PREDICTORS OF POST-DISCHARGE MORTALITY AMONG CHILDREN AGED 5-14 YEARS ADMITTED TO PAEDIATRICS WARDS AT MNH, JKCI, AND MOI: A PROSPECTIVE OBSERVATIONAL COHORT STUDY

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PREDICTORS OF POST-DISCHARGE MORTALITY AMONG CHILDREN AGED 5-14 YEARS ADMITTED TO PAEDIATRICS WARDS AT MNH, JKCI, AND MOI: A PROSPECTIVE OBSERVATIONAL COHORT STUDY.

By

Elton Roman, MD

A Dissertation Submitted in (Partial) Fulfilment of the Requirements for the Degree of Master of Medicine (Paediatrics and Child Health) of

Muhimbili University of Health and Allied Sciences.
October, 2024

CERTIFICATION

The undersigned certify that they have read and hereby recommend for acceptance by Muhimbili University of Health and Allied Sciences the dissertation titled **"Predictors of post-discharge mortality among children aged 5-14 years admitted to paediatrics wards at MNH, JKCI, and MOI"** in (partial) fulfillment of the requirements for the Degree of Master of Medicine (Paediatrics and Child Health) of the Muhimbili University of Health and Allied Sciences (MUHAS).

_____

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(Supervisor)

Date: _____

_____

Dr. Stella Mongella
(Co-Supervisor)

Date: _____

DECLARATION AND COPYRIGHT

I, Elton Roman Meleki, declare that this dissertation is my original work and it has not been presented and shall not be presented to any other university for a similar or other degree award**.**

Signature: _____ Date: _____

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I thank God for the good health He has granted me throughout my studies.

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Specially, I want to thank my late brother Godfrey Kavishe for his untiring encouragement, support, and motivation. I cherish his memories and I will hold him in my heart for the rest of my days on earth.

DEDICATION

I dedicate this work to all the families who have lost their loved ones.

ABSTRACT

Background: It is estimated that over 1 million children aged 5-14 years died in the year 2017, with 55% of the deaths occurring in Sub-Saharan Africa. Mortality of children following hospital discharge is reported to be high ranging between 1-18% and may exceed in-hospital mortality in lower-income countries. In Tanzania, there is a paucity of data on post-discharge mortality rate and its predictors among children aged 5-14 years.

Objectives: To determine the post-discharge mortality rate and its predictors among children aged 5-14 years admitted to paediatrics wards at MNH, JKCI, and MOI.

Methodology: A prospective observational cohort study was conducted among children aged 5-14 years admitted to paediatrics wards at MNH, JKCI, and MOI. Data was collected using a structured questionnaire, and collected information included socio-demographic characteristics, clinical profiles, and patients' outcomes. Post-discharge follow-up was carried out using phone calls at 1, 2, and 3 months following discharge. Data was analyzed using SPSS version 25. The association of demographic, social economic, and clinical factors with the outcome of all causes, 3 months post-discharge mortality was determined by Cox regression, and survival rates were displayed through Kaplan-Meier curves.

Results: A total of 786 children were enrolled in the study. The mean age of the children was 7.6 years (SD=2.8). There was a slight male preponderance of 59.4%. Of the 744 children discharged, the post-hospital mortality was 2.9%. Children with HIV disease (Hazard Ratio (HR) 9.83, 95 CI 2.3-41.5) and chronic kidney disease (Hazard Ratio (HR) 18.26, 95 CI 1.3-39.26) were found to have a high post-discharge mortality.

The predictors of post-discharge mortality were noted to be the duration of symptoms >2 weeks (Hazard Ratio (HR) 4.7, 95 CI 1.5-14.73), leukocytosis (Hazard Ratio (HR) 7.49, 95 CI 1.97-32.03), and discharge against medical advice (Hazard Ratio (HR) 55.4, 95 CI 4.46-393.11). More than half of the deaths occurred within the first month post-discharge, with more than 50% of them occurring outside the hospital.

Conclusion and Recommendations: The findings emphasize on the need for improved follow-up care for children aged 5-14 years, particularly those with chronic conditions or discharged against medical advice. Most deaths occurred within the first month, often at home, highlighting the importance of early post-discharge interventions for high-risk patients.

MUHTASARI

Utambulisho: Inakadiriwa kuwa zaidi ya watoto milioni moja wenye umri wa miaka 5-14 walipoteza uhai mwaka 2017, huku asilimia 55% ya vifo hivyo vikitokea Afrika, Kusini mwa Jangwa la Sahara. Kiwango cha vifo vya watoto baada ya kuruhusiwa kutoka hospitalini kinaripotiwa kuwa kati ya asilimia 1-18% katika nchi zenye uchumi wa chini na wa kati na mara nyingi kinazidi kiwango cha vifo vinavyotokea wakati wa kulazwa. Nchini Tanzania, kuna uhaba wa taarifa kuhusu kiwango cha vifo baada ya kuruhusiwa na sababu zake miongoni mwa watoto wenye umri wa miaka 5-14.

Malengo: Kubaini kiwango cha vifo baada kuruhusiwa hospitali, na viashiria vyake miongoni mwa watoto wenye umri kati ya miaka 5-14 waliolazwa katika Hospitali ya Taifa Muhimbili (MNH), Taasisi ya Moyo Jakaya Kikwete (JKCI), na Taasisi ya Mifupa Muhimbili (MOI).

Njia: Utafiti huu ulifanyika katika Hospitali ya Taifa Muhimbili (MNH), Taasisi ya Moyo Jakaya Kikwete (JKCI), na Taasisi ya Mifupa Muhimbili (MOI) kwa kuzingatia njia za kisayansi za kitafiti. Dodoso lilitumika kukusanya taarifa za kidemografia, taarifa za mgonjwa na matokeo ya matibabu. Mgonjwa alifuatiliwa kwa kipindi cha miezi mitatu baada ya kuruhusiwa kubaini hali yake. Viashiria vilivyohusishwa na vifo baada ya kuruhusiwa hospitali vilitokana na taarifa zilizokusanywa kwenye dodoso.

Matokeo ya Utafiti: Jumla ya washiriki 786 walihusishwa kwenye utafiti huu. Wastani wa umri wa washiriki ulikuwa miaka saba na nusu. Kulikuwa na ongezeko dogo la watoto wa kiume ambao walikuwa asilimia 59.4%. Kati ya washiriki 744 walioruhusiwa Kiwango cha vifo baada ya kuruhusiwa kutoka hospitali kilikuwa asilimia 2.9%. Watoto walioishi na Ukimwi na wale wenye magonjwa sugu ya figo walikuwa katika hatari zaidi ya kufariki baada ya kuruhusiwa.

Kuugua kwa muda mrefu (zaidi ya wiki mbili), na kutoka hospitali kinyume na ushauri wa daktari kuliongeza hatari ya vifo baada ya kuruhusiwa hospitali. Zaidi ya asilimia 50 ya vifo vilitokea ndani ya mwezi mmoja baada ya kuruhusiwa hospitali, huku zaidi ya nusu ya vifo hivyo vikitokea majumbani. Homa ya mapafu na saratani iliyosambaa zilichangia sababu za vifo hivyo kwa asilimia kubwa.

Hitimisho na Mapendekezo: Matokeo ya utafiti yanaonyesha hitaji la kuboresha huduma za ufuatiliaji kwa watoto wenye umri wa miaka 5-14, hususani wale wenye magonjwa ya muda mrefu au waliotoka hospitali kinyume na ushauri wa daktari. Vifo vingi vilitokea ndani ya mwezi wa kwanza baada ya kuruhusiwa hospitali, mara nyingi majumbani, ikionesha umuhimu wa kufuatilia mapema baada ya kuruhusiwa hospitalini kwa wagonjwa walio katika hatari kubwa.

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ABBREVIATIONS

ANC	-	Absolute Neutrophil Count
ED	-	Emergency Department
HB	-	Haemoglobin
HIV	-	Human Immunodeficiency Virus
IRB	-	Institutional Review Board
JKCI	-	Jakaya Kikwete Cardiac Institute
LMIC	-	Lower and Middle-Income Countries
LRTI	-	Lower Respiratory Tract Infections
MIC	-	Middle-Income Countries
MNH	-	Muhimbili National Hospital
MOI	-	Muhimbili Orthopaedic Institute
MUHAS	-	Muhimbili University of Health and Allied Sciences
PDM	-	Post Discharge Mortality
PMTCT	-	Prevention of Mother to Child Transmission
PPDM	-	Paediatrics Post-Discharge Mortality
SCD	-	Sickle cell disease
SDG	-	Sustainable Development Goals
SPSS	-	Statistical Package for Social Sciences
UN	-	United Nations
WBC	-	White Blood Cell

DEFINITION OF TERMS

Post-discharge mortality- This was defined as death occurring after 24 hours of discharge from the index admission and within 3 months of follow-up.

Discharge against medical advice- This was defined as discharge requested by the patient against the clinician's advice.

Abscondment- was defined as leaving the hospital without written documentation of discharge.

Symptoms of anemia-Included history of recurrent blood transfusion and/or palpitations.

