PATTERNS, PREDICTORS AND OUTCOME OF TIME TO PRESENTATION AMONG CRITICALLY ILL PAEDIATRIC PATIENTS AT EMERGENCY DEPARTMENT OF MUHIMBILI NATIONAL HOSPITAL, DAR ES SALAAM

Alphonce N. Simbila, MD

MMed (Emergency Medicine) Dissertation Report
Muhimbili University of Health and Allied Sciences
October, 2020

Muhimbili University of Health and Allied Sciences

Department of Emergency Medicine

PATTERNS, PREDICTORS AND OUTCOME OF TIME TO PRESENTATION AMONG CRITICALLY ILL PAEDIATRIC PATIENTS AT EMERGENCY DEPARTMENT OF MUHIMBILI NATIONAL HOSPITAL, DAR ES SALAAM

By:

ALPHONCE N. SIMBILA

A Dissertation Submitted in Partial Fulfillment of the Requirements for the Degree of Master of Medicine (Emergency Medicine) of the

Muhimbili University of Health and Allied Sciences

October, 2020

CERTIFICATION

The undersigned certify that they have read and herby recommend for acceptance by Muhimbili University of Health and Allied Sciences a dissertation entitled **"Patterns, predictors and outcome of time to presentation among critically ill paediatric patients at emergency department of Muhimbili National Hospital, Dar Es Salaam"** in (partial) fulfilment of the requirements for the degree of Masters of Medicine (Emergency Medicine) of the Muhimbili University of Health and Allied Sciences.

_____

Dr. Hendry R. Sawe

(Supervisor)

_____

Date

_____

Dr. Said S. Kilindimo

(Co-supervisor)

_____

Date

DECLARATION OF COPYRIGHT

I, **Alphonce N. Simbila**, declare that this **dissertation** is my own original work and that it has not been presented and will not be presented to any other University for a similar or any other degree award.

Signature _____ Date _____

ACKNOWLEDGEMENT

I thank God for His grace and blessings during the entire duration of my degree program and particularly during the dissertation process.

Sincere gratitude to my best friend, partner and lovely wife, Dr. Zawadi E. Kalezi, for always being there and for her unconditional support and help.

Sincere gratitude to my supervisor, Dr. Hendry R. Sawe, and co-supervisor, Dr. Said S. Kilindimo for their continuing guidance from the beginning of the dissertation project.

My deepest gratitude to Dr. Ellen J. Weber, for the timely guidance, endless support and inspiration offered to me during this journey.

I would like to thank Dr. Germana Leyna, for the guidance and support offered to me during this journey as well.

Special appreciation goes to my sister in-law Furaha E. Kalezi, for always being there for my children and making sure that they are well taken care of in the absence of their parents.

Appreciation goes to my friends Amne O Yussuf, Elishah N Premji and Hussein K Manji for the time, knowledge and support offered to me.

My gratitude also goes out to the faculty members in the Department of Emergency Medicine (MUHAS), for their constructive feedback which has made this dissertation project possible.

My appreciation also goes to Naftali and Team for their help in data collection.

Sincere acknowledgement to the study participants for agreeing to be included in the study and being ever-ready to respond to follow-ups.

DEDICATION

To my lovely wife and daughters Arielle and Adrielle

ABSTRACT

Background: On a global scale, half of the deaths among children under 5 years occur in Sub-Saharan Africa with 1 in 13 children dying before they reach their fifth birthday. One factor contributing to these early deaths, that has been suggested in prior studies in other countries, is the timeliness of presentation to the hospital. However, little is known about the patterns, predictors, outcome and the association between time to presentation and mortality among critically ill children who present to tertiary health care facilities for definitive care in limited resource settings.

Aim: To determine the patterns and predictors of time to presentation of critically ill paediatric patients aged 28 days to 14 years attending MNH ED, and the association between time to presentation and mortality.

Method: A hospital based prospective descriptive cohort study of critically ill paediatric patients aged 28 days to 14 years with level 1 triage at MNH ED from September 2019 and January 2020. A structured case report form was used to document demographics, timing of presentation and clinical course of critically ill children attending MNH ED. Data was transferred to and analysed by SPSS software version 26. Descriptive analysis was summarized as frequencies and median with interquartile range (IQR). The principal component analysis was used to manage the wealth index. Delay was considered presentation to the ED more than 48 hours from the onset of the current illness. Overall proportion of delayed critically ill paediatric patients was calculated and contingency tables were made for bivariate analysis to explore the associated factors. Relative risk was carried out to measure the relationship between delay and the primary outcome of mortality.

Results: A total of 440(59.1%) paediatric patients triaged ESI level 1 were enrolled into the study. The median age was 12 [IQR =9-60] months and 63.9% were males**.** The median time from onset of illness to arrival at the MNH ED was 3 days [IQR=1-5]. The proportion of critically ill paediatric patients with delayed presentation to the ED was 249 (56.6%). Age, type of referral and belonging to the poorest socioeconomic status were independent predictors of timeliness of presentation. Those who were below 1 year had 2.2 times increased odds of (OR=2.2 (95%CI 1.3-3.8) presenting late to the MNH ED. Critically ill paediatric patients who

were referred from facilities were more likely to be delayed whilst presenting to the ED (OR=1.8 (95% CI 1.1-2.8). The poorest socioeconomic status was 2.24 times more likely to present late to the ED (OR=2.4 (CI:1.2-4.8) The overall proportion of 30-day in-hospital mortality was 99(26.5%). Out of these, 64(29.5%) presented late to the ED compared to 35(22.3%) who came early. Those who presented late to the ED were 1.3 times more likely to die than those who presented early (RR=1.3, CI: 0.9-1.9). Delay was significantly associated with late (>24 hours) in-hospital mortality (P-value=0.021).

Conclusion: Delayed presentation to the ED of more than two days from onset of illness was associated with a high rate of late mortality of children who were admitted in the wards. A larger study is needed to evaluate the care pathway of critically ill paediatric patients to identify preventable failures in the care provided before reaching a tertiary level of care.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Figure 5: Disposition of paediatric patients aged 28days to 14 years ESI triage level 1..... 27

LIST OF ABBREVIATIONS

CPAP	Continuous Positive Airway Pressure
CPR	Cardiopulmonary Resuscitation
CRF	Case Report Form
DKA	Diabetic Ketoacidosis
ED	Emergency Department
EM	Emergency Medicine
EMR	Electronic Medical Record
ESI	Emergency Severity Index
HDU	High-Dependency Unit
ICU	Intensive Care Unit
IQR	Interquartile Range
IRB	Institutional Review Board
LMIC	Low- and Middle-Income Countries
LOS	Length of stay
MAMC	MUHAS Academic Medical Center
MNH	Muhimbili National Hospital
MUHAS	Muhimbili University of Health and Allied Sciences
PICU	Paediatric Intensive Care Unit
SAM	Severe Acute Malnutrition

OPERATIONAL DEFINITION OF KEY TERMS

ESI triage level 1:Is a triage category given to a patient who requires immediate lifesaving intervention(1).

ESI triage level 2: Is a triage category given to a patient whose condition has a potential threat to life, limb or organ and requires time-sensitive treatment(1).

Cardiopulmonary Resuscitation: CPR is an attempt to restore spontaneous circulation by performing chest compressions with or without ventilation(2).

Health seeking behavior: Individual's actions to promote maximum well-being, recovery and rehabilitation; this could happen with or without health concerns and within a range of potential to real health concerns(3).

Intubation: Intubation is the passage of an artificial airway (tube) into the patient's trachea, generally through the mouth (endotracheal tube intubation) or occasionally through the nose (nasotracheal intubation) for protection of the airway or to improve oxygenation (4). Presentation time is the sum total of time in hours elapsed from the onset of illness to their presentation at the EMD.

Need for advanced management: Need for interventions such as CPR, CPAP, Intubation, Central line placement, the use of inotropes within the first 4 hours of arrival at the ED shall be used as early outcome because they reflect critical condition of a child.

Death at the ED: Any death that occurs while a child is receiving care at the ED as per standard operating procedures of MNH-EMD.

Length of stay in the ward/ICU: Time period in hours spent by a child from arrival in the ward/ICU to either death or discharge home.

Death in the ward: Death that occurs after the child has left the ED and while the child is in either medical ward, surgical wards, orthopaedic and trauma ward, neurosurgery ward or PICU.

CHAPTER ONE

1 INTRODUCTION

1.1 BACKGROUND

Critical illness is a life-threatening process which, without medical intervention, is highly likely to result in death (5). In the paediatric population critical illness can occur due to wide a spectrum of illnesses as well as the sequence of events in seeking care. The unfolding of events in the process of critical illness is influenced by multiple factors. These factors can modify and affect the outcome of critical illness in the end. Timely and evidence-based provision of certain interventions and modification of the factors involved affect the final outcomes of the process. Parents and caretakers are usually advised to seek health care early in the course of their children's illnesses in order for health providers to start appropriate management early enough to avoid unwanted health outcomes.

Emphasis has been put on improving quality of health services provided at health facilities. Triage systems and tools for early recognition of paediatric critical illness are employed in health facilities to recognize and initiate appropriate care. For instance, in a busy ED paediatric early warning signs for clinical deterioration are used to allocate and triage patients to appropriate levels of care(6).

A five-level triage system such the ESI is used to sort patients according to their acuity of illness. According to the ESI triage system a patient triaged to level 1 is the one in need of resuscitation and stabilization measures(1). These measures are employed once the child reaches a health facility. Although this approach to an acutely ill paediatric patient has shown some success in improving morbidity and mortality it is not a panacea. Other factors do influence both the timeliness of presentation to the hospital and related outcomes of critical illness in children.

Timeliness of presentation to health care facilities is affected by many factors that can easily be overlooked while taking care of critically ill children at tertiary levels of health care. Delayed presentation to the hospital in the course of paediatric critical illness has been shown to be one of the factors that negatively influence health outcomes(7). *Umuhoza Christian et al* studied caregiver delay in seeking health care during the acute phase of paediatric illness at a tertiary

hospital in Kigali, Rwanda. This showed that 35% of caregivers sought care more than 48 hours after the onset of the illness(8). Likewise, delays in the system of provision of health care are among the factors that contribute to the health outcome of the children as well. *Wiens Matthew et al* did a study on mortality, morbidity and health seeking behavior among children aged 0 to 12 years in rural Southwestern Uganda and found out that 50% of those who reach hospitals and are admitted die within 24 hours. A possible explanation to this could be delay in attendance or untimely and inadequate care on arrival at hospitals(9). In a study conducted in Kilombero, Tanzania by *F. Font et al* almost 48% of paediatric referrals from the primary health care facilities spent 2 days or more to arrive at the referral hospital (10).

In Tanzania provision of health and social welfare services is organized in hierarchical and pyramid pattern. It is arranged beginning with community health care, dispensaries and health centers, and ascends through first level hospitals, regional referral hospitals and zonal and national hospitals, capable of providing specialized services. The hierarchy of care reflects the skills and resources available in each setting. The higher the level the better the skills and availability of specialized resources. This ascending order forms the basis of the referral system in Tanzania. However, the system does not always perform adequately due to challenges such as transportation and inability to provide adequate care expected at a certain level(11,12).

In search for appropriate health care for critical illness children, under their parents' and caretaker's guidance, go through several decision points and levels of implementation. Majority of children received at the referral hospitals for definitive care come from dispensaries, and almost half of them take two or more days to reach the hospital(13).

The objective of this study was to determine the patterns, predictors and outcome of timeliness of presentation among critically ill paediatric patients presenting to MNH ED, and how time to presentation affects their outcome. Findings from this study can serve as a basis for a larger study to further determine and map factors for delay in the pathway of care to the tertiary level of care among critically ill paediatric patients in Tanzania and Sub-Saharan Africa at large.

1.2 LITERATURE REVIEW

The burden of diseases and their negative outcomes is large among the low- and middle-income countries. A significant portion of this burden is occupied by the paediatric population. Globally, half of all deaths among children under 5 years occur in Sub-Saharan Africa. It is estimated that 1 in 13 children die before they reach their fifth birthday (14). Children are vulnerable to diseases and injuries which can unpredictably transform into critical illness.

Critical illness is a life-threatening process which, if no medical intervention is provided, results in significant morbidity and mortality. The outcome of critical illness is affected by all aspects of management from recognition of acute and serious illness, immediate stabilization all the way through discharge from hospital(5,15).

Several studies have convincingly demonstrated that time is of essence in critical illness. They have similarly explored the relationship between delay and mortality in critical illness. A prospective cohort study done on adult ICU patients by *Cordoso and Grion et al* showed that there is an association between delayed ICU admission and mortality. Fraction of mortality attributable to ICU delay was 30%(16).

