

**INCIDENCE AND RISK FACTORS FOR PAEDIATRIC MORTALITY
WITHIN 24-HOURS OF PRESENTATION AT EMERGENCY
MEDICINE DEPARTMENT MUHIMBILI NATIONAL HOSPITAL**

Raya Yusuph Mussa, (MD).

**MMed (Emergency Medicine) Dissertation
Muhimbili University of Health and Allied Sciences
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Muhimbili University of Health and Allied Sciences
Department of Emergency Medicine



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24-HOURS OF PRESENTATION AT EMERGENCY MEDICINE DEPARTMENT
MUHIMBILI NATIONAL HOSPITAL**

By

RAYA YUSUPH MUSSA

**A Dissertation Submitted in Partial Fulfilment of the Requirement for the
Degree of Masters of Medicine in Emergency Medicine**

Muhimbili University of Health and Allied Sciences

October, 2020

CERTIFICATION

The undersigned certify that he has read and hereby recommend for acceptance of a dissertation entitled; *“incidence and risk factors for paediatric mortality within 24-hours of presentation at emergency medicine department muhimbili national hospital, Dar Es Salaam-Tanzania”* in (partial) fulfilment of the requirements for the Degree of Master in Emergency Medicine of Muhimbili University of Health and Allied Sciences.

Dr. Hendry R. Sawe

Supervisor

Date

DECLARATION AND COPYRIGHT

I, **Raya Mussa**, 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

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DEDICATION

I dedicate my work to my dear husband Anwar Omar, My kids Fatma Anwar
And Ayman Anwar and my beloved mother Fatuma Hamadi.

ABSTRACT

Background:

In 2017 around 6.3 million children and young adolescents died, commonly due to reversible causes worldwide. A child in Sub-Saharan Africa (SSA) is 15 times more likely to die than a child in a high income country and children under five have higher mortality than adolescents. A significant number of children presenting in critical condition to our emergency department but their actual proportion and risk factors of early mortality are not known.

Materials and methods:

This was consecutive convenience prospective cohort study of all pediatric patients (aged 28 days and 14 years) presenting to the MNH ED in Dar es Salaam Tanzania from August 2019 to January 2020. For each eligible patient, a structured case report form (CRF) was used for documenting demographic information, clinical presentation, other diagnostic evaluation, EMD treatment, outcome and disposition. Patients were followed up from day of the admission up to the end of study period. The study mortality rate and risk factors were summarized with descriptive statistics, including median with IQR, RR with 95% and P value, as appropriate.

Results:

We enrolled 989 (27.4%) pediatric patients attended at ED-MNH when research assistance was available. 602(60.9%) were male, median age of 2 years IQR= 1-5) and 42.2% (n=437) of the enrolled patients were below 1year. 51.2 %(n=507) of the group enrolled were transferred from another health care facility. For all enrolled patients in ED 7.2% had congenital heart disease followed by sickle cell disease 4.2%. Of the 276 (27.9) were stable and discharged home from ED, 33 (3.3%) died in ED. Among admitted patients 623(63%) were admitted in the general wards and 57(5.7%) admitted in Pediatric ICU. Five (0.5%) patients died within 24hours from ED presentation and 52 (5.3%) died more than 24hours. Altered level of consciousness 85(8.6%) with a RR of 21.7(CI: 11.4-41.5), low random blood glucose 22(2.2%), RR 3.8(CI: 1.3-11.3), raised creatinine 22(2.2%), RR 8.2(CI: 3.8-17.6) and raised lactate above 2 were 134(13.5%) RR of 6.4(CI: 3.5-11.7) were among factors observed to be associated with 24hours mortality.

Conclusion:

This study revealed lactate levels above 2, altered levels of consciousness, low random blood glucose levels, low hemoglobin levels and raised creatinine has been shown to determine the twenty fours Mortality from ED presentation and mortality rate of 3.8%.

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LIST OF ABBREVIATION

DBP	-	Diastolic Blood Pressure
ED	-	Emergency Department
EMD	-	Emergency medicine department
GCS	-	Glasgow Coma Scale
HIC	-	Higher Income Countries
ICU	-	Intensive Care Unit
IRB	-	Institutional Review Board
LIC	-	Low Income Countries
LMIC	-	Low- and Middle-Income Countries
MDGS	-	Millennium development goals
MNH	-	Muhimbili National Hospital
MUHAS	-	Muhimbili University of health and allied sciences
POC	-	Point of care test
SBP	-	Systolic Blood Pressure
SPSS	-	Statistical package for the Social Sciences
SSA	-	Sub-Saharan Africa
WHO	-	World Health Organization
RR	-	Relative Risk
RBG	-	Random Blood glucose levels

DEFINITION OF KEY TERMS

- **EMD Length of Stay:** Will be defined as the time a pediatric patient enrolled in the study arrived in the Emergency department to the time the patient is disposed to the general ward/ theatre/ICU or died at EMD.(1)
- **24 Hours mortality(Early Mortality):** Any death that has ensued within first 24 hours of presentation (within and outside EMD of MNH) of all trauma and non-traumatic pediatric critically ill patient, who was planned or had been disposed to the ward/ICU or theatre.(2)
- **ICU mortality:** Any death of the enrolled patient in the ICU that has happened within 24 hours of hospital presentation.(3)
- **In hospital mortality:** Defined as any death occurring during the hospital stay.(4)
- **Clinical characteristics**
Constellation of physical signs or symptoms associated with a particular morbid process, the interpretation of which leads to a specific diagnosis. (5)

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

Child mortality or child death is the death of a child under the age of 14 while the child mortality rate has also been defined as units of deaths per 1,000 in children. (2) Due to global efforts, under-five mortality has been reduced by 58% from an estimated rate of 93 deaths per 1000 live births in 1990 to 39 deaths per 1000 live births in 2017. This means that in every 11 children 1 died before reaching age 5 in 1990 in comparison to 1 in 26 in 2017. (4) .Among children aged 5-14 the mortality declined by 52% from 1.7 million to 0.9 million. (6)

Despite much effort by WHO toward eradicating infectious disease with multiple vaccinations for children under five still a significant number of children under five are dying due to infectious causes (7). The leading cause of death are Preterm birth complications (18%), Pneumonia (16%), Intrapartum-related events (12%), Neonatal sepsis (7%), Diarrhoea (8%), Malaria (5%) and Malnutrition and Under nutrition (8). Delay in health care seeking behaviour, low social economic status, living in rural or slum areas, inadequate child spacing as well as the type of child care giver have contributed to paediatric mortality (9,10) (11,12) (13). Care giver poor hygiene practices of the child, failure of completion of immunization program and maternal level of education has further contributed to the raising of the child mortality. (14) (15)