Severe anemia- was defined as a hemoglobin level less than 7g/dL.

Moderate anemia- was defined as a hemoglobin level between 7-<10g/dL

Mild anemia- was defined as a hemoglobin level between 10-<11g/dL

Normal hemoglobin- was defined as hemoglobin level ≥11g/dL

Respiratory symptoms- were defined as symptoms of cough and/or dyspnea.

Abnormal renal functions- were defined as elevated creatinine and/or elevated blood urea nitrogen above the upper reference values for age.

Elevated liver enzymes- were defined as more than 2 times the upper limit of normal AST and/or ALT levels ≥35µmol/L.

Tachypnoea- was defined as a respiratory rate >30 breaths/minute at rest.

Tachycardia- was defined as a heart rate of >100 beats/minute at rest.

Fever- was defined as axillary temperature recorded at admission > 37.5C.

1.0 INTRODUCTION

1.1 Background

The third United Nations (UN) Sustainable Development Goals (SDG) are aimed at ensuring healthy lives and promoting health for all (1). In implementing the UN's third SDG, most of the global initiatives have been directed towards ending under-five mortality while similar efforts have not been made for children aged 5-14 years (2–4).

It was estimated that an average of 1 million children aged 5-14 years died in 2016 (3), with 98% residing in Low- and Middle-Income Countries (LMIC) (4–6). The available data describes the overall mortality rates but the post-discharge mortality (PDM) in children aged 5-14 years remains under-reported across the globe.

Children aged 5-14 years in Sub-Saharan Africa (SSA) face higher mortality rates compared to High-Income Countries (HICs) (5,7,8). Data on PDM in SSA for this age group is limited, with most studies combining it with under-five data (9–11). Only one study provided separate PDM statistics for children aged 5-14 years, reporting a mortality rate of 3.7 within the first three months following hospital discharge (12).

In Tanzania, the mortality decline among older children and adolescents was slow in the first two decades from the year 1990, then increased (13). Urban areas have higher mortality rates, possibly due to under-reporting in rural areas, and increased injury risks (14). There is a paucity of data on post-discharge mortality for children above 5 years in Tanzania, available data includes children below 5 years (10,15).

The overall leading causes of death for children aged 5-14 years globally are injuries, lower respiratory tract infections, diarrhea diseases, and meningitis (4). Infectious causes prevail in LMICs, especially in SSA (3,6,16–18). Available data describes overall mortality causes, but specific data on PDM causes for this age group is lacking globally. In Tanzania, PDM among older children is attributed to chronic conditions including sickle cell disease, neurological diseases, and heart diseases (10).

Limited global data exists on predictors of PDM for children aged 5-14 years. Studies report hemodynamic instability, long hospital stays, and low parental education correlate with PDM (12,19). In SSA, conditions linked to in-hospital mortality also increase PDM risk (12,20). In Tanzania, severe anemia, renal dysfunction, and respiratory illnesses were associated with PDM risk, according to Hau et al (10).

Currently, in-hospital mortality has declined significantly due to improved triaging and emergency services (21), but strategies to reduce PDM are lacking. Under-five PDM continues to receive much attention, while limited research exists on PDM among children aged 5-14 years (4). This study aims to determine the PDM rate and its predictors in children aged 5-14 years using data from three tertiary facilities in Tanzania.

1.2 Problem Statement

Global mortality for children aged 5-14 years is reported to be high in low and middle-income countries (22), predominantly (55%) in Sub-Saharan Africa (5). Studies show that paediatric post-discharge mortality rates irrespective of age in LMICs surpass in-hospital deaths (10,20,23), with the majority of the deaths occurring outside hospital settings (20).

In Sub-Saharan Africa (SSA), there is limited research on post-discharge mortality (PDM) among children aged 5-14 years, despite their significant mortality burden. Recent systematic reviews indicate a lack of specific data for this age group, with studies often combining data for older children with that of under-fives (20,23).

There is a lack of data in our setting. We do not know the burden of PDM and its predictors among children aged 5-14 years who are discharged from Muhimbili National Hospital, Muhimbili Orthopedic Institute, and Jakaya Kikwete Cardiac Institute.

1.3 Rationale

This study aims to analyze the burden of post-discharge mortality (PDM) among children and adolescents aged 5-14 years, an age group historically underrepresented in research. By shedding light on this overlooked age group, the findings of this study will heighten awareness among clinicians and health researchers.

Additionally, the study aims to identify predictors of mortality after discharge in this age group, thereby facilitating the development of evidence-based strategies for effective post-discharge follow-up care. Furthermore, the data obtained from this study will serve as crucial baseline information for future research endeavors, potentially contributing to the establishment of predictive models for PDM in children aged 5-14 years.

1.4 Conceptual Framework

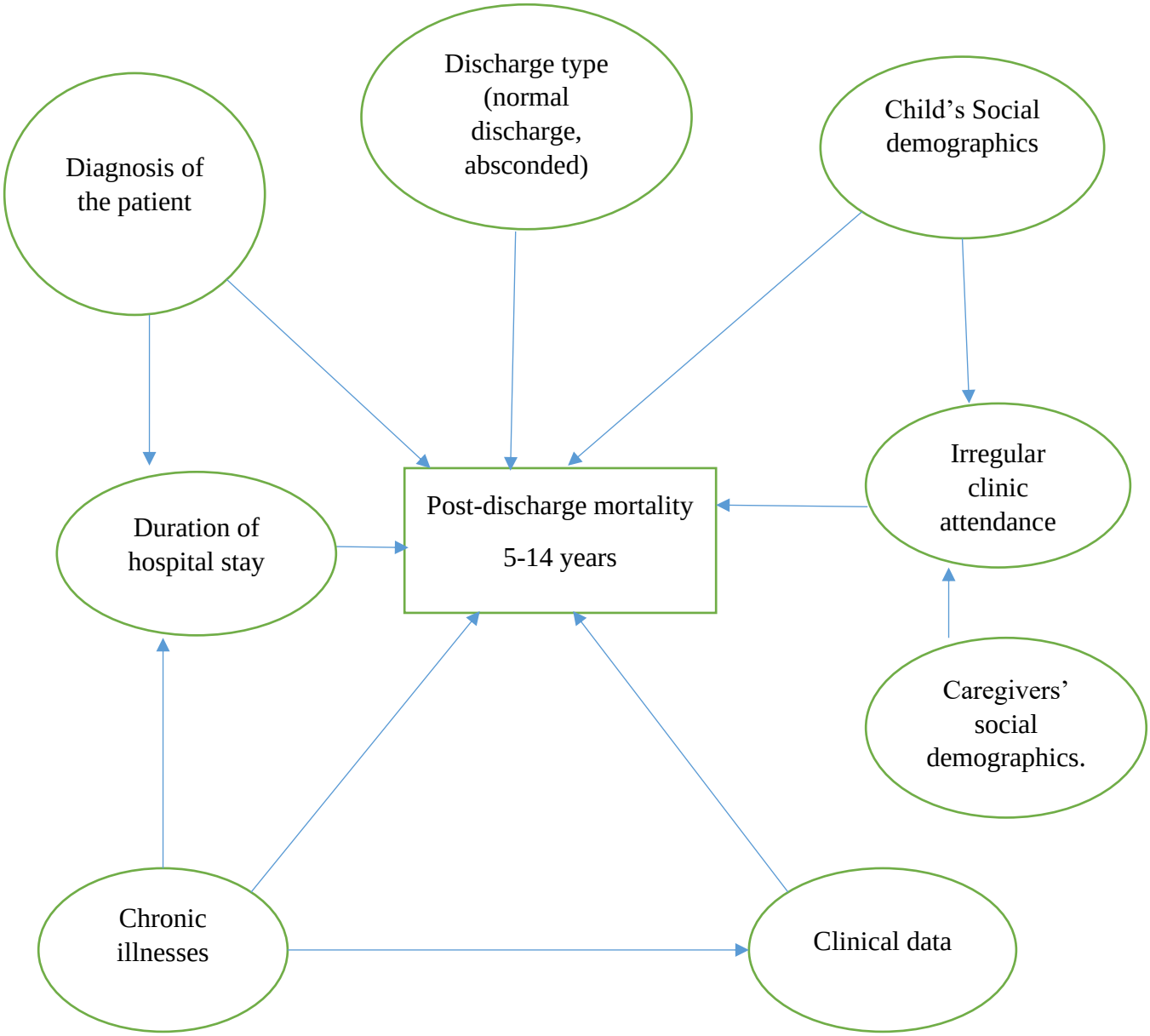


Figure 1: Conceptual framework

Conceptual framework: The proposed independent variables consisted of demographics, including age and sex, health insurance status, clinical characteristics including signs, symptoms, and laboratory values, discharge type, duration of hospital stay, clinic follow-up, and patient diagnosis. Based on previous research findings in younger children, it is anticipated that these variables will directly influence the dependent variable: post-discharge mortality at three months.