In Africa, studies on the effect of delay in child mortality have focused on the first phase of delay which essentially looks at health care seeking behavior of the parents and caretakers of the children concerned. A five-year chart review of deaths among children aged between 7days and 13 years done by *Jofiro G and Jemal J et al* at a tertiary hospital in Ethiopia showed that about 4. 1% of children died at the Paediatric Emergency Department, which translates to a mortality of 8.2 per 1000 children. Delay of more than 48 hours since the onset of symptoms was among the top causes of early mortality (7).

A study conducted in Uganda by Kallander K et al on children who died of pneumonia revealed a median of 2 days from the onset of fatal illness to seeking care outside the home. Overall, a child who died had been sick from fatal pneumonia for almost 7 days. This underscores the importance of seeking care early during critical illness in children(17).

Thaddeus and Maine put forward a three-phase model to explain the concept of delay and factors that affect the interval between the onset of symptoms and outcome of illness(18). This model was developed in relation to maternal mortality. The first phase is about delay at home, the second phase concerns delay on the way to the health facility and the third is while receiving care at the health facility. A similar model can be applied to the analysis of delay in the pathway of care in the paediatric population.

In a mixed methods analysis of verbal social autopsies of mortality among children under the age of five years in a study in Rwanda four phases of delay were identified. In this study the first phase which involved delay to seek care and the second phase which involved receiving care at the health facility dominated the overall mortality(19).

In Tanzania, child mortality is among the public health problems and effort is made to address it. The third phase of delay has been shown to play a significant role in the child mortality by a study by Samuelsen H et tal(13). This phase gives a better view of what happens when the children who die are already within the health care delivery system and the factors that contribute to the delay.

Disparities in health care seeking behaviour based on the gender of a child have been observed in low- and middle-income countries. There are reported delays in seeking care for female children as opposed to prompt health seeking practices for the male counterparts. Studies conducted in the India subcontinent and some Asian countries have revealed so(20,21).

In their study on household and socioeconomic factors associated with childhood febrile illnesses and treatment seeking behaviour *Deresa W et al* observed that seeking treatment after 48 h of illness onset was more common among children from households in the poorest socioeconomic category than those in the middle and highest wealth categories(22).

According to the analysis of the 2010 Tanzania Health and Demographic survey by *Kahabuka C et al*, caretakers with higher level of education commonly seek early care for their ill children and utilize higher levels of health facilities as compared to those with lower levels of education. (23).

Umuhoza Christian et al did a study on caregiver delay in seeking health care during the acute phase of paediatric illness in a tertiary hospital in Kigali, Rwanda which showed that 35% of caregivers sought care more than 48 hours after the onset of the illness(24).

An ineffective or inefficient referral system can be a hindrance to timely presentation of ill children to appropriate levels of care. Physicians receive inadequate training on when to make a referral(25). A study in Kiambu, Kenya revealed that the majority (53%) of the health workers from dispensaries, health centers and county referral hospitals had no skills in referral guidelines (26). This can delay acquisition of definitive care among critically ill children and hence affect their health outcomes in the end.

A study in Uganda found that there were no deaths associated with compliance to the referral that was recommended the same day. Of all the critically ill children that were referred to higher levels, there was a 5% mortality in those who delayed a day or later after the referral was made.
In Tanzania, *Samuelsen H et al* did a qualitative study of child deaths and analysed the third phase of delay at the level of health systems. They found out that delay at the health facilities is common among families with low social and cultural capital. Uncertainty about payment further delayed the referral practices and " impoverished communication" with the health workers(13).

Despite the fact that children's programs and strategies have been put in place to make sure that illness among children is recognized and treated in a timely fashion, we still witness significant critical illness. In low- and middle-income countries critically ill children die either prior to accessing healthcare or early after arriving in health care facilities. A study on mortality, morbidity and health seeking behavior among children aged 0 to 12 years in rural Southwestern Uganda found out that 50% of those who reach hospitals and are admitted die within 24 hours (9).

Other factors such as availability of care beyond the point of entry to a tertiary hospital does affect the outcomes of children with critical illness. In Tanzania, *Sawe H.R et al* revealed a severe shortage of age-appropriate ICU and dedicated staff to care for critically ill children in tertiary hospitals(27).

It is more likely that a sick child who has presented late to hospital with critical illness will need such supportive management as intubation for airway protection, CPAP and in the worst-case scenario CPR for a cardiac arrest while at the acute intake area.

1.3 PROBLEM STATEMENT

Delayed presentation to the hospital among critically ill children is a matter of concern in Low- and Middle-Income Countries like Tanzania. Despite the fact that there have been global and national efforts to increase early access to definitive care among ill children, EMD-MNH still receives quite a large number of very sick children. Their severity of illness on presentation directly affects their outcome, even with the best management. (9,13,28).

Many studies in this area have looked at timeliness to seek health care at the level of the family which affects the first phase in the *Thaddeus and Maine's delay model*. Several factors in the whole pathway to care of a paediatric illness may contribute to the overall delay observed at the referral tertiary health facility. There is paucity of data on the reasons for delayed presentation to a tertiary hospital for definitive care among critically ill paediatric patients which may be subject to modification. Moreover, the impact of delay on morbidity and mortality of critically ill paediatric patients that reach tertiary health care facilities is also unclear.

To the best of our knowledge we could not identify any study conducted in the Emergency Department concerning timeliness of presentation among critically ill paediatric patients in Tanzania.

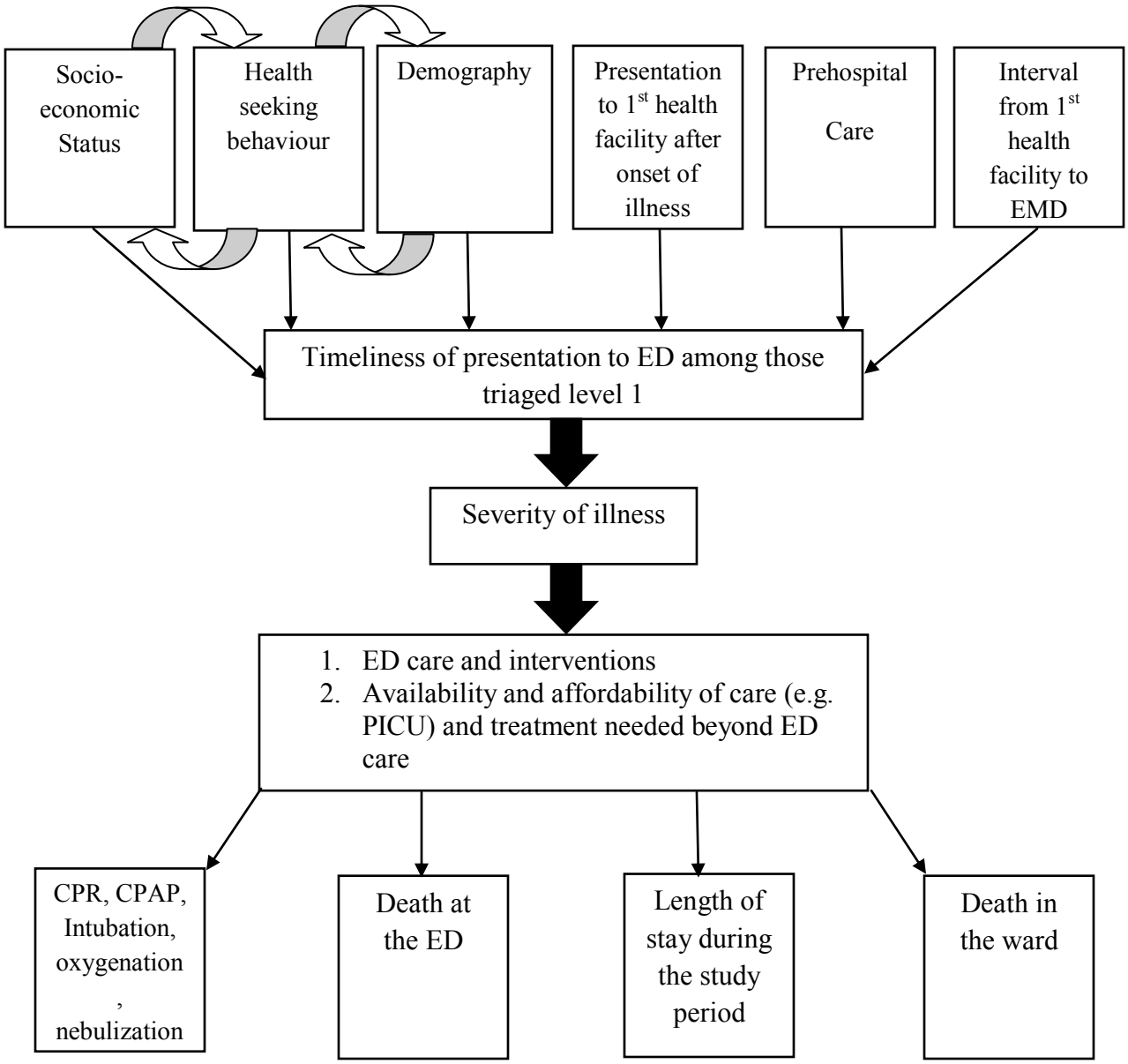
1.4 RATIONALE

Delay in seeking healthcare plays a significant role in morbidity and mortality among children under 5 years of age. While much emphasis has been put on recognizing and treating critical illnesses among children who present to different levels of the healthcare system, several factors affect access to health facilities within this established system, causing variation in the timeliness of presentation. Determinants of how early or late a child presents to the referral health facility in the course of critical illness are many and do vary across communities and countries.

This study sought to describe and document patterns and predictors of time to presentation to a tertiary referral hospital, the magnitude of delay, factors associated with delay, and the association between time to presentation and outcome of critically ill children presenting at the Emergency Department of an urban tertiary hospital.

A better understanding of all these factors is essential because it can assist and guide health policymakers and health care providers in laying down plans to meet the clinical and infrastructural needs of this population group.

1.5 CONCEPTUAL FRAMEWORK



CONCEPTUAL FRAMEWORK DESCRIPTION

Socioeconomic factors such as level of education and income of the parent/guardian of the child have been shown to influence the health seeking behavior for paediatric illness. Parents with higher level of education tend to seek health help earlier and at a higher level of care than their counterparts(23). In some societies male children are given preference to be sent to hospital earlier during illness than female children(29). Upon reaching the first point of entry into the health system such as a dispensary there may be a failure to recognize the level of illness and hence miss the need to refer a sick child earlier for specialized and definitive care. The above factors have been shown to cause significant delay in the pathway to care. These affect progression of illness in a child and level at which he/she will be triaged upon arrival at the hospital(30). This translates into a higher demand for E.D interventions and further ICU care. A summation of all the above pathways ends up affecting the outcome of critical illness in a child. Such outcomes as need for intubation, death in the ED, length of hospital stay, and death in the ward are the results of interaction of the factors.

1.6 RESEARCH QUESTION

What are the patterns and predictors of time to presentation of critically ill paediatric patients aged 28 days to 14 years attending MNH ED and what is the association between time to presentation and outcome?

1.7 OBJECTIVES

1.7.1 Broad objective

To determine patterns and predictors of time to presentation of critically ill paediatric patients aged 28 days to 14 years attending MNH ED, and the association between time to presentation and outcome.

1.7.2 Specific objectives

1. To determine the time interval from onset of illness to presentation at the MNH ED among paediatric patients aged 28 days and 14 years triaged ESI level 1.
2. To determine the proportion of paediatric patients aged 28 days to 14 years triaged ESI level 1 presenting to MNH ED more than 48 hours from the onset of illness.
3. To describe the clinical characteristics, ED interventions, disposition and outcome of paediatric patients aged 28 days to 14 years triaged ESI level 1 presenting to MNH ED
4. To determine factors associated with delayed (more than 48 hours) presentation to the MNH ED among paediatric patients aged 28days to 14years triaged ESI level 1.
5. To determine the association between delay and mortality among paediatric patients aged 28 days to 14 years triaged ESI level 1

CHAPTER TWO

2 METHODOLOGY:

2.1 STUDY DESIGN

This was a prospective observational cohort study of paediatric patients aged 28 days to 14 years triaged ESI level 1 at Emergency Department of Muhimbili National Hospital between September 2019 and January 2020.

