With 100 beds now available, including a new ward, the hospital treats up to 150 outpatientsdaily<sup>19</sup>.

About 40 percent of health workers have less than one year training, a quarter have 1 to 2 years of training and another quarter have three to five years of training. Limited information exists on education level and training certification<sup>18</sup>.

## **2.0 STUDY JUSTIFICATION AND UTILITY**

Malnutrition is a critical public health concern in south Sudan where an estimated 250,000 children under five are at risk of being malnourished<sup>25</sup>.

Studies have shown that implementing WHO evidence based guidelines for severe malnutrition can reduce mortality rates to less than 5%, also has the potential to save many lives currently being lost through malnutrition and contribute substantially to achieve the Millennium Development Goals of reducing the under-five mortality.<sup>13,14</sup>

Also implementation of these guidelines has been shown to be feasible and sustainable even in small district hospitals with limited resources.<sup>14</sup>

With the ongoing conflict, the number of malnourished children is expected to rise due to displacement and food insecurity.<sup>4</sup>

Assessing level of adherence to the guidelines would facilitate appropriate corrections and help develop strategies to improve the quality of care offered in malnutrition ward at Al-Sabah children hospital.

## **2.1 STUDY QUESTION**

To what extent does the inpatient care of children with severe acute malnutrition at Al-Sabah children Hospital follow World Health guidelines?



### **3.0 OBJECTIVE**

#### **3.1 PRIMARY OBJECTIVE**

- To determine the proportion of Children appropriately managed for severe acute malnutrition according to WHO guidelines at Al-Sabah Children Hospital.
- To determine the availability of essential supplies necessary for management of severe acute malnutrition at Al-Sabah Children Hospital.

## **4.0 DESIGN AND METHODOLOGY**

### **4.1 STUDY DESIGN**

A longitudinal survey that audits the implementation of WHO guidelines on management of severe acute malnutrition at Al-Sabah Children Hospital.

### **4.2 STUDY AREA**

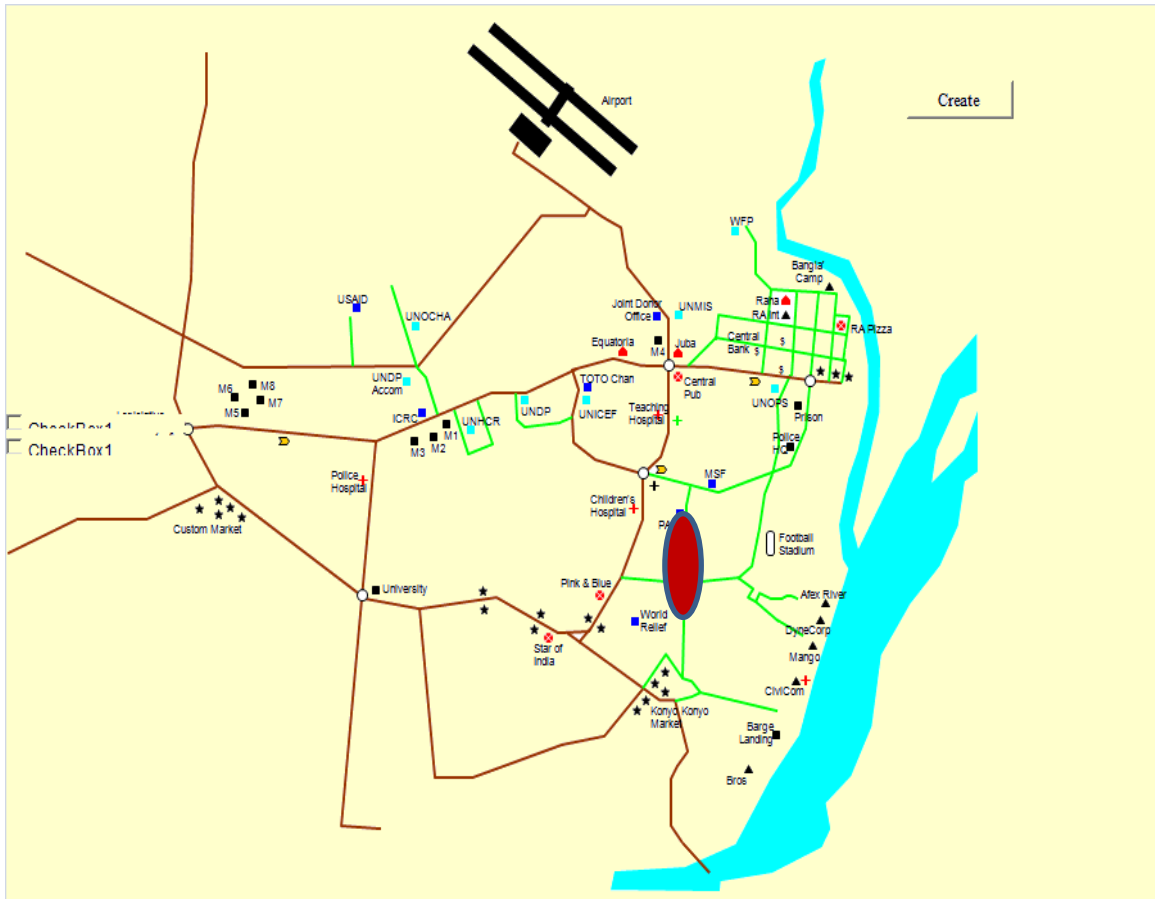
Al-Sabah Children Hospital (ACH), Juba-South Sudan. Juba is the capital city of south Sudan, located in Central Equatorial State.

In recent years, the hospital has undergone extensive renovation, with funding from UNICEF, the African Union and other donors. Ministry of Health in collaboration with the UNICEF recently renovated and built a new ward for malnutrition, in total consisting of 22 beds. The hospital also gets support from UNICEF in terms of the feeds for the severely malnourished children specifically F75, F100 and ready to use therapeutic food.

According to the hospital records admission rate in malnutrition ward is about two per day. The staff working in the malnutrition wards consist of one medical officer, five nutritionists, six nurses and three cleaners (one per a shift).

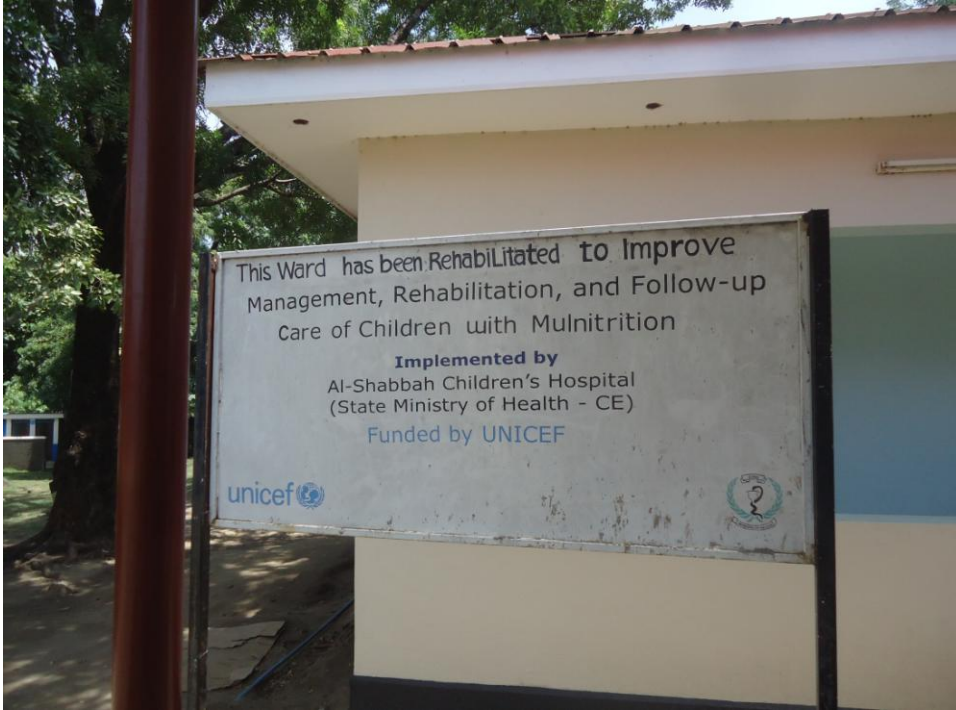
Children were seen first by the clinical officers at OPD, screened for malnutrition (weight for height/length <-3SD or mid upper arm circumference <115mm or oedema of severe malnutrition).

The study covered outpatient department and malnutrition Wards.



**Figure 1:** Map of Juba Town (position of study site shown in red circle)

The red crosses indicate the hospitals in Juba, with El -Sabbah located opposite Hai Malakal, half a kilometre from Juba teaching hospital, and just opposite Al Saints` Cathedral.



**Figure 2:** Malnutrition ward from outside

The study was carried out in the malnutrition Centre at Al-Sabah Children Hospital which has two wards each having eleven beds with a total of twenty two beds.