A correlation exists between the patient's diagnosis and the duration of hospitalization, thereby potentially affecting PDM. The nature of the patient's diagnosis is likely to influence the length of their hospital stay, while concurrently, the duration of hospitalization can impact the rate of PDM. Furthermore, the presence of chronic illnesses, including sickle cell disease, HIV disease, and neoplasms, may independently influence PDM or affect specific clinical and laboratory parameters as well as the duration of hospital stay.

Caregivers' level of education, as well as the age and sex of the patient, are anticipated to serve as moderator variables. Higher levels of caregiver education are expected to correlate with increased health-seeking behavior, potentially reducing the risk of PDM. Children with insurance coverage and older children capable of independently attending clinic appointments are more likely to adhere to follow-up protocols compared to uninsured children from economically disadvantaged backgrounds, particularly those reliant on parental or guardian assistance for clinical care attendance.

1.5 Research Questions

1. What is the mortality of children aged 5-14 years within 3 months following discharge from paediatrics wards at MNH, JKCI, and MOI?
2. What are the predictors of post-discharge mortality among children aged 5-14 years admitted to paediatrics wards at MNH, JKCI, and MOI?

1.6 Objectives

1.6.1 Broad Objective

To determine the post-discharge mortality rate and its predictors among children aged 5-14 years admitted to paediatric wards at MNH, JKCI, and MOI.

1.6.2 Specific Objectives

1. To determine the post-discharge mortality rate among children aged 5-14 years admitted to paediatrics at MNH, JKCI, and MOI.
2. To determine the predictors of post-discharge mortality among children aged 5-14 years admitted to paediatrics at MNH, JKCI, and MOI.
3. To determine the causes of post-discharge mortality among children aged 5-14 years admitted to paediatrics at MNH, JKCI, and MOI.

2.0 LITERATURE REVIEW

2.1 The burden of post-discharge mortality among children aged 5-14 years:

Over the past three decades mortality among children aged 5-14 years has declined from 1.7 million to 1 million translating to a 41% reduction (2,7). Mortality rates for children under five have decreased by over 50% during the same period (4). This disparity likely stems from uneven efforts in mortality reduction, with greater emphasis placed on children under the age of five (7).

It was projected that approximately 23 million older children and adolescents will die between 2020 and 2030 without intervention, with 71% of these deaths anticipated in Sub-Saharan Africa (SSA) (8). The existing literature addresses the overall mortality rate and risks among older children and adolescents while PDM among children of this age group remains unexplored.

In a recent systematic review of studies conducted in LMICs, the PDM rates ranged between 1-18% across various regions (23). The observed variation in PDM rates can be attributed to differences in study designs and the duration of follow-up in individual studies. Another limitation of the data from this systematic review was the predominance of studies focusing on children under five years old, with insufficient isolated data describing PDM rates specifically for children aged 5-14 years.

In Guinea, Veirum et al. documented an increased risk of post-discharge mortality among children aged 5-14 years compared to the general community risk (12). The authors noted a 4% mortality rate among older children; however, this figure may be underestimated as only 19% of participants in the study were children above 5 years. This underscores the underrepresentation of older children in the study, cautioning against making broad generalizations of the findings.

In Tanzania, Hau et al reported a higher burden of PDM among children aged 5-12 years, whereby the mortality was 23.3% (10). This higher PDM burden, exceeding rates in other studies, it is attributed to the prolonged follow-up duration of up to 12 months post-discharge. However, caution is warranted in interpreting these results, as many causes of death may be unrelated to the initial admission and influenced by the extended follow-up period.

Hau et al. included children aged 2-12 years in their study, with those above 5 years being underrepresented, thereby limiting the generalizability of their reported results for this age group (10). Additionally, Lyimo et al. reported a higher PDM rate of 9.9% in a study conducted at MNH (15), which may be attributed to the cohort consisting of sicker children admitted to the ICU. There are no other studies in the scientific literature that have assessed the PDM burden among children aged 5-14 years in Tanzania.

2.2 The causes of post-discharge mortality among children aged 5-14 years:

The overall primary causes of mortality vary across different WHO regions. In the WHO European region, non-communicable diseases are the predominant causes among children aged 5-14 years, whereas infections remain prominent in the WHO African region. Globally, according to the 2019 WHO report, injuries are the leading cause of death among children older than five years (24).

Additionally, interpersonal violence and self-harm are notably reported causes of mortality among older children in developed nations (3). Injuries, including road accidents and drowning, are also reported as contributors to mortality among older children. This can be attributed to their heightened engagement in risky behaviors and increased outdoor activities compared to younger age groups.

Infections including lower respiratory tract infections (LRTIs), diarrhea, and meningitis are commonly reported in studies from LMICs, where factors such as inadequate sanitation, impoverished socio-economic conditions, limited vaccine coverage, and deficient health infrastructure prevail (3,25,26). Additionally, neglected tropical diseases and malaria are also cited as contributors to mortality among children in LMICs (6).

This aforementioned data provides an overview of the overall primary causes of mortality globally among children aged 5-14 years but does not specifically address the causes of post-discharge mortality (PDM) within this age group. The global data on the specific causes of post-discharge mortality in this age group is still lacking.

A recent systematic review of paediatrics PDM in resource-poor countries revealed that most of the deaths were attributed to malnutrition and infections, including pneumonia and HIV (23). Corresponding results were observed in a study by Veirum et al. in Guinea, indicating that common admission diagnoses were also the primary causes of PDM, particularly infections such as diarrhea illnesses (12). The aforementioned data on the causes of PDM focused on children <5 years, while data on specific PDM causes for children aged 5-14 years is still lacking.

In the two studies conducted in Tanzania, chronic illnesses such as cancer, sickle cell disease, severe malnutrition, neurological diseases, and heart diseases were identified as contributors to post-discharge mortality (PDM) among older children. However, both studies lacked specific data on PDM causes for children aged 5-14 years, with older children being underrepresented in both cohorts (10,15).

2.4 The predictors of post-discharge mortality among children aged 5-14 years:

Globally, data are scarce on predictors of post-discharge mortality (PDM) among children aged 5-14 years. Literature from the Philippines highlights risks for PDM among children under five, including prolonged hospital stays, illness severity, and low caregiver education (19). These findings suggest that poor health-seeking behavior and delayed presentation, particularly among children with less educated caregivers, may contribute to severe illness at admission and increased risks of morbidity and mortality post-discharge.

Limited studies conducted in Africa have demonstrated an association between low socioeconomic status, indicated by poor housing quality and low caregiver education, clinical signs at admission (e.g., tachypnea, weak pulse, hypoxia, jaundice, hepatomegaly), and discharge against medical advice or without evaluation, with all-cause PDM among children aged 5-14 years (9,12,17). Furthermore, it is noted that diagnoses leading to in-hospital mortality often results in PDM as well (12).

The reported predictive factors from studies conducted in Africa suggest that many clinical predictors reflect hemodynamically unstable patients presenting with multi-organ damage, leading to poor outcomes post-discharge. Additionally, the higher mortality observed among those discharged against medical advice may be attributed to incomplete treatment or inadequate counseling, both of which contribute to the observed poor outcomes.

Paediatrics post-discharge mortality (PPDM) occurs predominantly within the initial months following discharge, regardless of age, as evidenced by several studies (12,20,27). This phenomenon is likely attributed to challenges associated with the transition of care from hospital to home-based care, where medication adherence may be a challenge. Moreover, a notable proportion of post-discharge deaths occur outside hospital settings, possibly due to delays in seeking further medical attention (20,23).

In Tanzania, there is a lack of specific data on predictors of PDM for children aged 5-14 years. The available data primarily focuses on children under 5 years (10). The reported predictors included clinical parameters such as proteinuria, hematuria, tachypnea, hypoxia, altered level of consciousness, and chronic illnesses such as cancer, neurological illnesses, heart diseases, and severe malnutrition (10). Most other paediatric mortality studies in Tanzania either solely address in-hospital mortality or concentrate on PDM among children under five (15,28,29).

3.0 METHODOLOGY

3.1 Study Design

This was a prospective observational cohort study conducted to analyze the burden of post-discharge mortality and its predictors among children aged 5-14 years admitted to paediatrics wards at Muhimbili National Hospital (MNH), Jakaya Kikwete Cardiac Institute (JKCI), and Muhimbili Orthopedic Institute (MOI).

3.2 Study Area

The study was conducted at the paediatrics departments of three hospitals, MNH, JKCI, and MOI, which are located in one compound and are teaching hospitals for the Muhimbili University of Health and Allied Sciences (MUHAS).

MNH: is a national referral hospital with a bed capacity of more than 1500. The paediatrics department at MNH has 6 main units namely; general paediatrics, acute care unit, infectious/diarrhea unit, malnutrition unit, haemato-oncology unit, and neonatal unit. The paediatrics building also houses other specialized units such as paediatric general surgery, ophthalmology, burn, dental, ENT, and urology units. The paediatric wards admits children aged from 0 days to 14 years.

On an average day, the paediatrics units admit 3 to 15 children, varying with the season. Monthly admissions for children aged 5-14 years at MNH range from 140 to 160.