2.2 STUDY SETTING

Muhimbili National Hospital is a national referral government hospital with 1500 beds, and attending 1500 outpatients daily. It is located in Ilala district, Dar es Salaam City, Tanzania. The Emergency Department was opened in 2010, and serves an annual average of 60,000 patients who are referred from all over the country. MNH serves as the top referral hospital in Tanzania. The ED is the first full capacity public ED in Tanzania and the training site for the only Emergency Medicine residency program in the country. The department is staffed 24 hours, seven days a week by locally trained specialist emergency physicians, who oversee the care of patients and training of interns, registrars and EM residents, On a daily basis the ED attends about 150-200 critically ill patients. Among them approximately 25% are children with 75% presenting with non-traumatic medical conditions(31). At MNH, patients younger than 28 days present directly to the maternity and neonatal ward, and those over 14 years are triaged to adult rooms and admitted to the adult ward. The EMD is equipped to provide plain radiographs, bedside ultrasound, continuous cardiorespiratory monitoring, low-flow oxygen, bag mask ventilation, intubation, mechanical ventilation, blood product transfusions, vasoactive medications, and resuscitation medications. MNH has a large general paediatric ward, a dedicated paediatric intensive care unit (PICU) and no paediatric HDU. In general, the MNH ward can administer intermittent medications, intravenous fluids, low-flow oxygen, and blood products and measure vital signs every shift. PICU was established in March, 2019 in collaboration with Emory University-Children's Health Care Centre of Atlanta. It is a 12-bed unit with 11 ventilator machines which operates 24 hours, seven days a week. It is staffed by 5 general paediatricians and 30 nurses.

2.3 TARGET POPULATION

All critically ill paediatric patients aged 28 days to 14 years presenting to acute intake areas of tertiary referral hospitals.

2.4 ACCESSIBLE POPULATION

All paediatric patients aged 28 days to 14 years presenting to Emergency Department of Muhimbili National Hospital in Dar es salaam, Tanzania.

2.5 STUDY POPULATION

All paediatric patients aged between 28 days to 14 years triaged ESI level 1 of care attended at the Emergency Department of Muhimbili National Hospital in Dar es salaam, Tanzania at the time the study was being conducted.

2.6 SAMPLING DESIGN

Consecutive convenient sampling technique was used to enroll paediatric patients aged 28 days to 14 years who were triaged ESI level 1, who met the inclusion criteria and informed consent had been attained from the parents or caretakers at the time the researcher or his assistants were collecting data.

2.7 SUBJECTS

2.7.1 Inclusion criteria:

All children between the age of 28 days and 14 years who were triaged level 1 at the ED.

2.7.2 Exclusion criteria:

Critically ill paediatric patients who had previously been enrolled in the study who presented again during the study duration

2.7.3 Variables of interest

The primary objective of this study was to determine the patterns and predictors of time to presentation of critically ill paediatric patients aged 28 days to 14 years attending MNH ED, and the association between time to presentation and outcome. The variables of interest were:

Predictor variables

1. Demographics of child: age and sex
2. Demographic characteristics of caretaker: age, level of education and occupation status of the child's parent/guardian.
3. Referral status: Referred by facility or self-referred
4. Clinical characteristics of patient: vital signs, ED diagnosis
5. ED interventions and disposition
6. Time interval from onset of critical illness to presentation at the MNH ED

Dependent variables

1. Delayed presentation – defined as presentation to ED after 48 hours from onset of illness.
2. 30 days mortality – divided into early (death that occurred within 24 hours after arrival to ED) and late (death that occurred beyond 24 hours of arrival at ED).

OUTCOMES

The primary outcome was association of delay with mortality and secondary outcome was predictors of delay among critically ill paediatric patients.

2.8 SAMPLE SIZE ESTIMATION

There are varying mortality rates for paediatric visits to the ED in LMIC's, ranging from 2.6% to 12.6%. This varies depending on the population studied, with low mortality when all children were included, and the higher mortality when only those with pneumonia were included. A pilot study done at our institution, looking at all Level 1 patients found a 4.38% mortality rate. Therefore, a conservative estimate for mortality in our study which focused on Level 1 children was 7.6%. Only 1 study could be found in children to estimate an effect size for delay. A study in Rwanda(22) found that 35% of children were delayed (> 2 days), and the relative risk for mortality for delay was 2.5. To determine the minimum sample size required, we used the formula for comparing two proportions with a dichotomous outcome between two samples, using the chi-square statistic (or Z-test).

$$N = \left(Z\alpha \sqrt{P(1-P)\left(\frac{1}{q1}+\frac{1}{q2}\right)} + z\beta \sqrt{P1(1-P1)\left(\frac{1}{q1}\right) + P2(1-P2)\left(\frac{1}{q2}\right)} \right)^2 \div (P1-P2)^2$$

Total group size, **N=<u>370</u>**

Where, Zα/2 is the critical value of the normal distribution at α/2 (for a confidence level of 95%, α is 0.05 and the critical value is1.96), Zβ is the critical value of the normal distribution at β (for a power of 80%, β is 0.2 and the critical value is 0.842) and p1 and p2 are the expected sample proportions of the two groups. With an overall mortality of 7.6% and relative risk of 2.5, p1 which was a proportion of critically ill children with no delay was 5% and p2 which was a proportion of critically ill children who delayed was 12.5%.

After adjustment to account for **<u>10%</u>** non-response and loss to follow up a **<u>sample size of 407</u>** paediatric patients triaged level 1 who were receiving care in the Emergency Department of Muhimbili National Hospital was estimated.

2.9 DATA COLLECTION

2.9.1 Patient recruitment

A consecutive convenient paediatric patient enrollment scheme was employed. At the beginning of every shift doctors and nurses working in the triage and paediatric sections of the MNH ED were informed to notify the principal researcher or his assistants whenever they received any critically ill paediatric patient triaged ESI level 1. In addition, the researcher and assistants monitored and tracked critically ill paediatric patients who were electronically registered and triaged ESI level 1 in the EMR to ensure that all patients were captured. A standardized checklist was used to assess the eligibility of a paediatric patient to be enrolled into the study.

Four research assistants were recruited to facilitate the data collection process for 24 hours on alternate days and nights. These assistants were trained on identification of eligible paediatric patients, the use of data collection checklist and important information to be collected for this study. The principal researcher supervised the data collection process and verified data quality and accuracy on a daily basis.

2.9.2 Data collection tool and technique

The data were prospectively collected using a researcher administered, standardized structured questionnaire which was developed in English. Research assistants were trained on how to collect relevant information for the study including the use of a Tanzania Demographic and Health Survey socioeconomic tool (32). Supplementary information was obtained from patients' medical records and EMR. Follow up was done at 24 hours and weekly for a period of 30 days from arrival to ED.

The standardized data collection form had the following components:

a. Patient baseline information

   The researcher or his assistants documented patients' baseline information including demographic data of patient and caretaker along with referral details

b. Case reporting

   Vital signs on arrival (heart rate, respiratory rate, oxygen saturation and temperature), ED diagnoses, ED interventions (oxygenation, intubation, central line, non-invasive ventilation, CPR, nebulization) performed and disposition were recorded. The dates and times of onset of illness and arrival to ED were recorded.

c. Case follow up

   The research assistants traced all patients enrolled (through their clinical files), throughout the duration of the study. Follow up was conducted at 24 hours then weekly for a 30-day period. Death or discharged whichever came first during the 30 day follow up period was noted.

2.9.3 Pre-testing of the tool

The Case Report Form was pre-tested to collect information from a convenience sample of parents presenting with their children at the ED for a period of four consecutive days. This helped to identify and address shortcomings that arose before the actual data collection begins.

2.9.4 Quality and accuracy of data

The data were transferred from a handwritten standardized structured questionnaire into an electronic data storage platform, the Research Electronic Data Capture (RedCap) version 6.0.1, Vanderbilt University, Tennessee, USA on a daily basis and were overseen by the principal researcher to maintain the quality and accuracy of the data entered. Questionnaires were stored in a safe locker whose key stayed with the principal researcher.

2.10 DATA ANALYSIS

Data were imported into the Statistical Package for Social Science for analysis (IBM SPSS Statistics 26.0) from the Research Electronic Data Capture (RedCap Version 6.0.1, Vanderbilt University, Tennessee, USA). Data entry and cleaning was done using SPSS. Relevant frequencies and tables were generated for categorical variables (injury and referral factors) and they were presented using bar and pie charts. Medians/inter-quartile ranges were calculated for continuous variables. The proportion of children with delayed presentation was calculated and contingency tables were constructed for univariate analysis to explore factors associated with delayed presentation using the Chi-square test. Multivariate logistic regression analysis was completed on variables with p value ≤ 0.20 in the univariate analysis to identify independent predictors of delayed presentation. The principal component analysis was used to manage the wealth index. Wealth was determined based on household characteristics and asset ownership. Households were then ranked, from lowest to highest score. Then those scores were separated into Quintiles; each representing 20% of the population. Those in the highest quintile might not have been rich but were in higher socioeconomic status than 80% of the participants in this study. Relative risks were computed for association of delay with overall, early and late mortality. The odd ratios and 95% confidence intervals were estimated for each studied factor. Statistical significance was set at p-value<0.05.

2.11 ETHICAL CONSIDERATION

Ethical clearance to conduct this study was obtained from MUHAS Senate of Research and Publication Committee (See appendix IV). Approval for data collection is sought from respective authorities at MNH (See appendix V).

All eligible children presenting to EMD were enrolled after obtaining a signed consent from their parents or caretakers. Acquired records were coded to hide patient's identity and stored in computer with password known by researchers only. The written forms were kept in a safe cabinet accessed by only researchers.

CHAPTER THREE

3 RESULTS

3.1 Strobe flow diagram of paediatric patients

A total of 3616 paediatric patients attended ED during the study period, of whom 745 (20.6%) were triaged ESI level 1. 440 (59.1%) were enrolled and the remaining were excluded – 15 (2.0%) who revisited the ED, 13 (1.7%) for whom consent could not be obtained and 277 (37.2%) who presented at a time when the research assistant was unavailable. Of the 99(26.5%) who died within 30 days of presentation, 64(29.5%) presented late (after 48 hours) and 35 (22.3%) presented early (before 48 hours). Amongst those who survived the 30-day follow-up period, 153 (70.5%) presented late and 122 (77.7%) presented early. (Figure 1)

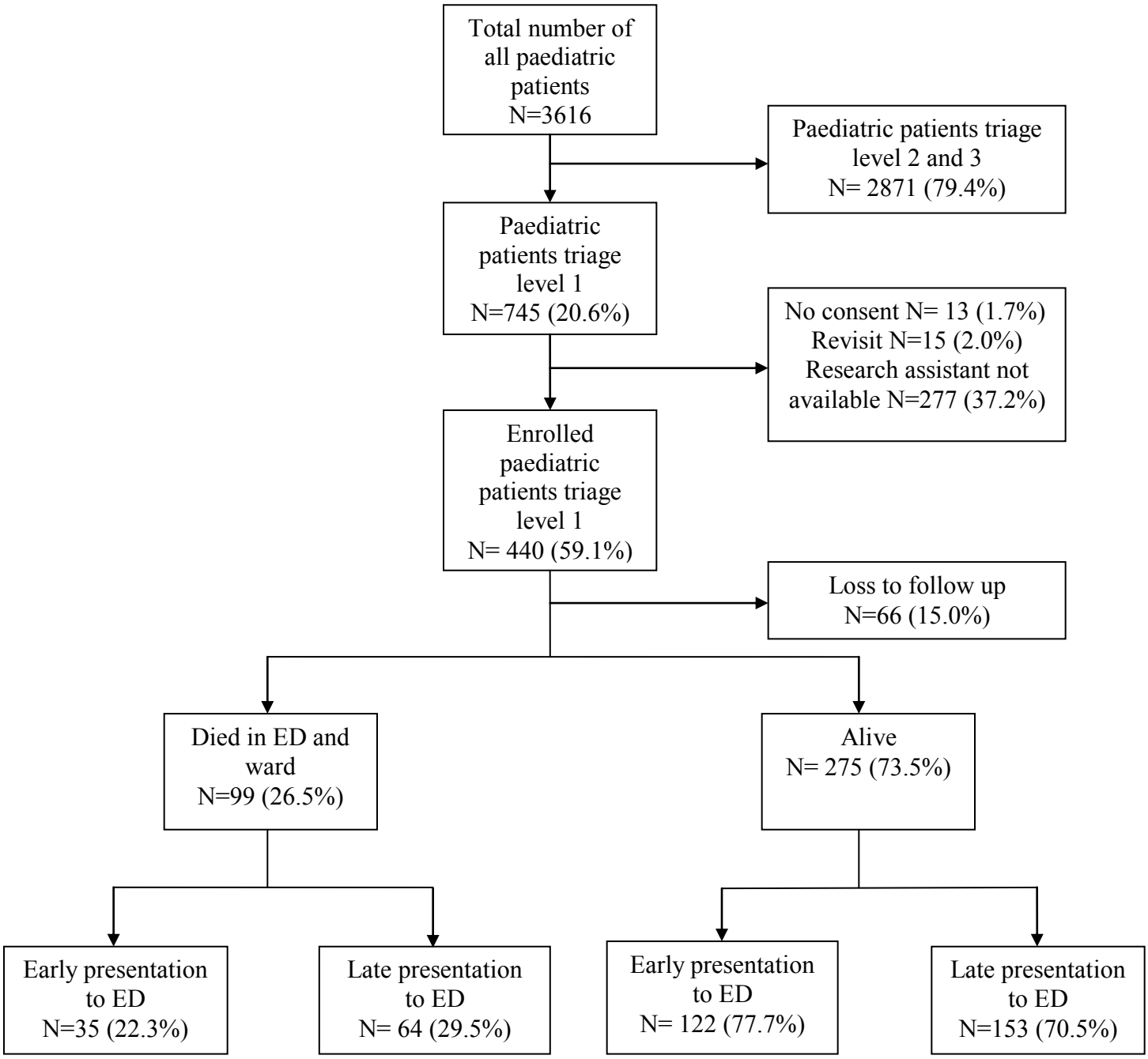


Figure 1: Flow chart of paediatric patients

3.2 Socio-demographic characteristics of paediatric patients aged 28 days to 14 years with ESI triage level 1 at the MNH ED and their caretakers