#### **4.3 STUDY POPULATION**

The study population comprised of children aged (6-59) months managed during the study period for severe acute malnutrition at Al-Sabah Children Hospital.

#### **4.4 STUDY PERIOD**

The study was conducted in two months period from 4<sup>th</sup> of Feb-4<sup>th</sup> April 2015.

#### **4.5 INCLUSION CRITERIA:**

- Children admitted to Al-Sabah Children Hospital with diagnosis of severe acute malnutrition aged 6-59 months.
- Informed consent from the parents/guardian

#### 4.6 EXCLUSION CRITERIA:

- Children with chronic medical conditions e.g. cardiac, renal diseases, cancer.... condition that predispose them to malnutrition
- Children who succumb within 24 hours of admission. It was assumed that they were not followed for a long time to assess quality of care.
- Children whom the PI was required to intervenes in their emergency management.

#### 4.7 SAMPLE DESIGN AND PROCEDURE

##### 4.7.1 Sample Size Determination

The sample size was calculated according to WHO formula for calculating one sample size using precision around a proportion .<sup>29</sup>

$$n = \frac{Z^2 \times p \times (1 - p)}{d^2}$$

Z: critical value at 95% confidence interval = 1.96

P: Proportion of children' management expected to adhere to guidelines estimated to be 50%

d:degree of precision / sampling error = 0.1

The estimated sample size is was

$$n = \frac{1.96^2 \times 0.50 \times 0.50}{0.1^2} = 96$$

**The minimum number of subjects was 96**

**Sampling criteria:** Consecutive enrolment of the patients who satisfy the study criteria and whom parents gave consent was done until the desired sample size was achieved.

#### **4.8 Data collection**

Data were collected by a team led by the principal investigator and two research assistants who were working amongst the health workers (Medical officer, Nurses, Nutritionists and the support staff) at the Al-Sabah children Hospital. The research assistants were trained by the principal investigator (PI) for three days on how to use the study tools and standard operating procedures manual until they demonstrated competency in the completeness and accuracy of data entered. The PI and one research assistant visited Malnutrition ward daily between 8 am and 8 pm and recruited eligible patients, the other research assistant did the same at nights. All medical records of patients with admission diagnosis of SAM were checked to ascertain if the patients met the inclusion criteria. We sampled consecutively all eligible patients until we reached our desired sample size. Informed consent was obtained from the parent/ guardian before a patient is recruited into the study.

The interviewer introduced herself/himself and explained to the potential study participants the purpose and methods of the study. Informed written consent was obtained using a predesigned consent which was sought from the Parents/ guardians (Appendix III).

All patient enrolled in the study had their weight and height measured and Z scores calculated as per WHO reference values, also the mid upper arm circumference was taken using the mid upper arm circumference tape (MUAC). The weight was taken with an electronic scale and height/length using stadiometer in the ward. The Principal Investigator (PI) assessed the nutritional status of the patients admitted to the malnutrition wards with diagnosis of SAM on day 1 of admission and information was extracted from admission and treatment charts on how the patient was triaged in OPD, random blood sugar measurement, whether kept warm, any comorbid condition on admission (Appendix VI) and documented. Patients were followed until day seven of admission, death or discharge whichever occurred earlier. Relevant information regarding the WHO first 8 steps in the management of SAM was abstracted and entered into pro-forma sheet. Information collected was supplemented with information obtained through a structured

interview with the care giver (appendix VII) and also direct observations on the ward during daily recruitment visits.

An inventory of commodities necessary in the management of severe of acute malnutrition, availability and reliability of supplies was done using a self-administered questionnaire with nurses and nutritionist (Appendix VIII).

#### **4.9 DATA MANAGEMENT AND ANALYSIS PROCEDURE**

The collected data were entered into the computer using Microsoft Access and analysed using IBM Statistics® V20. Confidentiality was observed, names did not appear on collected data. Data were checked for any wrong entry and double entry and corrected. Back up was created in an external hard disk in case of damage and/or loss of original data. Use of coded data were done to ensure maximum confidentiality. Descriptive data were presented as frequency tables, bar graphs, pie charts and cross tabulation. Categorical data were compared using Chi square, while student's t test and analysis of variance (ANOVA) were used for comparison of continuous data. An outcome was considered significant if p value was equal or less than 0.05. Summary of inventories, regularity of supplies were made.

#### **4.10 ETHICAL CONSIDERATIONS**

##### **Approval to carry out the study**

Approval to carry out the study was given by Kenyatta National Hospital ethics Review and Research committee and the Directorate of Research and planning Ministry of Health, Republic of South Sudan. Data were secured to ensure confidentiality. A written consent was obtained from parent/ guardian for any child to be enrolled into the study. Any life threatening condition identified was communicated to the word clinician and resuscitation and emergency care was done if indicated. . For the health workers interview on the inventory necessary for the management of SAM, an informed consent was obtained before participating in the study



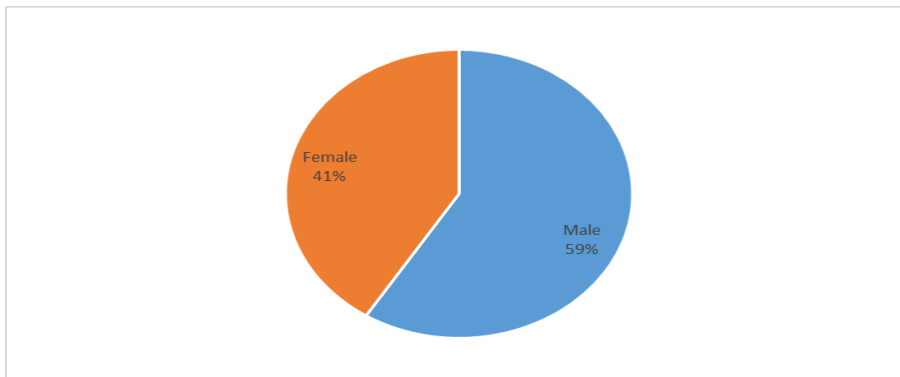


## 5.0 RESULTS

Study was conducted in the malnutrition wards of AL Sabah children's hospital from 5<sup>th</sup> February to 3<sup>rd</sup> Of April 2015. A total of 102 Children with admission diagnosis of severe acute malnutrition were recruited. Two were excluded because they met the exclusion criteria, one died before 24 of admission and the other one the principal investigator actively participated in his emergency treatment.

Out of 100 children with admission diagnosis of SAM 59 (59%) were boys and 41(41%) were girls with male to female ratio of 1.4:1.

**Figure 3: Sex distribution**

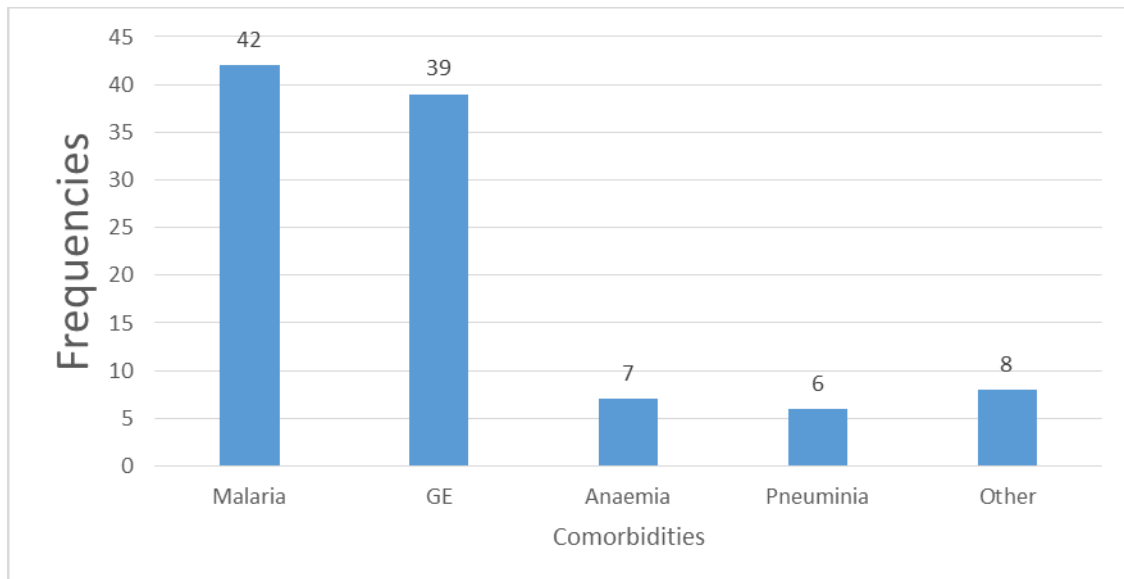


**Table 1: Demographic characteristics of admissions with acute malnutrition at ACH**

Variable	Category	Frequency (%)
Age in months		
	Below 24 months, n (%)	82(82)
	Above 24 months, n (%)	18(18)
Child's gender	Male	59(59)
	Female	41(41)
	Total	100(100)
Average age in months	All children (n = 100)	16.6 (± 10.9)
	Marasmus (n = 49)	25 (± 13.7)
	Kwashiorkor (n = 36)	16 (± 10.6)
	Marasmus- Kwashiorkor (n = 15)	20(± 7)