JKCI: is a government-owned specialized cardiac hospital with a capacity of 103 beds. The paediatric department at JKCI has an average outpatient patient load of 140 per day. Children aged 1 month to 14 years are admitted to the paediatric department at JKCI and an average of 80-100 children are admitted monthly.

MOI: is also a public specialized hospital for trauma, orthopedic, and neurosurgical services with a capacity of 362 beds. The paediatric unit at MOI admits children aged 1 month to 14 years on an average of 10-15 patients a month.

3.3 Study Population

All children aged 5-14 years discharged from paediatrics wards at MNH, JKCI, and MOI were eligible for the study if they provided assent and caregivers consented to participation.

3.4 Sample Size

The sample size was calculated using the open Epi Fleiss method for rates and proportions(30). All variables which are the presumed exposures were considered in sample size calculations utilizing findings from a previous study conducted in Northern Tanzania(10).

The variables included were low Hb, proteinuria, hematuria, having a diagnosis of cancer, heart disease, sickle cell disease, neurological disease, and clinical findings of higher respiratory rate, low oxygen saturation, low Glasgow Coma Scale (GCS), reduced urine output, and lower limb edema.

All the variables were entered into the formula comparing outcomes among exposed and unexposed. The variable "hematuria," which exhibited the largest sample size, was chosen for analysis. The post-discharge mortality rate from those who presented with haematuria on urinalysis was 40% in a study done in Mwanza by Hau et al (10).
Whereby:
Two-sided confidence level (1-alpha): 95
Power (% chance of detecting): 90
The ratio of sample size, unexposed/exposed: 24.3
Percentage of exposed with an outcome (patient who died and had proteinuria) 40%
Percentage of unexposed with an outcome (patient who died but never proteinuria) 16%
Odds ratio: 2.5

- Sample size - exposed: 28
- Sample size - unexposed: 669
- Total sample size: 697
- The minimum sample size was 593

After adjusting for a 5% non-response a final sample size of 734 was reached.

The sample was distributed based on the proportion of admissions from the three hospitals. Considering the admission rate of 30, 50, and 160 patients per month at MNH, JKCI, and MOI respectively, the sample was calculated as the proportion of admissions at every institute multiplied by the calculated sample size.

Whereby:

MNH: sample size= 160/ (30+50+160) x 734 = 489

JKCI: sample size= 30/ (30+50+160) x 734 = 92

MOI: sample size= 50/ (30+50+160) x 734 = 153

The participants in all three institutes were recruited consecutively at the admission

3.5 Inclusion Criteria

1. All children aged 5-14 years who were admitted to paediatrics wards at JKCI, MOI, and MNH whose parents/guardians consented for them to participate in this study. Older children (>7 years) who were developmentally capable also provided assent.

3.6 Exclusion Criteria

1. All children who died before discharge during enrollment.

3.7 Variables

Independent variables- These included demographics, clinical characteristics, type of discharge (i.e. against medical advice or Normal discharge), and patient diagnoses. The clinical characteristics comprised the presenting complaints, duration of symptoms before admission to either hospital, duration of hospital stay, clinical signs, and laboratory parameters.

The discharge type was documented as either normal, against medical advice, or abscondment. Respiratory symptoms were cough and/or dyspnoea, while anemia symptoms included history of blood transfusion and/or palpitations.

During clinical assessment, the respiratory rate (RR) was categorized as normal if it was <30 breaths/minute, while a rate ≥ 30 was considered tachypnea. Similarly, a heart rate (HR) ranging between 60-100 beats/minute (bpm) was deemed normal, with rates >100bpm indicating tachycardia, and those below 60bpm classified as bradycardia. Hypoxia was defined as oxygen saturation <90%, as measured by a pulse oximeter on the index finger.

Furthermore, pallor was noted if observed on the conjunctiva or palmar/plantar regions, and jaundice was recorded if noted on the sclera or other body parts. Cyanosis, whether peripheral or central, was also documented. Edema, whether localized (e.g., lower limbs, facial, or ascites) or generalized, was also recorded. Axillary temperature >37.5c was identified as fever.

Severe anemia was classified as hemoglobin (Hb) levels <7g/dL, while moderate and mild anemia were classified as Hb levels between 7-<10 g/dL, and 10-<11 g/dL respectively. Normal levels of Hb were defined as ≥11g/dL. Hyponatraemia was classified as sodium (Na+) levels <135µmol/L, while hypernatraemia was indicated by levels exceeding 145µmol/L. Hypokalaemia was defined as potassium (K+) levels <3.5µmol/L, and hyperkalemia as levels >5.5µmol/L.

Leukocytosis was indicated by a White Blood Cell (WBC) count >11X10^9/L, while leucopaenia was defined as a WBC count <4X10^9/L. Neutrophilia was characterized by an Absolute Neutrophil Count (ANC) >7X10^9/L, whereas neutropenia was defined as ANC <1.5X10^9/L. Abnormal renal function was identified by elevated creatinine (>88µmol/L) and/or blood urea nitrogen (>7.4µmol/L).

Elevated liver enzymes were identified when ALT and/or AST levels >X2 the upper limit of normal (ULN) (>35µmol/L). Platelet counts within the range of 100-450x10^9/L were considered normal, while counts <100x10^9/L indicated thrombocytopenia, and counts >450x10^9/L indicated thrombocytosis.

Dependent variables- The primary outcome was post-discharge mortality within 3 months, defined as any death occurring after hospital discharge and within 90 days following the first recorded admission during the study period. Secondary outcomes included hospital readmissions and unplanned outpatient visits.

3.8 Data Collection Methods

Participants were consecutively recruited upon admission at all three institutions from May 2023 to Jan 2024. Data collection was conducted by three research assistants, including the primary investigator. The three research assistants were medical doctors with a degree in doctor of medicine and none of them was involved in the care of the patient. Data collection was conducted daily, including weekends and public holidays.

There was one training session which lasted for two hours for the research assistants. During the training session, the study's primary investigator introduced the objectives of the study and the tools to be used for data collection, and all questions were discussed.

Additionally, research assistants were trained in interviewing skills for participant follow-up post-hospital discharge. Instructions were provided on effective telephone communication and managing participant emotions in the event of a deceased child. Following a pilot study conducted in the three hospitals MNH, JKCI, and MOI, the data collection tools were revised to clarify unclear questions and provide necessary clarifications.

Participants were recruited upon admission and followed up on alternate days in the ward until discharge. Follow-up continued for three months post-discharge or until death occurred using phone calls at 1, 2, and 3 months. Data collection utilized a structured questionnaire comprising of three parts, administered by the research assistants.

The first part of the questionnaire collected demographic data including the child's age, sex, insurance status, and caregiver's information including age, education level, and employment status. Clinical information from admission including presenting symptoms and duration, diagnosis, laboratory test results, duration of hospital stay, and outcomes of admission were extracted from participants' hospital charts and recorded in the first part of the questionnaire.

Caregivers provided three telephone contacts: their own and two others for close family members who could be reached if they were unavailable. These contacts were recorded in the first part of the questionnaire for follow-up at months 1, 2, and 3 post-discharge. The information obtained in the post-discharge follow-up was recorded in the second part of the questionnaire and included the participant's status (alive or deceased), overall participant's condition, readmission, and unplanned hospital/outpatient visits.

Details of the deceased individual were recorded in the third part of the questionnaire where a modified verbal autopsy form was used to collect information for determining the possible cause of death. The verbal autopsy interview was conducted by the study's primary investigator. Research assistants asked the caregiver's permission for a verbal autopsy phone interview after identifying the deceased participant.

3.9 Verbal Autopsy

A modified WHO verbal autopsy tool (31), consisting of three sections, was used to determine the cause of death. The first section collected demographic data including the child's age at death, the date of death, and the place of death (hospital or outside hospital). The second section collected information on symptoms preceding death, any previous illnesses leading up to these symptoms, and the duration of the illness preceding death.

Additionally, the time elapsed from symptom onset to death was also recorded in the second section. Clinical signs preceding death and treatment provided were extracted directly from the caregiver's description through guided questions featured in the third section.

Deceased participants' caregiver or other close family member was identified during follow-up phone calls and informed about the verbal autopsy process. Participants were briefed on the objective of the activity, which aimed to identify common post-discharge mortality causes for future prevention measures. They were asked if they would participate to identify the cause of death. Those who consented were subsequently interviewed.

Participants experiencing emotional distress during the phone call were met with empathy from the interviewer, who acknowledged the challenges of coping with grief. They were encouraged to express their feelings, and their emotions were validated. A gentle language was used during the conversation.

Individuals who found the conversation too uncomfortable were respectfully asked to be contacted later and advised to seek support from any trusted family member or friend. All participants were thanked for their participation, and a follow-up phone call was made to ensure their emotional well-being. Those who were persistently distressed in the follow-up call were advised to seek psychological support from the clinical psychologist.

3.10 Data Analysis

Data was entered into SPSS version 25. Categorical variables were described as proportions (percentage), and continuous variables as means with standard deviations. Univariable and multivariable Cox regression analysis was used to determine factors associated with mortality. All factors that were significantly associated with mortality in the univariable analysis were included in the multivariable analysis.