A total of 440 children were recruited into the study with 281(63.9%) being males, median age (months) was 12 [IQR 9 -60]. Patients who were referred from facilities were 321(73.0%). Most of the caretakers of the critically ill paediatric patients were parents 410(93.2%) and more than half of them 260(59.1%) were between the age of 25 and 34 years. Slightly more than half of them 236(53.6%) had primary education, 145(33.0%) were unemployed, 46(10.5%) were peasants and 87 (19.8%) were the poorest. (Table 1)

Table 1: Socio-demographic characteristics of paediatric patients aged 28 days to 14years with ESI triage level 1 at the MNH ED and their caretakers

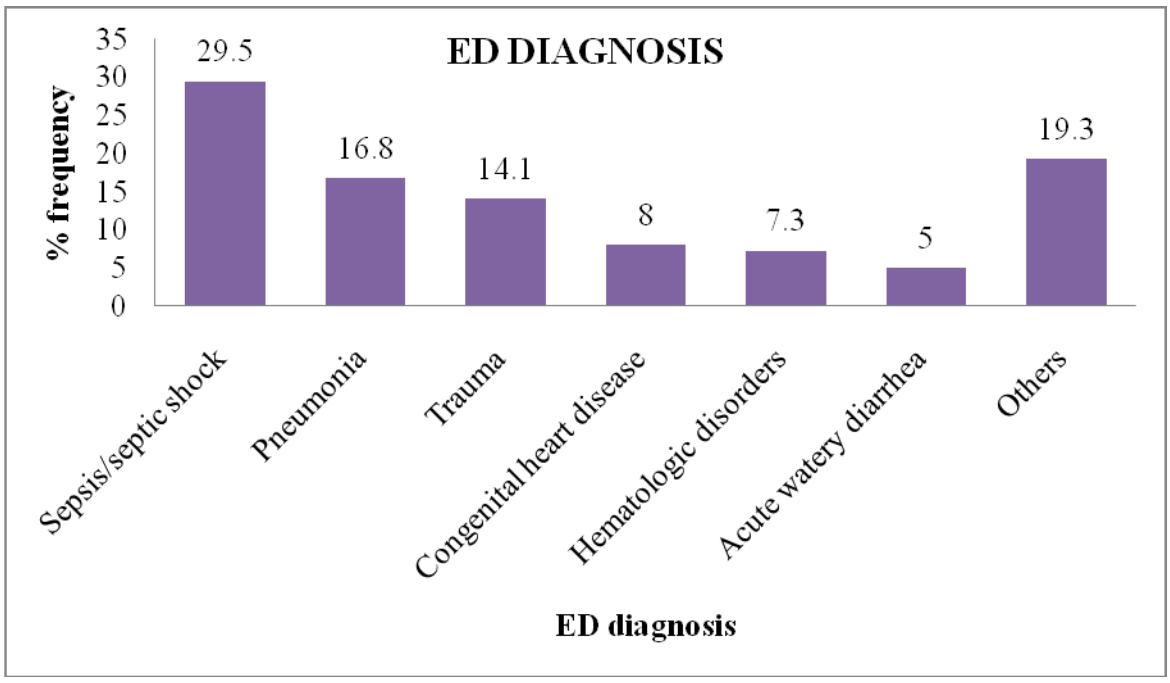
Variable	Category	Median [IQR]	Frequency (%) N=440
Age (months)	<12		142 (32.3)
	12-<60		181 (41.1)
	≥60		117 (26.6)
	Median [IQR]	12 [9-60]	
Sex	Male		281 (63.9)
	Female		159 (36.1)
Type of referral	Facility		321 (73.0)
	Self-referral		119 (27.0)
Caretaker	Parent		410 (93.2)
	Guardian		30 (6.8)
Age of caretaker (years)	<25		47 (10.7)
	25-34		260 (59.1)
	≥35		133 (30.2)
	Median [IQR]	32 [28-36.7]	
Level of education of caretaker	No formal education		32 (7.3)
	Primary education		236 (53.6)
	Secondary education		141 (32.0)
	University/college		31 (7.0)
Occupation status of caretaker	Employed		55 (12.5)
	Self employed		194 (44.1)
	Unemployed		145 (33.0)
	Peasant		46 (10.5)
Socioeconomic status	Poorest		87 (19.8)
	Poor		91 (20.7)
	Medium		92 (20.9)
	Rich		79 (18.0)
	Richest		91 (20.7)

3.3 Clinical characteristics and time to presentation of paediatric patients aged 28 days to 14 years with ESI triage level 1 at the MNH ED

Total of 229 (52.0%) had tachycardia upon arrival at the ED. Slightly more than half of them had (50.2%) had tachypnea. Almost a quarter of the study participants 102(23.2%) had hypoxia. Of all the study participants 143(32.5%) had hyperthermia. The most common ED diagnoses were sepsis/septic shock130 (29.5%) and pneumonia74 (16.8%). (Table 2 and figure 2). The overall proportion of paediatric patients who had delayed presentation to the ED from the time of onset of their illnesses was 56.6% (249/440). (Figure 3)

Table 2: Clinical characteristics of paediatric patients aged 28 days to 14years with ESI triage level 1 at the MNH ED

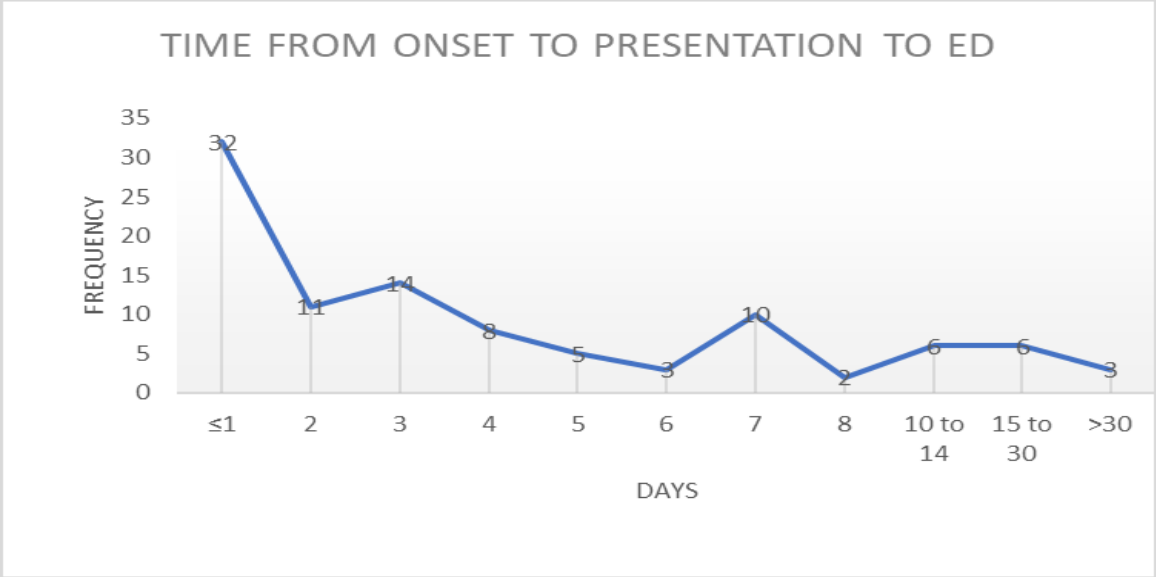
Variable	Category	Frequency N (%) N=440
Heart rate	Normal	200 (45.5)
	Tachycardia	229 (52.0)
	Bradycardia	11 (2.5)
Respiratory rate	Normal	176 (40.0)
	Tachypnoea	221 (50.2)
	Bradypnoea	43 (9.8)
Oxygen saturation	Normal	338(76.8)
	Low	102(23.2)
Temperature	Normal	297 (67.5)
	High	143 (32.5)



Others (DKA, SAM, Asthma, Intestinal Obstruction, Malignancy, Epilepsy)

Figure 2: ED diagnosis of paediatric patients aged 28 days to 14years with ESI triage level 1 at the MNH ED

3.4 Time interval from onset of illness to presentation at the ED among paediatric patients aged 28 days to 14years who are Triaged Level 1 at the MNH ED



Median time interval 3 days with IQR [1-5]

Figure 3: Time interval from onset of illness to presentation at the ED among paediatric patients aged 28 days to 14years who are Triaged Level 1 at the MNH ED

3.5 Proportion of paediatric patient aged 28 days to 14years with ESI triage level 1 at the MNH ED

The overall proportion of critically ill paediatric patients who had delayed presentation to the ED from the time of onset of their illnesses was 56.6% (249/440).

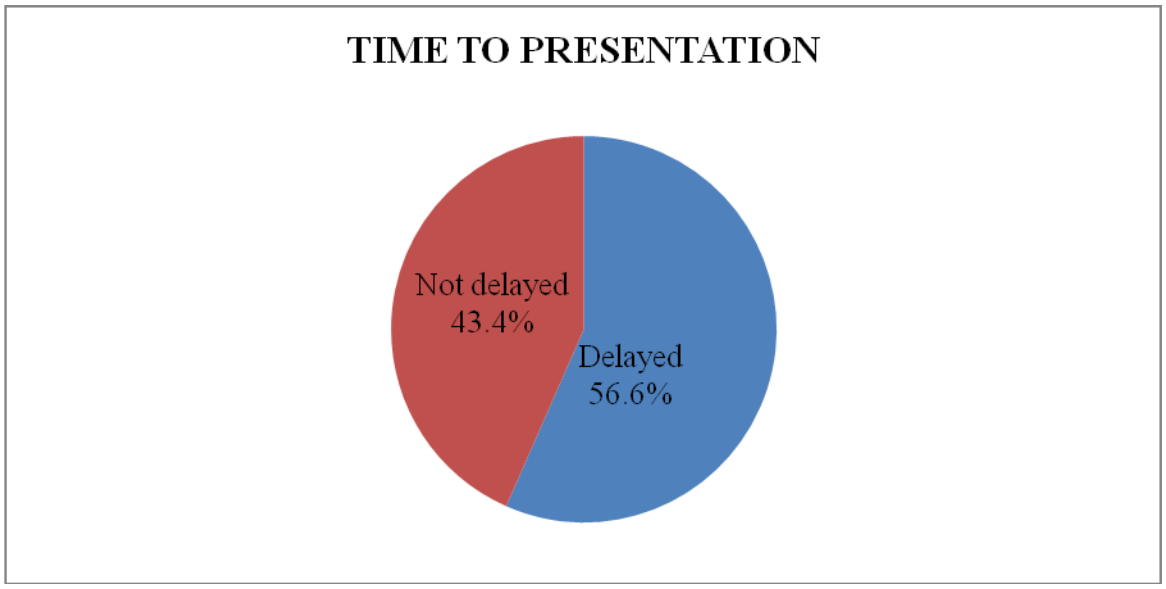


Figure 3: Proportion of paediatric patient aged 28 days to 14years with ESI triage level 1 at the MNH ED