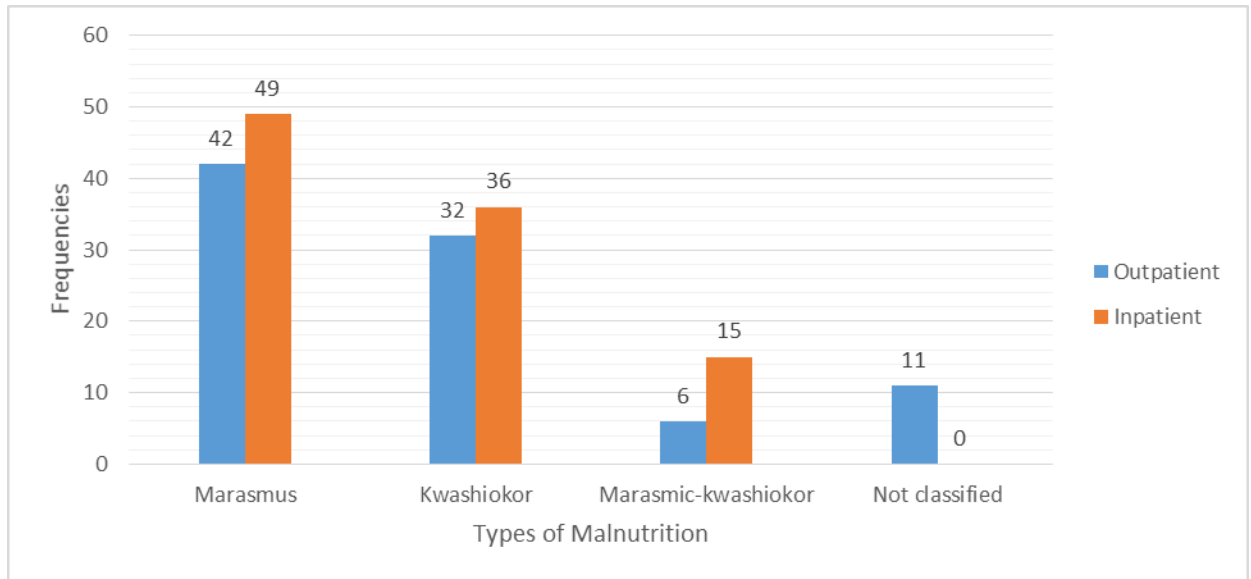
Among the malnourished children who had WHZ < 4, thirty seven (63%) were males while 20(51 %) were females. The average age of children with WHZ -3SD-4SD was 18 months (with a standard deviation of 12.4 months) and were older when compared to an average age of 14.9 months (with a standard deviation of 8.8) for children with WHZ < -4SD (Table 2). There was no significant association of the WHZ scores with either patient age (p = 0.17) or gender (p = 0.92).

**Figure 4: Comorbid conditions on admission**



The most common co-morbid condition documented at admission by the admitting clinician were malaria and gastroenteritis. Many children have more than one co-morbid at presentation.

**Figure 5: Classification by point of service (Outpatient and inpatient)**



The inpatient classification was done by the primary investigator. The most frequent type of severe malnutrition was Marasmus 49 (50%), followed by Kwashiorkor 36(36%) and Marasmus Kwashiorkor 15 (15%).

**Table 2: Definition of appropriately done steps**

Steps	Appropriately done if
Step 1 :Treat and prevent hypoglycaemia	<ul style="list-style-type: none"> <li>• Given dextrose 10%(5mls/kg) if RBS les than 3mmol/l or if not alert</li> <li>• Oral/NGT feeds as soon as possible&lt; 30 min</li> </ul>
Step 2 :Treat and prevent hypothermia	<ul style="list-style-type: none"> <li>• Provide warmth if axillary temp. is less than 35 degrees Celsius</li> </ul>
Step 3 :Treat and prevent dehydration	<ul style="list-style-type: none"> <li>• Assume dehydration in any malnourished child presenting with diarrhoea</li> <li>• Give ReSoMal 10mls/kg/hr-2hrs</li> <li>• If in shock, give 20mls/kg of 5% dexteros/HSD or Ringers/dexrous5%</li> </ul>
Step 4: Correct electrolyte imbalance	<ul style="list-style-type: none"> <li>• Commercial F75 for electrolyte correction (contains extra potassium and magnesium).</li> </ul>
Step 5 :Treat infections routinely	<ul style="list-style-type: none"> <li>• All malnourished children receive correct dose of broad spectrum antibiotics(Penicillin 50,000 iu/kg 6hourly / Ampicillin 50mg/kg 8 hourly and Gentamycin 7.5mg/kg OD</li> </ul>
Step 6: Correct micronutrient deficiencies	<ul style="list-style-type: none"> <li>• Vit A given orally on admission (6-12 months:100 000 IU; older children 200 000 IU) on day one</li> </ul>
Step 7 :Feed cautiously	<ul style="list-style-type: none"> <li>• Correct amount of F75 is given.</li> </ul>
Step 8: Catch up feeds	<ul style="list-style-type: none"> <li>• The starter F 75 is replaced with an equal amount of catch up F100 for 2 days.</li> <li>• Then each successive feed is increased by 10 mls until some remains uneaten</li> </ul>

**Table 3: Triage at OPD**

Category	n	%
<b>Emergency</b>	18	19.1%
<b>Priority</b>	60	63.8%
<b>Non-urgent</b>	1	1.1%
<b>No information</b>	15	16.0%

Appropriate triage is crucial in reducing time spent at the outpatient department before accessing care for the severely ill child.

In this study, any child who didn't wait to access care is considered appropriately triaged

At OPD 63.8% of children were triaged as priority cases and 19% as emergency cases as shown in the table above.

Overall 82.9% of children were appropriately triaged.

### **Step 1: Treatment or prevention of hypoglycaemia in the wards**

**TABLE 4: DIAGNOSIS AND TREATMENT OF HYPOGLYCEMIA IN THE WARD**

	n	%
Random blood sugar done	27	27%
Median [range]	4 [2-32]	
Treatment given (10% dextrose ) n=4/4	4	100%
Oral/ NGT glucose or feeds given within 30 min of admission	83	83%

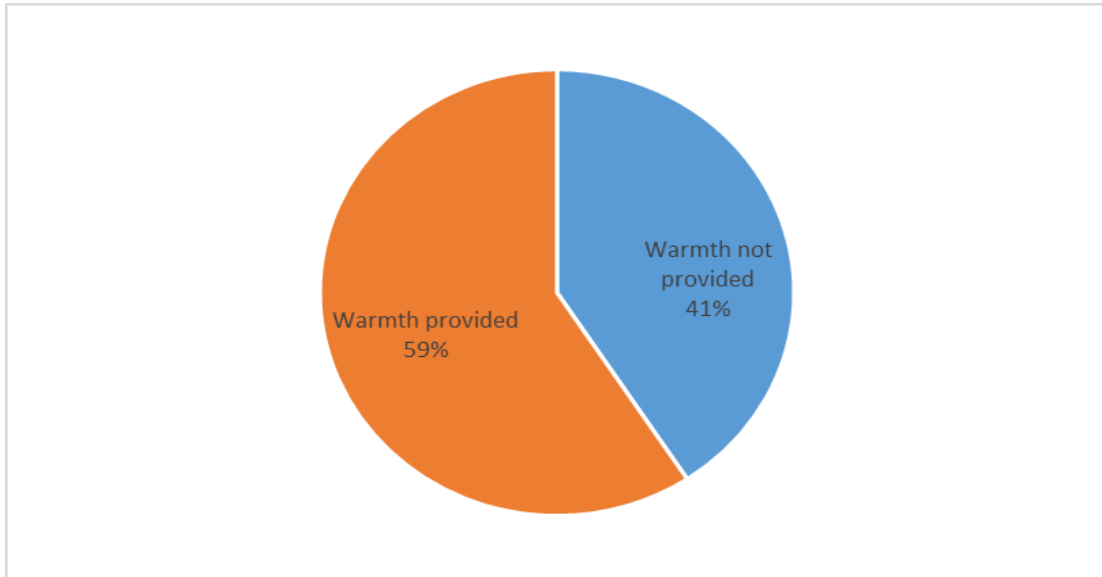
In the ward, twenty seven children had a random blood sugar done. Four of the twenty seven children had random blood sugars less than 3 mmol/l and all had 10% dextrose given correctly. Immediate feeding was routinely done with 83 children fed within 30 minutes of arrival in the ward.