The survival rate was displayed using the Kaplan-Meier curve, and a log-rank test was used to compare the mortality rates between different categories that showed significant association in the multivariate analysis. Hazard ratios and their 95% confidence intervals were reported with a significance level of 5%.

3.11 Ethical Issues

Ethical approval with reference number 04-2023-1662 was granted by the MUHAS institution review board, permission was obtained from the management of the three involved hospitals. Informed consents were obtained from parents/guardians before recruitment and children aged 7 years and above were asked to give assent.

4.0 RESULTS

4.1 Study Enrollment

A total of 786 participants were enrolled, out of which 647 (82.3%) were from Muhimbili National Hospital (MNH), 48 (6.1%) and 91 (11.6%), were from Jakaya Kikwete Cardiac Institute (JKCI) and Muhimbili Orthopedic Institute (MOI) respectively.

Thirty-two participants (4%) died in hospital, 6(0.8%) of the remaining 754 absconded from treatment and 4 (0.5%) could not be reached out during follow-up. The remaining 744 (98.7%) were followed up using phone calls made to the parents/guardians or their designated proxies at 1, 2, and 3 months following their hospital discharge.

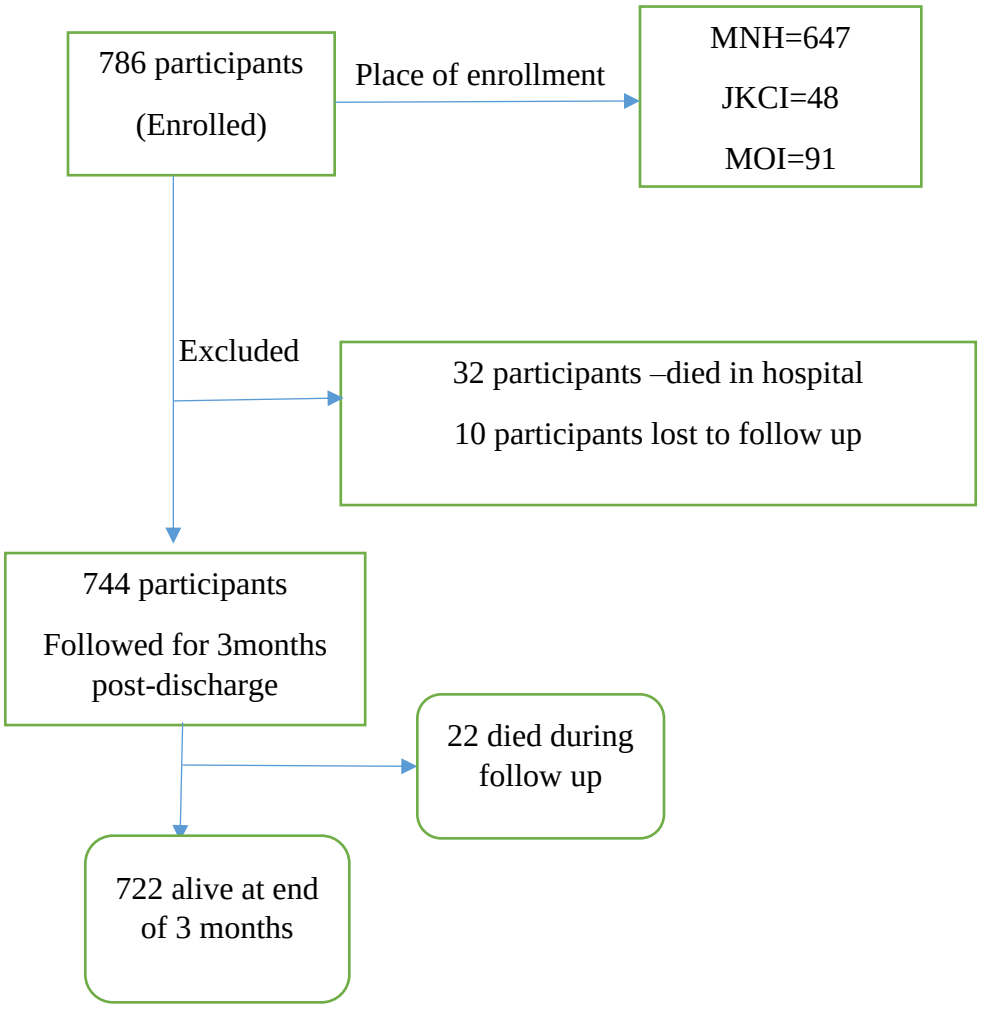


Figure 2: Flow Chart

4.2 Baseline Characteristics of the Study Participants

4.2.1 Social Demographics

Among the study participants, 59.4% were males. The median age of the study participants was 7 years (Interquartile range (1QR): 5-9 years). More than half (55.2%) of the participants had health insurance. Nearly half of the caregivers had a primary level of education (48.7%), and 13.2% were employed.

Table 1: Social demographic characteristics of the study participants

Variable		Frequency (n)	Percent (n)
Age groups	5-9 years	592	75.3%
	10-14 years	194	24.7%
Sex	Male	467	59.4%
	Female	319	40.6%
Health Insurance	Yes	434	55.2%
	No	352	44.8%
Caregiver's Education status	No formal education	51	6.5%
	primary education	383	48.7%
	secondary education	261	33.2%
	College/University	91	11.6%
Caregiver's employment status	Formal Employment	104	13.2%
	Other occupations	682	86.8%

4.2.2 Clinical Characteristics of Study Participants at Admission

The most commonly reported symptom on admission was fever followed by pain, respiratory symptoms such as cough and dyspnea, body swelling, and symptoms indicative of anemia, including recurrent blood transfusion and awareness of heartbeats.

More than half of the participants reported symptoms lasting for more than 2 weeks before admission, and most of them were hospitalized for more than 1 week. The median length of hospital stay was 7 days (Interquartile range (IQR): 4-17 days).

Table 2: Clinical characteristics (symptoms, duration of symptoms, and discharge status) of study participants

Variable		Frequency (n)	Percent (%)
Admission symptoms	Fever	210	26.8%
	Respiratory symptoms	177	22.5%
	Symptoms of anemia	139	17.7%
	Neurological symptoms	84	10.7%
	Bleeding	39	5.0%
	Sports Injuries	20	2.5%
	Pain	180	23%
	Body swelling	142	18%
	Weight loss and night sweats	52	6.6%
	Oliguria	34	4.3%
	GI complaints	73	9.3%
	Other complaints	165	21%
Duration of symptoms	< 2 Weeks	346	44%
	> 2 Weeks	440	56%
Duration of hospital stay	≤ 1 Week	402	51.1%
	> 1 Week	384	48.9%
Discharge status	Absconded	6	0.8%
	Against advice	4	0.5%
	Normal discharge	744	94.7%
	Deceased	32	4%

On admission, the most common signs observed were tachycardia, followed by tachypnea, pallor, and fever. Anemia was prevalent in over half of the participants, with most of the children experiencing moderate anemia, while a smaller proportion had mild or severe anemia.

Leukocytosis was observed in over a third of the participants, with neutrophils being the predominant white blood cell type. Electrolyte imbalances were also present, with hyponatremia, hypokalemia, and hyperkalemia being the commonest affecting different proportions of the participants,Table 3.

Table 3: Clinical characteristics (Signs, laboratory results) of study participants

Variable		Frequency (n)	Percent (%)
Signs at admission	Tachycardia (HR>100 bpm)	499	63.5%
	Tachypnea (RR>30bpm)	232	29.5%
	Fever (Temp>37.5c)	116	14.8%
	Hypoxia (Sats <90)	38	4.8%
	Pallor	168	21.4%
	Jaundice	43	5.5%
	Oedema	44	5.6%
	Heart Murmur	40	5.1%
	Digital clubbing	12	1.5%
	Displaced apex beat	16	2.0%
	Organomegally	59	7.5%
	Dysmorphism	6	0.8%
	Others	97	12.3%
Laboratory parameters	Anemia (Hb<11g/dl)	416	52.9%
	Severe anemia	103	24.8%
	Moderate anemia	194	46.6%
	Mild anemia	119	28.6%
	Leukocytosis	276	35.1%
	Leucopenia	47	6%
	Neutrophilia	240	30.5%
	Neutropenia	66	8.4%
	Thrombocytopenia	78	9.9%
	Abnormal renal Functions	131	16.7%
	Elevated Liver enzymes	62	7.9%
	Hyponatremia	199	29.1%
	Hypernatremia	12	1.8%
	Hypokalemia	83	14.6%
	Hyperkalemia	57	10%

4.2.3 Diagnoses of Study Participants

The frequency of reported diagnoses in this study is summarized in Table 4, the most frequent diagnosis was sickle cell anemia followed by lymphoma and acute lymphoblastic leukemia. HIV infection was noted in a small proportion of the participants.

The other reported diagnoses comprised aplastic anemia, rheumatic heart disease, congenital heart disease, burn injury, traumatic injury, and chronic kidney disease. The remaining diagnoses including other surgical conditions, hematological and infectious diseases, malignancies, and autoimmune conditions were grouped as others.