3.6 ED interventions and disposition of paediatric patients aged 28days to 14 years ESI triage level 1

The most frequent intervention performed at ED was oxygenation (40%) and Intubation (9.8%) (Figure 4) Three quarters of the children with ESI triage level 1 (72%) were admitted to the ward from the ED, (19%) were admitted to the paediatric intensive care unit and 9% (33/374) died while receiving care at the ED (Figure 5)

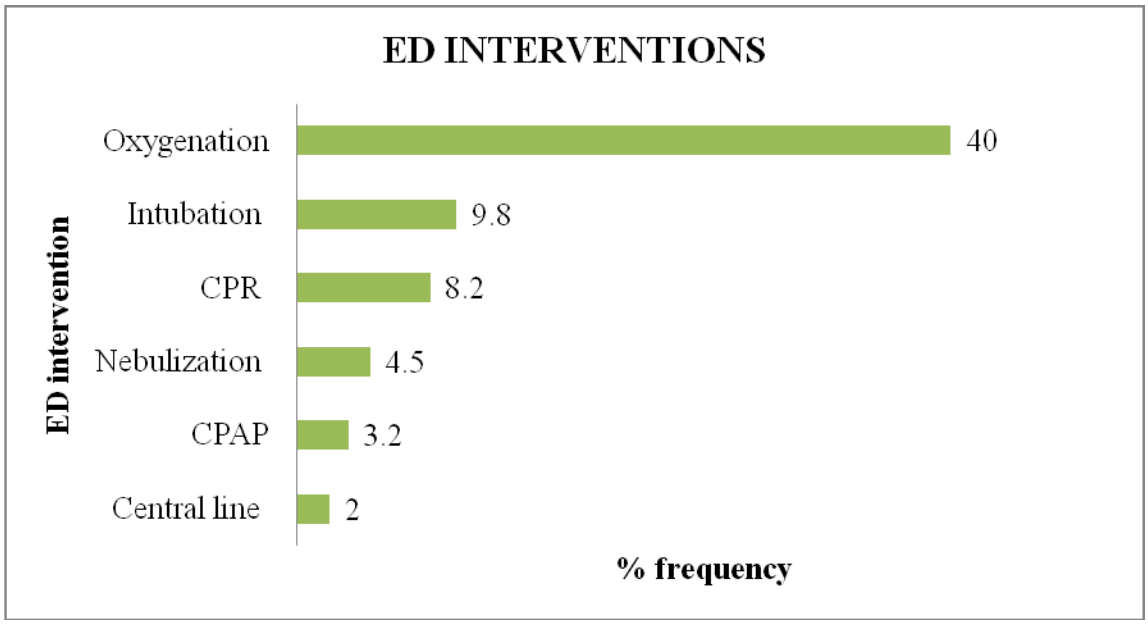


Figure 4: ED interventions of paediatric patients aged 28days to 14 years ESI triage level 1

3.7 Disposition of paediatric patients aged 28days to 14 years ESI triage level 1

Three quarters of the children with ESI triage level 1 (72.3%) were admitted to the ward from the ED, (18.9%) were admitted to the paediatric intensive care unit and less than ten percent (8.8%) died while receiving care at the ED

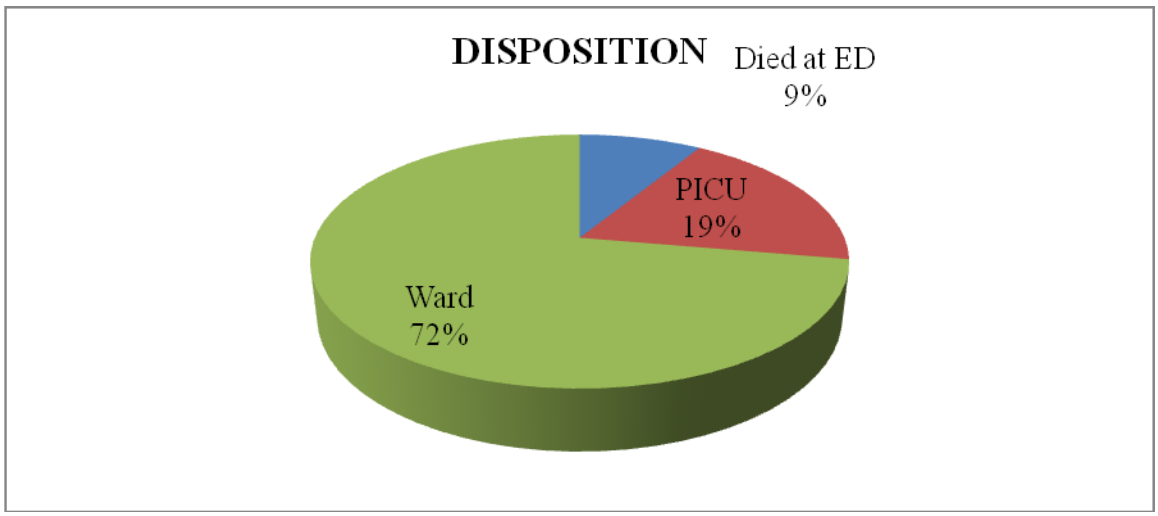


Figure 5: Disposition of paediatric patients aged 28days to 14 years ESI triage level 1

3.8 Factors associated with delayed presentation to the MNH ED among paediatric patients aged 28 days to 14years with ESI triage level 1

The factors found to be of statistical significance with delayed presentation were age of the child (p=0.007) and referral status (p=0.002). The proportions of children who were delayed decreased as the age increased. Delay was higher when patients arrived from a facility 196(61.1%) as opposed to arriving from home 53(44.5%). Delayed presentation was noted more among males 150(62.3%) than females 99(53.4%) to the ED and the proportions of those who delayed decreased as the level of education of the caretaker increased though these factors were statistically insignificant. Among those who delayed 59 (67.8%) were the poorest.

Table 3: Factors associated with delayed presentation to the MNH ED among paediatric patients aged 28 days to 14years with ESI triage level 1

Variable	Timeliness, N (%)		**P-value** (Pearson Chi-square)
	Early N=191	Delayed N= 249	
Age of a child (Months)			
<12	48 (33.8)	94 (66.2)	**0.007**
12-60	81 (44.8)	100 (55.2)	
≥60	62 (53.0)	55 (47.0)	
Sex			
Male	131 (46.6)	150 (53.4)	0.07
Female	60 (37.5)	99 (62.3)	
Type of referral			
Self-referral	66(55.5)	53(44.5)	**0.002**
Facility referral	125(38.9)	196(61.1)	
Level of education of a caretaker			
No formal education	10 (31.3)	22 (68.8)	0.27
Primary education	101 (42.8)	135 (57.2)	
Secondary and higher education	80 (46.5)	92 (53.5)	
Occupation status of a caretaker			
Employed	30 (54.5)	25 (45.5)	0.15
Self-employed/ Business	85 (43.8)	109 (56.2)	
Unemployed	76 (39.8)	115 (60.2)	
Socioeconomic status			
Poorest	28 (32.2)	59 (67.8)	0.1
Poor	40 (44.0)	51 (56.0)	
Medium	41 (44.6)	51 (55.4)	
Rich	34 (43.0)	45 (57.0)	
Richest	48 (52.7)	43 (47.3)	

3.9 Univariate analysis of predictors of delayed presentation to the MNH ED among paediatric patients aged 28 days to 14years with ESI triage level 1

An increased odds of delayed presentation was noted if a child was under five, particularly in infants (OR=2.2 (95%CI 1.3-3.7); p=0.002), presented as a facility referral (OR=2.20 (95%CI 1.3 -3.0); P=0.002) and belonged to the poorest socioeconomic status (OR=2.4 (CI:1.3-4.3);p=0.006) . Caretakers having a formal education presented with children earlier as opposed to those with no education and male children were brought earlier than females to the hospital. (OR=0.7 (95%CI 0.5 -1.0); P=0.07). (Table 4)

Table 4: Univariate analysis of predictors of delayed presentation to the MNH ED among paediatric patients aged 28 days to 14years with ESI triage level 1

Variable	OR (95%CI)	p- value
Age of a child (Months)		
<12	2.2 (1.3-3.7)	**0.002**
12-60	1.4 (0.9-2.2)	0.17
≥60*		
Sex		
Male	0.7 (0.5-1.0)	**0.07**
Female*		
Type of referral		
Self-referral*		
Facility referral	2.0 (1.3-3.0)	**0.002**
Level of education of a caretaker		
No formal education*		
Primary education	0.6 (0.3-1.3)	**0.20**
Secondary and higher education	0.5 (0.2-1.2)	**0.11**
Occupation status of a caretaker		
Employed	0.7 (0.4-1.2)	**0.16**
Self-employed/ Business*		
Unemployed	1.2 (0.8-1.8)	0.42
Socioeconomic status		
Poorest	2.4 (1.3-4.3)	**0.006**
Poor	1.4 (0.8-2.6)	0.24
Medium	1.4 (0.8-2.5)	0.27
Rich	1.5 (0.8-2.7)	0.21
Richest*		

***Reference**

3.10 Multivariate analysis of predictors of delayed presentation to the MNH ED among paediatric patients aged 28 days to 14years with ESI triage level 1

In a multivariate analysis model adjusted for all factors with P< 0.2, age and type of referral were independent predictors of timeliness of presentation. Compared to children in other age groups, those who were below 1 year were 2.4 times (OR=2.4 (95%CI 1.4-4.0) likely to present late to the ED. Paediatric patients who were referred from facilities were more likely to be delayed whilst presenting to the ED (OR=1.8 (95% CI 1.1-2.8). Poorest socioeconomic status was 2.24 times more likely to present late to the ED (OR=2.4 (CI:1.2-4.8). Sex, level of education and occupation of caretaker were not found to be significantly associated with delayed presentation. (Table 5)

Table 5: Multivariate analysis of predictors of delayed presentation to the MNH ED among paediatric patients aged 28 days to 14years with ESI triage level 1

Variable	OR (95%CI)
Age (Months)	
<12	**2.4 (1.4-4.0)**
12-60	1.5 (0.9-2.5)
Sex (Male)	0.7 (0.5-1.0)
Facility referral	**1.8 (1.1-2.8)**
Level of education of a caretaker	
Primary education	0.7 (0.3-1.6)
Secondary and higher education	0.9 (0.3-2.2)
Occupation status of a caretaker	
Employed	1.0 (0.7-1.6)
Unemployed	0.7 (0.4-1.4)
Socioeconomic status	
Poorest	**2.4 (1.2-4.8)**
Poor	1.4 (0.8-2.7)
Medium	1.7 (0.9-3.1)
Rich	1.5 (0.8-2.8)

3.11 Mortality and delay among paediatric patients aged 28 days to 14years with ESI triage level 1

Mortality outcome involved analysis of 374 paediatric patients (follow up rate 85%). The overall in-hospital mortality was 99 (26.5%). Out of these, 64 (29.5%) presented late to the ED compared to 35 (22.3%) who came early. Those who presented late were 1.3 times more likely to die compared to those who came early. (RR=1.3, CI: 0.9-1.9). (Table 6). The median LOS was 6 days [IQR=3-11]. Among those who died after 24 hours, 64.1% had a delayed presentation and this was statistically significant, (p-value=0.021). (Figure 6)

Table 6: Association of delay with overall mortality among paediatric patients aged 28 days to 14years with ESI triage level 1

Variable	Mortality N (%)		Relative Risk (95% CI)
	Dead	Alive	
	N= 99	N= 275	
Delayed	64 (29.5)	153(70.5)	1.3 (0.9-1.9)
Early	35 (22.3)	122 (77.7)	

Table 7: Mortality outcome based on the length of stay

Variable	Category	Frequency (%)	Median [IQR]
Mortality			
	Overall	99 (26.5%)	
	Early (<24hrs)	44 (11.8%)	
	Late (>24hrs)	55 (14.7%)	
Length of stay (days)	Median [IQR]		6 (3-11)

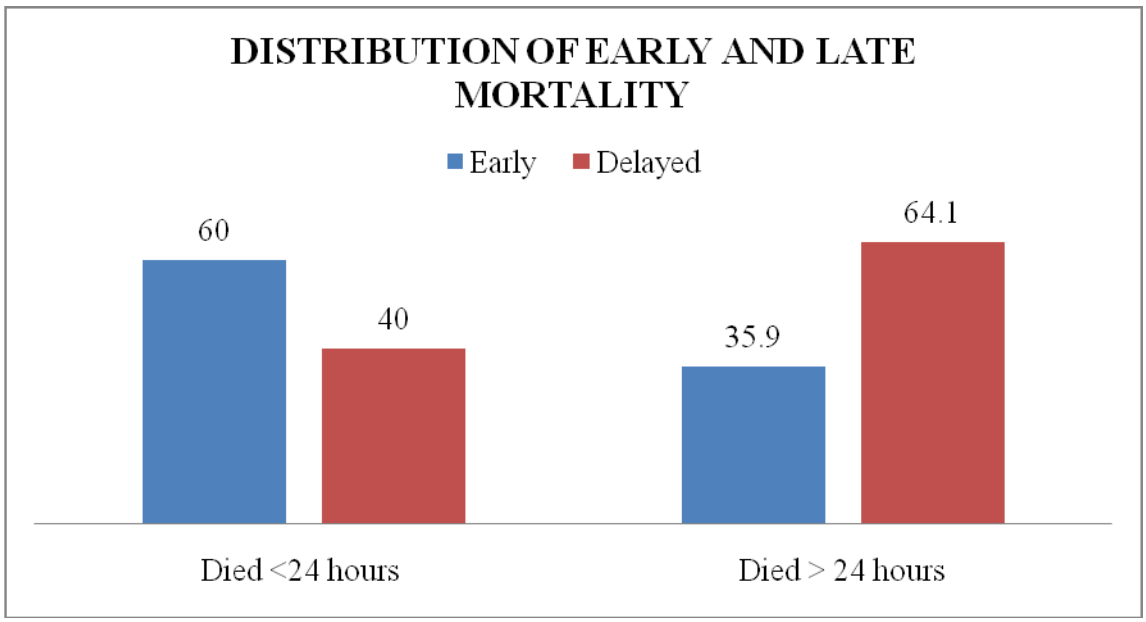


Figure 6: Early and late mortality among paediatric patients aged 28 days to 14years with ESI triage level 1

CHAPTER FOUR

4 DISCUSSION

4.1 DISCUSSION

This prospective cohort study aimed to determine factors associated with delay and whether delay makes a difference in mortality outcomes among critically ill children who seek care at a national tertiary referral hospital.

This study included 440 critically ill paediatric patients who presented to the MNH ED. Their median age was 12 months, the majority 281 (63.9%) were males and 249(56.6%) delayed more than 48hours. The median time from onset of illness to arrival at the MNH ED was 72 hours. Age below 1 year and facility referral were significant independent predictors of delay in this cohort. This study did not find any statistical significance in the association between delay and mortality. However, delayed presentation to the ED was significantly associated with mortality that occurred beyond 24 hours of hospital admission.

There is a general concern about delay to seek health care among paediatric patients. Fifty-seven percent of critically ill paediatric patients in this cohort presented late to the ED. This is similar to findings by a study conducted in Ethiopia but higher than that observed in a study in Rwanda.(7,8). A possible explanation for this difference might be the differences in sociodemographic characteristics and lifestyle of the study settings. Delay in seeking health care has been reported to be a cause of avoidable morbidity and mortality in the paediatric population.

The magnitude of delay and its association with mortality in the paediatric patients varies across regions and countries. Both have mostly been studied among the general population of paediatric patients with different severities of illnesses. In this cohort approximately a quarter of the critically ill children who presented to the ED more than 2 days from onset of illness died. However, this study did not find any statistical significance in the association between delay and mortality. One among many other explanations to this could be that the nature of illnesses with which the critically ill paediatric patients presented are strong predictors of death and as such a delay more than 48 hours had no effect in their outcome. The impact of delay may have been masked by their severe nature(33).

Delayed presentation to the ED of more than 2 days from the onset of illness was significantly associated with mortality that occurred beyond 24 hours of hospital admission. Two quarters of these deaths occurred beyond twenty-four hours after admission, and it was statistically significant. A study done at a tertiary hospital in Ethiopia had similar findings(7). This may signify that despite delay in presentation critically ill children received proper resuscitation and stabilization at the ED that presumably prolonged their lives beyond 24 hours but later decompensated in the wards due to inadequate monitoring, resources, treatment failure or the natural course of their illnesses(27). In one of the previous studies difficulties with the identification of critically ill patients and lack of structured triaging to the ICU by doctors in the wards was found to be among the things that contributed to poor patient outcomes in MNH(34). It could furthermore signify that resuscitation of children at the ED adhered well to the protocols and guidelines stipulated by the institution.

Critically ill children below one year were more likely to present late to the ED. Several factors are adduced to explain delay in this age group. Critical illness presents in a myriad of nonspecific symptoms in infants which makes it difficult for caretakers to recognize and seek timely appropriate healthcare. Similarly, caretakers' poor knowledge on danger signs of critical illness among these children may prolong the delay even further. This is a similar finding to a study which was conducted among infants with acute illness in Kenya.(35). Knowledge about the illness of a child positively correlated with early health care seeking behaviour in study conducted in Ethiopia(36). A better understanding of reasons for delay in this age group could pinpoint areas that need specific intervention.

This study observed that delay of more than 48 hours was more common among critically ill paediatric patients who were from households that belonged to the poorest socioeconomic status category than others. Coming from the poorest households independently doubled the odds of a critically ill paediatric patient being late to the tertiary hospital during a critical illness. This is in keeping with a study conducted in in Ethiopia which had similar findings(22). This can be explained by inability to pay for transport and other charges required for a paediatric patient to reach a referral facility.

Roughly two thirds of the critically ill paediatric patients who delayed were referred from primary health care facilities. Being referred from a facility independently doubled the odds of delay in this study cohort. A plausible explanation to this high proportion could be that majority of the children referred from primary health care facilities go through a series of evaluations by several primary health care providers before they are referred to definitive care(15). It could further be accounted for by the hierarchical referral system in place in Tanzania. This study was conducted in tertiary hospital which was the last and highest destination in the chain of referral(37).

About one-fifth of the paediatric patients were able to get admission to the PICU after resuscitation and stabilization. Majority of them whose critical conditions had temporarily been stabilized were admitted to various wards with no ICU capacity for definitive care. This could be explained by the limited paediatric ICU bed capacity. A shortage in age-appropriate ICU care had been previously documented by Sawe H. R et al(27). This reflects a shortage of paediatric ICU at a tertiary referral` level of health care.

4.2 STRENGTHS

1. This was a prospective study in which consecutive recruitment of participants was done, thus reducing the chance of missing potential participant(s).

2. A large number of variables were captured with no missing data, allowing greater insight into the reasons for delay and the association of delay and mortality.

4.3 LIMITATIONS

1. There was loss to follow up encountered in this study. However, it was mitigated by including 10% non-response and loss to follow up rate during the estimation of the sample size of the study participants who were to be included during the development of the study protocol.
2. This study was conducted at an urban tertiary hospital with full capacity to resuscitate and stabilize critically ill paediatric patients which may not be the case in most low resource setting health facilities. However, the MNH ED receives referrals from all over the country, the patients sampled are likely to provide a true representation of the Tanzanian population of critically ill paediatric patients.
3. This was a single center study, and this may affect the generalizability particularly because MNH is the main center for receiving severely injured trauma patients and hence we believe that our study might cast a picture of the general presentations

CHAPTER FIVE

5 CONCLUSION AND RECOMMENDATION

5.1 CONCLUSION

Delay is a problem among the critically ill paediatric patients. The median time taken from the onset of illness to presentation to the tertiary hospital is 3 days. Delay was observed to be significant among children under the age of one year and among those who were referred from primary health facilities. Timeliness of presentation to the tertiary hospital did not seem to affect the overall mortality in the end but predicted increased risk of dying after twenty-four hours of hospital admission among critically ill paediatric patients. A larger study is needed to evaluate the care pathway of critically ill paediatric patients to identify preventable failures in the care provided before reaching a tertiary level of care.

5.2 RECOMMENDATIONS

1. Develop guidelines with referral facilities which will facilitate easy evaluation of critically ill paediatric patients and thus fast track their referrals to tertiary health facilities capable of providing definitive care of their critical illness. Emphasis should be put on low threshold for referrals involving paediatric patients below one year

2. Creating public awareness of early danger signs of critical illness among children, especially those under one year, through mass media: short radio programs or commercials and television programs. This will ensure a larger population of caretakers is reached and educated.

3. Health policy initiatives should deliberately aim to build up paediatric ED and ICU capacity and increase access for children with critical illnesses. This can be achieved through improving infrastructure and training of health personnel. Training on basic and advanced paediatric life support skills for ED and ICU health personnel should be instituted to strengthen provision of better care to critically ill children.
4. There should be explicit ICU admission criteria and written guidelines in order to improve patient selection and in the end yield better patient outcomes.

5. A larger study is needed to further evaluate and map factors for delay in each level of acquisition of care before presenting to the tertiary hospital among critically ill patients.

REFERENCES

1. Ward DE. Classification of groups. J Spec Gr Work. 2006;31(2):93–7.
2. Jacobs I, Nadkarni V, Bahr J, Berg RA, Billi JE, Bossaert L, et al. Cardiac arrest and cardiopulmonary resuscitation outcome reports: Update and simplification of the Utstein templates for resuscitation registries. A statement for healthcare professionals from a task force of the International Liaison Committee on Resusci. Circulation. 2004;110(21):3385–97.
3. Poortaghi S, Raiesifar A, Bozorgzad P, Golzari SEJ, Parvizy S, Rafii F. Evolutionary concept analysis of health seeking behavior in nursing: A systematic review. BMC Health Serv Res [Internet]. 2015;15(1):1–8. Available from: http://dx.doi.org/10.1186/s12913-015-1181-9
4. West MP, Collins SM, Paz JC. Medical-Surgical Equipment in the Acute Care Setting. Acute Care Handb Phys Ther Fourth Ed. 2013;371–408.
5. Robertson LC, Al-haddad M. Recognizing the critically ill patient. Anaesth Intensive Care Med [Internet]. 2013;14(1):11–4. Available from: http://dx.doi.org/10.1016/j.mpaic.2012.11.010
6. Gold DL, Mihalov LK, Cohen DM. Evaluating the Pediatric Early Warning Score. 2014;1249–56.
7. Jofiro G, Jemal K, Beza L, Heye TB. Prevalence and associated factors of pediatric emergency mortality at Tikur Anbessa specialized tertiary hospital : a 5 year retrospective case review study. 2018;1–10.
8. Umuhoza C, Karambizi AC, Tuyisenge L, Cartledge P. Caregiver delay in seeking healthcare during the acute phase of pediatric illness, Kigali, Rwanda. Pan Afr Med J. 2018;30:160.
9. Wiens MO, Gan H, Barigye C, Zhou G, Kumbakumba E, Kabakyenga J, et al. A cohort study of morbidity, mortality and health seeking behavior following rural health center visits by children under 12 in southwestern Uganda. PLoS One. 2015;10(1):1–15.
10. Font F, Quinto L, Masanja H, Nathan R, Ascaso C, Menendez C, et al. Paediatric referrals in rural Tanzania: The Kilombero District Study - A case series. BMC Int Health Hum Rights. 2002;2:1–6.
11. Ministry of Health. Health Sector strategic Plan III. 2012;2020(July):170.
12. MoH. Second Health Sector Strategic Plan (HSSP). 2008;(June):1–58.
13. H. S, B.P. T, S.S. M. Do health systems delay the treatment of poor children? A qualitative study of child deaths in rural Tanzania. BMC Health Serv Res. 2013;13:67.
14. UNICEF. Levels & Trends in Child Mortality: Report 2019-Estimates developed by the UN Inter-agency Group for Child Mortality Estimation. Unicef/Who/Wb/Un. 2019;1–32.

15. Hodkinson P, Argent A, Wallis L, Reid S, Perera R, Harrison S, et al. Pathways to care for critically Ill or injured children: A cohort study from first presentation to healthcare services through to admission to intensive care or death. PLoS One. 2016;11(1):1–16.

16. Cardoso LTQ, Grion CMC, Matsuo T, Anami EHT, Kauss IAM, Seko L, et al. Impact of delayed admission to intensive care units on mortality of critically ill patients: A cohort study. Crit Care. 2011;15(1):1–8.

17. Källander K, Hildenwall H, Waiswa P, Galiwango E, Petersona S, Pariyob G. Delayed care seeking for fatal pneumonia in children aged under five years in Uganda: A case-series study. Bull World Health Organ. 2008;86(5):332–8.

18. Thaddeus S, Maine D. Too To Walk : Maternal Mortality in. Soc Sci Med. 1994;38(8):1091–110.

19. Roder-Dewan S, Gupta N, Kagabo DM, Habumugisha L, Nahimana E, Mugeni C, et al. Four delays of child mortality in Rwanda: A mixed methods analysis of verbal social autopsies. BMJ Open. 2019;9(5):1–12.

20. Naheed A, Breiman RF, Islam S, Saha SK, Naved RT. Disparities by sex in care-seeking behaviors and treatment outcomes for pneumonia among children admitted to hospitals in Bangladesh. 2019;1–16.

21. Pillai RK, Williams S V, Glick HA, Polsky D, Berlin JA, Lowe RA. Factors affecting decisions to seek treatment for sick children in Kerala , India. 2003;57:783–90.

22. Deressa W, Ali A, Berhane Y. Household and socioeconomic factors associated with childhood febrile illnesses and treatment seeking behaviour in an area of epidemic malaria in rural Ethiopia. 2007;

23. Hinderaker SG, Kahabuka C, Kva G. Care-Seeking and Management of Common Childhood Illnesses in Tanzania – Results from the 2010 Demographic and Health Survey. 2013;8(3).

24. Umuhoza C, Karambizi AC, Tuyisenge L, Cartledge P. Caregiver delay in seeking healthcare during the acute phase of pediatric illness , Kigali , Rwanda. 2019;2–9.

25. Broni AO, Aikins I, Asibey O, Agyemang -Duah P. THE CONTRIBUTION OF TRANSPORT (ROAD) IN HEALTH CARE DELIVERY "A CASE STUDY OF MANKRANSO DISTRICT HOSPITAL IN THE AHAFO ANO SOUTH DISTRICT OF ASHANTI REGION" BACKGROUND OF THE STUDY. Online) Br Journals Mark Stud [Internet]. 2014;2(4):2053–4051. Available from: www.eajournals.org

26. Kamau KJ, Osuga BO, Njuguna S. Challenges Facing Implementation Of Referral System For Quality Health Care Services In Kiambu County, Kenya. Heal Syst Policy Res. 2017;04(01):1–8.

27. Sawe HR, Mfinanga JA, Lidenge SJ, Mpondo BCT, Msangi S, Lugazia E, et al. Disease patterns and clinical outcomes of patients admitted in intensive care units of tertiary referral hospitals of Tanzania. 2014;14(1):1–8.

28. Källander K, Hildenwall H, Waiswa P, Galiwango E, Petersona S, Pariyob G. Delayed care seeking for fatal pneumonia in children aged under five years in Uganda: A case-series study. Bull World Health Organ. 2008;86(5):332–8.

29. S.E. A, A.H. B, C.G. V, R.E. B, J. B, D.M.E. H, et al. Sex and socioeconomic differentials in child health in rural Bangladesh: Findings from a baseline survey for evaluating integrated management of childhood illness. J Heal Popul Nutr [Internet]. 2008;26(1):22–35. Available from: http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=emed11&NEWS=N&AN=351865324

30. Lillitos PJ, Hadley G, Maconochie I. Can paediatric early warning scores (PEWS) be used to guide the need for hospital admission and predict signi fi cant illness in children presenting to the emergency department ? An assessment of PEWS diagnostic accuracy using sensitivity and speci fi c. 2015;1–9.

31. Sawe HR, Mfinanga JA, Mwafongo V, Reynolds TA, Runyon MS. Trends in mortality associated with opening of a full-capacity public emergency department at the main tertiary-level hospital in Tanzania. Int J Emerg Med [Internet]. 2015;8(1):4–9. Available from: http://dx.doi.org/10.1186/s12245-015-0073-4

32. Survey H, Survey I. Tanzania. 2015;

33. Kutko MC, Calarco MP, Flaherty MB, Helmrich RF, Ushay HM, Pon S, et al. Mortality rates in pediatric septic shock with and without multiple organ system failure. 2003;4(3):333–7.

34. Baker T, Lugazia E, Eriksen J, Mwafongo V, Irestedt L, Konrad D. Emergency and critical care services in Tanzania : a survey of ten hospitals. 2013;

35. Wambui WM, Kimani S, Odhiambo E. Determinants of Health Seeking Behavior among Caregivers of Infants Admitted with Acute Childhood Illnesses at Kenyatta National Hospital , Nairobi , Kenya. 2018;2018.

36. Simieneh MM, Mengistu MY, Gelagay AA, Gebeyehu MT. Mothers ' health care seeking behavior and associated factors for common childhood illnesses , Northwest Ethiopia : community based cross-sectional study. 2019;4:1–7.

37. A CLOSER LOOK AT THE HEALTHCARE SYSTEM IN TANZANIA. 2016;(October):2016.

APPENDICES

APPENDIX I: CASE REPORT FORM

INCLUSION CRITERIA			COMMENT
Age of 28days and 14 years	YES	NO	
ESI Triage level 1			
Medical, surgical or trauma cause of illness			
EXCLUSION CRITERIA			COMMENT
	YES	NO	
Sent to resuscitation room for cannulation (Not formally triaged as ESI level 1)			
Missing information and readmission in the period of the study			

	YES	NO	COMMENT
CONSENT			

PATIENT INITIALS: MRN: DATE:

Day		Month		Year			

DEMOGRAPHICS

Birthdate: Age in years: If<1-year Months:

Day		Month		Year			

Sex:

Male	Female

Patient's address:

District	Region

Name of the referring facility

Time seen at the referring facility:

Time arrived at MNH-EMD:

Mode of arrival at EMD:

☐ Self-referral
☐ Referred
☐ Days/Time spent at the referring facility
☐ Missing referral documentation

Type of referring facility

	Tertiary Hospital
	Regional Hospital
	District Hospital
	Health Centre
	Dispensary

CHILD CARETAKER'S INFORMATION:

☐ Parent ☐ Guardian

☐ Age in years

Level of education:

☐ No formal education
☐ Primary education
☐ Secondary education
☐ University/College education

Occupation:

☐ Unemployed

☐ Employed
☐ Self-employed/Business
☐ Farmer/Peasant

Level of income:

☐ High
☐ Middle
☐ Low

TIMELINE OF ILLNESS:

When did the child start suffering from this illness?

Date:

Day		Month		Year			

☐ Days
☐ Weeks
☐ Months

How long was it from the time the child fell sick till your visit to the first health facility?

☐ Hours
☐ Days
☐ Weeks
☐ Months

How long was it from the time the child fell sick till your visit to the EMD?

☐ Hours
☐ Days
☐ Weeks
☐ Months

How long has it been from the time the child was referred from the last health facility to EMD?

	Hours
	Days
	Weeks
	Months

INITIAL VITAL SIGNS ON ARRIVAL:	
PR (per minute)	
RR (per minute)	
SpO2 (% RA)	
Temp (°C)	
PR (per minute)	

ED DIAGNOSIS

ED INTERVENTIONS:

CPR	
CPAP	
INTUBATION	
CENTRAL LINE PLACEMENT	
INOTROPE USE	

DISPOSITION:

	ALIVE ON DISPOSITION FROM EMD

	ADMITTED TO:

a.

GENERAL PAEDIATRICS	
PAEDIATRIC BURN	
MOI	
PICU	
ENT	
OPHTHALMOLOGY	
DENTAL	
PAEDIATRIC SURGERY	
PAEDIATRIC ONCOLOGY	

b.

☐ DISCHARGED HOME FROM EMD

☐ DIED WHILE IN EMD

Day		Month		Year			

FOLLOW UP:

PROGRESS DURING HOSPITAL STAY:

WITHIN 24 HOURS OF ADMISSION:

DIED	
ALIVE	
DISCHARGED HOME	

WITHIN 1 MONTH OF FOLLOW UP:

DIED	
ALIVE	
DISCHARGED HOME	

Date of death

Day		Month		Year			

APPENDIX II : INFORMED CONSENT (ENGLISH VERSION)
PATTERNS AND PREDICTORS OF PRESENTATION TIMELINESS AMONG CRITICALLY ILL PAEDIATRIC PATIENTS SEEN AT EMERGENCY DEPARTMENT OF MUHIMBILI NATIONAL HOSPITAL

Hello, my name is..... we are conducting a study to determine the patterns and predictors of timeliness of presentation among critically ill paediatric Patients presenting to Emergency Department of Muhimbili National Hospital. The findings from this study will help to determine the magnitude and characteristics of critically ill children who delay to come to the hospital, where they are from and what they go through to reach here, as well as to determine how other factors such as level of education of the parent/caretaker, socioeconomic status and health seeking behaviour affect their health outcomes.

We have approached you because your child is within the age of 28 days and 14years, he/she is triaged level 1 and therefore s/he is a potential candidate to participate in this study. If you agree for your child to participate in this study, we will ask you some questions related to your child and family.

Participation is voluntary:

You are invited to participate in this study because your child is within the age of 28 days and 14years, he/she is triaged level 1, however it is your choice to participate or not. You may also decide to participate and if not willing to continue doing so then withdraw at any time, your child will still continue to receive appropriate medical care at this hospital.

The number of children expected to participate:

This study is expected to include a total of 396 children who are aged between 28days and 14 years who are triaged level 1 here at the EMD-MNH.

Duration of participation:

You and your child will participate once during course of this study; your contact details will be taken for easy follow up of your child after admission.

Study procedures:

If you agree for your child to participate in this study, we will ask you some questions related to your child and your family. We will also gather information about your child's illness from the medical records. We do not anticipate any harm from participating in the study.

Compensation for participation:

Participation in this study is voluntary. There will be no monetary incentive for your participation in the study. Neither will you need to pay in order to participate.

Confidentiality:

All the information obtained from this study will remain confidential. We will use hospital registration and study ID numbers for identification of study participants, no names will be used in this study or in future publications resulting from this study. Names will appear on this consent form only, which will be kept separately by the investigator, away from other case report forms.

Do you have any questions?

Thank you for agreeing to participate in the study. Please do not hesitate to contact me for any clarification should need arise.

Statement of consent

I ……. have read the contents of this consent form, or this consent form has been read to me. All my questions have been answered and I have been offered a copy of this consent form. I voluntary allow my child to participate in this study

Parent's/ guardian signature …… Date: …….

Consent declaration by a witness of the parent/guardian who cannot read or write

I ……. have witnessed the accurate reading of this consent form to parent/guardian of the potential child for the study. The parent/guardian had the opportunity to ask questions which were answered fully. I confirm that the parent/guardian has voluntarily allowed his/her child to participate in the study

Witness's signature ……..……. Date: …….

Parent's/Guardian's thumb print

Contact Information

Dr. Alphonce Nsabi Simbila

Principal Investigator

Mobile No: +255755666910

E-mail: alphoncesimbila@gmail.com

Dr. Bruno Sunguya

Director of Research and Publications,

Research and Publication Committee,

Muhimbili University of Health and Allied Sciences,

P.O. Box 65001, Dar es Salaam.

Telephone Number: 2150302-6

APPENDIX III : INFORMED CONSENT (SWAHILI VERSION)
MIUNDO NA VIASHIRIA VINAVYOATHIRI MUDA WA KUFIKA KATIKA IDARA YA MAGONJWA YA DHARURA YA HOSPITALI YA TAIFA YA MUHIMBILI MIONGONI MWA WATOTO WALIO WAGONJWA MAHUTUTI.

Utangulizi:

Habari, jina langu ni .... Tunafanya utafiti ili kuchunguza miundo na viashiria vinavyoathiri muda wa kufika katika idara ya magonjwa ya dharura ya Hospitali ya Taifa ya Muhimbili miongoni mwa watoto walio wagonjwa mahututi. Matokeo ya utafiti huu yatasaidia kutambua ukubwa wa tatizo na tabia za tabia mbalimbali za watoto walio mahututi ambao huchelewa kufika hospitali, vitue wapitiavyo mpaka kufika hospitali, na vile vile kuchunguza jinsi vitu vingine kama daraja la elimu la mzazi/mlezi, hali ya kiuchumi na tabia za utafutaji huduma za afya wakati wa ugonjwa vinavyoathiri matokeo ya ugonjwa wa mtoto.
Tumemchagua mtoto wako kwa kuwa yupo katika umri kati ya siku 28 na miaka 14, na pia amewekwa katika daraja la kwanza la kupewa kipaumbele cha tiba hapa idarani, hivyo anafikia vigezo vya ushiriki katika utafiti huu. Ikiwa unakubaliana na mtoto wako kushiriki katika utafiti huu, tutakuuliza baadhi ya maswali yanayohusiana na mtoto wako na familia yako.