The picture is different from under five whereby among children aged 5 to 14 years their probability of dying was 7.2 deaths per 1 000 children aged 5 in 2017. Children 5-9 years accounted for 61% of all deaths of children aged 5 to 14 years. The risk profiles of this age groups has shifted away from infectious causes and the top cause of death is Injury, including road traffic injuries, drowning, burns, and falls. (16) (17) Gathering effort of governments, WHO and UNICEF aims to reduced mortality from preventable cause by scaling up proven, high-impact, cost-effective health and nutrition interventions. Moreover, MDGs which focus on reducing child mortality have changed their goal from reducing mortality to ending death of under-fives by 2030, through early recognition and intervention into common causes of death which are preventable. (18) (6)

Cost effective measures are the keystone of reducing child mortality by introduction of vaccine availability of antibiotics, micronutrients supplementation, insecticide-treated bed nets, improvement of family care, exclusive breast feeding practise for six months and oral dehydration therapy (18)(19). Women empowerment, accessibility of basic social services together with improvement of critical care services are among major effort to improve quality of health care system and reducing child mortality .(7) (20) (21)

1.2 LITERATURE REVIEW

In 2017, approximately 6.3 million children and young adolescents died, commonly due to reversible causes Worldwide. The world has been able to continuously save young children's lives. The rate of child mortality under five had dramatically dropped by 60 per cent from 2000–2017.(22) (23)

In Sub Saharan Africa (SSA) 1 child in 13 dies before his or her fifth birthday, while in the world's high-income countries the ratio is 1 in 189. A child born in Sub Saharan Africa has a 15 times greater chance of dying before age of 5 than children in high income countries.(18) (16) Low income countries(LICs) in Africa are still facing challenges in their health care systems in meeting the high demand for acute care services, due to a lack of adequate healthcare resources as well as skilled health care providers. (24) (25) (26) (27).

In Tanzania, 270 children who are under 5 years of age die every day due to Malaria, pneumonia and diarrhoea and other infectious disease. (28) This occurs despite multiple efforts to eradicate infection in children by provision of free insecticide treated bed nets to all pregnant women and children under five, childhood vaccination, and several regular postnatal visits with mother providing education on child nutrition.

Establishment of emergency medicine globally has provided the chance of primary and secondary disease prevention improve public health care by interventions for addressing substance abuse and interpersonal violence, education about safety practices, epidemiological surveillance, enrolment of patients in clinical research trials focusing on acute interventions, education and clinical training of health-care providers and participation in local and regional responses to natural and man-made disasters.(29)

By provision of early recognition of preventable life threatening situations and immediate correction and stabilization, progressive growth of emergency care in Africa has managed to rescue significant numbers of paediatric who would otherwise have died due to disease outbreaks, trauma and natural disasters(30)

In 2010, The Tanzanian Ministry of Health established the First fully equipped emergency care service at Muhimbili National Hospital as well as establishment of a postgraduate training program in Emergency Medicine (EM) at Muhimbili University of health and allied science. This signalled the acknowledgement of EM as a new medical specialty in the country. (24)

The severity of child mortality are shown to be aggravated by different reasons, including delay in health services seeking behaviour, (31) chronic diarrhoea, Pneumonia, sepsis, malaria, heart failure (secondary to anaemia), acute respiratory tract infections and meningitis. (32) (18) (12).if these factors are early identified and accurately treated has been revealed to reduce childhood mortality in acute paediatric hospitals and poor nutritional status(33) (34) (35). Delay in health seeking behaviour in most mothers or caregivers were contributed by long distance to the nearest health facility, high number of under-fives in household,

living with non-biological parents, caregiver education attainment, household wealth and seeking care at home.(36) (37) (38)

Childhood mortality has been shown to highly associate with clinical presentation, such as shortness of breath, pallor, lethargic appearance, ill-looking appearance, febrile convulsion, altered sensorium, skin lesions, hepatomegaly or edema, Which are all among revisable cause if recognized early and immediately corrected (39) (40,41)

The quality of treatment of patients in paediatric emergency departments is determined by mortality rate as a replication of the severity of illness. The aim of this study is to prospectively identify all cause and predictors of early mortality among paediatric patients presenting to Emergency medicine department Muhimbili National Hospital. Better understanding of early mortality predictors will allow us to determine effectiveness of our management guidelines protocol to focus more on predictors of early mortality by close monitoring of the paediatric patients.

The establishment of the Emergency Medicine Department at Muhimbili National Hospital in 2010 has provided an opportunity to improve and standardize care in the management of critically ill paediatric patients and will also help to develop a tool so as can be used in a peripheral hospital to recognize children who need immediate transfer. Most of these patients usually came late and present in a critically ill stage and require emergency interventions to abate death and decrease long-term morbidity. While EMD is set for early interventions and stabilization of these critically ill children, Pattern and predictors of early mortality among paediatric patients presented to Emergency department(ED) remains unknown. Reasons are assumed to be Multifactorial and taken into account both burden of Trauma, communicable and non-communicable disease unavailability of health care services, well trained emergency health personnel and limited resuscitation medical equipment.(22) (42) (32) .

1.3 PROBLEM STATEMENT

Opening of EMD at MNH in Tanzania has provided an opportunity for early recognition, stabilization and initial interventions of paediatric patient presented with acute illness but the prevalence and risk factors associated with early mortality has not yet being established which can impede the recognition and early treatment of patients who could survive.

1.4 RATIONALE

Understanding the incidence and risk factors of early mortality among paediatric will provide great resource supportive information on early recognition of alarming sign of early mortality and will bring awareness of effectiveness of management given at EMD MNH by changing approach of the these patients and their management.

1.5 RESEARCH QUESTIONS

1. What is the 24-hour in hospital mortality rate among paediatric patients presenting to Emergency Medicine Department of Muhimbili National Hospital?
2. What are the risk factors for 24-hours in-hospital mortality rate of pediatric presenting to Emergency Medicine Department Muhimbili National Hospital?