Ten children who were in shock were not eligible to be fed within 30 minutes of admission.

Overall 83% of children were appropriately managed for step 1 according to WHO guidelines in the wards. (95% CI 75.6-90.3)

## Step 2: Treat / prevent hypothermia in the wards

**Figure 6: Treat / Prevent Hypothermia**



Only 54% of children had their temperature taken, and 41% of those had temperature taken had fever and were not provided with warmth.

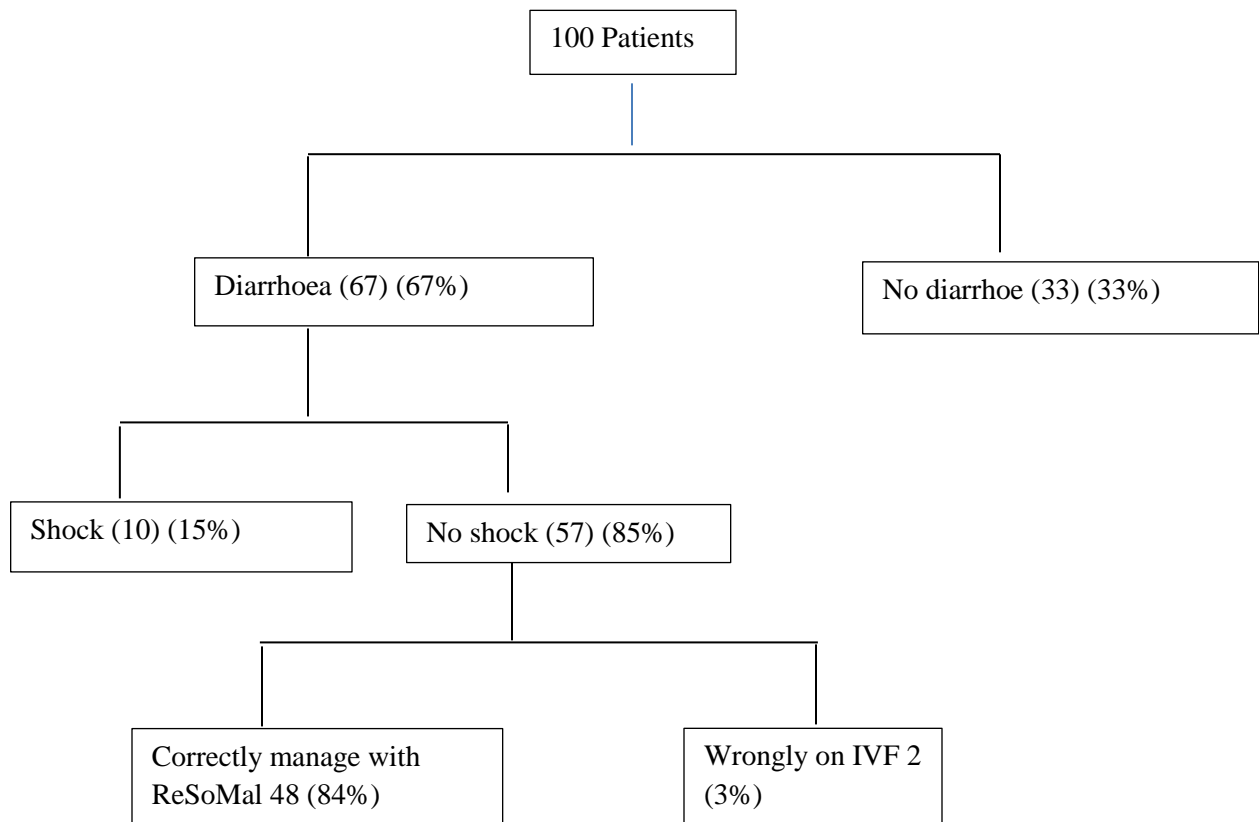
The proportion of patients appropriately kept warm were 59% (95% CI 71.02%-86.9%).

### STEP 3: TREAT AND PREVENT DEHYDRATION IN THE WARDS

**Table 5: Management of dehydration in the ward**

Management of shock in the ward n= 10		Management of dehydration n=67	
IVFs given	10 (100%)	IVFs given wrongly	2(2.9%)
Correct choice of IVFs given\HSD in 5% dextrous	10 (100%)	ReSoMal given n: 55/67	55 (82%)
Correct volume of IVFs given(20mls/kg in 2 hrs)	10 (100%)	Correct volume of ReSoMal given n: 47/67	47 (70%)
Number correctly managed for shock	10 (100%)	Number correctly managed for dehydration n: 47/67	47(70%)

**Flow chart: Treatment and prevention of dehydration in the ward**



In the ward, diarrhoea was documented in 67 (67%) children, Ten children were admitted in shock, and were all treated with correct fluid and given correct volume. Two children who were not in shock were inappropriately put on IVFs.

84% of children who were not in shock were appropriately managed with correct volume of ReSoMal. Seven children were not put on ReSoMal.

Overall 100% of children who were in shock were appropriately managed for shock and 70% were appropriately managed for dehydration in the malnutrition wards. (95% CI 76.8-91.1%)

### **Blood transfusion**

Seventy eight percent of children had HB levels done, eight had HB of less than 4 and were transfused with correct volume of blood. (10mls/kg whole blood +Lasix 1mg/kg)

### **Step 4: Correct electrolyte imbalance**

A total of 100 (100%) children were fed on ready to use formula F75 that contain extra potassium and magnesium.

### **Step 5: Treat infections routinely**

**Table 6: Treat infections routinely**

	n	%
Antibiotic prescribed (Penicillin (or Ampicillin)and Gentamycin)	92	92%
Antibiotic dose correct	58	58%

Ninety two children were managed with broad spectrum antibiotics but only fifty eight had correct doses as per WHO guidelines.



## STEP 6: CORRECT MICRONUTRIENT DEFICIENCIES

**Table 7: Correct micronutrient deficiencies**

	n	%
<b>Vitamin A given on admission</b>	62	62%
<b>dose correct</b>	58	58%
<b>Iron withheld in the initial phase</b>	34	34%

Out of 100 children 62 (62%) received high dose vitamin A on day one in the ward, and 58% of them had correct dose given, and 34 children had Iron withheld in the initial phase.

Overall 58% of children were appropriately managed for step 6. (95% CI 48.33-67.67)

## STEP 7: INITIATE FEEDING CAUTIOUSLY

**Table 8: Initiate feeding cautiously**

Fed with F75 n=99/100	99 (99%)
Correct feed volume in the initial phase(n=97/99)	97 (97.9%)
Fed in the first hour of arrival in the ward (n=99)	88 (88.8)
Route of feeding specified (n=99)	84 (84.8%)
Feed intake monitored	94 (94.9%)

A total of 99 (99%) were fed with F75 in the initial phase. Children who were breastfeeding continued with breastfeeding. Route of feeding was oral in 71% of children and feeds were monitored in 94% of children.

In step 7, 97% of children were appropriately managed. (95% CI 95.0%-100.7%)

## Step 8: Rehabilitation / catch up feeds

**Table 9: Rehabilitation/catch up feeds**

	n	%
Transition to F100 prescribed	88	88%
Correct volume prescribed in the transition period	86	86%
Volume of F100 increased after the transition period	45	45%

Of 91 patients who were alive on their day 7 of admission, 88 were prescribed F100 and 86 of them were prescribed and given the correct volume.

In step 8, 97% of children were appropriately managed according to WHO guidelines. (95% CI 93.66%-100.34%)