Table 4: Participants' diagnoses

Variable		Frequency (n)	Percent (%)
Patient diagnosis	Sickle cell anemia	116	14.8
	Acute lymphoblastic leukemia	42	5.3
	Aplastic anemia	12	1.5
	Lymphoma	54	6.9
	Acute myeloid leukemia	22	2.8
	Rheumatic heart disease	29	3.7
	Congenital heart disease	9	1.1
	Burn injury	30	3.8
	Traumatic injuries	78	9.9
	HIV	13	1.7
	CKD	9	1.2
	Other diagnoses	372	47.3

4.3 Outcomes of the Study Participants

The overall mortality was 6.9%. Twenty-two participants died after hospital discharge, with over half of these deaths occurring before hospital readmission. Post-discharge mortality rate, excluding losses to follow-up, was 2.9%. The median time to death after discharge was approximately 20 days.

Out of 744 participants, a small number were readmitted after discharge, with most being readmitted only once. Some participants reported unplanned outpatient hospital visits post-discharge. Fever was the primary reason for readmission and unplanned out-patient hospital visits (Table 5).

Table 5: Outcomes of the study participants

Variable	Frequency (n)	Percent (%)
Post-discharge deaths	22	2.9%
Place of death		
Within Hospital	9	40.9%
Died at home	13	59.1%
Readmission		
Re-admitted after discharge	58	7.8%
Frequency of readmission		
Once	42	72.4%
More than once	16	27.6%
Reasons for re-admission		
Fever	16	28%
Body swelling	4	7%
Pain	12	21%
Cough/DIB	7	12.1%
Vomiting	4	7%
Other reasons	15	26%
Unplanned outpatient visits		
Unplanned outpatient visit	109	14.7%
Reasons for unplanned outpatient visits		
Fever	32	29.4%
Vomiting	6	5.5%
Abdominal pain	4	3.7%
Loss of apetite	3	2.8%
Convulsions	6	5.5%
Body Malaise	15	13.8%
Awareness of heartbeats	8	7.3%
others	35	32.1%

4.4 Factors Associated with Mortality

The predictors of post-discharge mortality in this study were noted to be duration of symptoms of more than two weeks, discharge against medical advice, leukocytosi, HIV infection, and chronic kidney disease (Table 6).

Table 6: Univariate and multivariate analysis of factors associated with post-discharge mortality

Variable		Univariate Cox regression			Multivariable Cox regression		
		Crude HR	95 CI	P value	Adjusted HR	95 CI	P value
Age	5-9 years	1.28	0.49-3.03	0.6			
	10-14 years	Ref					
Sex	Male	1.33	0.56-3.13	0.5			
	Female	Ref					
Health insurance	Yes	2.57	1.04-6.36	0.003			
	No	Ref					
Duration of symptoms	> 2 Weeks	3.25	1.094-9.66	0.034	4.7	1.5-14.73	0.008
	< 2 Weeks	Ref					
Discharge type	Against advice	28.47	3.79-113.11	0.001	55.4	4.5-393.11	0.002
	Normal discharge	Ref					
Respiratory symptoms	Yes	2.97	1.23-7.17	0.015			
	No	Ref					
Oedema	Yes	2.92	1.21-7.05	0.017			
	No	Ref					
White cell count	Normal	Ref					
	High	11.48	2.87-45.89	0.001	7.947	1.97-32.03	0.004
	Low	5.10	1.60-16.26	0.006			
Neutrophil count	Normal	Ref					
	High	4.90	1.38-17.37	0.014			
	Low	2.80	0.94-8.3	0.06			
Anaemia	Moderate	7.92	2.21-28.40	0.001			
	Severe	10.47	2.71-40.50	0.001			
	No Anaemia	Ref					
Renal Functions	Abnormal	1.98	1.04-3.75	0.037			
	Normal	Ref					
Liver enzymes	Abnormal	2.12	1.22-3.70	0.008			
	normal	Ref					
HIV disease	Yes	15.23	4.48-51.76	0.000	9.83	2.3-41.54	0.002
	No	Ref					
CKD	No	Ref					
	Yes	13.15	3.1-46.51	0.001	18.26	1.3-39.27	0.027
Nephrotic syndrome	Yes	5.92	1.74-20.10	0.004			
	No	REF					
Readmission	Yes	3.30	1.1-9.93	0.034			
	No	Ref					

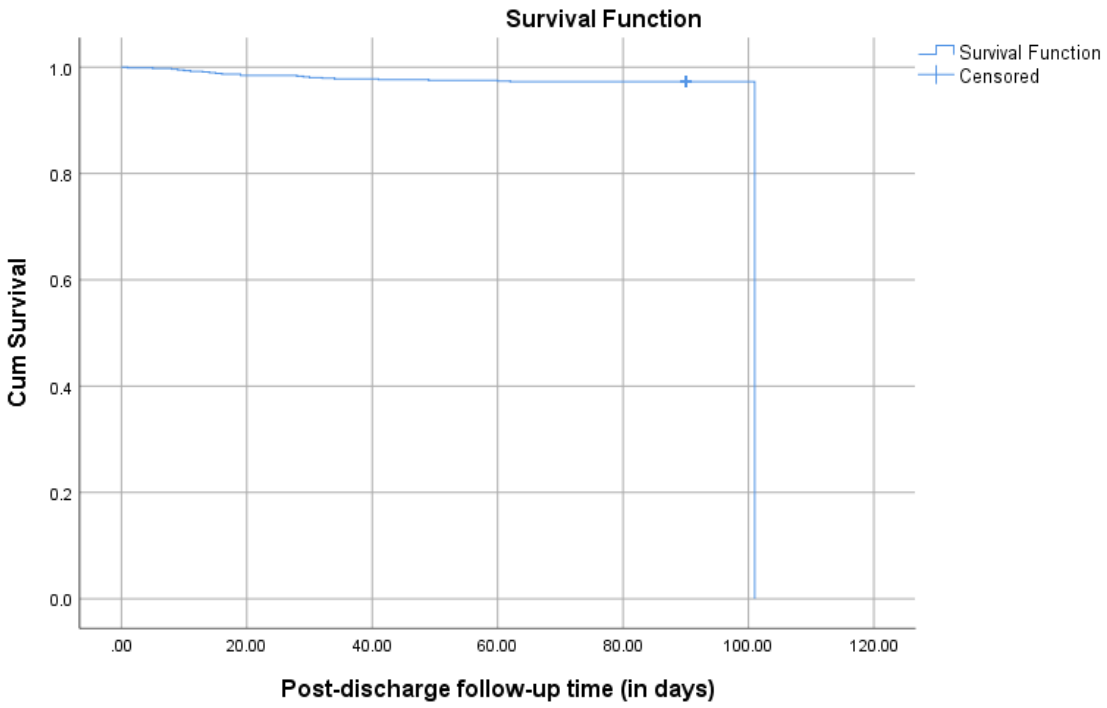


Figure 3: Kaplan Meier survival curve showing the overall survival post-discharge

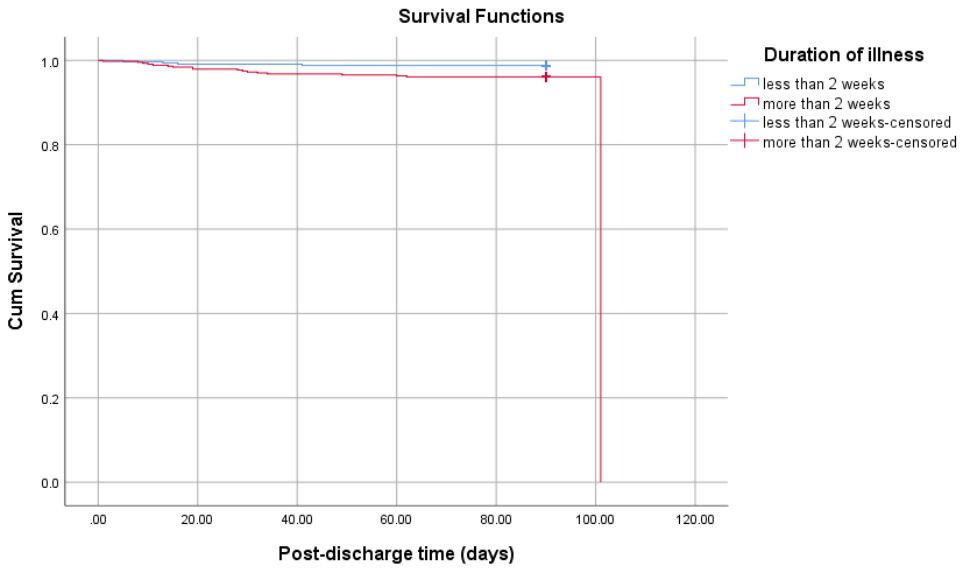


Figure 4: Kaplan Meier survival curve comparing children with less than 2 weeks duration of illness versus those with more than 2 weeks duration of illness. (P=0.008)