1.6 OBJECTIVES

1.61 Broad objective.

To determine the incidence and risk factors for pediatric mortality within 24-hours of presentation at Emergency Medicine Department Muhimbili National Hospital

1.62 Specific Objectives

1. To determine the 24-hour in hospital mortality rate among paediatric patients presentation at Emergency Medicine Department of Muhimbili National Hospital
2. To describe the clinical characteristics of paediatric patients who die within 24-hours of presentation at the Emergency Medicine Department of Muhimbili National Hospital
3. To describe the management strategies of pediatric patients who die within 24-hours of presentation at the Emergency Medicine Department of Muhimbili National Hospital
4. To determine the risk factors for 24-hours in-hospital mortality rate of pediatric presenting to Emergency Medicine Department Muhimbili National Hospital

CONCEPTUAL FRAME WORK

The outcome of critically ill children (including cardiac arrest, ED mortality, mortality within 24 hours who present to Emergency Medicine Department at Muhimbili National Hospital may be associated with age, sex, address, mode of arrival to the hospital, delay in seeking health care (> 48hours) , history of vaccination, time spent in ED, mode of referral, clinical profile in terms of vital parameters or presenting complain and POC/ laboratory findings, comorbidities and management done during their ED stay.

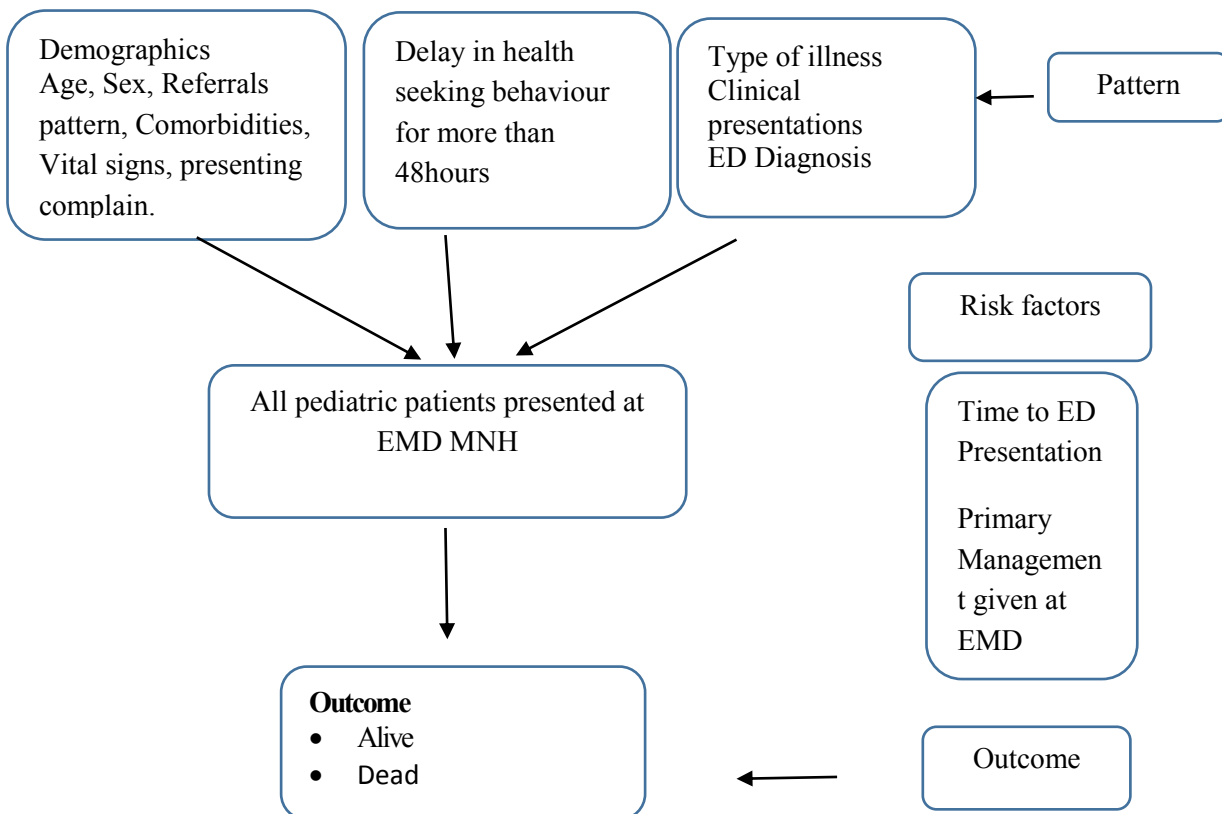


Figure 1: Conceptual Frame Work

CHAPTER TWO

2.0 METHODOLOGY

2.1 Study design

This study was a prospective cohort study of consecutive paediatric patients seen at EMD MNH in Dar es Salaam, Tanzania, from September 2019 to January 2020.

2.2 Study area

The was conducted at the Emergency Medicine Department of Muhimbili National Hospital (EMD-MNH), located in Ilala district, Dar es Salaam, Tanzania. MNH is the largest tertiary referral hospital with 1500 beds, serves as the main referral for all patients from across the country (24) . The EMD-MNH was opened in 2010, being the first and only full capacity emergency medicine department in the country which operates 24-hours and attends an average of 150 to 200 critically ill patients a day, of which 25% are paediatrics. Clinical care is under the supervision of the specialist emergency physician who oversee registrar, resident and inters 24/7, while nursing care is under supervision of critical care nurses.

2.3 Target Population

All paediatric patients presenting to acute intake areas of tertiary referral hospitals in Tanzania.

2.4 Accessible Population

All paediatric patients presenting to emergency medicine department of Muhimbili national hospital in Dar es salaam, Tanzania.

2.5 Study population

All paediatric patients presented at the emergency medicine department of Muhimbili national hospital in Dar es salaam, Tanzania.

2.6 Sampling design

Consecutive sample of all paediatric patients presenting to the emergency medicine department of Muhimbili National Hospital at the time the researcher or his assistant(s) are available for data collection.

2.7 Subject

2.71 Inclusion criteria

All registered paediatrics aged 28days to 14years medical and trauma patients and parents /care taker consented to participate in the study.

2.72 Exclusion criteria

All registered pediatric aged 28days to 14years patient who parents/care takers who did not consent to participate in the study.