**Table 10: Summary of the steps**

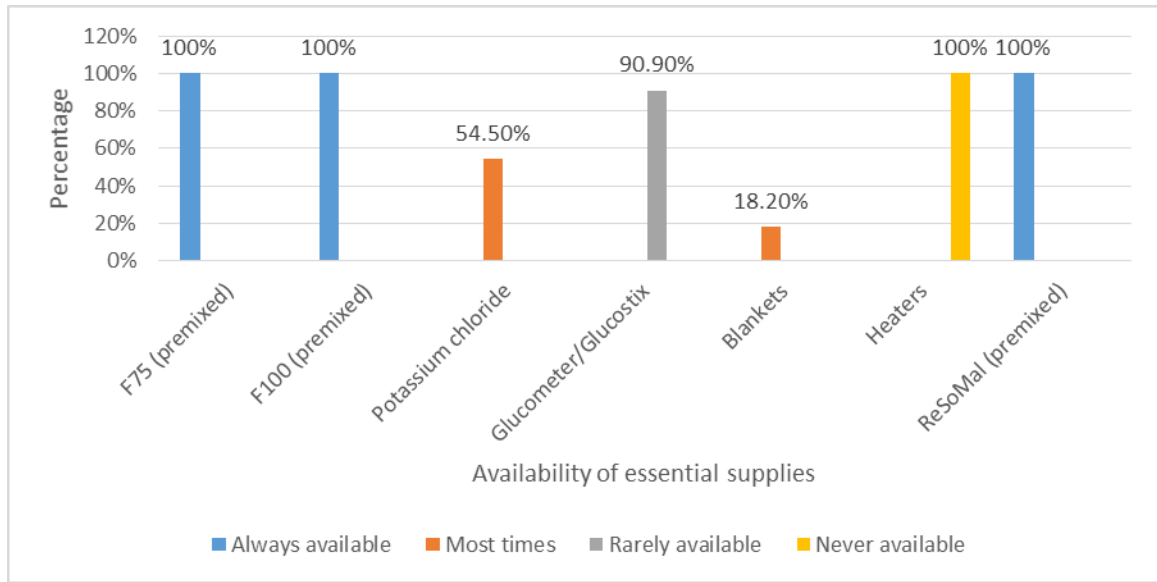
STEPS	PERCENTAGES
Step 1 :Treat and prevent hypoglycaemia	83%
Step 2 :Treat and prevent hypothermia	59%
Step 3 :Treat and prevent dehydration	70%
Step 4: Correct electrolyte imbalance	100%
Step 5 :Treat infections routinely	58%
Step 6: Correct micronutrient deficiencies	58%
Step 7 :Feed cautiously	97.9%
Step 8: Catch up feeds	97%

**Table 11: Outcome**

	n	%	
<b>Outcome</b>	Alive	86	86%
	Dead	9	9%
	Not aware	5	5%
<b>Duration of hospital stay in days – Median [range]</b>	13 [2-42]		

From the study population of 100 patients, 9 patients died giving case fatality of 9%. Two patients absconded before day seven of their admission.

**Figure 7: Availability of essential supplies**



An inventory of essential supplies was done through observations in the ward and structured interviews with nurses and nutritionists. A total of 11 health workers were interviewed.

During the time of the study, F75, F100, XPEN, Gentamycin, ReSoMal were available all the time.

## 6.0 DISCUSSION

This study evaluated current practices of care of children with severe malnutrition at AL Sabah Children's Hospital, in malnutrition wards and how it compares to WHO guidelines.

The majority of the children were younger than 2 years old. This age distribution among severely malnourished is similar to what other studies found in Colombia, Uganda, South Africa and Kenya<sup>13,15,18,35</sup>. Marasmus was the commonest presentation and this contrasts with what Bernal et al, Colombia and Bachou et al, Uganda found in that Kwashiorkor was the commonest presentation in the two studies<sup>18, 30</sup>.

The most common clinical presentation in this study population at admission was malaria [42 %]. This was similar to observations made by the Gambian and Ethiopian studies which showed the malaria was the commonest presentation<sup>31, 32</sup>. Diarrhoea was also common [39 %] which is similar to observation by Khanum and Bernal where they found that most with severe malnutrition had diarrhoea<sup>22, 18</sup>.

In this study 82.9% of patients were appropriately triaged at OPD. Similar studies in South Africa and Colombia found that emergency triaging at the emergency departments was poorly practiced resulting in long waiting times of up to 8 hours before accessing care<sup>33</sup>.

Prompt diagnosis, treatment and prevention of hypoglycaemia was inadequately done at OPD with 72% who were treated appropriately. Also 82% of children were fed within one hour of admission. This contrasts to what Ashworth in South Africa where they found some delay in giving first feed with children waiting for up to 11 hours before feeding. Night feeds were given in wards and it is probable that nurses and even the parents/guardians took feeds for malnourished children as “drugs” rather than routine feed. NGT feeding was prescribed for 6% of children similar to South Africa where NGT feeding for critically ill children was uncommon.

Children with severe malnutrition are susceptible to hypothermia. Prompt diagnosis and treatment of hypothermia was poor in this study. As in the South Africa study, temperatures were rarely checked on admission to ward and no routine measurements

were carried out. From this study it was noted that temperature were not routinely taken for critically ill children and those with diarrhoea were unlikely to be properly kept in warm rooms since malnutrition rooms did not have a heater during the entire duration study and the rooms. Children with diarrhoea were nursed in “malnutrition rooms” but the rooms were not warm, although it is usually hot it sometimes gets cold especially during rainy season. However unlike in South Africa where electric heaters were largely available and mothers were admitted with their children though only 13.9% were trained on how to keep children warm.

Because of the difficulty in diagnosis of dehydration in malnutrition and estimation of its severity, rehydration fluids should only be given intravenously only 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 number of children not documented to be in shock were indiscriminately prescribed IV fluids both at OPD and ward. This could be due to lack of well-trained motivated clinicians. Choice of IVF for shock was unsatisfactory in OPD compared to the wards with 11.2% of children being resuscitated with normal saline. This observation could be explained by differences in knowledge and skills of health workers with wards being managed by more skilled personnel. Oral rehydration was poorly done in OPD compared to wards and there was high likelihood of standard ORS being used in OPD than wards, this could be explained by unavailability of standard ORS in malnutrition wards. Neither monitoring for signs of rehydration nor recording volumes of fluids given was properly done both at OPD and wards. This could be due to lack of knowledge about the dangers of over rehydration and also the limited number of nursing staff. Similar practices were observed by Puone et al in South Africa, where they found indiscriminate use of intravenous fluids and lack of monitoring was due to lack of knowledge about the dangers of intravenous therapy and over rehydration in severe malnutrition<sup>34</sup>.

Infections are common in malnourished children but can be difficult to diagnose because common signs such as fever, inflammation and crepitation are often missing<sup>35</sup>. Broad spectrum antibiotics are routinely administered to severely malnourished children

because these children may not present with signs or symptoms of infection. In this study antibiotics were routinely prescribed but only 58% of the children appropriately received broad spectrum antibiotics with both gram positive and negative cover unlike KNH study by Nzioka where 91% of children were appropriately managed for infections<sup>15</sup>. This could be due to the training of clinicians in emergency triage and treatment plus inpatient care at KNH.

The increasing severity of the biochemical imbalance in malnourished children is enhanced by the deficit of vitamins and minerals mainly zinc, folic acid and copper. Therefore, high doses of vitamin A, folic acid and mineral supplements, given at the start of therapy, are fundamental in improving outcome<sup>36</sup>. In this study only 58% of children received correct dose of vitamin A. A similar finding was documented in South Africa where most of the micronutrients were not routinely supplemented.

Children with severe malnutrition should be given small frequent feeds of a starter formula and continue breastfeeding where applicable. In this study 99% of children were fed with F75 and those who were on breast milk continued to do so. Ashworth in South Africa found that children were being fed on full strength milk and adults meals. Ready to use starter formula F75 was always available in the ward unlike in South Africa. Monitoring and computing daily feeds was done in 94% of children unlike Nzioka's finding at KNH where monitoring of feeds were rarely done. Studies done in other places have shown that activities that require frequent physician and nursing staff besides presence are often poorly done<sup>36</sup>. Availability of nutritionist in the malnutrition wards and their knowledge about the special needs of severely malnourished in terms of feeding could explain above findings.

The initial phase had a medium duration of 4 days. Bernal in Colombia found on average, appetite improved by the fifth day of hospitalisation. At this time children attained the minimal necessary metabolic and physiological requirements and could transit to rehabilitation phase safely<sup>18</sup>. In our study, 88.8% of children alive at day six started the rehabilitation phase with 97.7% receiving the correct feed volume during the transition. However feed volume was increased after transition for 52% of children only. From the observations during the study period, failure to increase feed volume was principally due

to intolerance by the children but not failure by the doctors\ nutritionist in changing feeds prescriptions accordingly.

In our study most of the children were accompanied by care givers who were responsible for feeding their children, charting and supervisions were done by the nurses and the nutritionists. For the duration of the study, most of the caregivers developed the ability to feed their children competently. However, it was noted that a few were sharing their ward diet with the children especially when they go around in the hospital. Hence from this study there is a great potential for care givers to contribute to care of children in view of the shortage of nursing staff. However close monitoring and teachings would be required and this was missing in malnutrition wards.

Case fatality rate in this study was at 9%, WHO considers this as moderate case-fatality rate<sup>39</sup>. Bernal in Turbo Columbia found a mortality rate of 5.7%. A study in Bangladesh reported application of WHO protocol. Although it is difficult to compare case fatality across various studies due to population characteristics differences, studies have shown that implementation of WHO guidelines results in a decrease in hospital based case fatality rate<sup>13, 18, and 14</sup>. Most of the fatalities were due to late to seek medical care and others ran away from the hospital before finishing treatment and by the time they were readmitted, the children were in critical condition. The high case fatality rate in this study could be a factor of poor clinical care also. Out of the 9 patients who died 2/9 (22%) were inappropriately managed for hypothermia. Management of dehydration, electrolyte and micronutrient imbalance and feeding were also inadequate among those who died. Other factors that could be contributing to mortality in this study may be the severity of illness probably due to delayed hospital presentation, with acute medical conditions mainly diarrhoea and acute respiratory tract infections being the primary reason for hospital presentation, hence critically ill patients requiring intense medical and nursing care.