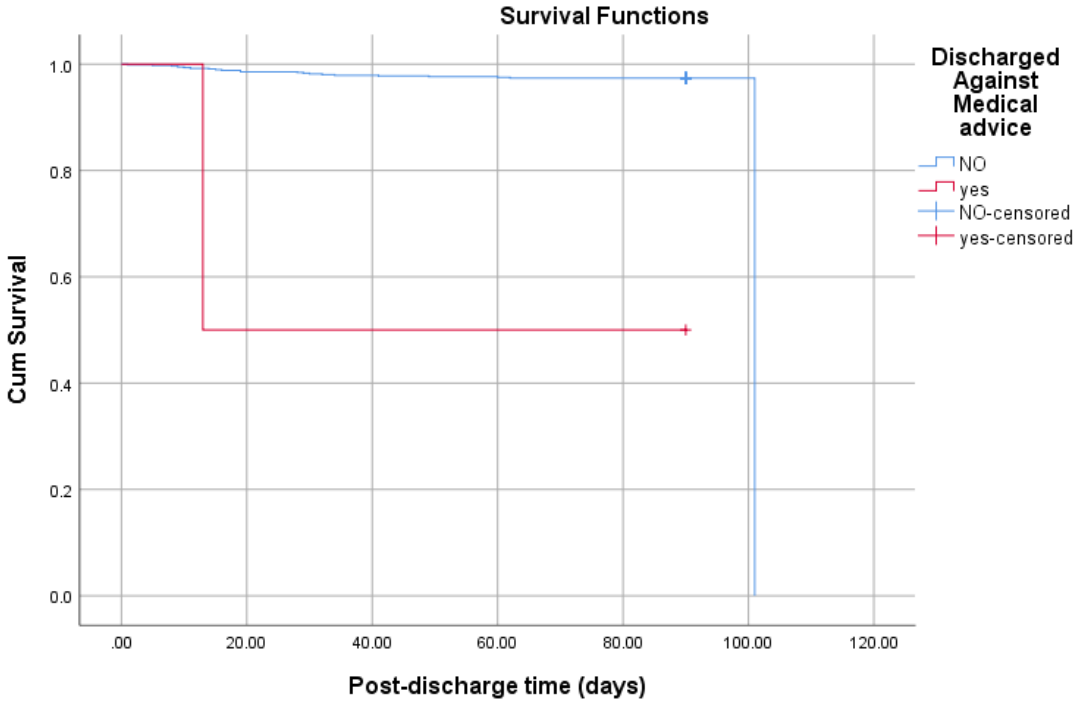


Figure 5: Kaplan Meier survival curve comparing children discharged against medical advice versus those discharged normally. (P=0.002)

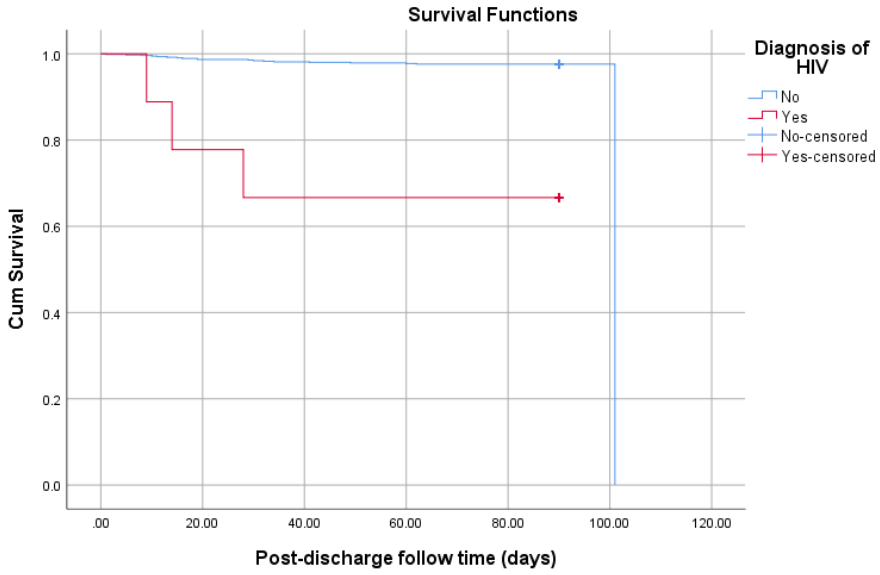


Figure 6: Kaplan Meier survival curve comparing children with or without HIV diagnosis (P=0.002)

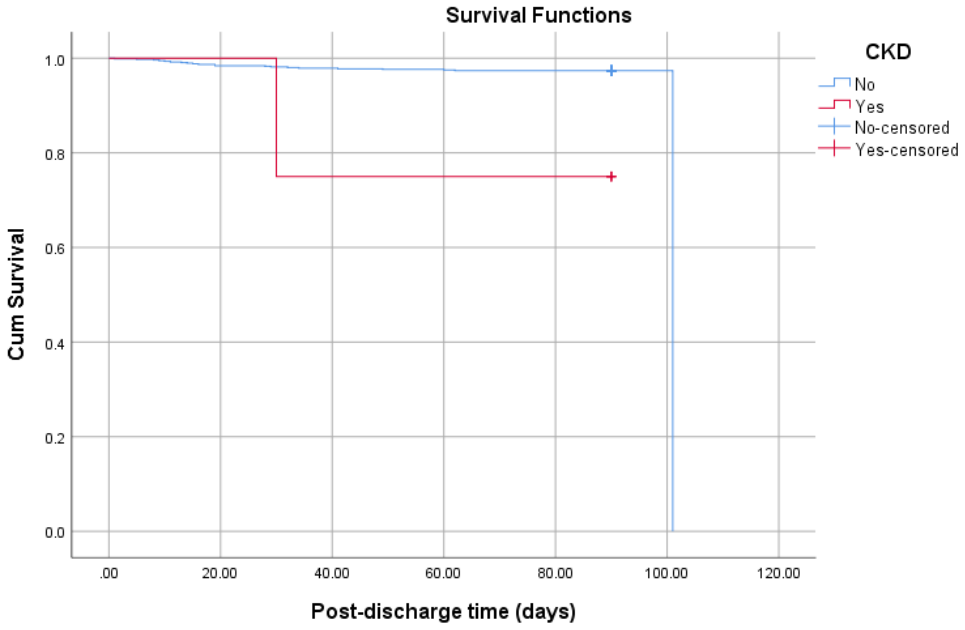


Figure 7: Kaplan Meier survival curve comparing children with or without Chronic Kidney disease (CKD) (P=0.027)

4.5 Post-Discharge Mortality Causes

The most common primary causes of mortality after hospital discharge were identified as pneumonia and malignancies. The other identified causes were septic shock, severe anemia, and hypovolemic shock.

Among the 22 deceased participants, the cause of death remained undetermined in some participants, whereby, three of these participants declined to participate in the call, and in the remaining five participants the cause was uncertain due to lack of enough information (Table 7).

Table 7: Post-Discharge Mortality Causes

Causes of post-discharge mortality	Frequency	percent
Pneumonia	4	18.2%
Malignancies	4	18.2%
Severe anemia	1	4.5%
Hypovolemic shock	2	9.1%
Septic shock	3	13.6%
Uncertain	5	22.7%
Declined the call	3	13.6%
Total	22	100%

5.0 DISCUSSION

Globally, the mortality rate among children aged 5-14 years is high (2), yet there remains a paucity of data regarding post-discharge mortality (PDM) for this age group, especially in Tanzania. This study aimed to determine the PDM and its predictors among children aged 5-14 years admitted to three tertiary facilities in Tanzania, utilizing clinical parameters for prediction.

The PDM in our study was almost similar to that of Southern Mozambique's, and falls within the range from systematic reviews in resource-poor countries (11,23). Participants with chronic conditions and those discharged against medical advice had higher PDM. Despite the seemingly low overall PDM observed in this cohort, these high-risk individuals represented a minority, indicating a potential for increased PDM within this group.

We found a lower PDM compared to studies by Hau et al. in Mwanza (10) and Veirum et al. in Guinea (12), both these studies were conducted in similar settings. However, the difference may be due to the fact that they had an extended 12-month follow-up, potentially capturing deaths unrelated to the initial admission or primary illness. Additionally, the study by Hau et al. included children below 5 years, a demographic known for higher mortality rates.

Children living with HIV had higher PDM, aligning with findings from a study by Madrid et al. and two systematic reviews in resource-poor countries (11,20,23). This increased mortality likely arises from emerging self-autonomy in this age group, posing challenges for drug adherence. The findings emphasize the importance of implementing effective post-discharge follow-up protocols in children living with HIV to reduce their risk of PDM.

Our findings highlight the increased PDM risk among children with chronic kidney disease (CKD), consistent with findings from a study by Hau et al (10). Children with CKD face progressive deterioration and may succumb without access to costly and inaccessible renal replacement therapy. Therefore, early post-discharge follow-up is crucial for identifying children with deteriorating renal function who may need renal replacement therapy.