2.8 Variables of interest

2.81 Predictor variables

- Comorbidities eg Malnutrition, HIV, Pneumonia
- Vital sign on arrival eg Heart rate,SPO2 and BP
- Provisional diagnosis
- Presenting chief complain eg Dyspnoea, Fever,
- Management given in ED

2.82 Confounding variables

- Information of the comorbidities
- Provisional diagnosis

2.83 Outcome variables

The primary outcome risk factors of early mortality among paediatric patient presented to ED-MNH

Secondary outcome is 24- hour mortality rate; i.e. the proportion of paediatric patients acuity who die within 24 hours of arrival to the ED

2.9 Sample size estimation

Age is among predicting factors which determine the early mortality among paediatric patient. Based on the study which was done in the paediatric ED of the NICH, Karachi, which has an annual census of around 172 162 (average Monthly was 14 346) visits in 2014 in Pakistan. Based on this study, the mortality rate for those over 5 was 5.88 and for those under 5 (excluding premature infants) was 13.1%, for an effect size (difference) of 7.22%). The sample size for this study was calculated using two sample dichotomous outcome using the following formula:

$$N = \left(Z\alpha \sqrt{P(1-P) \left(\frac{1}{q_1} + \frac{1}{q_2} \right)} + z\beta \sqrt{P_1(1-P_1) \left(\frac{1}{q_1} \right) + P_2(1-P_2) \left(\frac{1}{q_2} \right)} \right)^2 \div (P_1 - P_2)^2$$

Where by:

The standard normal deviate for $\alpha = Z\alpha = 1.960$

The standard normal deviate for $\beta = Z\beta = 0.842$

Pooled proportion = $P = (q_1 * P_1) + (q_0 * P_0) = 0.115$

$A = Z\alpha \sqrt{P(1-P) (1/q_1 + 1/q_0)} = 1.535$

$B = Z\beta \sqrt{P_1(1-P_1) (1/q_1) + P_0(1-P_0) (1/q_0)} = 0.537$

$C = (P_1 - P_0)^2 = 0.005$

Total group size = $N = (A+B)^2 / C = 847$

Continuity correction (added to N for Group 0) = $CC = 1 / (q_1 * |P_1 - P_0|) = 18$

Following adjustment for 10% non-response rate a sample size of 933 was estimated to be recruited in the study.

2.10 Patient recruitment and data collection

Patients screening and enrolment was overseen by the principal investigator and research assistants who were available in the emergency department 3 days in a week it was done in alternate day and night during the study period.

2.10.1 Standardized data collection form

A standardized structured case report form (CRF) was used to document demographic information, clinical presentation, investigation, EMD treatment, outcome and disposition for all eligible paediatric patients.

All paediatric patients' guardians or parents voluntarily participated in the study after being asked to provide informed consent after they have received full information about the study.

The standardized data collection form had three parts:

1. Part I: Baseline assessment of patients

Research assistants documented prospectively the patient's baseline information (demographics, initial vital signs, chief complaints, existing comorbidities, pre referral information and final diagnoses). This information was prospectively recorded from the providers' clinical notes.

2. Part II: Case reporting

Information from the files of patients who meet the inclusion criteria was recorded in part II of the form. Pertinent data from the history and physical examination, laboratory results, treatment delivered, and emergency provider clinical impressions and final EMD diagnoses and disposition. All diagnostic, treatment and disposition decisions was made by treating physician.

3. Part III: Case follow up

Research assistants traced all the patients (through their daily clinical progress notes), throughout the duration of the study, recorded the duration of hospital stay, clinical progress (if the patient was admitted to high acuity ward), final hospital diagnoses. The data was transferred from hand written standardized data collection form into online Research Electronic Data Capture (Redcap, Version 6.0.1, Vanderbilt University, Tennessee, USA), every day during the collection. The principal investigator oversees the data check to ensure accuracy and quality of the data.

2.11 Data Analysis

The data from Redcap (Version 6.0.1, Vanderbilt University, Tennessee, USA) was exported into an Excel file (Microsoft Corporation, Redmond, WA, USA) then imported and analysed with SPSS (Version 23) statistical software. Procedure, frequency and univariate functions performed to check for any outliers and clean the dataset. Patient descriptive characteristics were reported, including medians, confidential interval. Relative risk analysis was used to examine the relationship between EARLY MORTALITY (24hours mortality) and the history, clinical presentation and EMD diagnostic test. A variable with ($p < 0.05$) was considered as statistically significant.

2.12 Ethical consideration

Ethical clearance to conduct this study was obtained from MUHAS Senate of Research and Publication Committee of MUHAS. Approval for data collection is sought from respective authorities at MNH. All eligible paediatric patients presenting to the EMD was enrolled after obtaining a signed informed consent from patient's parent or guardian. Acquired records was coded to hide patient's identity and stored in computer with password known by researchers only. The written forms kept in a safe cabinet accessed by only researchers.

Validity and Reliability of the tool

Data were collected using purpose designed CRF and all measurements were repeated twice to ensure reliability, and the research assistance repeated the answer twice to ensure the accuracy. The data were transferred from hand written standardized data collection form into online Research Electronic Data Capture (RED Cap, Version 6.0.1, Vanderbilt University, Tennessee, USA), every day during the collection. The principal investigator has overseen the data check to ensure accuracy and quality of the data.

CHAPTER THREE

3.0 RESULTS

3.1 Flow chart of paediatric patients presented to ED-MNH

During 6months of study period 3616 patients presented in ED whereby they were seen either in resuscitation or treatment room. Of the 989 children below 14 years old were enrolled in the study. Of these patients 680 (68.7%) were admitted either in the general wards or Paediatric ICU, 276 (27.9). Discharged from ED. The overall 6months 24 hours mortality rate since ED presentation is 3.8%. Among admitted patients 5(0.7%) died within 24hours and 52(5.3%) died more than 24hours and 601(88.3%) survived to discharge.