From this study, severe malnutrition was satisfactorily managed at AL Sabah Children's hospital with patients being managed appropriately in more than 50% of cases, and from the observation, the least percentages were noted in steps concerned with the clinician prescription. Also major shortfalls in care found in this study include delayed medical care seeking, treatment of hypoglycaemia and hypothermia, inadequate and basic nursing



care like monitoring of fluids and vital signs. Supply of major commodities was good most of the time, being different from what Chopra found in South Africa<sup>13</sup>. But the rooms are not well equipped with heaters to suit malnourished children.

Finally clinical approach to improve quality of care at AL Sabah should be accompanied by efforts to improve health system infrastructure and management. The rooms set aside for care of children with severe malnutrition are well ventilated and almost the coolest rooms in the hospital, and the parents/guardians take the children outside the room just under the trees because its hot for them inside, exposing these children to hypothermia and drought also this makes it difficult to maintain proper hygiene and across infection is a major problem.

Shortage of nurses and nutritionists and low morale noted in this study compromised quality of care and this has been noted in other studies<sup>37,38</sup>. Availability of adequate skilled, motivated, well trained staff is vital determinant of successful implementation.

**Study Limitation:**

- The study was not designed to assess staff's knowledge of the WHO guidelines.
- Study exclusion criteria biased the study towards survivors.

**Conclusion:**

Quality of care for children admitted with severe malnutrition at Al-Sabah children's hospital was with more than 50% of children were appropriately managed in all the eight steps, some of the essential commodities necessary for management of severe acute malnutrition were also lacking,

**Recommendations**

There is need to assess knowledge of staff on WHO guidelines and carry out training according to the gaps identified, infrastructural improvement for malnutrition rooms and improving staffing levels are key to proper implementation of the WHO guidelines and therefore improve quality of care. A follow up study will be needed to find out the level of implementation of WHO guidelines after training.

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## **APPENCIES**

### **APPENDIX I: PARENT/GUARDIAN CONSENT INFORMATION**

Study Identification Number: \_\_\_\_\_

Date: \_\_\_\_\_

#### **Study title**

Audit of care of children with severe malnutrition at Al-Sabah Children Hospital – Juba

#### **Investigators Statement**

I am Dr. Maria Warille a postgraduate student at the University of Nairobi – Department of Paediatrics. I am conducting a study as part of the requirement for the degree of Master of Medicine in Pediatric. I am requesting you to participate in this study by providing some information in a research study. The purpose of this consent form is to help you decide whether you can participate in this study or not. Please read through this form carefully. You are free to ask any questions about the study. Approval for this Study has been given by the Kenyatta National Hospital/University of Nairobi ethics committee {KNH/UON-ERC}. The investigator will be available to answer any queries that come up during the study and subsequently thereafter.

#### **Brief description of Study**

Children with severe malnutrition are seen at the OPD and admitted to the malnutrition ward. The study will look at the care they receive at OPD and malnutrition wards. The study aims to determine the proportion of children appropriately managed for severe malnutrition at the Al-Sabah children hospital. This assessment will be carried out by checking how the children are managed as per the WHO guidelines. The findings of the study will recommend on the areas of care that needs improvement and thus better the outcomes for such children. The information obtained will be used to improve the said care.

## **Procedures**

The study will assess the nutritional status of the child. This includes measuring the height and weight, taking blood to check the blood sugar and urea and electrolytes. The files will be audited to look at the care provided.

## **Risks**

There is no harm or risks that will be subjected to your child as a result of participating in this study. Any information obtained will be used to improve care

## **Benefits/ Costs/ Compensation**

There will be no costs incurred by participating in this study. There will be no compensation as well. This study will not benefit your child immediately. The information obtained will be interpreted to you and will be used to improve the overall care provided in the hospital.

## **Confidentiality**

This is to assure you that confidentiality will be maintained for any information regarding your child. The information obtained relating to your child will not be discussed or published.

## **Rights/ Voluntaryness**

Your participation in this study is purely voluntary. You may withdraw your participation or refuse to participate at any stage of the study. This will not affect or influence the care your child is receiving.

## **Persons to contact**

If you have any questions about the study or your participation in the study you can contact the main investigator, Dr. Maria Warille; Telephone: +254787149195; E-mail:-  
abiwarille@hotmail.com



If you have any questions on your rights as a research participant you can contact the Kenyatta National Hospital Ethics and Research Committee (KNH- ESRC) by calling 2726300 Ext. 44355.

OR Supervisors:

Professor Grace Irimu, Department of paediatrics and Child Health, University of Nairobi  
Contact: Telephone 0722564600 email: girimu06@yahoo.com

Professor Ezekiel Wafula, Department of Paediatrics and child Health, university of Nairobi

Contact: Telephone 0722366077

Your participation in the study will be highly appreciated.

**APPENDIX II: PARENTS OR GUARDIAN CONSENT FORM**

The study has been explained to me. I have understood the purpose and also my rights as a subject in this study. I had an opportunity to ask questions and seek clarifications. I also understand that I can withdraw from the study at any time without impacting on the care my child will receive. If I have questions later about the research, I can contact one of the researcher/ supervisors listed above.

I voluntarily agree to participate.

Signed (Parent / Guardian) ----- Date -----

Signed (Investigator) ----- Date-----

### **APPENDIX III: HEALTH WORKERS CONSENT INFORMATION**

Study Identification Number: \_\_\_\_\_

Date: \_\_\_\_\_

#### **Study title**

Audit of care of children with severe malnutrition at Al-Sabah Children Hospital – Juba

#### **Investigators Statement**

I am Dr. Maria Warille a postgraduate student at the University of Nairobi – Department of Paediatrics. I am conducting a study as part of the requirement for the degree of Master of Medicine in Pediatric. I am requesting you to participate in this study by providing some information in a research study. The purpose of this consent form is to help you decide whether you can participate in this study or not. Please read through this form carefully. You are free to ask any questions about the study. Approval for this Study has been given by the Kenyatta National Hospital/University of Nairobi ethics committee {KNH/UON-ERC}. The investigator will be available to answer any queries that come up during the study and subsequently thereafter.

#### **Brief description of Study**

The study is being conducted to assess the management of children with severe malnutrition seen at OPD and admitted to the malnutrition wards, ACH. The objective of the study is to audit the care offered to children with malnutrition at Al-Sabah hospital, to determine the proportion of children appropriately managed according to WHO guidelines and to determine the availability of the necessary commodities for management of the children with SAM at ACH. Children who are seen at the OPD and get admitted to the malnutrition wards, and who are diagnosed as having severe malnutrition will be enrolled in this study. The study will look at the care they receive at OPD and malnutrition ward. The information obtained will be used to improve the said care. The overall aim of the study is to audit the care these children receive in order to determine the areas that we can collectively improve.

**Procedures**

The study will assess the nutritional status of the child. This includes measuring the height and weight, taking blood to check the blood sugar and haemoglobin level. Further, the daily records of the admitted patients will be audited to look at the care provided.

In order to collect as much information as possible, questionnaires will be given to you to fill in as accurately as you can. We (the Supervisors and the Principal Investigator) do not anticipate that the questions will be difficult to answer. Your participation is voluntary and you may refuse to answer any question or you may withdraw from the study at any time without penalty.

**Risks**

There is no harm or risks that will be subjected to you by participating in this study.

**Benefits/Costs**

This study will not benefit you directly. You will not incur any costs by participating in this study. The information obtained will enable the hospital identify any weaknesses and thus strengthen or improve the care provided in the hospital and therefore the outcome of sick children.

**Confidentiality**

This is to assure you that confidentiality will be maintained. The information collected will be anonymous. There will be no record of names. No findings in this study will be linked to individual respondents. Your supervisors will not have access to the individual questionnaires as all data will be kept under lock and key.

**Rights/ Voluntaryness**

Your participation in this study is purely voluntary. You may withdraw your participation or refuse to participate at any stage of the study. This will not affect or influence the care your child is receiving.

**Persons to contact**

If you have any questions about the study or your participation in the study you can contact the main investigator, Dr. Maria Warille; Telephone: +**254787149195**; E-mail:-  
abiwarille@hotmail.com

If you have any questions on your rights as a research participant you can contact the Kenyatta National Hospital Ethics and Research Committee (KNH- ESRC) by calling 2726300 Ext. 44355.

OR Supervisors:

Prof. Grace Irimu, Department of paediatrics and Child Health, University of Nairobi  
Contact: Telephone 0722564600 email: girimu06@yahoo.com

Prof. Ezekiel Wafula, Department of Paediatrics and child Health, university of Nairobi  
Contact: Telephone 0722366077

Your participation in the study will be highly appreciated.

**APPENDIX IV: CONSENT FORM AND PARTICIPANT’S STATEMENT**

This research has been explained to me in details. I have understood the purpose and also my rights as a participant in this study. I had an opportunity to ask questions and seek clarifications where I needed. I also understand that I can withdraw from the study at any time without penalty. If I have questions later about the research, I can contact one of the researchers listed above.

I therefore voluntarily

- Agree to participate in the study
- Do not agree to participate in this study.

Signed (Health Worker)..... Date.....

Signed (Investigator)..... Date.....

**APPENDIX V: TEN STEPS IN THE CARE OF SEVERELY MALNOURISHED CHILDREN**

	Steps	Phase		
		Stabilization		Rehabilitation
		Days 1-2	Days 3-7	Weeks 2-6
1	Treat/ prevent hypoglycemia	—————→		
2	Treat / prevent hypothermia	—————→		
3	Treat/ prevent dehydration	—————→		
4	Correct electrolyte imbalance	————— No Iron —————		————— with Iron —————→
5	Treat infections	—————→		
6	Correct micronutrient deficiencies	—————→		
7	Start cautious feeding	—————→		
8	Catch up growth		—————→	
9	Provide sensory stimulation	—————→		
10	Prepare for follow-up		—————→	

Source: Pocket book of Hospital care for children; guidelines for the management of common illness with limited resources, WHO, 2006: page 176

**APPENDIX VI: AUDIT TOOL: APPROPRIATE MANAGEMENT OF SEVERE ACUTE MALNUTRITION AT ACH**

Questionnaire Serial Number-----Name of Interviewer -----

Date (when the audit was carried out) -----

DEPARTMENT (Tick as appropriate)

Malnutrition ward.....OPD.....

**PART 1: Demographic characteristics of the patient**

1. Date of birth (dd/mm/yy)-----
2. Age-----months-----Years -----
3. Sex    M        F        (tick as appropriate)

**PART 11: Anthropometric measurements**

4. Weight----- (Kg)----- (gm)
5. Height or Length (CM) -----
6. Weight for Height(length) Z score
7. MUAC
8. Check for presence of (Tick as appropriate)

	Present	Absent
Visible severe wasting(buttocks)		
Oedema bilateral( Pitting)		

9. Classification of severe malnutrition (tick as appropriate)

Kwashiorkor      Marasmus      Marasmus-Kwashiorkor      Non severe malnutrition



**PART 2: Management Steps:**

Emergency management at OPD

10. How was the patient triaged at OPD?

Emergency      Priority      Non urgent      No information

11. Step 1 (tick or fill as appropriate) – Treatment or prevention of hypoglycaemia (if RBS < 3mmol/l)

(i) Was Random blood sugar done    Y    N

(ii) If Yes    Result-----

(iii) Was treatment given (5mls/kg of 10% dextrose)    Y    N

(iv) If not dextrose what else was given to treat hypoglycaemia on admission? -----  
-----

(v) Was oral/ ngt glucose or feeds given    Y    N    How long after admission-----

12. Step 2 (tick or fill as appropriate) Treat / prevent hypothermia (Axillary temp <35C)

1) Was temperature taken on admission?    Y    N    Axillary Temp -----Rectal Temp-----

2) Was warm provided    Y --    N ---no information---

3) If yes, how?

By warmed blankets ----- heater----- any other-----

4) Was instructions given to mother on the day of admission to keep child warm?    Y  
N

13. Step 3 Treat or prevent Dehydration (Tick or fill as appropriate)

(i) Was diarrhoea present?    Y    N

(ii) If yes, was dehydration present?    Y    N

(iii) If yes, was hypovolemic shock present?    Y    N

{Shock: reduced consciousness, cold hands absent, slow (<60bpm) or weak pulse}.

(iv) If yes, proceed to (V), if no skip to 10

(v) Was IVF prescribed?    Y    N Type of IVF given

- (vi) HSD in 5%D.....HSD plain....Ringer's lactate plain.... Ringer's lactate in 5%D.....Any other.....
- (vii) Was IV Fluids Y N
- (viii) Was choice of IVF correct ? Y N
- (ix) Was amount of IVF given in 1<sup>st</sup> hour correct (15mls/kg of HSD in 5% dextrose over 1 hour)? Y N
- (x) Was there monitoring and recording of IVF? Y N
- (xi) Was child reviewed after 1 hour of IVF? Y N
- (xii) Did patient have ReSoMal prescribed? Y N
- (xiii) Did the patient receive ReSoMal? Y N
- (xiv) Was the volume of ReSoMal correct {10mls/kg/hour for up to 10 hours}?  
Y N
- (xv) Was ReSoMal monitored? Y N
- (xvi) Was Hb done? Y N
- (xvii) If yes, result .....
- (xviii) Was the patient transfused? Y N
- (xix) Was amount/volume correct? Y N
- {Transfuse if HB < 5g/dl, with 10mls/kg whole blood + frusemide 1mg/kg in 3 hours}

#### 14. Assessment on admission to the ward

- (i) Was temperature recorded at admission Y N
- (ii) Results .....
- (iii) Was oedema documented on admission by ward clinician? Y N
- (iv) Eye changes
- (v) oral thrush
- (vi) Was severe wasting documented by ward clinician? Y N
- (vii) What was the diagnosis by admitting clinician?  
Marasmus Kwashiorkor Marasmus-kwashiorkor not classified

(viii) Any co-morbid conditions noted by admitting clinician?

(a) (C)

(b) (D)

### Ward management

15. Step 1 (tick or fill as appropriate) – Treatment or prevention of hypoglycaemia (if RBS < 3mmol/l)

(I) Was Random blood sugar done Y N

(II) If Yes Result-----

(III) Was treatment given (5mls/kg of 10% dextrose) Y N

(IV) If not dextrose what else was given -----

(V) Was oral/ NGT glucose or feeds given within 30 mins of admission? Y N

If no, how long after admission? -----

16. Step 2 (tick or fill as appropriate) Treat / prevent hypothermia (Axillary temp <35C)

a) Was temperature taken Y N Axillary Temp -----Rectal Temp-----

b) Was “keep warm” prescribed in the treatment sheet? Y N

c) Was warm provided Y N

d) If yes, how?

By warmed blankets ----- heater----- any other-----

e) Was instructions given to mother to “keep child warm”? Y N

If yes, by 1/adequate cover? Y N 2/ Minimal washing Y N 3/ any other means Y N

17. Step 3 Treat or prevent Dehydration (Tick or fill as appropriate)

(I) Was diarrhoea present? Y N : if No proceed to XIII

(II) If yes, was dehydration present? Y N : if No proceed to XIII

(III) If yes, was hypovolemic shock present? Y N

{Shock: reduced consciousness, cold hands absent, slow (<60bpm) or weak pulse}.

(IV) If yes, proceed to (V), if no skip to X

- (V) Was IVF prescribed? Y N
- (VI) Was IVF given? Y N
- (VII) Was choice of IVF (HSD in 5% dextrose) correct ? Y N
- (VIII) Was amount of IVF given in 1<sup>st</sup> hour correct (15mls/kg of HSD in 5% dextrose over 1 hour)? Y N
- (IX) Was there monitoring and recording of IVF? Y N
- (X) Was child reviewed after 1 hour of IVF? Y N
- (XI) Was patient switched to/ prescribed ReSoMal (check T sheet? Y N
- (XII) Was the volume of ReSoMal correct {10mls/kg/hour for up to 10 hours}? Y N
- (XIII) Was ReSoMal monitored? Y N
- (XIV) Was Hb done? Y N
- (XV) If yes, result .....
- (XVI) Was the patient transfused? Y N { if HB < 4g/dl,10mls/kg whole blood + frusemide 1mg/kg in 3 hours }

18. Step 4 : Correct electrolyte imbalance (Tick or fill as appropriate)

- (i) Was electrolyte imbalance corrected? Y N
- (ii) With commercial F75? Y N
- (iii) If commercial F75 not available, Was mineral mix or extra potassium (4mmol/kg) mixed to feeds? Y N

19. Step 5: Treat or prevent infections (tick or fill as appropriate)

- (i) Was antibiotic (Penicillin (or Ampicillin) and Gentamycin prescribed? Y N
- (ii) Was the dose correct of X-pen (50,000 iu/kg 6 hourly) or ampicillin 50mg/kg 8 hourly) , gentamycin(7.5mg/kg OD), (Check T sheet?
- (iii)Others (Check T Sheet):Nystatin/ clotrmazole(if oral thrush present) -----  
mebendazole (after 7 days) ----- TEO (if pus or ulceration in the eye) ---

20. Step 6 : Correct micro-nutrient deficiencies (tick or fill as appropriate)

- (i) Was Vitamin A given on admission (check T sheet)? Y N

- (ii) Was the dose correct (6-12months:100,000 IU; above 1 year: 200,000 IU) on day 1? Y N
- (iii) Was folic acid given/ prescribed on T sheet on admission (2.5mg on alternate days)? Y N
- (iv) Was multivitamin given/ prescribed in the T sheet? Y N
- (v) Was iron withheld in the initial phase? Y N
- (vi) Was iron given in the catch up phase if it was indicated? Y N-----when?  
.....

21. Step 7 Initiate feeding/starter feeds (tick or fill as appropriate)

- (i) Was starter feeds F75 prescribed? Y N
- (ii) Was starter feeds F75 given? Y N ( If no diarrhoea)
- (iii) Was correct amount prescribed (if no oedema 130mls/kg/day or 100mls kg/day if oedema)? Y N
- (iv) Was correct amount of F75 given? Y N
- (v) Was frequency of feeds correctly prescribed? Y N
- (vi) What the frequency was of feeds 2hourly..... 3 hourly..... Not specified.....
- (vii) Was the patient fed within one hour of admission? Y N
- (viii) If no, how long did the patient stay in the ward before the first feed was given?.....hours
- (ix) What was the route of feeding? Oral NGT Not specified
- (x) Mean days on starter formula (F75).....
- (xi) Was the feed intake monitored daily? Y N

22. Step 8 Rehabilitation / catch up feeds (tick or fill as appropriate)

- (i) Was transition to F100 prescribed Y N
- (ii) Was correct volume prescribed in the transition period? Y N(check T sheet if same feed volume of amount of F75)
- (iii) Was volume of F100 increased after the transition period? Y N

23. Was pulse, respiratory rate, temperature monitored at least 6 hourly in first 2 days? Y  
N

24. Outcome : Discharged ----- Alive      Dead.

25. Duration of Hospital stay .....days

~~~~~END~~~~~

**APPENDIX VII: CARE GIVERS INTERVIEW AT THE END OF FIRST WEEK**  
**FILL IN THE CAREGIVERS' RESPONSES IN THE SPACE PROVIDED**

Let the caregiver explain then indicate the response as provided.

1. Have you been informed about the cause of your child's illness? Yes No  
If yes, explain
2. Do you know the treatment your child is receiving for this illness? Yes No  
If yes, explain.....
3. In the last one day, how many times did the child feed?
  - i) During the day.....
  - ii) During the night.....
4. Who feeds the child?
  - i) During the day.....
  - ii) During the night.....
5. Have you been informed on the amount of milk the child is supposed to take at each feed?.....
6. Are the feeds measured? Yes No Explain.....
7. Have you been informed on how to keep your child warm? Yes No  
If yes, explain.....
8. Do you have a heater in the room? Yes No
9. Have you been informed on the importance of playing with the child? Yes No  
If yes, explain

**APPENDIX VIII: HEALTH WORKERS QUESTIONNAIRE ON THE  
IMPLEMENTATION OF MOH GUIDELINES IN THE MANAGEMENT OF  
SEVERE MALNUTRITION AT ACH**

QUESTIONNAIRE

\*Please do not write your name. Your time spent in participating in this research is very much appreciated.

Questionnaire Serial Number \_\_\_\_\_

Date of interview \_\_\_\_\_

Name of interviewer \_\_\_\_\_

INVENTORY OF ESSENTIAL SUPPLIES

| Availability of               | All the time | Part of the time | Rarely | Don't Know |
|-------------------------------|--------------|------------------|--------|------------|
| Weighing Scale / Height board |              |                  |        |            |
| Thermometer                   |              |                  |        |            |
| Glucometer                    |              |                  |        |            |
| Glucostix                     |              |                  |        |            |
| Drugs- Xpen                   |              |                  |        |            |
| Drugs- Gentamycin             |              |                  |        |            |
| Drugs- Metronidazole          |              |                  |        |            |
| Drugs- Mebendazole            |              |                  |        |            |
| Vit A                         |              |                  |        |            |
| Folic Acid                    |              |                  |        |            |
| Syrup multivitamin            |              |                  |        |            |
| Iv Fluids HSD                 |              |                  |        |            |
| IV Fluids 5% dextrose         |              |                  |        |            |
| ReSoMal                       |              |                  |        |            |



|                          |  |  |  |  |
|--------------------------|--|--|--|--|
| F75                      |  |  |  |  |
| F100                     |  |  |  |  |
| Potassium<br>Supplements |  |  |  |  |
| Heaters                  |  |  |  |  |
| Blankets                 |  |  |  |  |

~~~~~END~~~~~

\*\*\* Thank you very much for taking time to participate in this research.

## APPENDIX IX: TRANSLATION OF THE STUDY INFORMATION INTO LOCAL ARABIC LANGUAGE

التاريخ \_\_\_\_\_ :: الرمز: \_\_\_\_\_

المعلومات التالية هي لتمكينك فهم طبيعة هذه الدراسة، بحيث يمكنك إعطاء موافقتك إذا كنت تشعر بالراحة معها.

عنوان الدراسة :

تقييم العلاج المتوفرة للأطفال التي تتراوح أعمارهم بين 9 و 12 شهرا و يتلقون العلاج لسوء التغذية في مستشفى الصباح، جوبا جنوب السودان

الغرض من هذه الدراسة :

كجزء من متطلبات درجة الماجستير في جامعة نيروبي، يجب إجراء دراسة بحثية. وتتركز الدراسة على معرفة وممارسات العلاج لسوء التغذية الحصرية في مستشفى الصباح بجوبا.

لقد طلبت منك لأنك مناسبة خصيصا لتوفير البيانات عن دراستي. لدي استبيان مع مجموعة من الأسئلة التي سوف أجرى مقابلة معك.

فوائد المشاركة:

مشاركتكم في هذه الدراسة هو طوعي تماما و يمكنك رفض الإجابة عن أي سؤال أو اختيار التوقف عن المشاركة في أي وقت. لن يكون هناك أي فائدة مالية لك من الدراسة. لن يكون هناك تعويض عن مشاركتكم في الدراسة. إذا كنت تشارك، فإن المعلومات التي سوف تقدم مساعدة لتحسين ممارسات الرضاعة الطبيعية في بلادنا، من خلال معرفة الممارسات بين الأمهات ومحاوله لتحسين عليها إذا كان هناك حاجة. وهذا سوف يساعد في تحسين صحة الأطفال في جنوب السودان

مخاطر المشاركة

وبصرف النظر عن الوقت الذي يستغرقه لملء الاستبيان (حوالي 15 دقيقة) التي قد يأخذك بعيدا عن الأنشطة الأخرى، لا يوجد أي مخاطر متوقعة أخرى. معلوماتك الشخصية سوف تكون سرية وسيتم تدميرها بعد ذلك. أنت حر في الانسحاب من الدراسة في أي وقت ودون إيذاء أسباب للانسحاب. لن تستخدم عدم المشاركة في هذه الدراسة ضدك وسوف لن يؤثر على علاقتك مع الباحث. لا تتردد في طرح أي أسئلة حول الدراسة. إذا كان هناك أي جزء من هذا النموذج غير مفهوم كن حرا في طرح الأسئلة حول هذا الموضوع. يمكنك أيضا الاتصال بي بعد المقابلة لأية إيضاحات أو أسئلة على الدراسة.

السرية: وسيتعمل بجميع المعلومات التي قمت بتقديمها خلال البحوث في الثقة ولن يظهر اسمك في أي تقرير لنشر البحوث. وسيتم تحديد لك من خلال رمز وسيتم التعامل مع المعلومات الشخصية الخاصة بك مع مستوى عال من السرية. سيتم تخزين البيانات الخاصة بك بأمان في منشأة مؤمن وليس هذا فقط الباحثة والمشرفين لها الحصول على هذه المعلومات.

د/ ماريا واريللى

قسم طب الأطفال

جامعة نيروبي

بيروبي - كينيا

+ 21195620 7530 E-mail :abiwarille@hotmail.com

أو

رئيس،

عشر المراجعة الأخلاقية الأمانة العامة، / KNH

BOX، 20723-00020 ص ب

نيروبي كينيا

أو

الدكتور فيليكس تويلى

## APPENDIX X: TRANSLATION OF THE CONSENT FORM INTO LOCAL ARABIC LANGUAGE

لقد شرح لي و فهمت غرض الدراسة، و أيضا عرفت حقوقي كمشارك في الدراسة. لدي فرصة لاسئل أسئلة لاي توضيح. و اعرف ان لي حق انسحاب في أي لحظة خلال الدراسة من دون ان تؤثر علي علاج طفلي. اذا كان لدي أي سؤال أو استفسار، يمكنني اتصال احد الباحثين/مشرفين ذكر أسمائهم .

اتطوع في اشتراك في الدراسة.

التوقيع (والي امر).....: التاريخ.....

التوقيع (الباحث).....: التاريخ.....