Kushiriki ni kwa hiari:

Unaombwa kushiriki katika utafiti huu kwa sababu mtoto wako ana umri wa kati ya siku 28 na miaka 14, pia amewekwa kwenye daraja la kwanza la kipaumbele cha tiba, hata hivyo ni chaguo lako kushiriki au kutoshiriki. Unaweza pia kuamua kushiriki na ikiwa hutaki kuendelea kufanya hivyo basi unaweza kujitoa wakati wowote na mtoto wako ataendelea kupokea matibabu sahihi katika hospitali hii.

Idadi ya watoto wanaotarajiwa kushiriki:

Utafiti huu unatarajiwa kuwa na jumla ya watoto 396 walio kati ya siku 28 na miaka 14, walio katika daraja la kwanza la kipaumbele cha kupatiwa tiba hapa idara ya magonjwa ya dharura.

Muda wa ushiriki:

Wewe na mtoto wako mtashiriki mara moja katika utafiti huu, maelezo yako ya mawasiliano yatachukuliwa ili kurahisisha ufuatiliaji pindi mtakapolazwa kwa muendelezo wa tiba.

Taratibu za utafiti huu:

Ikiwa unakubaliana na mtoto wako kushiriki katika utafiti huu, tutakuuliza baadhi ya maswali yanayohusiana na mtoto wako na familia yako. Pia tutakusanya taarifa zinazohusiana na ugonjwa wa mtoto wako katika rekodi za hospitali. Hatutarajii madhara yoyote yatokanayo na kushiriki katika utafiti huu zaidi ya maumivu wakati wa kutoa damu.

Je, kuna fidia kwa kushiriki?

Kushiriki katika utafiti huu ni kwa hiari. Hakutakuwa na malipo yoyote ya fedha kwa kushiriki kwako katika utafiti. Wala hautahitaji kulipa ili ushiriki.

Usiri:

Taarifa zote zitakazopatikana kutoka kwenye utafiti huu zitaendelea kuwa siri. Tutatumia namba ya hospitali na namba ya utambulisho ya utafiti, hakuna majina yatakayotumika katika utafiti huu au katika machapisho ya baadaye yatokana na utafiti huu. Majina yataonekana kwenye fomu hii ya idhini tu, ambayo itahifadhiwa na mtafiti mbali na fomu nyingine.

Je! Una maswali yoyote?

Asante kwa kukubali kushiriki katika utafiti. Tafadhali usisite kuwasiliana na mimi kwa maswali yoyote.

Taarifa ya idhini

Mimi ..... nimesoma au nimesomewa yaliyomo katika fomu hii ya idhini. Maswali yangu yote yamejibiwa na nimepewa nakala ya fomu hii ya idhini. Mimi kwa hiari yangu ninaruhusu mtoto wangu kushiriki katika utafiti huu

Sahihi ya Mzazi / mlezi ..... Tarehe: …….

Azimio la kibali na shahidi wa mzazi / mlezi ambaye hawezi kusoma au kuandika

Mimi ..... nimeshuhudia usomaji wa fomu hii ya kibali kwa mzazi / mlezi wa mtoto. Mzazi / mlezi alikuwa na nafasi ya kuuliza maswali ambayo yalijibiwa kikamilifu. Ninathibitisha kwamba mzazi / mlezi amemruhusu mtoto wake kushiriki katika utafiti

Sahihi ya Shahidi ..... Tarehe:…….

Kidole cha Mzazi / Mlezi wa kidole

Mawasiliano:
Dkt. Alphonce Nsabi Simbila,
Mtafiti Mkuu.
Namba ya Simu: +255755666910.
Barua pepe: alphoncesimbila@gmail.com

Dr. Bruno Sunguya
Mkurungenzi wa Utafiti na Machapisho,
Kamati ya Utafiti na Machapsiho,
Chuo Kikuu Cha Sayansi na Tiba Cha Muhimbili,
S.L.P. 65001, Dar es Salaam.
Namba ya Simu: 2150302-6

APPENDIX IV : PAEDIATRIC ADVANCED LIFE SUPPORT VITAL SIGNS REFERENCE CHART:

American Heart Association. | AMERICAN ASSOCIATION of CRITICAL-CARE NURSES

PALS

Vital Signs in Children

Heart Rate (per minute)

Age	Awake Rate	Sleeping Rate
Newborn to 3 months	85 to 205	80 to 160
3 months to 2 years	100 to 190	75 to 160
2 to 10 years	60 to 140	60 to 90
>10 years	60 to 100	50 to 90

Respiratory Rate (breaths/min)*

Age	Rate
Infant	30 to 60
Toddler	24 to 40
Preschooler	22 to 34
School-aged child	18 to 30
Adolescent	12 to 16

Definition of Hypotension by Systolic Blood Pressure and Age

Age	Systolic Blood Pressure (mm Hg)
Term neonates (0 to 28 days)	<60
Infants (1 to 12 months)	<70
Children 1 to 10 years (5th BP percentile)	<70 + (age in years × 2)
Children >10 years	<90

Modified Glasgow Coma Scale for Infants and Children†

	Child	Infant	Score
Eye opening	Spontaneous	Spontaneous	4
	To speech	To speech	3
	To pain	To pain	2
	None	None	1
Best verbal response	Oriented, appropriate	Coos and babbles	5
	Confused	Irritable, cries	4
	Inappropriate words	Cries in response to pain	3
	Incomprehensible sounds	Moans in response to pain	2
	None	None	1
Best motor response‡	Obeys commands	Moves spontaneously and purposely	6
	Localizes painful stimulus	Withdraws in response to touch	5
	Withdraws in response to pain	Withdraws in response to pain	4
	Flexion in response to pain	Abnormal flexion posture to pain	3
	Extension in response to pain	Abnormal extension posture to pain	2
	None	None	1

APPENDIX V : ETHICAL CLEARANCE FROM MUHAS

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES
OFFICE OF THE DIRECTOR OF POSTGRADUATE STUDIES

P.O. Box 65001
DAR ES SALAAM
TANZANIA
Web: www.muhas.ac.tz

Tel G/Line: +255-22-2150302/6 Ext. 1015
Direct Line: +255-22-2151378
Telefax: +255-22-2150465
E-mail: drps@muhas.ac.tz

Ref. No. DA.287/298/01A/

14th August, 2019

Dr. Alphonce Nsabi Simfukwe,,
MMed. Emergency Medicine,
School of Medicine,
MUHAS.

RE: APPROVAL OF ETHICAL CLEARANCE FOR A STUDY TITLED:" PATTERNS, PREDICTORS AND OUTCOME OF PRESENTATION TIMELINES AMONG CRITICALLY ILL PAEDIATRICS PATIENTS AGED 28 DAYS-14 YEARS AT EMERGENCY DEPARTMENT OF MUHIMBILI NATIONAL HOSPITAL"

Reference is made to the above heading.

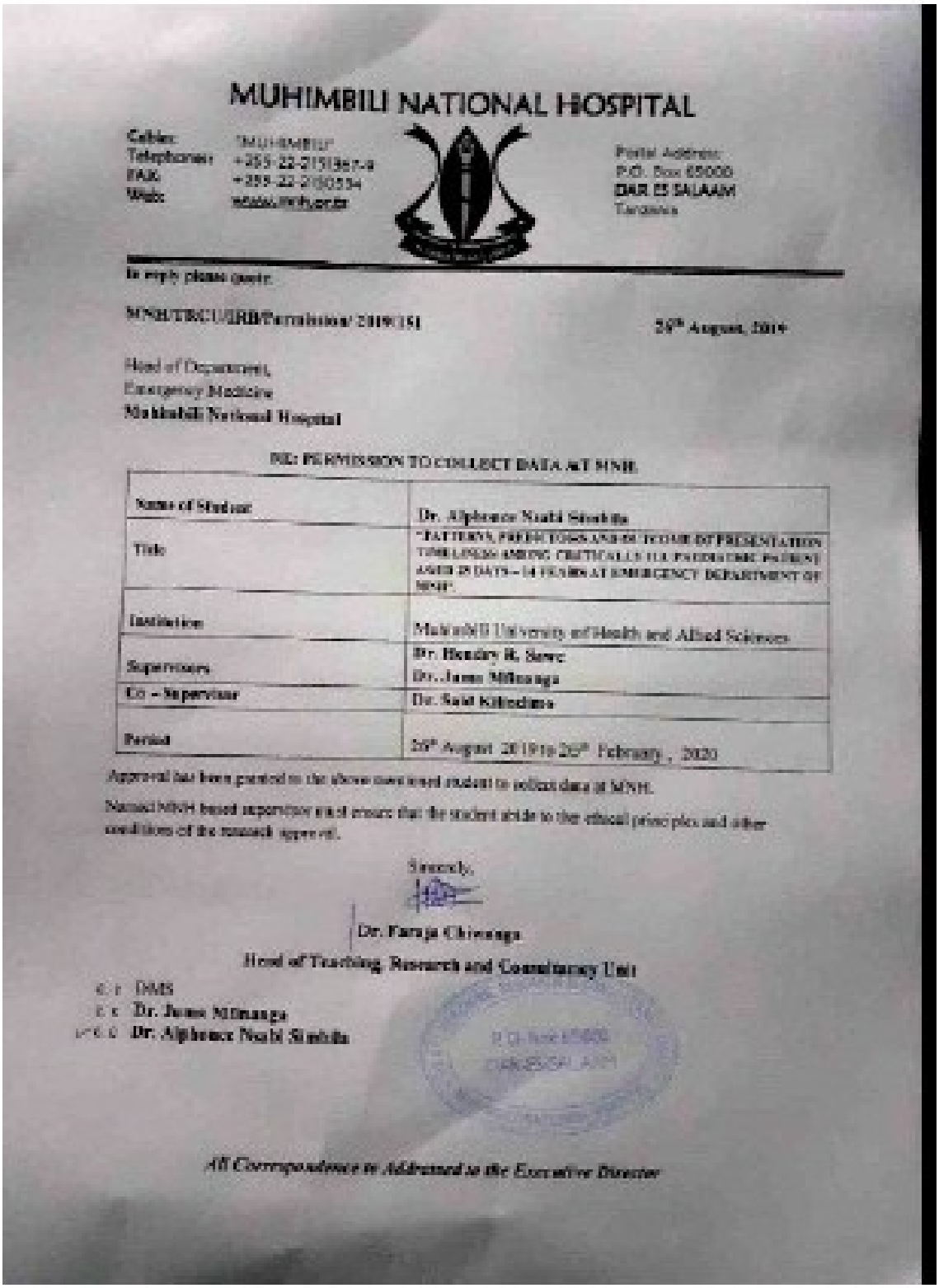
I am pleased to inform you that, the Chairman has, on behalf of the Senate, approved ethical clearance for the above-mentioned study. Hence you may proceed with the planned study.

The ethical clearance is valid for one year only, from **13th August, 2019 to 12th August, 2020.** In case you do not complete data analysis and dissertation report writing by **12th August, 2020,** you will have to apply for renewal of ethical clearance prior to the expiry date.

Dr. Bruno Sunguya
Ag: DIRECTOR OF POSTGRADUATE STUDIES

cc: Director of Research and Publications
cc: Dean, School of Medicine **MUHAS**

APPENDIX VI : PERMISSION TO COLLECT DATA AT MNH



MUHIMBILI NATIONAL HOSPITAL

Cables: "MUHIMBILI"
Telephones: +255-22-2151967-9
FAX: +255-22-2150534
Web: www.mnh.or.tz

Postal Address:
P.O. Box 65000
DAR ES SALAAM
Tanzania

In reply please quote:

MNH/TRCU/IRB/Permission/2019/151 29th August, 2019

Head of Department,
Emergency Medicine
Muhimbili National Hospital

RE: PERMISSION TO COLLECT DATA AT MNH

Name of Student	Dr. Alphonce Nsubi Simbila
Title	"PATTERN, PREDICTORS AND OUTCOME OF PRESENTATION TIMELINESS AMONG CRITICALLY ILL PAEDIATRIC PATIENT AGED 29 DAYS – 14 YEARS AT EMERGENCY DEPARTMENT OF MNH"
Institution	MUHAS/Muhimbili University of Health and Allied Sciences
Supervisors	Dr. Hendry R. Sawe Dr. Jamo Mfinanga
Co – Supervisor	Dr. Saint Kilindimo
Period	29th August 2019 to 28th February , 2020

Approval has been granted to the above mentioned student to collect data at MNH.

Named MNH based supervisor must ensure that the student abide to the ethical principles and other conditions of the research approval.

Sincerely,

Dr. Faraja Chiwanga
Head of Teaching, Research and Consultancy Unit

c.c DMS
c.c Dr. Jamo Mfinanga
c.c Dr. Alphonce Nsubi Simbila

All Correspondence to Addressed to the Executive Director