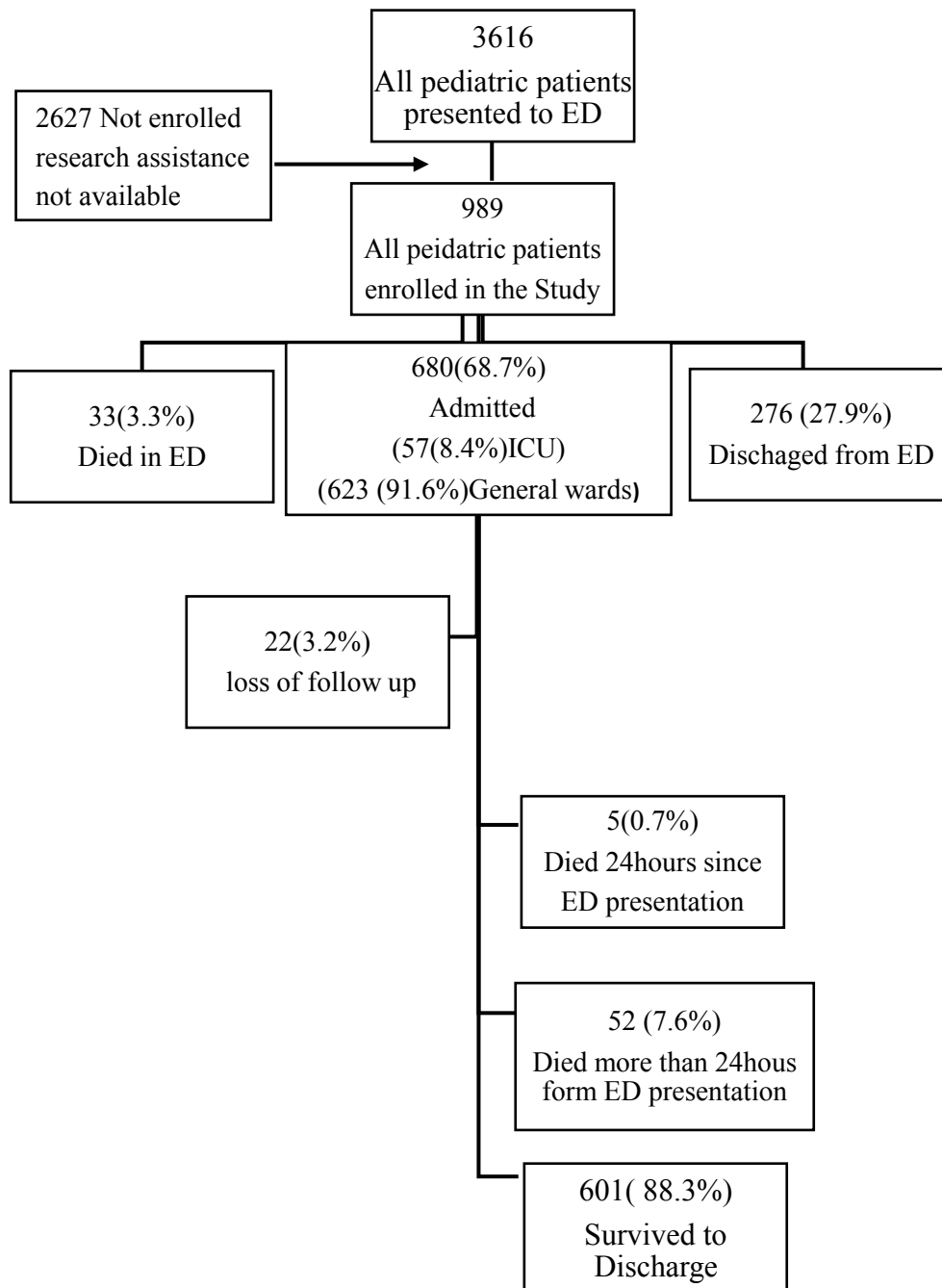


Figure 2: paediatric patient Flow chart

3.2 Demographic

Among paediatric patients enrolled in the stud 602(60.9%) were male, and 42.2% (n=437) were paediatric patients below 1year, with median age of 2Years with IQR of 1 to 5. Among these patients 51.2 %(n=507) are being transferred from another health care facility and 40.9 %(405) were triaged as emergency. For all enrolled patients in EMD 7.2% had congenital heart disease followed by 4.2% had sickle cell disease these are higher rates compared to other comorbidities .(Table 1.1)

Among those patients who died within 24hours of EMD presentation 52.6% (n= 20) were female. Of these patients 73.6% (n=28) were age below 5years and 89.5% (n=34) were transferred from other health facility.(Table1.2)

Table 1: Demographics of study population

Demographics	Number	Percentage
	N=989	(%)
Sex		
Female	387	39.1
Male	602	60.9
Age Group		
1 month-<1 year	437	44.2
1year -<5years	323	32.7
5 years-< 14 years	229	23.1
median age	2	
Interquartile range	4(1-5)	
Referral Status		
Self-referral	483	48.8
Referred	507	51.2
Triage		
Emergency	405	40.9
Priority	584	59.1
Comorbidities		
HIV	9	0.9
Sickle cell	45	4.6
Congenital heart disease	71	7.2
Malnutrition	4	0.4
Others	96	9.7

Table 1.2:
24-hours mortality Patients
demographics

Demographics	Number	Percentage
	N=38	(%)
Sex		
Female	20	52.6
Male	18	47.4
Age Group		
<5years	28	73.7
5 years-< 14 years	6	23.1
median age	1	
Interquartile range	1 to 3	
Referral Status		
Self-referral	4	10.5
Referred	34	89.5
Triage		
Emergency	38	100
Priority	0	0
Comorbidities		
HIV	1	2.6
Congenital heart disease	2	5.3
Malnutrition	1	2.6
Malignancy	3	7.9

3.3 Vital sign and presenting complain

The top chief complain for all these patients were fever 17.5(n=174), headache 16.7% (n=166) and difficulty in breathing 12% (121) and the least reported chief complain was diarrhoea 2.5 %(n=25) and general body malaise 1.4% (14) .Only vomiting shown to be scientifically significant to be associated with 24hours mortality.

The first documented vital signs patient presented with before any intervention was analysed and Tachycardia was the most frequent abnormal vital sign 29.1% (n=288) followed by fever of greater than 37.5 C 22.9% (n=227) and tachypnea 18.8% (n=186) the spo2 <95% 10.6%(105) which is scientifically significance and the least reported vital sign was bradycardia 3.1% (31). Among these patients 8.6(85) were altered and it was scientifically significant associated with within 24 hours death among paediatric patients presented in ED.

Table 2: Patient's vital sign and complain

	Overall N=986	Died N=38	Survived N=951	Relative risk	P- Value
Vital signs	n (%)	n (%)	n (%)	RR (95%CI)	
Tachypnea **	186(18.8)	10 (62.5)	176 (18.5)	1.5 (0.8-3.1)	0.16
Tachycardia**	288(29.1)	10(26.3)	278(29.3)	0.8(0.4-1.8)	0.69
Febrile (T > 37.5°C)	227(22.9)	15(39.4)	212(22.3)	0.9(0.4-1.8)	0.6986
SpO ₂ * < 95%	105(10.6)	15(39.5)	90(9.4)	6.9(3.6-13.4)	<0.0001
Altered mental status	85(8.6)	26(68.4)	59(6.2)	21.7(11.4-41.5)	<0.0001
Bradycardia**	31(3.1)	2(5.2)	29(3.0)	1.72(0.43-6.8)	0.4421
Presenting complaints					
Fever	174(17.5)	10(26.3)	164(17.2)	1.7(0.8-3.38)	0.132
Abdominal Symptoms	32(3.2)	0(00)	32(3.4)	0.4(0.02-6.0)	0.4898
Respiratory Symptoms	197(19.9)	13(34.2)	184(19.3)	2(1-4)	0.0266
Convulsion	37	0	37(3.9)	0.3(0.02-5.2)	0.9874
Diarrhoea	25(2.5)	1(2.6)	24(2.5)	1(0.02-9.0)	0.9874
Vomiting	64(6.4)	9(23.6)	55(5.8)	4.5(2.2-9)	0.0001
General body malaise	14(1.4)	1(2.6)	24(2.5)	1.8(0.3-12.8)	0.5174
** age adjusted					

3.4 Investigation done in ED

Among patient seen in ED 13.8% (136) WBC were above 11K/uL. Of the 86(8.7%) their potassium level were below 3mmol/L, 134(13.5%) their lactate levels were above 2. Among investigation done raised creatinine, lactate and low RBG carried high chance of 24hours mortality and it was scientifically significant.(Table 3)

Table 3: Investigations ordered in the ED

	Overall	Died	Survived	Relative risk	P-Value
Laboratory Tests	n/N (%)	n/N (%)	n/N (%)	RR (95%CI)	
	N=989	N=38	N=951		
WBC (> 11 K/uL)	136 (13.8))	5(13.1)	131 (13.8)	0.9(0.4-2.4)	0.913
Haemoglobin (< 7g/dL)	63(6.3)	5(13.1)	58(6.1)	2.2(0.9-5.5)	0.083
Potassium<3mmol/L	86(8.7)	4(10.5)	82(8.6)	1.2(0.42-3.21)	0.76
Malaria test positive	21(2.1)	1(2.6)	20(2.1)	1.2(0.17-8.65)	0.82
Elevated RFT***	22(2.2)	6(15.8)	16(1.7)	8.2(3.8-17.6)	<0.0001
Lactate >2	134(13.5)	19(50)	115(12.0)	6.4(3.5-11.7)	<0.0001
Low RBG (< 3mmol/L)	22 (2.2)	3 (7.8)	19 (1.9)	3.8(1.3-11.3)	0.018

*** RIFLE Criteria

3.5 Management

Almost all patients received intervention during their visit, the most common medication types prescribed were antibiotic 30.9% (n=306), anticonvulsant 5.2% (n=52) and antipyretic 19.7% (195)

The other commonly intervention given were IV fluids either is ringer lactate or Normal saline (26.2%), Oxygen 7.2% other intervention like dextrose was given due to hypoglycaemia or hyperkalaemia correction. Among all patients 3.3% (n=33) were intubated and 3.8% (38) CPR were done.

Table 4: Management in EMD

Frequency of intervention initiated in the EMD		
	N	%(CI)
Oxygen therapy	71	7.2(5.7-8.9)
Antibiotic	306	30.9(28.3-33.9)
IV fluids(RL/NS)	265	26.8(24.1-29.7)
Bronchodilators/nebulization	30	3.0(2.03-4.3)
Electrolyte re placement (K),MG,(insulin dextrose)	82	8.2(6.6-10.1)
Nasogastric tube insertion	5	0.5(0.2-1.2)
Blood transfusion	31	3.1(2.1-4.4)
Anticonvulsants	52	5.2(3.9-6.8)
Intubation	33	3.3(2.3-4.6)
CPR	38	3.8(2.7-5.2)
Others (cardioversion, catheterization, iv placement etc)	121	12.2(10.2-14.4)

3.6 Final diagnosis

As of the 105(10.6%) paediatric patients diagnosed to have respiratory distress with spo2 below 95%, pneumonia 77(7.8%) as first provisional diagnosis followed by malnutrition 20(2%) and sepsis 62(6.2%).

Table 5: Final ED diagnosis

Final ED Diagnosis	N=989	% (95% CI)
Respiratory distress (spo2<95%)	105	10.6(8.8-12.7)
Pneumonia	77	7.8(6.1-9.5)
Sepsis	62	6.2(.8-7.9)
Anaemia	26	2.6(1.7-3.8)
Malnutrition	20	2(1.2-3.1)
Malaria	17	1.7(0.99-2.7)
Meningitis	14	1.4(0.8-2.4)
Renal Failure***	6	0.6(0.2-1.3)

*** RIFLE criteria

3.7 Disposition

Of the 989 paediatric patient seen in ED in period of 6months 27.9% (276) were treated and discharged home from ED, While 68.9% (681) were admitted and 3.3% (33) died in ED before being admitted to the ward.

Among admitted patients 63% (n=624) were stabilized in ED and being admitted to the general ward while 5.7(n=57) were critically ill and admitted to ICU. Of the patient followed up 0.5% (n=5) died within 24 hours and 5.3% (52) died more than 24hours.the median of hospital stay is seven days (IQR: 2-16).

Table 6: Disposition

Disposition	N = 989	% (95% CI)
Admitted	680	68.7(65.7-71.6)
Discharged from ED	276	27.9(25.1-30.8)
Died in ED	33	3.3(2.2-4.6)
Death within 24-hours of ED presentation	38	3.8(2.7-5.2)
>24hoursInpatient mortality	52	5.3(3.9- 6.8)
Overall mortality	85	8.5(6.8- 10.4)
	Median	IQR
Median length of hospital stay	7	14(2-16)

CHAPTER FOUR

4.1 DISCUSSION

This study described the characteristics and outcomes of paediatric patients presenting to a tertiary ED in an LMIC, and the risk factors for 24-hour mortality. In this study early mortality rate among paediatric patients was observed to be almost the same compared to what has been observed in other similar studies which were done in similar settings but is significantly higher than in high income countries.(14) (15) (16)

About half of the patients were triaged as emergency and they needed immediate care in resuscitation room for paediatric patients and were referred from other hospitals. We also found a significant proportion of patients were observed to have comorbidities such as congenital heart disease and sickle cell disease.

The common sign and symptoms were tachycardia, altered level of consciousness, fever, vomiting, tachypnea and hypoxia. Not only that but also high heart rate, chief complain of respiratory symptoms and vomiting were significantly associated with early mortality. This was also observed in the another study done in Ethiopia where shortness of breath, fast breathing, fever, vomiting, and cough were the most common sign and symptoms observed to be associated with early mortality.(16)

Our study found that majority of paediatric patients had elevated WBC, low potassium levels elevated level of lactate, low RBG, increase creatinine level and low haemoglobin levels. All these tests had been done as soon as patients arrived at ED, this displays the critical conditional of majority of paediatric patients when arriving at ED from the referring hospital.

Most common observed diagnosis in this study was respiratory tract infection disease and was the first cause of mortality in children under the age of five years. This study reflect the same results where by pneumonia and under five carried a high chance of mortality (4) , However large proportion of these patients have been observed with severe anaemia, malnutrition ,malaria, sepsis and meningitis as their common diagnosis. This has also been revealed in another study done in Ethiopia where by these were their common diagnosis(16).

Majority of the patients received antibiotics, IV fluids either Ringer lactate, normal saline or DNS depending on patient diagnosis and clinical presentation. Not only that but also received electrolyte replacement such as potassium chloride infusion in management of hypokalaemia,

hypertonic saline or just normal saline in low sodium and depending on clinical presentation of the patient as a part of ED stabilization before patients being admitted to the ward. We also found that all paediatric patients who arrested in ED had CPR done.

Out of the 63 (6.3%) patient who presented with Haemoglobin less than 7g/dl only 31(3.1%) received blood transfusion. This may be due either attending physician was unable to pick up if patient needed blood, patient is sickle or blood was not available in the blood bank as it has been shown in the study done at Emergency Medicine department of Muhimbili National Hospital in Tanzania which explained reasons for not issuing blood among paediatric patients who were anaemic were either blood not being ordered and not being available in the blood bank.(17)

Surprisingly half of our patients were being transferred from the other hospital facility and they came very sick. Their high acuity of illness cause a large proportion of these patients to warrant an admission and significant number of patient were admitted to ICU. We thought probably more patient needed ICU care but because of inadequate ICU capacity in our hospital, patient ended up being admitted to the general ward.(18) . The high acuity triage of these patients are believed to be contributed by delays in health seeking behaviour and they present late to hospital or parents usually start to treat this patient by over the counter remedies or herbal medication as it has been shown in other studies. (19) (20).

However low level of random blood glucose levels, elevated creatinine levels, and increase levels of creatinine during time of presentation were observed to be predictors of 24hours mortality. These findings reveal the condition of the patient who came critically ill during ED presentation. Same findings has also been observed in different study done in different areas with the same hospital facility setting.(21) (22)

4.2 LIMITATION OF THE STUDY

This is a single centred study conducted at a tertiary level hospital, and hence results may not be generalized to the whole health care system of Tanzania. We enrolled a convenient sample of patients at time when research assistant was available to collect the data, however at times when he was available efforts were made to enrol all patients.

CHAPTER FIVE

5.0 CONCLUSION

Altered mental status, hypoxia, elevated Creatinine levels, low random glucose levels and elevated lactate are associated with early mortality among paediatric patients presenting to the EMD-MNH, and the twenty four hours mortality rate was 3.8%.

5.1 RECOMMENDATION

Further study should be done looking into risk factors of more than 24hours mortality from ED presentation. Patients with early risk of mortality should therefore be monitored and evaluated closely by developing protocol how often should be monitored and how well can be evaluated closely.

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APPENDIX

APPENDIX I: CASE REPORT FORM

Paediatric Patient aged 28days to 14years old	
NO	
YES	
Patient initial	
Patient MR Na	
Date of attendance	
First day child fall sick(days)	
Consent	
Yes	
NO	
Exclusion criteria: any pediatric who aged between 28days to 14years who brought dead at pediatric rooms	

A: DEMOGRAPHIC

Date of birth(date/month/year)	age (Year/Month)	Unknown

Address(region/district)	
--------------------------	--

Mode of arrival to EMD	
Time of arrival to ED	
Self –referral	
Referred/facility	
Reason for referral	
Days spent on facility	

B: CHRONIC/ UNDERLYING ILLNESS

Renal Disease	
Heart disease	
Diabetic	
Malnutrition	
HIV	
Malignancy	
Sickle cell disease	

C: INITIAL VITAL SIGN

BP	
PR	
RR	
SPO2	
AVPU	

D: CLINICAL CHARACTERISTIC

Chief complain

E: PHYSICAL EXAMINATION IN ED

Primary survey

	Normal	Abnormal	Not Done	Comment on abnormality(*if any)	intervention done(if any)
Airway (A)					
Breathing (B)					
Circulation (C)					
Disability (D)					
Exposure (E)					

G: **EMD INVESTIGATION**

VBG(POC)	RESULTS	URINE DIPSTICK	RESULTS
NOT DONE		NOT DONE	
DONE		DONE	
RBG		Nitrates	
PH		Leukocytes	
PCO2		Glucose	
HCO3		Protein	
		PH	
ELECTROLYTE			
DONE			
NOT DONE			
Cl			
Na			
K			
Creatinine			
Urea			

FBP	RESULTS	SERUM ELECTROLYTE	RESULTS
NOT DONE		NOT DONE	
DONE		DONE	
Hemoglobin		Potassium	
Reticulocyte Count		Sodium	
Hematocrit		Calcium	
WBC		Magnesium	
Platelet count		Chloride	
RENAL FUNCTION TEST	RESULTS	LIVER FUNCTION TEST	RESULTS
NOT DONE		NOT DONE	
DONE		DONE	
Creatine		Total Bilirubin	
BUN		Direct Bilirubin	
		Indirect Bilirubin	
		Lactate dehydrogenase	
		Aspartate Transaminase	
BLOOD CULTURE		URINE ANALYSIS	
NOT DONE		NOT DONE	
DONE		DONE	
Growth(specify)		Normal	
No growth		Abnormal (specify)	

J: IMAGE INVESTIGATION FROM RADIOLOGY DEPARTMENT

CT		RESULTS	RESULTS
NO	<input type="checkbox"/>		
YES	<input type="checkbox"/>		
ABDOMEN	<input type="checkbox"/>		
HEAD	<input type="checkbox"/>		
CHEST	<input type="checkbox"/>		
OTHER	<input type="checkbox"/>		
RESULTS		RADIOLOGIST	EMD DOCTORS

EFAST US		RESULTS	RESULTS
NO	<input type="checkbox"/>		
YES	<input type="checkbox"/>		
RESULTS		RADIOLOGIST	EMD DOCTORS

FORMAL ULTRASOUND			
NO DONE			
YES DONE			
ABDOMINAL			
PELVIC			
OTHERS			
RESULTS		RADIOLOGIST	EMD DOCTORS

K: PRIMARY EMD MANAGEMENT GIVEN
--

NO MANAGEMENT GIVEN		
YES MANAGEMENT GIVEN		
(If yes fill in information below)		
Medication	Dose	Route
Blood Product (in mls and type of blood given platelets,whole blood)		
NO		
YES		
if YES specify amount in	Type of blood given	Amount in mls
Other emd treatment(Intubation, procedures,cpap,cardioversion,intraossous,cpr etc)		

L: DISPOSITION

Date of death	
Died while in EMD	
Time of death in ED	
Alive on disposition	
Time of disposition	
Date of disposition	
Admitted to	
WARD	
ICU	
OTHERS (*specify)	
Discharged home from EMD	
Time of disposition	

M: PROGRESS DURING HOSPITAL STAY

Survived to discharge in ward /Icu	Date(day/month/year)	(Day/month/year)
YES		(Day/month/year)
NO		(Day/month/year)
Date of discharge(IF YES)		(Day/month/year)
Died		(Day/month/year)

APPENDIXES

APPENDIX II. CONSENT FORM (ENGLISH VERSION)

STUDY TITLE: PATTERNS AND PREDICTORS OF EARLY MORTALITY AMONG PAEDIATRIC PATIENTS PRESENTING TO EMERGENCY MEDICINE DEPARTMENT OF MUHIMBILI NATIONAL HOSPITAL

Introduction

Greetings, I Dr.Raya Y.Mussa, a second year resident undertaking Emergency Medicine course at Muhimbili University of Health and Allied Sciences (MUHAS).

I am currently conducting a study as titled above as part of my study requirements. I hereby request your participation and support in my study once I or my research assistant approaches you. Your choice to participate or not will have no any effect on the care and management beloved one.

Please you may ask questions, any time if you do not understand anything patterning this study.

Aim of the study

The purpose of this study is to describe the patterns and predictors of early mortality among pediatric patients presenting to emergency medicine department of Muhimbili National Hospital during period of study.

Benefits

No payment or any fringe benefits for your participation in the study as personal in steady the results and its implication will be beneficial for the hospital and general population using the hospital.

Risks

There is no risk in participating in this study.

What does this study involve?

This study involves the research assistant or principal investigator asking structured questions to you, the patient, or relatives and filling the responses in the prepared questionnaire. Also information about you will be obtained from your hospital file.

Consent

Your consent to be enrolled in the study is entirely voluntary and amenable by signing the consent form. You are free not to consent and this will not affect care and management

offered to your patient. You may decide on to stop participating in this study at any time for any reason.

Confidentiality

The information you provide is extremely respected and will be preserved strictly confidential. The study information will be stored in protected computer files and in paper records stored in a locked filing cabinet. Only study staff will have access to the information.

Access of information

By signing this form, you allow the research team to use the information and give it to others involved in the research. The research team includes the researcher, facilitators plus others working on this study at MUHAS and EMD-MNH.

For further information, questions or queries, you can contact:

1. The Principal Investigator,

Dr.Raya Y,Mussa

Department of Emergency Medicine,

MUHAS,

P. O. Box 65001,

Dar es Salaam, Tanzania.

Tel: +255717149496

Email: rayayusuph@gmail.com

2. Dr. Hendry Sawe

Department of Emergency Medicine,

MUHAS/MNH,

P. O. Box 65001,

Dar es Salaam, Tanzania.

Tel: +255 754 885658

Email: hendry_sawe@yahoo.com

Signature:

I, _____ have read/been told the contents of this form. My questions have been answered. I agree to participate in this study.

Signature of participant _____

Date of signed consent _____

APPENDIXES

APPENDIX III. CONSENT FORM (SWAHILI VERSION)

FOMU YA RIDHAA YA KUSHIRIKI KATIKA UTAFITI

Utangulizi

Jina langu naitwa Dkt.Raya Y.Mussa, mwanafunzi wa udaktari bingwa wa magonjwa ya dharura (Emergency Medicine) katika Chuo Kikuu Cha Afya na Sayansi Shirikishi Muhimbili (MUHAS). Ninaomba ushiriki wako au kwa niaba ya mgonjwa wako katika utafiti huu endapo mimi ama msaidizi wangu atakapokufuata ili kukuuliza taarifa muhimu za mgonjwa wako.

Madhumuni ya utafiti:

Utafiti huu unalenga kuangalia sababu zinapelekea vifo vya mapema katika watoto wanaletwa wakiwa

Mahututi kupata mtibabu katika Hospital ya Taifa Muhimbili.

Ushiriki katika utafiti:

Watoto walioletwa wakiwa mahutitu na kutibiwa katika vyumba vya magonjwa ya dharura

Hatari:

Hatutarajii kuwepo na athari/hatari yeyote itokanayo na ushiriki katika utafiti huu.

Faida za utafiti:

Ushiriki wako ama Ridhaa ya mgonjwa wako kushiriki katika utafiti huu, utawezesha kujua sababu zinazoleta vifo vya mapema kwa watoto wanaoleta wakiwa mahututi

Usiri:

Taarifa zote zitakazokusanywa katika utafiti huu zitakuwa siri, hivyo ushiriki wako hautajulikana na mtu asiye husika na utafiti bali timu ya watafiti tu.

Malipo:

Kwa kushiriki kwenye utafiti huu, hautalipwa wala hautalipa ghrama yeote.

Ukiwa na swali au tatizo lolote, unaweza kuwasiliana na wafuatao:

1. Mkuu wa Utafiti

Dkt.Raya Yusuph Muaa,

Idara ya Magonjwa ya Dharura na Mahututi (Emergency Medicine),

MUHAS,

S.L.P 65001,

Dar es Salaam, Tanzania.

Simu: +255 771494967

Barua pepe: Rayayusuph@gmail.com

2. Dkt. Hendry R Sawe

Idara ya Magonjwa ya dharura na Mahututi,

MUHAS/MNH,

S.L.P 65001,

Dar es Salaam, Tanzania.

Tel: +255 754 885658

Barua pepe: hendry_sawe@yahoo.com

Kuweka sahihi ya makubaliano:

Mimi, _____, nimesoma/nimesomewa maelezo yote yaliyomo kwenye fomu hii na nimeelewa. Maswali yangu yamejibiwa vizuri na niko tayari kushiriki.

Sahihi ya mshiriki _____

Sahihi ya Mtafiti _____ Tarehe _