Children with chronic conditions, defined as symptoms persisting over 2 weeks, were found to have increased PDM, consistent with findings in two other Tanzanian studies (10,15). The two studies conducted in Tanzania by Hau et.al and Lyimo et al identified a correlation between chronic conditions including sickle cell disease, neurological disorders, and heart diseases with PDM. This highlights a need for comprehensive follow-up plans after hospital discharge for children with chronic conditions.

Children who left against medical advice were found to have higher post-discharge mortality similar to findings from studies conducted in Southern Mozambique and Guinea Bissau (11,12), reflecting the challenges associated with treatment interruptions during critical illness. These findings highlight the importance of elucidating the reasons behind patients leaving against medical advice and enhancing continuity of care for this subset of patients.

In our study, a notable finding was the identification of a higher white cell count as an independent predictor of post-discharge mortality (PDM). Adult studies documented this association (33,34), but its significance in the paediatric population remains unexplored.

The median time to PDM in this cohort was about 20 days, with more than half of the deaths occurring within 1 month post-discharge. These findings align with findings from studies across different countries, highlighting the vulnerability of patients during the immediate post-discharge period (12,17). The transition from hospital-based to home-based care poses challenges in providing adequate attention, potentially compromising patient care (11).

Our study reveals a high PDM during the immediate period after discharge similar to findings from the study conducted in Mozambique (11). Additionally, the Mozambique study indicated a reduction in mortality after three months post-discharge emphasizing the critical nature of the initial three-month period. Strengthening follow-up plans, particularly during the first month post-discharge, is necessary as most deaths occur within this timeframe.

Furthermore, our study revealed that more than 50% of post-discharge deaths occur outside of the hospital setting, similar to findings from systematic reviews in Sub-Saharan Africa (20,23). Delays in seeking care and socio-economic challenges prevalent in these settings likely contribute to this trend. Enhanced follow-up of discharged patients is crucial to promptly identify those requiring medical attention, mitigating the risk of adverse outcomes at home.

The predominant causes of PDM in our study were pneumonia and malignancies, corresponding to findings from a study conducted at Muhimbili (15). However, a notable proportion of participants did not have an established cause of death, highlighting challenges in determining causes using verbal autopsy methods. A comparable difficulty in establishing the cause of death using verbal autopsy is also reflected in several other literature (15,35–37).

This cohort had a readmission rate within three months post-discharge, aligning with the literature, which reports varying rates across different disease conditions (38–40). Fever, a common symptom during initial admission in our study, similarly led to readmission, highlighting the importance of addressing underlying diseases comprehensively to mitigate the need for readmission.

In our study, some participants reported at least one unscheduled outpatient visit, a lower rate than that reported by Rees et al. in a study conducted in Tanzania (41), which included children < 5 years. The discrepancy may be due to the different age groups between the two studies. The primary reason for these visits in our study was fever, possibly stemming from incomplete treatment during admission, underscoring the importance of ensuring thorough treatment before discharge.

6.0 STRENGTHS OF THE STUDY, LIMITATIONS OF THE STUDY, CONCLUSION AND RECOMMENDATIONS

6.1 Strengths of the study

1. The study had a large sample size of participants from the three largest tertiary facilities in the country which provides a good representation of the general population of patients aged 5-14 years.
2. The monthly follow-up for up to three months post-discharge minimized recall bias among study participants.
3. All the participants provided more than one available phone contact which led to a very low rate of loss to follow-up, hence enhancing the reliability and completeness of the data.

6.2 Limitations of the study

1. Among the limitations of this study was a failure to get enough data to establish the causes of death in some of the study participants due to evoked emotions during verbal autopsy.
2. Unclear descriptions of symptoms provided over the phone by some of the parents/guardians posed challenges in translating the signs, thus impeding a comprehensive understanding of the underlying conditions leading to mortality in some participants.
3. The study was conducted in a tertiary facility, where more severe and complex conditions are typically managed, as a result, the findings may not be directly generalizable to settings with less complex and less severe conditions.

6.3 Conclusion

This study reveals an overall mortality rate of 6.9% and post-discharge mortality (PDM) of 2.9% among hospitalized children aged 5-14 years in Tanzania. Predictors of PDM included chronic kidney disease (CKD), HIV, leukocytosis, and symptom duration of more than two weeks, with most deaths occurring within the first month after discharge. Pneumonia and malignant conditions emerged as the predominant causes of post-discharge mortality.

6.4 Recommendations

1. Children with chronic conditions admitted to the ward should be scheduled for follow-up within two weeks after hospital discharge.
2. A plan to reduce the number of patients leaving against medical advice should be established as this raises their risk of post-discharge mortality.
3. Further research needs to be done to elucidate the biological pathways through which leukocytosis may contribute to post-discharge mortality.

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APPENDICES

Appendix I: Consent Form (English and Swahili Versions):

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES ETHICAL REVIEW BOARD

1. ENGLISH VERSION: This is an informed consent form for parents of children admitted to Muhimbili National Hospital (MNH), Jakaya Kikwete Cardiac Institute (JKCI), and Muhimbili Orthopedic Institute (MOI).

INTRODUCTION: My name is Elton Roman and I'm a resident in the paediatrics department at Muhimbili National Hospital, Dar-Es-Salaam. I'm researching to determine the predictors of post-discharge mortality among children admitted at MNH, JKCI, and MOI. I am going to give you information and invite you to be part of this research. Before you decide, you can talk to anyone you feel comfortable with about the research.

There may be some words that you do not understand. If you have questions, please ask me. You are allowed to interrupt me as I question you if anything is not clear.

Purpose of the research: The purpose of this research is to determine the predictors of post-discharge mortality among children aged 5-14 years admitted to paediatrics wards at MNH, JKCI, and MOI. The aim of this is to bring awareness about the burden of post-discharge mortality among children aged 5-14 years and the contributing factors. This research also aims to inform clinicians on the need to improve care and follow-up of children after they are discharged.

What does participation involve? This research will involve a questionnaire with multiple questions that aim at capturing the social demographics, disease history, and laboratory and imaging investigations. This questionnaire will be filled by taking information from your child's hospital file. To participate, you sign this consent form and answer the questions in the questionnaire. It will take approximately 5 minutes.

We are inviting all parents of children who are admitted to general paediatrics wards at MNH, MOI, and JKCI during this study period.

Your participation in this research is entirely voluntary. It is your choice whether to participate or not. Whether you choose to participate or not, all the services you receive will continue and nothing will change.

If you choose not to participate in this research project, you will receive the same treatment as if you would have participated. You may change your mind later and stop participating even if you agreed earlier.

CONFIDENTIALITY: The information that we collect from this research will be kept confidential. Information about you that will be collected during the research will be put away and no one but the researcher will be able to see it. We will not be sharing the identity of those participating in the research. The questionnaires will not have the names of the participants.

RISKS: By participating in this research, you will not be subject to any risks compared to parents/caregivers who will not participate.

RIGHT TO REFUSE OR WITHDRAW: You do not have to take part in this research if you do not wish to do so and refusing to participate will not affect your services at this ward in any way. You will still have all the benefits that you would otherwise have at this ward. You may stop participating in the research at any time that you wish without losing any of your rights as a client here. Your services at this ward will not be affected in any way.

BENEFITS: There may not be direct benefits for you now but your participation is likely to help us find the answer to the research question and help us establish the predictive score for both in-hospital and post-hospital mortality and save several lives of children. It will also inform the stakeholders and healthcare workers on preventive approaches to avoid unnecessary childhood deaths.

WHOM TO CONTACT: If you have any questions about this study or need to report a study-related problem you can contact the following:

Prof. Francis Furia (Supervisor)

Paediatrician,

Associate professor,

Paediatrics and Child Health Department,

Muhimbili University of Health and Allied Sciences (MUHAS)

P.O. Box 65001, Dar-Es-Salaam.

Telephone 0743-623381

Email: Fredrick.francis78@gmail.com

Dr. Stella Mongella (Co-Supervisor)

Paediatrics cardiologist,

Paediatrics and Child Health Department,

Jakaya Kikwete Cardiac Institute (JKCI)

P.O. Box 65141, Dar-Es-Salaam.

Telephone: 0754-076022

Email: mongellasms@gmail.com

Dr. Elton Roman Meleki (Principal Investigator).

Resident Paediatrics and Child Health Department,

Muhimbili University of Health and Allied Sciences (MUHAS)

P.O. Box 65001, Dar-Es-Salaam

Telephone: 0713-038141

Email: ellierolland@gmail.com

If there are questions about your rights as a participant you may contact:

Director of Publications and Research,

Muhimbili University of Health and Allied Sciences (MUHAS),

Research and Publication Committee,

P.O. Box 65001,

Dar-Es-Salaam.

Telephone: 222152489.

CERTIFICATE OF CONSENT: I have read the foregoing information/it has been read to me. I have had the opportunity to ask questions about it and any questions that I have asked have been answered to my satisfaction. I consent voluntarily to participate as a participant in this research.

Name of Participant_____

Signature of Participant _____

Date _____

Day/month/year

If ILLITERATE: A literate witness must sign (if possible, this person should be selected by the participant and should have no connection to the research team). