CURRENT PRACTICES AND CHALLENGES IN ASSESSMENT OF NUTRITIONAL STATUS AMONG HOSPITALIZED CHILDREN AT MOI TEACHING AND REFERRAL HOSPITAL, ELDORET KENYA

SANGA SHEILAH

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DECLARATION

Student's declaration

This thesis is my original work. It has not been submitted for an award of another degree in any other institution of higher learning. Views expressed herein are the researcher's unless stated otherwise, and where such is the case, the reference has been cited. No part of this research thesis may be reproduced without prior written permission of the author and or Moi University.

Sanga Sheilah,
SM/PGCHP/09/15,
P.O Box 83-20402
Longisa.
Tel; +254 725 101193

Signature:……Date……

Supervisors' declaration

This research thesis has been submitted for examination with our approval as University supervisors.

Dr. Irene Marete,
Senior lecturer
Department of Child Health and Paediatrics
School of Medicine,
Moi University
P.O Box 4606- 30100
Eldoret, Kenya.
Tel: +254 720458695

Signature:……Date……

Dr. Festus Njuguna,
Lecturer
Department of Child Health and Pediatrics
School of Medicine,
Moi University
P.O Box 4606-30100
Eldoret, Kenya.
Tel: +254 721 219 761

Signature:……Date……

DEDICATION

I would like to dedicate this study to my loving husband James for his unending support. To my son Travis and daughters Talia and Tasha for their source of joy and laughter even in tough times. To my parents and siblings for their unlimited support and love and above all the almighty God. I will always love you and am grateful for everything.

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OPERATIONAL DEFINITION

Current practices in assessment of nutritional status as per this study refer to:

1. Anthropometric measurements taken; weight, height and mid upper arm circumference
2. Classification of nutritional status

Clinical Wasting: Loss of muscle bulk and subcutaneous fat in limbs and gluteal region evidenced by sagging skin (baggy pants) and prominence of bony structures (ribs and cheek bones)

Admission: Period covering 24 hours since the child is admitted in the wards

Appropriate classification: Classification done correctly in comparison to investigator's (Weight for height z scores)

ABBREVIATIONS AND ACRONYMS

BMI	Body Mass Index
CIN	Clinical Information Network
KDHS	Kenya Demographic and Health Survey
KII	Key Informant Interview
MUAC	Mid Upper Arm Circumference
MDG	Millennium Development Goals
MTRH	Moi Teaching and Referral Hospital
SDG	Sustainable Development Goals
SPSS	Statistical Package for the Social Sciences
STATA	Data analysis and statistical software
UNICEF	United Nations Children's Emergency Fund
WHO	World Health Organization
WHZ	Weight for Height Z score

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ABSTRACT

Background: Malnutrition occurs due to deficiencies, excesses or imbalance in essential nutrients. Anthropometry is objective and forms the basis for diagnosis and classification. Various nutritional classification methods have been adopted; however, the World Health Organization (WHO) recommends the use of weight for height and Mid Upper Arm Circumference (MUAC) because of their objectivity. Previous studies have reported infrequent nutritional status assessment and classification. This could lead to missed cases, delayed intervention and negative impact on patient outcomes.

Objectives: To describe the nutritional assessment practices and barriers to assessment of nutritional status among children aged 6-59 months seen at Moi Teaching and Referral Hospital (MTRH).

Methods: This study adopted a cross-sectional mixed method sequential design among children hospitalized at MTRH pediatric medical wards between January to June 2017. A total of 322 children aged 6-59 months were sampled systematically from the pediatric wards while a stratified sampling technique was used to recruit the healthcare workers in the pediatric wards. Anthropometric measurements were taken from all the sampled children and their clinical charts reviewed. Key-informant interviews were conducted among sampled nurses and nutritionists, followed by three focus group discussion sessions with the clinicians to evaluate reasons behind the current nutritional assessment practices. Quantitative data was analyzed to determine the proportion of children correctly classified, anthropometric measurements taken and their associated factors using descriptive (median, frequencies and proportions) and inferential (Pearson chi-square test) statistical techniques at 95% confidence interval. Qualitative data was transcribed and analyzed thematically on N-Vivo version 12 software.

Results: Majority of the children 184 **(**57.1 %) were male, 191 (59.3%) were aged between 6-24 months with 293 (91%) of them being admitted for the first time. Weight was taken among all the children sampled while height (17.1%) and MUAC (15.5%) were infrequently measured. Wasting and edema were significantly associated with MUAC and height measurements (p-value <0.001). The most common form of malnutrition was severe acute malnutrition 68 (21.2%). Healthcare workers classified the nutritional status of 67 (20.8%) children of whom 55 (82.1%) were correctly classified based on WHZ scores. The reasons for lack of nutritional assessment and classification of all admitted children given by healthcare workers included: insufficient equipment, high number of patients and inadequate in-service training.

Conclusions: All children had their weight taken while height and MUAC were not routinely done. Nutritional status was rarely classified however most of those classified had it appropriately done. Low levels of nutritional status assessment were attributed to inadequate equipment, high number of children and inadequate training of staff.

Recommendations: Routine nutritional assessment and classification should be done for all children admitted at MTRH. There is need to provide adequate nutritional assessment equipment and training of staff.

CHAPTER ONE

1.0 INTRODUCTION

1.1 BACKGROUND

Malnutrition is a disorder caused by inadequate or excessive intake of nutrients and therefore it may present as undernutrition (wasting, stunting and micronutrient deficiencies) and overweight. Wasting is defined by weight for height which is less than -2 standard deviation of the WHO child growth standard median and has been demonstrated to carry a higher burden as far as child survival is concerned. Stunting is defined by height for age which is less than -2 standard deviation of the WHO child growth standard median. Overweight is defined by weight for height that is more than+2 standard deviation of the WHO child growth standard median.

Under nutrition is an outcome of three factors namely; household level food security, access to health and sanitation and child caring practices. The factors can be linked to many causes which are classified as primary or secondary based on the etiology.

Primary cause of malnutrition occurs due to socio-economic factors resulting in lack of food. These social factors include cultural belief, custom, food taboos, ignorance, low maternal knowledge, large families, single mothers, poor weaning practices such as early weaning and poor choice of feeds, poverty and political instability. Economic factors include; low income and small land for farming (Ayaya, Esamai, Rotich, & Olwambula, 2004; Kikafunda, Walker, Collett, & Tumwine, 1998).

Secondary causes of malnutrition occur in children who have an underlying medical condition leading to increase in caloric requirements. This may be due to ; infections, worm infestations and malignancies or increased caloric loss resulting from malabsorption, inborn errors of metabolism, increased gastrointestinal losses i.e.

vomiting and diarrhea, burns and renal impairment; impaired utilization which could result from endocrine disorders and decreased caloric intake which could result from oral sores thus restricting intake and anorexia (Kliegman, Stanton, Geme, Schor, & Behrman, 2011).

Under nutrition has been shown to be a major contributor to childhood morbidity and mortality either directly or indirectly. In a joint report by WHO and UNICEF in the year 2018, more than half of all the mortalities of children under the age of five years were linked to malnutrition with children in sub-Saharan countries being forteen times more likely to die than in developed countries (Hug et al., 2018; "Malnutrition in Children - UNICEF DATA," n.d.) Several other studies have demonstrated associations between malnutrition and increased risk of mortality, morbidity and increased length of hospital stay (Costa, Tonial, & Garcia, 2016a; Nangalu, Pooni, Bhargav, & Bains, 2016; Pelletier, Frongillo, & Habicht, n.d.).

Early identification of children with malnutrition help in institution of proper management plan and ensures continuity of care leading to shorter hospital stay , reduced mortality and proper allocation of resources. Classification of nutritional status gives the direction of management and early referral for milder cases of malnutrition to nutritional expert to avoid worsening of the cases to severe forms

Although good progress has been made towards achieving sustainable development goal on reducing childhood mortality globally to 25 per 1000 in every country by 2030 as set by the United Nations, Kenya has had a reduction of child mortality from 93 per 1000 in 1991 to 39 per 1000 in the year 2018 (UNICEF, 2019). The rate of reduction is not adequate to meet the target. In Kenya, just like many other countries, the rate of reduction is still not adequate to meet the target (Hug et al., 2018).

Sustainable development goals that involve proper identification, classification and subsequent management of malnutrition are therefore very important in reducing childhood mortality (Golding et al., 2017).

In Kenya according to KDHS 2014 report, 26%, 11%, and 4% of children under the age of five were stunted, underweight and wasted respectively (KDHS, 2016). Wilson,(2010) reported that the proportion of children admitted with malnutrition at the medical pediatric wards at MTRH was forty percent by .(Wilson, 2010). There is an average of fifteen cases of severe acute malnutrition monthly and a case fatality of 4.5% (Chepng'etich, 2018).

Mortality due to malnutrition will not be reduced if efforts are only directed towards the management of severe cases of malnutrition .The greatest impact can be achieved when attention is directed towards all grades of malnutrition by timely and appropriate identification of cases. This is possible if anthropometric measurements are routinely done whenever a child is taken to a health facility.

Nutritional assessment is the interpretation of anthropometric, biochemical (laboratory), clinical and dietary data to determine whether a person or groups of people are well nourished or malnourished (over-nourished or under-nourished). Anthropometric indices which include; weight, height, MUAC and head circumference are adequate and they form the basis of classification of nutritional status (Green Corkins & Teague, 2017). Classification of nutritional status acts as a guide to health care practitioners to decide on how to manage or follow up a child especially if malnutrition is detected.

Health care workers have been reported not to be keen when it comes to taking of anthropometric measurements of children seen in health facilities. Weight is mostly taken compared to the other measurements because of its requirements for other

purposes e.g. for calculating dosages of drugs to give in addition to screening of malnutrition. Classification of nutritional status in children has not been standardized in many settings whereby some older methods of classification are still in use despite recommendations by WHO to use Weight for Height Z scores leading to discrepancies and some cases of malnutrition going unnoticed.

There are several reasons why screening by WHZ is potentially problematic and is frequently not undertaken in practice in sub-Saharan Africa. First, height is difficult to measure accurately in children at any time but especially so in a busy ward and when children are ill or distressed. The measurement of weight depends on the presence of properly calibrated and functioning scales, which often are not available. The actual weight-for-height determination depends on correctly recording 2 separate values and then looking up a third value on a chart, which must be readily available. The use of clinical judgment, high number of children seen and competing patient interests also play a role in hindering assessment of nutritional status of admitted children.

1.2 Problem Statement

Malnutrition is highly prevalent among children admitted in pediatric wards especially those who have chronic illnesses which the case with majority of children admitted at MTRH. Nutritional assessment which is the critical step in managing malnutrition is rarely done in many Sub- Saharan African hospitals hence missing out the opportunity to manage cases of malnutrition early leading to poor outcomes (Irimu, 2014; Mogeni et al., 2011)

Majority of the mortalities occur within 72 hours of admission with 40% of them occurring within 24 hours of admission which worsens when diagnosis is not made early (Gachau et al., 2018).

Mild to moderate grades of malnutrition which are rarely picked at admission may worsen to severe form of malnutrition during the hospital stay due to the negative impact of hospitalization on nutritional status and this has been shown to contribute to 43-83% of mortalities among hospitalized children (Pelletier et al., n.d.).

World Health Organization (WHO) has proposed the use of weight for height Z scores in assessment and classification of hospitalized children because of its objectivity and to bring out uniformity. This is however not routinely followed in various settings due to various challenges (Jensen et al., 2003). The status at MTRH is unknown due to paucity of data.

1.3 Justification

There is insufficient data on the nutritional status assessment and classification as well as the challenges faced by the health care workers while attending to the children admitted at the MTRH medical pediatric wards.

This study therefore set out to find the current practices and views of health care workers regarding assessment and classification of nutritional status of the children admitted to the medical wards.

The findings of the study will help in putting interventions and measures to ensure proper assessment and classification of nutritional status of children seen which translate to timely management of malnourished children and improvement of child survival.

Lack of informed interventions put in place will lead to continued missed opportunities in diagnosis of malnutrition leading to higher mortalities and children getting severe forms of illnesses (Mogeni et al., 2011). Moi Teaching and Referral Hospital being a learning institution should be at the forefront of imparting the correct

clinical practices among its students which can only be achieved by ensuring that gaps and challenges faced in assessment of nutritional status are identified and addressed adequately.

1.4 Research Question

What are the current practices and barriers in assessment and classification of nutritional status in addition to proportion of children appropriately classified based on WHZ scores among hospitalized children aged 6-59 months at medical pediatric wards MTRH?

1.5 Objectives

1.5.1 Broad Objective

- To evaluate the current practices and barriers in assessment and classification, of nutritional status in addition to proportion of children appropriately classified based on WHZ scores among children aged 6-59 months admitted to the medical pediatric wards at MTRH

1.5.2 Specific Objectives

1. To determine the current practices in assessment and classification of nutritional status of hospitalized children aged 6-59 months at pediatric medical wards MTRH.
2. To determine the proportion of children aged 6-59 months appropriately classified based on WHZ scores at pediatric medical wards.
3. To describe the barriers to assessment and classification of nutritional status among hospitalized children aged 6-59 months at pediatric medical wards MTRH.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Assessment of Nutritional Status

Assessment of nutritional status is an integral part in management and follow up of children with malnutrition (Borda, Espitia, & Otalvaro, 2018). Nutritional status is assessed by two types of methods; direct and indirect. Direct assessment deals with the individual while indirect assessment deals with community health indices that reflect nutritional status. Indirect methods are divided into three categories which are; ecologic factors like crop production, economic factors e.g. per capita income and vital health statistics particularly the under five years mortality. The direct methods are anthropometric methods which include measurement of body weight, height and mid upper arm circumference. In hospital setting, nutritional assessment is done by integration of both focused history, examination, anthropometric measurements and laboratory evaluation (Beghin, Cap, & Dujardin, 1988; Green Corkins & Teague, 2017). It is important to assess a child's nutritional status because of various implications including; morbidity and mortality risks (Costa, Tonial, & Garcia, 2016c; Grippa et al., 2017; Marwali et al., 2015) financial implications, education and research purposes (Corkins, 2017) length of hospital stay and increased risk of readmission (Correia & Waitzberg, 2003; Lin Lim, 2014). In the initial assessment, a focused history is paramount. History should include the usual diet of the child before the current ill-health, recent intake in terms of foods, duration of breast feeding including the period of exclusive breastfeeding, weaning age, the type of complementary foods introduced. Diarrhea in terms of duration, frequency, consistency and presence or absence of blood, vomiting if any including the duration and frequency. Presence and duration of Cough, any associated progressive weight

loss, contact with suspected or open TB case, recent contact with a person with measles and HIV status (WHO, Guidelines for the management of common childhood illnesses, 2013).

2.1.1 Clinical Signs of Malnutrition

Malnutrition can be detected from clinical signs, which can be combined with other factors to confirm malnutrition. Some of the clinical signs that are usually picked from children with malnutrition:

Hair changes includes silkiness, curliness or straightness; lightly colored to shades of brown/red; lack of luster; sparsely distributed to alopecia; thin and easily pluck able (Ebenebe, Ulasi, Azubuike, & Nkaginieme, 2007; Poskitt, 1991; Shetty, 2006).

Dermatosis*:* This is common in the edematous type of malnutrition and manifest as hypo or hyperpigmentation, rough patches (hyperkeratosis), shedding of the skin in scales and sheets, cracks and fissures that may ooze plasma. Extensive skin desquamation may present appearances like second degree burns (Grover & Ee, 2009; Poskitt, 1991). Areas commonly involved are nappy areas, legs and forearm, face, behind the ears and the armpits.

Dermatosis may be rated as; mild when only few rough patches or areas of hypopigmentation are present, moderate when there are seen large areas or multiple patches of hypopigmentation, and severe when there is flaking or raw skin, cracks and fissures (Heilskov et al., 2014; Shetty, 2006).

Stomatitis: This usually manifests as angular stomatitis and glossitis with loss of papilla (Ebenebe et al., 2007; Poskitt, 1991). It may be related to deficiency of micronutrients such as iron or vitaminB2, and are mostly complicated by infections.

In severe cases of stomatitis, anaerobic infection of the oral mucosa and gums by fusiform bacilli and spirochetes can lead to gangrenous stomatitis called cancrum oris (Enwonwu, Falkler Jr, & Phillips, 2006).

Visible Signs of Wasting*:* Wasting is usually as a result of loss of muscle bulk and subcutaneous tissues and can be easily seen in the following areas: chest as prominent ribs, arms and thighs as loose skin and flabby muscle, the back as prominent scapula and spine, and the buttocks as loss of fat and muscles with the overlying skin hanging loose in atypical "baggy pants" fashion (Grover & Ee, 2009; Kliegman et al., 2011).

Peripheral Edema*:* The presence of bilateral pedal edema in a child should alert health practitioners on the possible diagnosis of edematous malnutrition, particularly in the presence of other physical signs of malnutrition. Edema in malnutrition is rated as follows: Mild, involves only the feet; moderate, feet and legs and/or the upper limbs and severe, generalized edema or moderate with facial edema (Grover & Ee, 2009; Kliegman et al., 2011).

Other clinical features of Malnutrition

These include pallor (from anemia related to deficiency of protein, iron and folate), moon face with drooping cheeks, abdominal distension (related to fatty liver, gaseous distention, worm infestations), apathy and irritability (from mental and neurological dysfunction) (Ebenebe et al., 2007; Grover & Ee, 2009; Poskitt, 1991).

2.1.2 Anthropometry

Anthropometry is the determination of nutritional status by physical measurements and comparing them to relevant reference charts such as the WHO weight-for-height reference chart ("WHO | Weight-for-length/height," n.d.) .

Anthropometric measurements alone such as weight and height, and the interpretation of these measurements are an objective and quantitative element of nutritional assessment and forms the basis of diagnosis (Cross et al., 1995; Green Corkins & Teague, 2017). It has also been shown that using anthropometry as opposed to using clinical signs alone to identify those with malnutrition results in better clinical outcomes (Tan et al., 2020).

Various methods of assessment of nutritional status for different age groups have been developed together with cut off values to aid in deciding the management plan, place of management and follow up plan for the patients. The world health organization advocates for the use of weight for height for management purposes and use of MUAC for screening purposes. These anthropometric measurements have been reported to be more objective compared to other methods used earlier (Beser et al., 2018).

Weight for Age is a measure of child's weight and is compared to the expected weight of that particular age and gender; it is a sensitive method especially when recorded serially. A reduction in weight gain or loss in weight can be seen within one month. This however has a setback in that age is sometimes not given accurately or is not known by the caretaker making it subjective and has led to the preference of age independent anthropometry (D B Jelliffe & The, n.d.).

Height for Age:This is used to assess linear growth. Deficit indicates long-term, cumulative nutritional inadequacies (Organization, 1999).

Children whose height-for-age indices fall below 90% of the median value (< –2 SD) of the WHO reference value are classified as stunted with those below 85% (<–3SD) being severe (WHO, 1999) Because deficit in height results from a long-term process, stunting denotes chronic malnutrition. Length is measured for children less than 2 years of age while standing height is done for the others more than two years.

Length is usually greater than standing height by 0.5cm but this difference is accounted for in most reference charts. This method compares the child's height with the expected height for the age. This anthropometric measurement is useful in identification of stunting in children and is a measure of prolonged period of malnutrition (Seal & Kerac, 2007).

Weight for Height: This compares a child's weight with the expected weight of the same height. This method is important when differentiating between acute and chronic malnutrition. Acute Malnutrition is indicated by wasting and is confirmed by weight for height being low. Children whose measurements fall below 80% of the median value (< – 2 SD) of the WHO reference value are classified as wasted with those below 70% (< –3SD) being severe (Organization, 1999) Weight-for-height is the current recommended measurement for defining acute malnutrition. This is an objective method since both height and weight can be confirmed by the health care provider (Cole, Donnet, & Stanfield, 1981; Ramachandran & Gopalan, 2011).

Left Mid Upper Arm Circumference (LUMAC): This anthropometric measurement is usually used for screening purposes and is usually used at the community level especially where the collection of height and weight measurements

may be difficult as, for example, in emergency situations like refugee crises and famines (WHO 1999). It gives a guide in knowing the severity of malnutrition. If the LUMAC is 12.5-13.5, the child has mild malnutrition 11.5cm-12.5cm, the child has moderate malnutrition and if it is less than 11.5 cm it is suggestive of severe malnutrition. This is useful for screening a large number of children but less useful in long term growth monitoring (Hibbah Araba Saeed1). The techniques to measure mid upper arm circumference include accurate measurement with a tape and the use of a simple bangle test. Bangle test (Bengoa, 1970) makes use of using plastic bangles of an inner diameter of 3.7 cm (Red Bangle) and 4 cm (Yellow bangle). The use of this anthropometry has however been reported to be a good predictor of mortality (Kumar et al., 2018).

Weight-for-age has traditionally been used in defining malnutrition with children whose measurements fall below 80% of the median value (< – 2 SD) being classified as malnourished (Organization, 1999). Because low weight-for-age may be due to low height for-age (stunting), low weight-for-height (wasting), or both (global malnutrition), weight-for-age is not currently a recommended measurement to define acute malnutrition (WHO, 1999).

Skin fold thickness, measured with skinfold caliper, assesses the thickness of the skin and subcutaneous fat and may thus indicate nutritional stores. Classical sites of measurements are over the triceps, biceps, sub scapula, and abdomen (Organization, Child, Health, & UNICEF., 2000) . Values are judged by reference to centile charts. Used alone, they are of limited value for assessing the degree of wasting because they fail to take into account changes in muscle mass (WHO, 1999).Skinfold thickness are widely used for assessing obesity among adults.

Head circumference, measured as the longest measurement around the head in the occipito-frontal plane, may be used to assess for the rapid brain growth that occurs in the first 2 years of life. Nutritional deficiencies during this period may reflect in faltering head circumference. Thereafter, it reflects nutritional state poorly (Grover & Ee, 2009; Poskitt, 1991).

These measurements are important because they represent diagnostic criteria for malnutrition in children (Casadei & Kiel, 2019).

The value of clinical judgment alone for identifying nutrition risk is not reliable and has been found uniformly poor in the absence of anthropometric measurements (Bavelaar JW, 2008).

Studies have shown that weight is the most recorded anthropometry Cummings *et al* .,(2005) reported eighty nine percent of children at admission had their weights taken (Cummings, John, Davis, & McTimoney, 2005) Similar findings were also reported by Afu (Afu, 2017) and slightly lower percentages were reported by Akugizibwe *et al,(2013)* across four rural hospitals in Uganda (Akugizibwe, Kasolo, Makubuya, & Damani, 2013).

Height on the other side is taken variedly in different settings, Afu reported 0.4% of children seen at admission had their heights taken (Afu, 2017) whereas Cummings *et al.,2005)* showed that almost half of the children seen had their heights recorded (Cummings et al., 2005) while Akugizibwe *et al*., (2013) reported an average of 14% across four hospitals in Uganda (Akugizibwe et al., 2013).

Left mid upper arm circumference is the least taken despite it being the most feasible of all the other parameters. Cummings *et a.,(2005)l* did not report LMUAC taken on

the children admitted to the tertiary hospital (Cummings et al., 2005) whereas Afu, (2017) reported 14% of children seen had their LMUAC taken which was similar to Akugizibwe et al., (2013(Afu, 2017; Akugizibwe et al., 2013))

2.1.3 Laboratory Indices of Malnutrition

Several biochemical derangements occur in malnutrition although blood values do not always reflect body reserves accurately. The assessment of tissue content and stores by analysis of hair, bone marrow, or liver biopsy may be more accurate but less practical (Kliegman et al., 2011; Poskitt, 1991).

Recognizable biochemical abnormalities that occur in malnutrition include low Serum prealbumin (transthyretin) and albumin, depressed blood urea nitrogen, profoundly low serum cholesterol, and reduced levels of transferrin (Ebenebe et al., 2007; Potter & Luxton, 1999). They may also serve as useful markers in monitoring response to treatment.

2.2 Classification of Nutritional Status

WHO has proposed the use of weight for height Z scores in classifying malnutrition in addition to presence of oedema or other complications in hospital settings and use of LMUAC in community settings for screening purposes (WHO, Guidelines for the management of common childhood illnesses, 2013).

Before this other classification methods existed some of which are still being used in various settings. Classification was done based on the clinical or community setting.

The Welcome classification of malnutrition has been adopted for hospital or clinical surveys. This is based on percentage of expected weight for age and presence and absence of oedema. This like many others has a setback when age is not accurately known.

Table: 1 Wellcome classification

Body weight % of standard*	Edema	
	Yes	No
80 – 60	Kwashiorkor	Underweight
< 60	Marasmic- kwashiorkor	Marasmus

* Per cent of standard (NCHS reference value).

Gomez classification was adopted for community surveys for public health interventions and was based on the weight for age though also had a shortcoming when age is not known. The child's weight is compared to that of a normal child (50th percentile) of the same age. Gomez divided malnutrition into 3 degrees as follows: First degree: between 90-75% of standard (Harvard fiftieth percentile), Second degree: between 75-60% and third degree: less than 60% (Gomez, Galván, Cravioto, & Frenk, 1955).

(Derrick Brian Jelliffe & Organization, 1966) on the other hand proposed a similar classification as Gomez but with different intervals as follows: between 90-80% of expected weight, between 80- 70% of accepted weight, between 70-60% of expected weight and < 60% of expected weight to indicate grade 0, 1, 2 and 3 respectively.

Bengoa used the Gomez classification but included all cases with edema in 3rd category, regardless of the body weight (Bengoa, 1970).

Traditionally, acute under nutrition in children has been defined as low weight-for-age or low weight-for-height (wasting), and chronic under nutrition has been classified on the basis of low height-for-age (stunting) as described by Water low (Waterlow, 1972) which has been shown to pick cases of overweight as well (Ferreira, 2020). Indices derived from percentage weight-for-height have been developed, but these require more calculations and a certain degree of competence in dealing with growth

charts. The accuracy of these calculations, even when undertaken by experienced Professionals, has been questioned. Several studies and reviews have shown that the classification of nutritional status in children (Pawellek, Dokoupil, & Koletzko, 2008; Wright, Ashenburg, & Whitaker, 1994). The information that can be derived from single measurements is limited because growth rates differ between children and with the developmental stage. In view of these difficulties, use of anthropometric indices or one of the classification methods to define nutritional status and the risk of malnutrition in hospitalized children is currently less than satisfactory.

WHO emphasizes that the measure of height or length to age ratio measures the duration of malnutrition (WHO, WHO Technical Report series, 1971). The Seoane and L (Seoane & Latham, 1971) classification was based on the concept of height/length to age ratio. The descriptive terms proposed from the 2 parameters (Waterlow, 1972) are: 'stunting'-for deficit in height for age, 'wasting'- for a deficit in weight for height.

The use of Z scores has an advantage over percentage of the reference used in Welcome classification. The size of the standard deviation of anthropometric measures such as height for age and weight for age varies with age (WHO, Guidelines for the management of common childhood illnesses, 2013). Use of the Z-score system is important for identifying all facets of under-nutrition and is important for estimating the true prevalence of under-nutrition (Seetharaman N, 2007).

In view of all these classification methods WHO has therefore in an attempt to bring some order in classification of malnutrition came up with the use of weight for height to classify the degree of wasting and height for age to classify the degree of stunting in addition to presence of edema in determining chronicity of malnutrition (Head R.,

1999), Severe wasting and edematous malnutrition represent acute, severe malnutrition and all such children should be preferably admitted to hospital where they can be observed, treated and fed day and night (WHO, 1999). Since stunting denotes chronic form of malnutrition; such children may be satisfactorily managed in the community, rather than in hospital. This also plays a role in deciding the cases to be managed as inpatient and those that can be managed as outpatient cases (Head R., 1999). The use of Weight for Height Z scores therefore gives a better way of classification of acute malnutrition in hospitalized children because of its objectivity.

2.3 Missed Opportunities

Identification and documentation of nutritional status has been reported to be poor worldwide leading to missed cases of malnutrition and opportunities in either managing the acute cases or preventing mild cases from progressing to severe cases (Campanozzi et al., 2009). In Canada, Cummings *et al*.,(2005) reported that 35% of all children seen in a tertiary hospital had a nutritional assessment (Cummings et al., 2005). In India Dave *et al*., (2016) found out that almost all the children with various forms of malnutrition admitted to surgical wards did not have such a diagnosis nor a management plan (Dave, Nimbalkar, Phatak, Desai, & Srivastava, 2016) in a study in Ghana at Volta Hospital Afu found out that 71% of children admitted to the hospital with various forms of malnutrition were not identified during their entire period of stay in the hospital (Afu, 2017). A study by Akugizibwe *et al*., (2013) across four rural hospitals in Uganda also reported low levels of nutritional assessment and classification ranging between 18-24 percent, leading to 32.9% of children with malnutrition being missed out by the health care providers (Akugizibwe et al., 2013). Hammer .,*(2015)* in Gambia reported that half of the children with malnutrition were

missed out even after the health care providers underwent training on the same (Hamer, Kvatum, Jeffries, & Allen, 2004). Binagwaho et al., (2011) also pointed out same problems of under-diagnosis in Rwanda (Binagwaho et al., 2011). In Kenya low levels have been reported as well by Irimu, (2014) in a study across fourteen Clinical Information Network hospitals where it was found out that only a third of children seen had a nutritional classification (Irimu, 2014).

The setting where the children are seen worsens the situation as depicted by Antwi, (2009) whereby a study conducted in an out- patient setting showed that only 6% of children with malnutrition were picked by the health care worker (Antwi, 2009).

2.4 Barriers to Nutritional Assessment and Classification

Nutritional status assessment which is generally considered to be a basic requirement during the admission process is not routinely done in clinical practice because many limitations exist (Jensen et al., 2003). A lack of functioning, calibrated and fit-for-purpose equipment is commonly report (Akugizibwe et al., 2013; Cummings et al., 2005; Huysentruyt et al., 2015) When equipment is available, the technique used to obtain measurements is not always standardized and the recording of measurements is often poor, if done (Binagwaho et al., 2011; Stephenson, Latham, & Ottesen, 2000). Availability of equipment plays a major role in determining the number of children whose measurements are taken. In an interventional community study on community based weighing of newborns, it was found that the percentage of exact weight recorded ranged from less than 40% before the intervention to nearly 100% after the intervention (Gisore et al., 2012).

Other barriers to assessment and documentation of nutritional status reported are inadequate training on the use of assessment tools, competing patient care tasks,

tiredness and less acceptance of evidence based practice (Akugizibwe et al., 2013a; Ndiema, Makworo, & Mutai, 2018; Tafese & Shele, 2015; Yalcin, Cihan, Gundogdu, & Ocakci, 2014).

Reports suggest that there are problems in initially identifying severely malnourished children at hospital admission (Black RE, 2OO3). In many hospitals in sub-Saharan Africa, weight is the only systematically measured anthropometric index (Afu, 2017; Akugizibwe et al., 2013). Consequently, in practice, the diagnosis of severe acute malnutrition among children upon admission to hospital often depends on clinical recognition and judgment by the health care providers whereby mostly children with obvious signs of malnutrition are assessed (Cummings et al., 2005; Hamer et al., 2004; Headey, 2014; Ndiema et al., 2018; Yalcin et al., 2014)). However reports have shown that health care providers are poor when it comes to weight estimation (Greig, Ryan, & Glucksman, 1997) therefore relying on personal judgments can be misleading (Mogeni et al., 2011).

There is flawed perception by health care providers on the children's nutritional status which may disrupt assessment classification and the management of malnourished children (Ibekwe & Ashworth, 1994).

CHAPTER THREE

3.0 METHODOLOGY

3.1 Study Site

The study was conducted at Moi Teaching and Referral Hospital (MTRH) located along Nandi Road in Eldoret town. Eldoret is in the North Western side of Kenya, about 310 km from Nairobi the capital city of Kenya in Uasin Gishu County where farming is the main economic activity for majority of the residents. The MTRH is the second-largest public teaching and referral hospital in Kenya serving the western part of the country, parts of Eastern Uganda and Southern Sudan with a catchment population of approximately 24 million. It has a bed capacity of over 900 and about 1200 patients at any given time.

The study was carried out in the medical pediatric wards where children between the ages of 1 month to 14 years are admitted. Approximately 5000 children are admitted to the medical wards every year with about 2300 of them within the age bracket of 6-59 months and average of 15 admissions per day. The number of children admitted with malnutrition is estimated to be about 52 children per month. The health services received are paid for through either out of pocket payments or through insurance mostly National Hospital Insurance Fund. The health care workers attending to the children admitted include approximately 20 pediatricians, 30 residents, 4 medical officers, 15 clinical officers, 5 nutritionists, 8 medical and clinical officer interns and nurses among others. Assessment of nutritional status in MTRH is done by clinicians and nutritionists managing the children either at the emergency department or in the wards. This is done as part of the initial evaluation of the children by the admitting clinician by use of clinical signs of malnutrition and anthropometric measurements

(weight, height and MUAC). Those children found to have malnutrition have their classification done based of severity by use of WHO WHZ scores.

3.2 Study population

The study population was all children aged 6-59 months admitted at MTRH medical pediatric wards between January and June 2017 and their caregivers (clinicians, nurses and nutritionists).

3.3 Study Design

This study adopted a cross-sectional mixed method sequential design among children hospitalized at MTRH pediatric medical wards and health care workers from January 2017 to June 2017.

The design used in this study involved the collection and analysis of quantitative data in the first phase of research followed by the collection and analysis of qualitative data in a second phase that builds on the results of the initial quantitative results. Weight typically was given to the quantitative data, and the mixing of the data occurred when the initial quantitative results informed the secondary qualitative data collection.

A sequential explanatory design was typically used to explore the barriers in assessment and classification of nutritional status among children aged 6-59 months admitted in the medical pediatric ward.

3.4 Sample Size

Fischer's formula was used to calculate the sample size

$n=z2pq/e2$,

Where n-is the number of subjects to be recruited

z-is 1.96 for 95% confidence interval

p-is 30 % (proportion of children admitted whose nutritional status was assessed across 14 CIN hospitals in Kenya 2012)

e-is 0.05, the precision or the margin of error

q=1-p

Therefore, the sample size was 322

A total of 34 clinicians recruited to take part in focus group discussion whereas two nurses and two nutritionists were also enrolled into the study to participate in key informant interviews.

3.5 Sampling procedure

In this study Systematic sampling technique was used in sampling the children to participate in the study; the admissions book in the ward contains the names and the age of the children admitted therefore all the children admitted during the study period who were aged between 6-59 months were given numbers sequentially in the admissions book according to their order of admission. The interval was calculated by dividing approximate number of admissions by using the number of previous admissions of children aged between 6-59 months for six months by the sample size. From the records department there were 863 admissions from the month of December 2015 to May 2016 of children between 6-59 months in the medical pediatric wards at MTRH.

Therefore the interval (K) was 863/322.69=2.67 in this case 2 was used as K e.g. if the first sample is 1 then the next was 3.

The K served as the constant difference between any two consecutive numbers in the progression until the sample size is reached

Stratified sampling was used to recruit clinicians to participate in focus group discussions. This was done by classifying the residents into parts 1,2 and 3 depending on the years of study i.e. year 1, 2 and 3 and taking each part as a strata. Medical and clinical officers formed one strata with the interns forming the final strata. There after convenient sampling was used to recruit participants from each cluster depending on their availability.

Purposive sampling was used to recruit nutritionists and nurses to participate in key informant interviews whereby a nurse and a nutritionist in charge of each ward were recruited into the study. This was based on the positions they held and presumption that they would provide in-depth insight of the challenges faced while assessing nutritional status of admitted children.

3.5.1 Inclusion Criteria

1. Children aged 6-59 months admitted to the medical pediatric wards between January 2017 and June 2017.
2. Clinicians, nutritionists and nurses working in the pediatric department seeing children at admission.

3.6 Data Collection Methods

Data collection was done by the principal investigator with assistance of a research assistant.

Role of the Principal Investigator: The principal investigator's role was to train the research assistant on the study procedure and data collection tools and played a major role in collecting quantitative data as well as qualitative data by conducting focus group discussions and key informant interviews.

Research Assistant: The research assistant was a clinical officer by profession with qualifications of diploma in clinical medicine. He was working in the pediatric department and had experience in research after participating in several researches as research assistant in addition to background knowledge on nutritional assessment and classification. The research assistant was trained on the purpose of the study, the recruitment procedure of the study participants, data collection procedures, assessment of nutritional status and also sensitized on professional conduct during the study period. This was achieved through going through the questionnaire with the principal investigator and taking anthropometric measurements practically in the nutrition room**.**

Role of the research assistant: The role of the research assistant was to help the principal investigator in collecting data by identifying the children who met the inclusion criteria by going through the admissions book, recruitment of participants, and collection of data with or without the principal investigator.

3.6.1 Data Collection Tools

Quantitative data: Quantitative was collected by use of a data collection form which had demographic details of the child which were age, sex, and the birth weight. The data collected from the files was; the time of admission, whether the child was referred from another facility or not, the diagnosis of the child, the clinical signs of malnutrition i.e. clinical wasting and oedema, anthropometric measurements taken and recorded by the health care providers and lastly whether a child had a nutritional classification done The last section of the data collection form had anthropometric measurements and nutritional classification done by the principal investigator.

Qualitative data: Focus group discussions to the clinicians and key informant interviews to the lead nutritionists and nurse in charges of the pediatric wards were used in collecting qualitative data. The clinicians in the pediatric wards had sets of questions that probed on their understanding of nutritional assessment of children, methods of classification used and whether they were aware of the current recommendations. The questions sought to find out whether the clinicians assessed the nutritional status of all the children admitted to the wards and some of the barriers the might hinder the nutritional assessment. The guide questions inquired on whether the health care providers had undergone any trainings and sensitizations on assessments of nutritional assessment and if not what were some of the challenges they faced. The clinicians gave their views on the impact of nutritional assessment on morbidity and mortality and they explained how the impact came about. The questions had on whether the clinicians had proposals in ensuring proper assessment of nutritional status and were free as well to add anything more on assessment of nutritional status.

The nurse in charge of the ward and nutritionist in charge were selected to participate in key informant interviews on the basis of their understanding of how daily activities are carried out in the ward and where and how nutritional assessment tools are availed. The guide questions to the key informants probed on the understanding of the nutritional assessment in the pediatric wards and sought to find out some of the barriers that have been brought up by the clinicians were facing while assessing the admitted children .The questions inquired on availability of assessment equipment in the wards, the state of equipment in terms of function and their accessibility. The nutritionists also gave the challenges they face while assessing the nutritional status of the children. The questions also sought to inquire some of the recommendations the key informants thought were going to ensure that all the children admitted had a nutritional assessment done on them.

The flow of patients

The flow of patients started from the triage area where categorization of patients was done until the child was admitted which was the point of entry of the study .This is shown in figure 1 below.

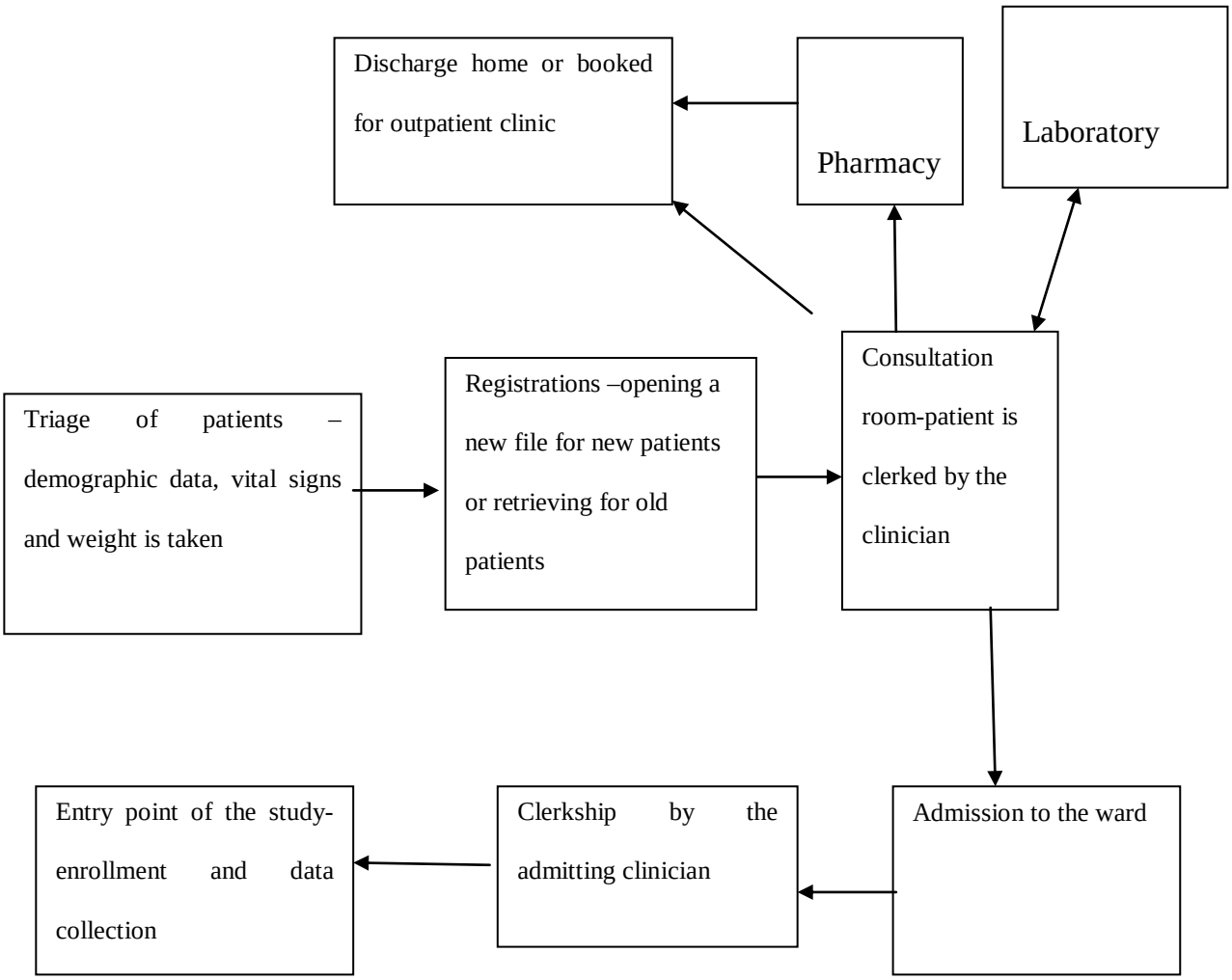

Figure 1: Flow of Patients

3.6.2 Study procedure

The entry point of the study for children was within 24 hours of admission. The first participant was picked randomly from a list of 5 children made in numerical order from admission book. This was from children who met the criteria from the ward which admitted the previous day. The numbers were written in small pieces of paper, wrapped, tossed and one piece picked, the number which was picked became the first participant for the entire quantitative aspect of the study and was number 3 in our case. A constant interval (K) which was 2 in this case was used as the difference between two consecutive participants. The principal investigator or the research assistant went through the admission book every morning from the ward which admitted children the previous day. All the children between the ages of 6-59 months who were admitted were listed down according to the order in which they appeared in the admission book. They were numbered as a continuation from the previous listings done. The procedure was followed until the sample size of 322 was reached.

The participant was identified, the parent /guardian were informed about the study and the procedure explained to them. Written informed consent was obtained from parents/guardians after which the data collection form was filled through getting information from the file of the patient. The data obtained included age, gender, time of admission, diagnosis, clinical signs of malnutrition (wasting and oedema) characteristics. The anthropometric measurements taken and classification of nutritional status done by health care workers were obtained from the file as well.

The principal investigator/research assistant there after took anthropometric measurements following the WHO standard procedures i.e. weight, height and mid upper arm circumference irrespective of the presence of these anthropometric measurements in the file in the patients file and recorded in the data collection form.

Clinical signs of malnutrition (wasting and edema) were recorded as well and thereafter classification of nutritional status was done by using weight for height z scores. Grading of malnutrition was done in accordance to WHO guidelines as follows; severe (≤-3SD, kwashiorkor), moderate (>-3 to ≤-2), mild (>-2 to ≤-1) and normal (>-1).

The study procedure was carried out as shown in figure 2.

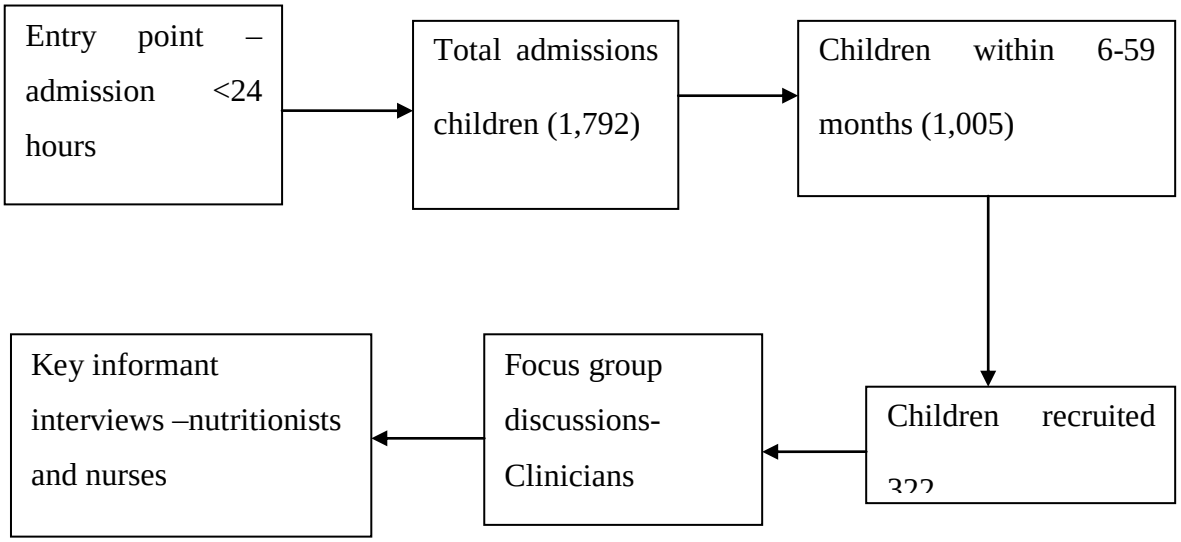

Figure 2: Study procedure

WHO GUIDELINES ON ANTHROPOMETRIC MEASUREMENTS.

1) TAKING A CHILD'S WEIGHT.

1. At the start of the process the child is undressed.

2. Weighing scale is balanced to zero (i.e.to make sure the arrow is on 0).

3. Placement of the child on the weighing scale.

4. Making sure the child is not holding onto anything.

5. Reading the child's weight. The arrow must be steady.

6. Recording the weight in kg to the nearest 100g e.g. 6.6kg for an older child or 50 grams e.g.2350 grams for infants or in case of the Seca machine's use.

7. The scale is not to be held while reading the weight

2) TAKING A CHILD'S LENGTH.

For children less than 87 cm**,** the measuring board is placed on the ground.

1. The child is placed lying down along the middle of the board.

2. The assistant holds the sides of the child's head and positions the head until it firmly

touches the fixed headboard with the hair compressed.

3. The health care provider then places her hands on the child's leg, gently stretches the child and then keeps one hand on the thighs to prevent flexion.

4. While positioning the child's legs, the sliding foot-plate is pushed firmly against the bottom of the child's feet.

5. For reading of the height measurement, the foot-plate must be perpendicular to the axis of the board and vertical.

6. The height is read to the nearest 0.1 cm.

3) TAKING A CHILD'S HEIGHT.

1. The child stands, upright against the middle of the measuring board.

2. The child's head, shoulders, buttocks, knees, and heels are held against the board by the research assistant.

3. The head is the positioned with the cursor.

4. The height is read to the nearest 0.1 cm.

5. Measurement recorded immediately.

4) TAKING A CHILD'S MIDDLE UPPER ARM CIRCUMFERENCE (MUAC).

1. Asking the mother to remove any clothing covering the child's left arm.

2. Calculating the midpoint of the child's left upper arm: first locate the tip of the child's

Shoulder (Acromion process) with your fingertips.

3. Bending the child's elbow to make the right angle.

4. Placing the tape at zero, on the tip of the shoulder and pulling the tape straight down past the tip of the elbow (Olecranon process)

5. Reading the number at the tip of the elbow (Olecranon process) to the nearest centimeter. Division of this number by two to estimate the midpoint.

6. Marking the midpoint on the arm with a pen

7. Straightening the child's arm and wrap the tape around the arm at the midpoint. Making sure the numbers are right side up and the tape is flat around the skin.

8. Inspecting the tension of the tape on the child's arm to make sure the tape has the proper tension and is not too tight or too loose.

9. With the tape in correct position on the arm with the correct tension, the measurement is read to the nearest 0.1cm.

10. Recording of the measurement.

Table 2: WHO classification of nutritional status

Indicator	**Severe acute malnutrition**	**Moderate**	**Mild**
WHZ	**<-3**	**-3to<-2**	**-2to<-1**
MUAC	**<11.5**	**11.5-12.4**	**12.5-13.4**
Oedema	**Present**	**Absent**	**Absent**

3.6.3 Anthropometric Measurements

Anthropometric measurements were taken by the principal investigator or the research assistant according to the standard procedures of the World Health Organization (WHO, 2008). The weight of the children, wearing light weight clothes (undergarments) only and diaper removed was measured to the nearest 100 grams. Recumbent length (children less than two years old) or standing height (children more than 2years old) was measured to the nearest 0.1 cm using wooden measuring board with a sliding foot or head piece.

Weight measurements for younger children was done by use of infant weighing scale seca 354 made in Germany whose maximum weight is 20kgs and precision up to 50 grams, for older children digital bathroom weighing scale was used (PD 100 ProDoC scale) made in United States America whose maximum weight is 220kgs and precision of up to 0.1kgs, the weighing scales were checked for accuracy and calibrated weekly by biomedical engineering department.

At the start of the weighing process the child's clothing was removed retaining the inner clothing and the weighing scale balanced to zero (so as to make sure the arrow is on the 0 mark). The child was then placed on the weighing scale, making sure the child was not holding onto anything. Then the child's weight was read when the arrow was steady, weight was recorded in kg to the nearest 100g. The scale was not held while reading the weight.

Height was measured by use of a stadiometer (PRESTIGEHM009) made in China whose maximum height is 130cm and graduation of 1mm and length by use of measuring board. For children less than 2 years length was measured by use of a measuring board which was placed on the ground, then the child was placed lying

down along the middle of the board. The assistant would then hold the sides of the child's head and positions the head until it firmly touched the fixed headboard with the hair compressed, the investigator would then place her hands on the child's leg, gently stretches the child and then keeps one hand on the thighs to prevent flexion. While positioning the child's legs, the sliding foot-plate will be pushed firmly against the bottom of the child's feet. For reading of the length measurement, the foot-plate had to be perpendicular to the axis of the board; the height was read to the nearest 0.1 cm. and recorded in the data collection form.

For the height measurement, the child stood upright against the middle of the measuring board. Then the child's head, shoulders, buttocks, knees, and heels were held against the board by an assistant. The investigator would then position the head and the torso; the height was read to the nearest 0.1 cm. The measurements were recorded in the data collection form.

Mid upper left arm circumference (MUAC) was measured at the mid- point distance between the tip of the shoulder (Olecranon process) and the tip of the elbow (Acromion process) by use of a non- stretch MUAC tape. This was measured as follows:

The child's non-dominant arm which was mostly the left arm was exposed, and the landmarks were identified as the Olecranon and the Acromion processes. Then the mid upper arm circumference was measured from the midpoint of the child's left upper arm.

The investigator located the tip of the child's Acromion process with fingertips. Then the child's elbow was bent to make a right angle. The tape was then placed at zero mark on the tip of the shoulder (Acromion process) and then pulled straight down past the tip of the elbow (Olecranon process), then the number at the tip of the elbow

(Olecranon process) was read to the nearest centimeter, this number was divided by two to estimate the midpoint.

A pen was used to mark the midpoint on the arm, the child's arm was then straightened and then the tape wrapped around the arm at the midpoint, making sure the numbers are right side up and the tape is flat around the skin, inspecting the tension of the tape on the child's arm to make sure the tape has the proper tension and is not too tight or too loose.

With the tape in correct position on the arm with the correct tension, the measurement was read to the nearest 0.1cm, and then the measurement recorded.

The measurements were taken and recorded in the data collection form.

3.6.4 Focus Group Discussions

Focus group discussions for clinicians were held after the quantitative data had been collected. The clinicians were sampled by use of convenient sampling. A total of three focus group discussions were held and at this point saturation had been reached determined by similarity of responses given by the participants. These were held as per three clusters as follows; cluster 1 (year1 residents), cluster 2 (year 2 residents) and lastly cluster 3 (medical and clinical officers, medical and clinical officer interns). The 3 focus group discussions had 12 participants, 11 participants and 11 participants from cluster 1, 2, and 3 respectively. The FGDs were held to discuss the challenges faced during the assessment and classification of nutritional status of children admitted at MTRH pediatric wards. We used teaching room 3 in the Mother and baby building in MTRH to conduct the interviews. The room was chosen because of convenience to the participants; it offered a quiet environment and was in in use by students frequently. Date and time was communicated to the participants via short mobile message through which they also confirmed their attendance. Written

informed consent was obtained from all participants. Each session took about one hour. Focus Group Discussion Guide questions were used to direct and moderate the discussion having an assistant who had prior experience on how focus group discussions are conducted as the moderator and the principal investigator taking notes, documentation and audio recording of the proceedings. All participants were given equal chances and confidentiality was maintained.

Key informant interviews were also held for each key informant .The nurses in charge of the two medical wards gave their views as well as the nutritionist in charge. The key informants were selected based on their knowledge on the availability of resources in the pediatric wards. All the responses given were documented and audio recorded.

3.7 Data Management Methods

3.7.1 Data entry

Data was entered into the computer using Epi Info. Double data entry was done to check for any errors.

3.7.2 Data cleaning

Completeness and consistencies were checked regularly and/or as need arises.

3.7.3 Data storage

After collection, data was checked by the Principal Investigator for completeness and accuracy then the data was entered using Epi info after cleaning it, ensuring that strict confidentiality is maintained by excluding any information that can identify the patient. The database was password protected to prevent un- authorized access. Data was backed up in a remote disk and flash drive to safeguard against any data loss**.** The

questionnaires were stored under lock and key accessible to only the Principal investigator and the research assistant.

3.8 Data analysis

Quantitative data was analyzed using STATA 13 (SE). The data was summarized using measures of central tendency for numerical data such as age, height and weight. Proportion was calculated for categorical variables like sex and clinical evaluation. Inferential statistics like factors associated with height measurements were summarized using chi-square/Fischer's exact and logistic regression. The level of significance was set at 95% confidence interval, where a p-value of less than 0.05 was considered statistically significant.

Qualitative data analysis involved transcription through writing down verbatim the information that was recorded on the audio recorder. The data was reduced through coding which involved organizing it into categories and themes. Thematic analysis was done in line with the objective by the use of Nvivo version 12. The findings were presented using tables, graphs, charts and text.

3.9 Ethical Consideration

Approval to carry out the study was sought from the Institutional Research and Ethics Committee (IREC) and the Chief Executive officer of Moi Teaching and Referral Hospital.

Parents/guardians and health care workers were informed about the study. No incentives were used to convince the study participants for consent to participate in the study. The data collection tool did not contain the names or any identifiers of the participants. Confidentiality was maintained throughout the study. Parents/guardians were assured that medical attention would be given to the children as necessary irrespective of their decision on consenting to participate in the study. Any child

enrolled to the study found to have malnutrition had their primary clinician informed of their status for proper management to be instituted. The raw data collected were stored in a locked cabinet throughout the study period while the data in the computer was in a password protected file. The results shall be presented in the university thesis defense and will also be availed for reference at the College of Science Resource Centre. The results of this study shall also be availed for publication in a reputable journal for access and use by the scientific and general population in the improvement of patient management.

CHAPTER FOUR

4.0 RESULTS

QUANTITATIVE COMPONENT

4.1 Socio Demographic and Clinical Characteristics of Study Participants

In this study, 322 children were enrolled for the study from the medical pediatric wards of Moi Teaching and Referral Hospital (MTRH). The median age for the participants was19.5 months (IQR 12-34). The distribution of the participants was skewed to the right where 50% of the age ranged from 5 to 19 months. Average birth weight was 3.16 (0.7) kg ranging from 1 to 9 kg.

Details are shown in figure 3, 4 and table 3

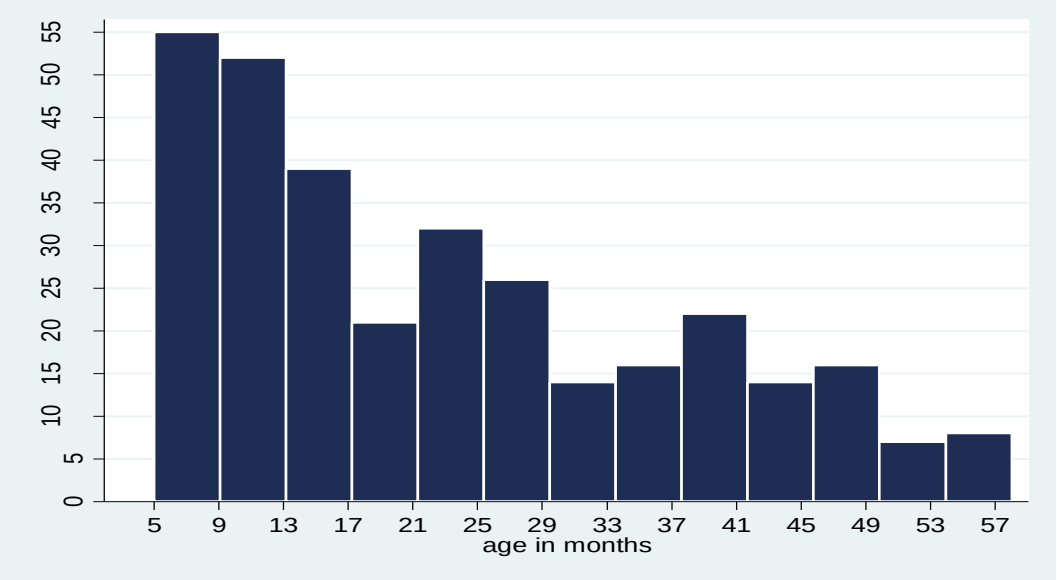

Figure 3: Age distribution of the children (n=322)

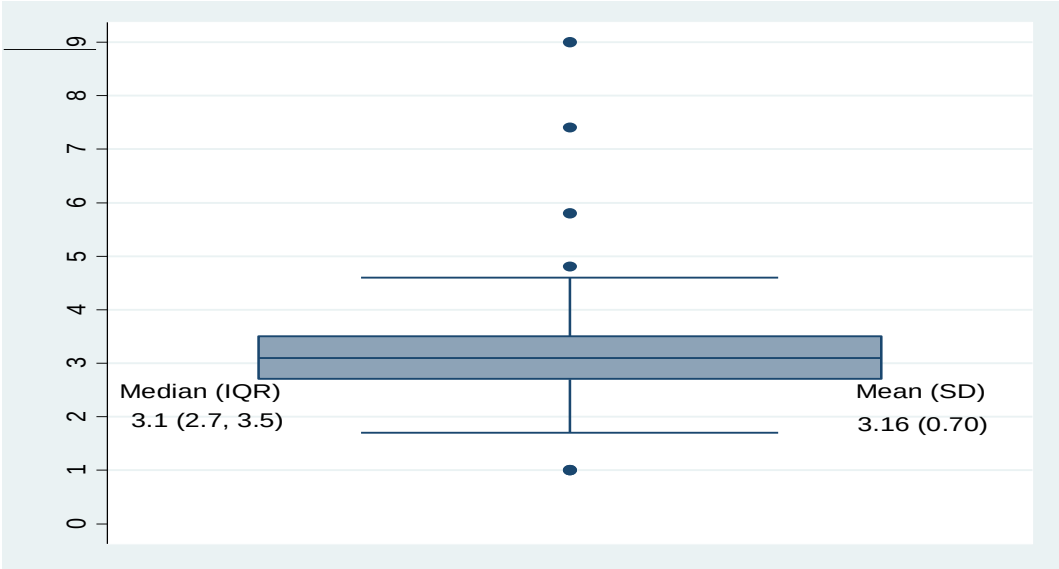

Figure 4: Birth weight distribution of the children (n=322)

Table 3: Characteristics of the children enrolled in the study

Variable	Category	Frequency (n=322)	Percentage (%)
Sex	Males	184	57.1
	Females	138	42.9
Age	<24 months	191	59.3
	>24 months	131	40.7
Birth weight	<2500g	22	6.8
	>2500g	300	93.2
Referral	Yes No	97 225	31.9 69.1
Readmission	Yes	29	9.0
	No	293	91.0
Clinical wasting	Yes	73	22.7
	No	249	77.3
Time of admission	Day	237	73.6
	Night	85	26.4
Oedema	Yes	22	6.8
	No	300	93.2

A total of 38 health workers were also enrolled into the study. These were categorized as: Medical Officer Interns (n=6) Clinical Officers (n=5) Residents in Pediatrics (23), Nutritionists (n=2) and Nurses (n=2).

4.2 Assessment and classification of nutritional status of children at admission

4.2.1 Anthropometric measurements done by health care workers at admission

All children 100% (n=322) recruited in this study had their weights taken while 17.1% (n=55) and 15.5% (n=50) had their height and MUAC measurements respectively taken and recorded in the medical charts.

4.2.2 Factors associated with anthropometric measurements taken by health care workers at admission.

4.2.2.1 Factors associated with MUAC measurements.

There was a significant association (p <0.001) between wasting and whether MUAC was taken or not, where 41.1% of those with wasting had MUAC taken compared to 8.4% among those who didn't not have wasting. Half (50%) of those with edema had MUAC taken compared to 13.3% who didn't have edema, this difference in proportion was statistically significant (p<0.001).

Table 4: Association between clinical and demographic characteristics of children and MUAC measurement.

		MUAC taken		
Variable	**Category**	**No**	**Yes**	**p-value**
Gender	Female	122	16	0.071
	Male	149	35	
Age group	6-24 months	160	32	0.621
	25-59 months	111	19	
Wasting	No	228	21	**<0.001**
	Yes	43	30	
Edema	No	260	40	**<0.001**
	Yes	11	11	
Referral	No	186	34	0.782
	Yes	85	17	
Re-admission	No	244	47	0.799
	Yes	27	4	
Time of Admission	Day	201	36	0.594
	Night	70	15	

4.2.2.2 Factors associated with height measurement.

There was a significant association (p<0.001) between wasting and whether height was taken or not, where 43.8% of those with wasting had height taken compared to 9.2% among those who didn't not have wasting. Half (50%) of those with edema had height taken compared to 14.7% who didn't have edema, this difference in proportion was statistically significant (p<0.001).

Table 5: Association between Clinical and demographic Characteristics of children and Height measurement

		height taken		
Variable	**Category**	**No**	**Yes**	**p-value**
Gender	Female	121	17	0.261
	Male	153	31	
Age group	6-24 months	155	37	0.204
	25-59 months	112	18	
Wasting	No	226	23	**<0.001**
	Yes	41	32	
Edema	No	256	44	**<0.001**
	Yes	11	11	
Referral	No	184	36	0.616
	Yes	83	19	
Re-admission	No	240	51	0.516
	Yes	27	4	
Time of Admission	Day	201	36	0.132
	Night	66	19	

4.3: Proportion of children who had their nutritional status classified by health care workers at admission.

The study enrolled 322 children in the pediatric wards. Of these, 20.8% (n=67) had their nutritional status classified by health care workers as; severe malnutrition 76.2 % (n=51), moderate malnutrition 11.9 % (n=8) and mild malnutrition 11.9 % (n=8)

4.3.1 Children with malnutrition as recorded by the investigator at admission.

Out of all the children enrolled in this study 42.5 % (n=137) children were diagnosed with various degrees of malnutrition by the investigator as follows; severe 49.6 % (n=68), moderate 23.4 % (n=32) and mild 27.7 % (n=37). Therefore health care workers missed half of the cases of malnutrition 50.1% (n=70) at the initial assessment.

4.3.2 Cases of malnutrition recorded by investigator and healthcare workers at admission.

Severe forms of malnutrition were more likely to be identified by the health care worker compared to the milder forms.

Table 6: Cases of malnutrition recorded by investigator and healthcare workers and at admission

	Health care worker				
Malnutrition Grade	**Yes**	**NO**	**O.R**	**95 %CI**	**P Value**
Severe	51	17	10.88	(4.181, 28.282)	<0.001
Mild	8	29	0.09	(0.035, 0239)	
Severe	51	17	9.00	(3.140, 23.751)	
Moderate	8	24	0.11	(0.421, 0.293)	<0.001
Moderate	8	24	0.09	(0.395, 3.700)	
Mild	8	29	0.73	(0.272, 2.535)	0.740

4.4 Proportion of children whose nutritional status was appropriately classified based on WHZ score at admission.

Of those identified and classified 82.1% (n=55) of them were correctly identified and classified in comparison to WHO WHZ score by the health care workers.

QUALITATIVE COMPONENT

Focus group discussions for clinicians

A total of 38 health workers were also enrolled into the study. These were categorized as: Medical Officers 15.8% (n=6), clinical officers13.2% (n=5) and residents in Pediatrics 60.5 % (23).

4.5. Assessment of nutritional status of hospitalized children aged 6-59 months at pediatric medical wards MTRH

The first aspect of the qualitative aspect of the study was to find out whether all the children admitted to the pediatric wards had nutritional assessment done on them at admission by the clinicians. The question posed to them was "do you assess all children admitted to the pediatric ward?" The responses given by the clinicians indicated that all children admitted are not assessed during the admission period.

4.5.1 Not all children are assessed

It came out from the focus group discussion that children seen during admission period don't get to have a nutritional status done on them.

Personally, I don't assess the nutritional status of all children. It is basically once in a while and it is basically for that child that I think part of the diagnosis is malnutrition (Medical officer intern).

4.5.2 Assessment is based on clinical state of the child

It was reported that clinical appearance of the child had a bearing on whether was going to have their nutritional status assessed or not.

Personally I don't assess all the patients. If I see a child looks malnourished, and then I would want to know, is the child actually malnourished? So I take the weight, height and MUAC but when I see those who look healthy, I really don't bother with them" (Resident).

4.6 Barriers in assessment and classification of nutritional status of hospitalized children aged 6-59 months at pediatric medical wards MTRH.

The clinicians were probed on the barriers that hinder them from assessing the nutritional status of the children admitted with the question "what are the barriers to assessment of nutritional assessment of children admitted to the pediatric wards? posed to them.

4.6.1 Insufficiency of Equipment

It came out strongly from the health care providers that there was an insufficiency and faulty nutritional assessment devices such as weighing scales, height/length boards and MUAC tapes. It was reported that the weight was the only measurement taken at the emergency department because weighing scale was the only equipment available whereas in the wards the only few available were shared among the wards and under the care of nutritionists. It was also reported that most of the time the scales were not functional and gave varied readings which were not reliable. It was reported that there was 1 weighing scale in the emergency department, two in the wards and one height board in the wards which is shared among the two medical wards. The MUAC tapes

could only be accessed by the nutritionists and clinicians are expected to have their own.

"In the wards the height boards are usually shared between the two wards and thist is usually kept by the nutritionists. It then becomes difficult to routinely asses; the other thing is that simple things like MUAC tape should be availed for the residents. There should be MUAC tapes, for everyone instead of expecting everyone to have their own and carry it around." (Resident).

In the emergency department, we don't have a stadiometer so we can't even take heights for the children, we are also not provided with MUAC tapes so we only take the weights because we only have a weighing scale and a nurse is present to take the weights. (Medical Officer).

4.6.2 Clinical judgment

Clinicians reported that they mostly rely on the physical appearance of the child when deciding on doing a proper nutritional status assessment and classification. Those children who look healthy are subjected to any nutritional classification whereas those that look wasted or thin have their anthropometric measurements taken as well as nutritional classification done on them

"So, if a child has not been queried for malnutrition in the emergency department, it is very easy to overlook the assessment and you might not even realize that the patient is malnourished because you went with the diagnosis from the emergency department" (Medical Officer Intern).

*Those children who have edema, or those other signs like wasting will make you be more careful to take their appropriate measurements and classify their nutritional status appropriately (*clinical officer*).*

4.6.3 Competing patient interests

It emerged that due to the high number of patients seen during admission with various forms of severe conditions requiring emergency treatment, the available team gives priority to the emergency care and hopes the nutritional status assessment will be done by someone else later.

"Sometimes you have so many admissions and emergencies that you can hardly think of doing a proper nutritional status so provided you have the weight the rest can wait" (Resident).

4.6.4 Clinician Training and Sensitization on Nutritional Assessment

Health care providers alluded to the fact that they had knowledge and education as far as malnutrition is concerned mainly from school as college students but majority of the clinicians acknowledged that they have not gone through specialized in- service training or sensitization on nutritional assessment and classification The major complaints by the clinicians for lack of in service- training were lack of time, opportunities and enough funds to go for the training.

*"Actually there have been minimal in-service trainings on malnutrition that I have heard of or maybe we are not usually the target group. I think it is just expected that once you go through school, you should be able to pick those things. But the truth of the matter is that people are not aware of any new changes or updates that might have occurred concerning malnutrition cases. It is unfortunate that we don't have the trainings" (*Resident*).*

"Even if the funds or openings are available for training you are expected to be in the hospital most of the hours so no time to attend any seminars" (Medical Officer Intern).

We should be having regular continuous medical education so that we can all be on the same page when attending to these children it is always assumed that all of us are up to date on everything yet we are not" (Resident).

4.6.5 Impact of Nutritional Assessment on Morbidity and Mortality

All clinicians regardless of their level of training believed that nutritional assessment has an impact on the morbidity and mortality risks of the children.

The question that was raised was "do you think nutritional assessment has an impact on morbidity and mortality?"

It was pointed out that the way a clinician classifies a child's nutritional status affects the type of management offered to the said child. Malnutrition has been associated with organ failure, prolonged hospital stay and death in the case of severe malnutrition.

Health care providers agreed that nutritional status assessment guides the management of children in the following ways: First, weight is used to calculate our dosages and improves the knowledge of what kind of fluids and feeds to be given to the sick child. Secondly, when the nutritional status is neglected and the clinician attends to other needs, there is a great likelihood that the child does not improve. Third, knowledge that a child is malnourished will enable the clinician to better support the children and enhance their chance of survival. Fourth, when overweight children are identified early, it is possible to prevent future complications

"We all know that treating children with malnutrition needs a step wise approach in terms of the stages that have to be taken according to WHO protocols. So, in case you think a child has malnutrition, and the same time dehydration secondary to

malnutrition; the management is different from how you will manage the one who has dehydration and is not malnourished" (Medical Officer Intern).

"On general care, we all know that when a child is malnourished, they sort of slow down. Everything else in their system slows down. If you fail to pick malnutrition, then you expose them to danger and even death if they are not managed properly. They need warmth; they need to be fed on time so that they survive. If they are just left with those other children in the wards, they are likely to get infected and die. The obese children only need to be identified earlier and appropriate measures given to reduce the risk of non-communicable diseases in future" (Resident).

Key informant interviews

Key informant interviews were carried out among the nurses in charge of the two wards and the nutritionist in charge.

4.7 Assessment of nutritional status

The key informant interviews had assessment as part of the qualitative data that was collected from the key informants. The guide question inquired on whether all the children admitted had a nutritional assessment done on them.

4.7.1 All children admitted don't have a nutritional status assessment

The responses given during the key informant interview sessions pointed out to the fact that not all children who are admitted have a nutritional status classification done on them.

" All children don't have nutritional assessment when they are brought to the ward ,those children who are noticed during nursing procedures to be malnourished even

without a diagnosis of malnutrition , we usually move them to the malnutrition room and inform the nutritionist or the clinician to assess" (Nurse in charge).

4.8 Barriers

The key informants were interviewed in order to establish the barriers that the clinicians were facing during the assessment of nutritional status of children. The key informants held managerial positions hence had a wider scope on the issues the clinicians and nutritionists were facing.

The question posed to them was "what are the barriers the clinicians and nutritionists face during assessment of nutritional status assessment of the admitted children?"

4.8.1 Inadequate equipment

During key informant interviews it emerged that the equipment available were not adequate and sometimes they were shared among the two wards. When the equipment were available they sometimes were not functional and might take some time before they are repaired are not functional.

"*We have weighing scales and height/length boards in the ward which are shared between the medical wards and are usually kept in the nutritionist's room so accessing them can sometimes be a challenge especially at night because there is no nutritionist who comes at night*." (Nutritionist).

4.8.2 High number of children admitted

It was pointed out that the number of admitted children could sometimes be overwhelming to the clinicians and more so when they present in critical conditions requiring urgent attention.

"We are usually very few such that it becomes impossible to do a nutritional assessment on all the children admitted, so sometimes we only do an assessment on those that the clinicians have requested" (Nutritionist).

"The admitting clinician sometimes becomes so busy such that they postpone nutritional assessment so as to attend to emergencies" (Nurse in charge)

4.9 Recommendations

The key informants were asked to give their views on what they thought would improve the assessment of the children admitted to the pediatric wards. The question which was put forward was "what are your recommendations for improving nutritional assessment of the children admitted to the pediatric wards?"

4.9.1 Nutrition room in the emergency department

A theme on availing a nutrition room in the emergency department arose. It was pointed out that the presence of a fully equipped room with a nutritionist at any given time would ensure that all children get assessed before being taken to the ward.

"There should be a nutrition room with a nutritionist in the emergency department so that every child can pass through the room for nutritional status assessment before being taken to the ward" (Nurse in charge).

4.9.2 Increase the number of staff

Another theme that came up as a recommendation was increasing the number of staff in the department; this was thought to improve assessment because the workload to one individual was going to be reduced.

"If the number of staff was high it would be easier for the admitting clinician because the other person can concentrate of stable cases and another of emergency cases and this will ensure all aspects of a child's aspect is addressed "(Nurse in charge)

4.9.3 In-service training

The third theme that was brought out was on training, it was pointed out that continuous in-service training was of paramount in insuring that health care providers are updated on the current recommendations.

*"In service training should be done for all the clinicians, nutritionists and some nurses so that assessment becomes a collective responsibility and have a unified method of assessment and classification" (*Nutritionist)

CHAPTER FIVE

5.0 DISCUSSION

5.1 Current practices in assessment and classification of nutritional status of admitted children.

Assessment of nutritional status being the first step towards reducing the burden of malnutrition requires effort from all health care workers to ensure that this is done for all the children seen in health facilities. This is achieved through taking of anthropometric measurements and comparing them with standard reference values.

5.1.1 Anthropometric measurements taken by health care workers on admitted children.

This study determined that all the children had their weight taken when they were admitted to the medical pediatric wards at MTRH. During the triage process which is the starting point for all the children, the nurse stationed in the area takes weight in addition to vital signs and demographic data. It is expected that weight being part of basic anthropometric measurements weight is always documented. Weight measurement is also needed for other purposes e.g. dosing of drugs and calculating intravenous fluids to administer to the children and this is reflected in the findings of this study. This findings are similar to Ghanaian (Afu, 2017) and Canadian (Cummings et al., 2005) studies which found that 89% and 89.7% respectively of the children had their weights taken during admission. Both studies were conducted at teaching hospitals just like MTRH and the study population were also admitted children just like our study.

However, the proportion of children whose weight was measured in this study was higher than that reported in a Ugandan study at 74% (Akugizibwe et al., 2013). The Ugandan study was carried out across four rural hospitals which unlike our facility

among other factors could be having few health care providers running the facilities and minimal or lack of equipment making it hard to carry out all the weight measurements given the issue of competing patient interest. This study was conducted on outpatient children unlike our study.

These findings were also higher than that reported by Dave *et al*., (2016) who found out retrospectively that 75% of children admitted to a tertiary Indian hospital had their weights taken (Dave et al., 2016), majority of the children recruited into the study however were from surgical department where nutritional status is not of so much concern as it does in the medical wards.

For a tertiary level hospital, it is expected that taking of heights would be routine especially due to the fact that WHO recommends the use of weight for height Z scores in classifying acute malnutrition. From this study however, height was rarely taken. For such an institution, one would expect that all the forms of malnutrition would be documented including stunting for better clinical care of patients and accessibility of data for research purposes. These results are explained by lack of height board in the emergency department and only one in the ward which was shared among the two pediatric wards. This is also due to the fact that clinicians use clinical judgment to decide on which child requires a full nutritional assessment and the competing patient interests making clinicians to focus on emergencies and postpone taking of height. This finding was similar to the low proportions reported among studies in Uganda, Ghana and India which found a frequency of 14% (Akugizibwe et al., 2013),0.4% (Afu, 2017) and 5.19% (Dave et al., 2016) respectively. The major reason given for the low numbers in all these studies was the limited or absence of height boards both in the emergency department and the wards coupled with high number of patients and

limited staff. The measurement of height was mostly taken when there were obvious signs of malnutrition.

Cummings *et al*.,(2005) who reported that forty two percent of children seen at a tertiary Canadian hospital had their heights taken which is higher than 17.1% found in our study (Cummings et al., 2005). Unlike our setting, no shortages of assessment equipment were reported and the staff handling the children where adequate which could explain the higher numbers of children having their heights taken during hospital admission.

Mid upper arm circumference (MUAC) was only measured in a few of the children who were admitted to the pediatric medical wards. The MUAC measurement is not cumbersome to take and also MUAC tape is light to walk around with therefore it is expected that a big proportion of children get this measurements done during admission, this was however not the case in this study. From the responses given by the health care workers it was evident that MUAC tapes are not provided to each one of them and majority of them don't own one, therefore they rarely take MUAC. These findings are similar to those of other studies in Uganda (Akugizibwe et al., 2013) and Ghanaian (Afu, 2017) which found a proportion of 14% had their MUAC measured in the wards, while no child had their MUAC assessed in either the clinic or emergency departments of Canada (Cummings et al., 2005). Many other studies have found low frequency of MUAC measurement in outpatient clinics (Costa, Tonial, & Garcia, 2016b; Kumar et al., 2018; Mwangome, Fegan, Prentice, & Berkley, 2011). Similar reasons in all these studies that have been put forward are; MUAC tapes not being easily accessible, competing patient interests, few numbers of health care workers and clinical judgment by the health care providers.

Previous studies have reported that of all the anthropometric measurements it is easier to take weights for children as opposed to other anthropometric measures as the children do not have to remove their shoes or home clothes for the measurement to be taken (Costa et al., 2016). The removal of clothes and shoes causes a lot of inconvenience and long queues in many outpatient departments of hospitals. This could explain the finding of a higher frequency of weights taken compared to height measurements and MUAC in the wards.

Single anthropometric measurements for example weight or height alone are not very useful in assessing nutritional status if they are not computed to a reference chart. In developing countries where age is sometimes not known weight for height gives an advantage because it is age independent.

5.1.2 Classification of nutritional status.

From the study it was determined that the nutritional status was rarely classified for the children hospitalized at the pediatric medical wards. This was corroborated by health care workers during focus group discussion where it was reported that all children are not assessed and classified and that priority was given to those who looked obviously malnourished, hence the low rates of classification. With the emergence of the issue of double burden of malnutrition (Kimani-Murage et al., 2015) children should have a nutritional status classification whenever they are sick enough to be taken to a health facility.

The findings of this study are similar to a Ugandan study by Akugizibwe *et al.* ,*(2013)* which was carried out across four rural hospitals (Akugizibwe et al., 2013), whereby it was established that a range of between 18% to 22% of the children seen

in the health facilities had their nutritional status classified. Similar study setting, study design and study population explains the similarity of the findings.

A study by Afu, (2017) in Ghana found out that the children whose nutritional status were classified were only 12.5% of all the children seen which is similar to the findings of our study (Afu, 2017). This study was carried out on hospitalized children, similar study setting and similar cadre of health care workers as this study.

The findings of the current study are lower than those reported in Canada where 35% of the children had their nutritional status classified (Cummings et al., 2005). Given the setting of the study, availability of resources e.g. personnel and equipment was less likely to be an issue. The study included the entire period the children were admitted in the hospital which could explain the higher percentage compared to findings of this study which only looked at a single point which was admission.

Among the children who had their nutritional status classified, majority of them had the severe form of malnutrition. This is expected because children with obvious signs of malnutrition are easily picked leading to the highest proportion classified being those with severe cases of malnutrition. This was corroborated by the health care workers whereby they reported that they pay more attention to those children with obvious clinical signs of malnutrition. This finding is similar to what was reported at the Kenyatta National Hospital (KNH) in Nairobi , Kenya which found that severe malnutrition was the most reported (56.1%) followed by poor weight gain at 15.2% (Ndiema et al., 2018). Both studies were carried out in tertiary teaching hospitals, among admitted children and both studies were cross-sectional.

5.2. Appropriate classification of nutritional status based on WHZ scores.

Appropriate classification of children ensures that proper management or proper nutritional counseling is given timely. This will also ensure that children's nutritional status don't worsen during the hospital stay (Ibraheam Kazem, 2011) any changes noted are addressed adequately.

From this study, it was established that those who had their nutritional status classified majority of them had their nutritional status appropriately identified and classified. This is due to the fact that majority of those classified had the severe form of malnutrition and therefore more attention was paid to them as stated by the clinicians. This is similar to the findings in a Ghanaian study where all the children identified were appropriately classified (Afu, 2017). Both studies were carried out on admitted children so it is possible there was enough time to classify these children appropriately. The settings were also teaching hospitals hence highest standards are observed.

However the findings of this study were higher than those of another Ghanaian study where only 5.9% of those identified were appropriately classified (Antwi, 2009b). This study was done on children seen at an outpatient setting unlike this study.

Previous systematic reviews have demonstrated that anthropometric measurements are the most commonly used indices in nutritional status assessment and classification (Boschi-Pinto, Young, & Black, 2010; Costa et al., 2016b; Hossain et al., 2017). However, many studies determined that all the parameters are not often measured. This incomplete measurement increases the likelihood of inappropriate classification as well as cases of malnutrition being missed out.

During admission period where there are so many emergencies to be attended to it is more likely to overlook cases of milder forms of malnutrition hoping that the next clinician seeing the patient is more likely to pick it but that is not usually the case. This may lead to many cases of malnutrition getting missed. The use of clinical judgment or estimation of weights by the health care providers has also led to under diagnosis of malnutrition because such judgments are not always accurate (Greig et al., 1997) .

Given the effects of malnutrition on increasing mortality, the length of hospital stay and the financial implications is expected that in every hospital more so a tertiary hospital no cases of malnutrition are missed because this translates to missed opportunities of intervention both in the hospital and the community.

Of all the children sampled, 42.5% (n=137) had various degrees of malnutrition, however half of these cases 51.1% (n=70) were missed out by the health care providers. This is due to the fact those with severe forms are easily picked leaving those with milder grades of malnutrition as alluded to by health care workers. This findings are similar to a study done in Gambia by Hammer *et al*., (2004) who reported that 50% of cases of malnutrition were missed, same was reported in a Ugandan by Akugizibwe .,*(2013)* where 32.9% of children were missed out when they were seen at various rural hospitals (Hamer et al., 2004). All these studies were carried out at admission and given the various life threatening conditions at admissions which may require emergency treatment then the likelihood of missing malnutrition is very high. The use of clinical judgment, competing patient interests and inadequate equipment were reported in all these studies to have played a major role in contributing to the missing of cases.

The findings are lower compared to Afu, (2017) in Ghana and Cummings .,*(2005)* and this is due to the fact that these two studies included the entire period of admission which could have led to more cases being picked as the children were being routinely seen in the hospital (Afu, 2017; Cummings et al., 2005). Similarly Antwi (Antwi, 2009) found very high proportion of missed cases which could be due to the fact that their study unlike this study was done on outpatient children and so the contact time between the health care providers and the patient was limited.

5.3 Barriers to nutritional status assessment of hospitalized children seen at MTRH.

There are many challenges faced by health care workers while attending to children with various ailments and malnutrition is not an exception. From this study determined that nutritional status measurement and classification was not done among all the children admitted at the MTRH medical pediatric wards.

The barriers to assessment raised by the healthcare workers (clinicians, nutritionists and nurses) were high patient queues and competing patient interests, lack of sufficient working measurement equipment (such as weighing scales, stadiometers and measurement tapes) and limited training. Our study site being the 2nd largest public referral hospital, it attends to a high number of patients and most of them with life threatening conditions, so the strain on available resources is expected. Lack of sufficient equipment was also reported in the United Kingdom (Bunting & Weaver, 1997) and the Netherlands (Hutteman, van der Ende, & Schweizer, 2008) ,with settings similar to ours.

In a systematic review reported by the World Health Organization (Black et al., 2008), clinical judgment was used in the assessment of nutritional status of children.

In another Australian study (Porter, Raja, Cant, & Aroni, 2009), high patient numbers and competing patient interests was reported as a barrier to pediatric nutritional assessment just like the current study. The similarity in study setting explains the similarities.

Inadequate training emerged as a reason in an Australian tertiary (O'Connor, Youde, Allen, Hanson, & Baur, 2004). The lack of continuous in-service training of healthcare workers on nutritional status assessment and care was also reported at the KNH which is a similar setting to ours where more than half of the healthcare workers reported having attended limited in-service training on assessment of malnutrition (Ndiema et al., 2018) It was determined that in a Ghanaian hospital, very few healthcare workers received specialized training (Yalcin et al., 2014). Some of them reported to have received their training through reading of academic journals and other relevant medical literature (Yalcin et al., 2014). Inadequate in-service training has been reported as a major hindrance for pediatric nutrition assessment in Ethiopia (Headey, 2014). The similarities are due to the fact that the settings for the studies are similar as well all inclusion of all cadres of staff.

Majority of the healthcare workers enrolled in this study however agreed that all children should have a nutritional classification because it has positive impact on child's morbidity and mortality. These findings are similar to those reported at Kenyatta National Hospital where nearly all the health workers agreed that nutritional assessment has an impact on the child's morbidity and mortality (Ndiema et al., 2018). The respondents pointed out that nutrition assessment is beneficial for early detection and proper management of children with nutritional requirements. Similar findings were also reported in Hawassa, Ethiopia where majority of the respondents believed that nutritional assessment for children attending the pediatric clinics was

important and the need for routine nutritional assessment for children every time they are being attended to by the health workers (Tafese & Shele, 2015). The settings where the two studies were carried are similar to our setting.

CHAPTER SIX

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

1. All children aged 6-59 months admitted to pediatric medical wards had weight taken while height and MUAC were not routinely done.
2. Nutritional status was rarely classified however; most of those classified had it appropriately done.
3. The reasons for low nutritional status assessment and classification were; insufficient equipment, high number of patients and infrequent in -service training.

6.2 Recommendations

1. Routine nutritional assessment and classification should be done by health care workers for all children admitted at MTRH.
2. There is need for provision of adequate nutritional assessment equipment, improve health care worker to patient ratio and continuous in-service training by MTRH management

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APPENDICES

APPENDIX 1: CONSENT INFORMATION FORM FOR PARENTS ANDGUARDIANS

IP NO ……..
SERIAL NO……..
DATE……

BACKGROUND

We are carrying out a study to evaluate assessment of nutritional status among children admitted at MTRH pediatric wards. Your daughter / son have been identified therefore we are requesting you to join our study. This form contains information that will guide you decide or decline to participate in the study.

The purpose of the study.

This study will describe assessment of nutritional status among children in the wards. It will reveal the areas that need improvement and this will help us assess your child and other admitted children in a better way.

Study Procedures

No laboratory investigations will be done for the purposes of this study; any investigations/ procedures will be standard for all patients irrespective of their participation in the study and will be in accordance with the hospital treatment protocols. I will also look at your child's treatment records at the end of the treatment period.

You are allowed to raise questions regarding the study at any given stage.

Rights

You are not under any pressure to participate in this study, it is voluntary and you may withdraw at any given point if you wish to, the decision to participate or not in this study shall not affect the treatment of your child in any way.

Any questions regarding the study are entertained at any stage for example; before, during and after joining.

The purpose of the study is identify the strengths and weaknesses in the treatment of severe malnutrition at pediatrics wards at MTRH and this will guide in improving the care accorded to children with similar illnesses in future and this may not benefit your child in the current management.

Risks

There will be no invasive procedures done on your child for the purpose of the study and the treatment shall not be delayed or withdrawn from your child.

Confidentiality

Confidentiality shall be upheld and no information identifying your child shall be discussed in public or published.

You are allowed to ask questions and seek clarification about the study at any given stage.

My contacts are as given below Dr.Sanga Sheila phone no 0725101193 email sangshix@yahoo.com.

Institutional Review Board

This study has been approved by the Institutional Research and Ethics Committee (IREC) of Moi University/Moa Teaching and Referral Hospital. Contact IREC if you have questions regarding your child's right as a participant, and also if you have complaints or concerns which you do not feel you can discuss with the investigator. Contact IREC using the address; The Chairman IREC, Moi Teaching and Referral Hospital, PO BOX 3, Eldoret, Kenya. Tel. 33471/2/3

APPENDIX 2: CONSENT FORM FOR PARENT'S/CAREGIVER'S STATEMENT

The principal investigator and / research assistant have explained to me about the study. I understand the purpose of the study and my child's rights in the study.

I have been given an opportunity to ask questions and I NOW understand that the information shall be kept confidential and that am allowed to asking questions at any stage during the study, I have also understood that I can withdraw from the study and still my child shall receive standard treatment as per the hospital protocol.

I agree to participate in the study voluntarily.

I the participant do confirm that explanations have been made to me regarding the study, I therefore have understood and voluntarily consent to participate in the study.

Parent's /care giver's signature ----------Date----------

I the investigator do confirm that I have explained all the relevant information regarding the study and the participant has consented voluntarily.

Investigators signature----------Date----------

Witness signature ----------Date----------

APPENDIX 3: FOMU YA RIDHAA KWA MZAZI/MLEZI

NAMBARI---------- TAREHE----------

UTANGULIZI

Tunafanya utafiti kutadhamini kiwango cha huduma wanao pokea watoto ambao wanalazwa katika hospitali hii.

Naomba mtoto wako kujiunga katika utafiti huu.Hii fomu ina taarifa zote zinazo husiana na huu utafiti ili kukuwezesha wewe kuamua kama utajiunga au la. Kushiriki kwako ni kwa hiari yako

MADHUMUNI YA UTAFITI

Utafiti huu utaelezea matibabu hali ya matibabu wanayopokea watoto waliolazwa kwa hospitali

hii.Nitawezakutambuasehemuambazozinahitajikuboreshwa.Hiiitawezeshahospitalikuh udumiamtotowakonawenginewalionaugonjwahuu bora zaidi.

TARATIBU ZA UTAFITI

Hakuna vipimo vya maabara ambazo zitachukuliwa kwa madhumuni ya utafiti huu.

Nitaangalia pia zile kumbukumbu za hospitali za mtoto wako.

Uno an hour kuuliza maswali yoyote juu ya huu utafiti katika hatua yoyote.

HAKI

Ushiriki wako wote ni kwa hiari yako.

Unaweza kuamua kujiondoa kwenye utafiti huu katika hatua yoyote.

Uamuzi wako wa kushiriki au kutoshiriki ama kujiondoa katika utafiti huu hakutaathiri kwa njia yoyote matibabu ya mtoto wako.

Utafiti huu utawezesha hospitali kutathimini udhaifu katika matibabu ya ugonjwa wa utapiamlo.Hii itasaidia kuboresha huduma wanayopokea watoto waliona ugonjwa huu.Inawezekana hali hii haitafaidi motto wako kwa wakati huu.

MADHARA

Mtoto wako hatanyimwa au kuchelewa kutibiwa kwa sababu ya utafiti huu.

Hakuna damu itakaochukuliwa ama taratibu zozote ila zile madaktari wanaotibu motto wako watakaoagiza.

Matibabu yote ambayo mtoto wako anahitaji atapokea.

USIRI

Taarifa zote zitakuwa za siri.Hakuna habari yoyote ambayo inaweza kutambua mtoto wako itachapishwa au kujadiliwa hadharani.

Iwapo kama utakuwa na swali kuhusu utafiti huu au namna ambayo majibu ya utafitihuu

yatatumika unaweza kuwasiliana na mchunguzi mkuu: Daktari Sanga Sheila kupitia nambari ya simu 0725101193

Baruapepe:sangshix@yahoo.com

IDHINISHO KUTOKA KWA BODI

Utility hue umekubaliwa na kamati ya chuo ya utafiti na maadili (IREC) ya chuo kikuu cha Moa na hospitali ya mafunzo na Rufaa ya Moi Eldoret.

Julisha mwenye kiti kama kuna swali Kuhusu haki ya mtoto wake kuhusishwa katika utafiti au kama una malalamishi au jambo ambalo huwezi kujadiliana na mtafiti kupitia kwa anwani hii: Mwenyekiti kamati ya chuo ya utafiti na maadili (IREC) ya chuo kikuu cha Moi na hospitali ya mafunzo naRufaa ya Moi Eldoret,

S.L.P. 3, ELDORET, Kenya

Nambari ya simu: 3371/2/3

APPENDIX 4:CHETI CHA RIDHAA

TAARIFA YA MZAZI/MLEZI

Nimeelezewa kikamilifu juu ya utafiti huu.Nimeelewa mathumuni yake na haki zangu kama mshiriki.Nimepatiwa nafasi ya kuuliza maswali na nimehakikishiwa nikiwa na swali juu ya huu utafiti ama haki zangu kama mshiriki ninaweza kumuuliza mpelelezi mkuu wakati wowote.

Nimeelewa kuwa nina weza kujiondoa kutoka kwa utafiti huu wakati wowote.

Nimeamua kwa hiari kushiriki kwenye utafiti huu

Sahihi ya Mzazi----------Tarehe----------

Nadhibiti ya kwamba nimepeana maelezo thabiti kuhusu utafiti huu, naye mhusika ametoa uamuzi wa kushiriki bila ya kulazimishwa.

Sahihi ya Mchunguzi----------Tarehe----------

Sahihi ya Shahidi----------Tarehe----------

APPENDIX 5: CONSENT FORM

Consent to Participate in Focus Group Discussion

You have been asked to participate in a focus group sponsored by Dr.Sanga Sheilah. The purpose of the group is to try and understand the factors behind the current practices in assessment of nutritional status of children admitted to medical pediatric wards. The information learned in the focus groups will be used to make recommendations on assessment of nutritional status of children.

You can choose whether or not to participate in the focus group and stop at any time. Although the focus group will be tape recorded, your responses will remain anonymous and no names will be mentioned in the report.

There is no right or wrong answers to the focus group questions. We want to hear many different viewpoints and would like to hear from everyone. We hope you can be honest even when your responses may not be in agreement with the rest of the group. In respect for each other, we ask that only one individual speak at a time in the group and that responses made by all participants be kept confidential.

I understand this information and agree to participate fully under the conditions Stated above:

Signed: _____ Date: _____

APPENDIX 6: DATA COLLECTION FORM

INTERVIEWER NAME: ----------

STUDY NO ----------

IPNO ----------

WARD ----------

INFORMANT: ----------

DATE ----------

CONSENT Yes ☐ No ☐

FILL IN THE APPROPRIATE RESPONSE IN THE SPACES PROVIDED.

A) Demographic characteristics of children

1. Name initials ☐
2. Date of Birth ☐
3. Age in months ☐

4. Sex M ☐
   F ☐
5. Birth weight ☐
6. Current weight

B**) Anthropometric measurements at the sick child clinic**

6. Height ☐
7. Length ☐
8. Weight ☐ gms ☐
9. MUAC

C) **Clinical evaluation of nutritional status at the sick child clinic**

9. Visible severe wasting YES ☐

NO ☐

10. Bilateral pedal edema

YES ☐

NO ☐

12. Classification of nutritional status:

Yes ☐ No ☐

If yes …….

13. Diagnosis

14. Referral

15. Readmission

16. Time of admission

(E) ASSESSMENT IN THE WARD

17. Diagnosis……

18. Anthropometric measurements:

Weight: ----------kgs ---------gms

Height/ Length: ----------cm

Left upper mid- arm circumference (LUMAC): ----------cm

19. Did the child have visible wasting? YES ☐

NO ☐

20. Did the child have bilateral edema? YES ☐

NO ☐

21. Classification of malnutrition

Yes ☐ No ☐

If yes ……

(F)ASSESSMENT BY THE INVESTIGATOR

22. Anthropometric measurements:

Weight: ----------kgs ---------gms

Height/ Length: ----------cm

Left upper mid- arm circumference (LUMAC): ----------cm

23. Does the child have visible wasting? YES ☐

NO ☐

24. Does the child have bilateral edema? YES ☐

NO ☐

25. Classification of malnutrition

Normal ☐

Mild ☐

Moderate ☐

Severe ☐

APPENDIX 7: GUIDE QUESTIONS FOR FOCUSSED GROUP DISCUSSION

1. Do you assess the nutritional status of all children admitted to pediatric medical wards? If not what are some of the factors hindering assessment?
2. Which methods do you use to assess and classify nutritional status?
3. What are the current recommendations on assessment of nutritional status of children?
4. Have you undergone any trainings /sensitizations on the current recommendations if no why?
5. Do you think assessment of nutritional status has an impact on morbidity and mortality if yes how?
6. What are your proposals in ensuring proper assessment of nutritional status of children is carried out?
7. Any other additions.

DEMOGRAPHIC DATA FOR FOCUSSED GROUP DISCUSSION

1. Gender

2. Cadre

3. Years of experience

APPENDIX 8: GUIDE QUESTIONS FOR KEY INFORMANT INTERVIEWS

1. Do you think all children admitted to pediatric wards in MTRH are assessed? If not what are some of the factors hindering assessment?
2. Have you and the other health care providers undergone any trainings /sensitizations on the current recommendations if no why?
3. Do you think assessment of nutritional status has an impact on morbidity and mortality if yes how?
4. What are your proposals in ensuring proper assessment of nutritional status of children is carried out?
5. Any other additions.

DEMOGRAPHIC DATA FOR THE KEY INFORMANTS

1. Gender

2. Cadre

3. Years of experience

APPENDIX 9: ANTHROPOMETRIC MEASUREMENTS.

1) TAKING A CHILD'S WEIGHT.

1. At the start of the process the child's will be undressed.

2. Weighing scale will be balanced to zero (i.e.to make sure the arrow is on 0).

3. Placement of the child on the weighing scale.

4. making sure the child is not holding onto anything.

5. Reading the child's weight. The arrow must be steady.

6. Recording the weight in kg to the nearest 100g e.g. 6.6kg for an older child or 50grams e.g.2350grams for infants or incase of the Seca machine's use.

7. The scale shall not be held while reading the weight

8. Two measurements will be taken, one by the Principal Investigator and another by the research assistant then the average calculated and recorded in the data collection form.

2) TAKING A CHILD'S LENGTH.

For children less than 87 cm, the measuring board will be placed on the ground.

1. The child will be placed lying down along the middle of the board.

2. The assistant will hold the sides of the child's head and positions the head until it firmly

touches the fixed headboard with the hair compressed.

3. The investigator will then places her hands on the child's leg, gently stretches the child and then keeps one hand on the thighs to prevent flexion.

4. While positioning the child's legs, the sliding foot-plate will be pushed firmly against the bottom of the child's feet.

5. For reading of the height measurement, the foot-plate must be perpendicular to the axis of the board and vertical.

6. The height will be read to the nearest 0.1 cm.

7. Two measurements will be taken, one by the Principal Investigator and another by the research assistant then the average calculated and recorded in the data collection form.

3) TAKING A CHILD'S HEIGHT.

1. The child will stand, upright against the middle of the measuring board.

2. The child's head, shoulders, buttocks, knees, and heels will be held against the board by the research assistant.

3. The investigator will then position the head and the cursor.

4. The height will be read to the nearest 0.1 cm.

5. Measurement recorded immediately.

6. Two measurements will be taken, one by the Principal Investigator and another by the research assistant then the average calculated and recorded in the data collection form.

4) TAKING A CHILD'S MIDDLE UPPER ARM CIRCUMFERENCE (MUAC).

MUAC is an alternative way to measure thinness (alternative to weight for height). It is used especially for children ≥6 months to 5 years old.

How to measure MUAC.

1. Asking the mother to remove any clothing covering the child's left arm.

2. Calculating the midpoint of the child's left upper arm: first locate the tip of the child's shoulder (Acromion process) with your fingertips.

3. Bending the child's elbow to make the right angle.

4. Placing the tape at zero, on the tip of the shoulder and pulling the tape straight down past the tip of the elbow (Olecranon process)

5. Reading the number at the tip of the elbow (Olecranon process) to the nearest centimeter. This number is divided by two to estimate the midpoint.

6. Marking the midpoint on the arm with a pen

7. Straightening the child's arm and wrap the tape around the arm at the midpoint. Making sure the numbers are right side up and the tape is flat around the skin.

8. Inspecting the tension of the tape on the child's arm to make sure the tape has the proper tension and is not too tight or too loose.

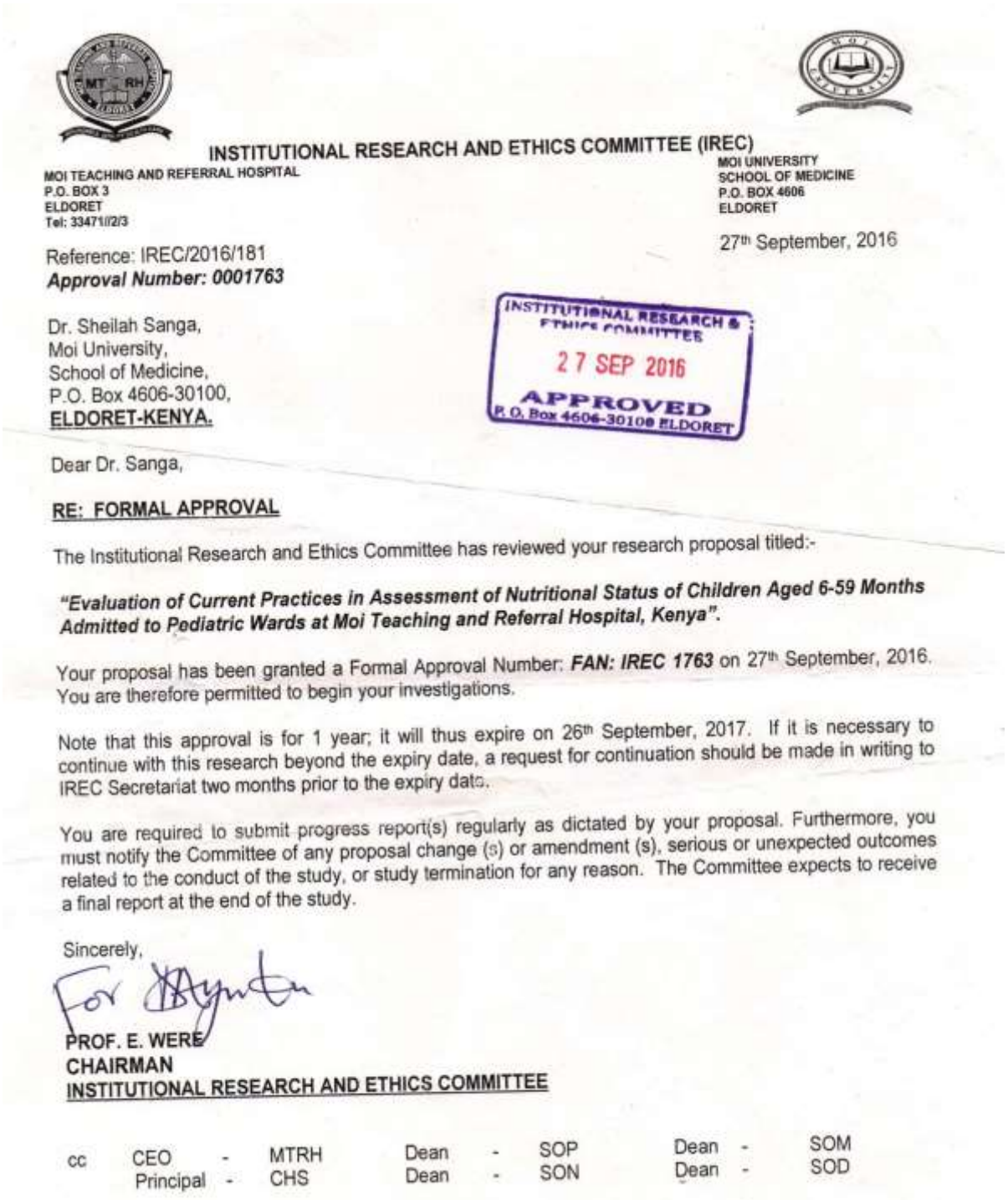
9. With the tape in correct position on the arm with the correct tension, the

Measurement will be read to the nearest 0.1cm.

10. Recording of the measurement.

11. Two measurements will be taken, one by the Principal Investigator and another by the research assistant then the average calculated and recorded in the data collection form.

APPENDIX 10: IREC APPROVAL



INSTITUTIONAL RESEARCH AND ETHICS COMMITTEE (IREC)

MOI TEACHING AND REFERRAL HOSPITAL
P.O. BOX 3
ELDORET
Tel: 33471/2/3

MOI UNIVERSITY
SCHOOL OF MEDICINE
P.O. BOX 4606
ELDORET

27th September, 2016

Reference: IREC/2016/181
Approval Number: 0001763

INSTITUTIONAL RESEARCH & ETHICS COMMITTEE
27 SEP 2016
APPROVED
P. O. Box 4606-30100 ELDORET

Dr. Sheilah Sanga,
Moi University,
School of Medicine,
P.O. Box 4606-30100,
ELDORET-KENYA.

Dear Dr. Sanga,

RE: FORMAL APPROVAL

The Institutional Research and Ethics Committee has reviewed your research proposal titled:-

"Evaluation of Current Practices in Assessment of Nutritional Status of Children Aged 6-59 Months Admitted to Pediatric Wards at Moi Teaching and Referral Hospital, Kenya".

Your proposal has been granted a Formal Approval Number: ***FAN: IREC 1763*** on 27th September, 2016. You are therefore permitted to begin your investigations.

Note that this approval is for 1 year; it will thus expire on 26th September, 2017. If it is necessary to continue with this research beyond the expiry date, a request for continuation should be made in writing to IREC Secretariat two months prior to the expiry date.

You are required to submit progress report(s) regularly as dictated by your proposal. Furthermore, you must notify the Committee of any proposal change (s) or amendment (s), serious or unexpected outcomes related to the conduct of the study, or study termination for any reason. The Committee expects to receive a final report at the end of the study.

Sincerely,

For

PROF. E. WERE
CHAIRMAN
INSTITUTIONAL RESEARCH AND ETHICS COMMITTEE

cc CEO - MTRH Dean - SOP Dean - SOM
Principal - CHS Dean - SON Dean - SOD

INSTITUTIONAL RESEARCH AND ETHICS COMMITTEE (IREC)

MOI TEACHING AND REFERRAL HOSPITAL
P.O. BOX 3
ELDORET
Tel: 33471/2/3

COLLEGE OF HEALTH SCIENCES
SCHOOL OF MEDICINE
P.O. BOX 4606
ELDORET
Tel: 33471/2/3

Reference IREC/2016/181
Approval Number: 0001763

22nd December, 2020

Dr. Sheilah Sanga,
Moi University,
School of Medicine,
P.O. Box 4606-30100,
ELDORET-KENYA.

Dear Dr. Sanga,

RE: APPROVAL OF AMENDMENT

The Institutional Research and Ethics Committee has reviewed the amendment made to your proposal titled:-

"Current Practises and Challenges in Assessment of Nutritional Status among Hospitalized Children at Moi Teaching and Referral Hospital Eldoret, Kenya".

We note that you are seeking to make an amendment as follows:-

1. To change the title to above from "Evaluation of Current Practises in Assessment of Nutritional Status of Children aged 6-59 Months Admitted to Pediatric Wards at Moi Teaching and Referral Hospital, Kenya".

The amendment has been approved on 22nd December, 2020 according to SOP's of IREC. You are therefore permitted to continue with your research.

You are required to submit progress(s) regularly as dictated by your proposal. Furthermore, you must notify the Committee of any proposal change(s) or amendment(s), serious or unexpected outcomes related to the conduct of the study, or study termination for any reason. The Committee expects to receive a final report at the end of the study.

INSTITUTIONAL RESEARCH & ETHICS COMMITTEE
22 DEC 2020
APPROVED
P. O. Box 4606-30100 ELDORET

Sincerely,

DR. S. NYABERA
DEPUTY-CHAIRMAN
INSTITUTIONAL RESEARCH AND ETHICS COMMITTEE

cc: CEO - MTRH Dean - SPH Dean - SOM
Principal - CHS Dean - SOD Dean - SON

APPENDIX 11: HOSPITAL APPROVAL (MTRH)

MOI TEACHING AND REFERRAL HOSPITAL

Telephone: 2033471/2/3/4
Fax: 61749
Email: director@mtrh.or.ke
P. O. Box 3
ELDORET

Ref: ELD/MTRH/R.6/VOL.II/2008

30th September, 2016

Dr. Sheila Sanga,
Moi University,
School of Medicine,
P.O. Box 4606-30100,
ELDORET-KENYA.

RE: APPROVAL TO CONDUCT RESEARCH AT MTRH

Upon obtaining approval from the Institutional Research and Ethics Committee (IREC) to conduct your research proposal titled:-

"Evaluation of Current Practices in Assessment of Nutritional Status of Children Aged 6-59 Months Admitted to Pediatric Wards at Moi Teaching and Referral Hospital, Kenya".

You are hereby permitted to commence your investigation at Moi Teaching and Referral Hospital.

30/09/2016

DR. WILSON ARUASA
CHIEF EXECUTIVE OFFICER
MOI TEACHING AND REFERRAL HOSPITAL

CC - Deputy Director (CS)
- Chief Nurse
- HOD, HRISM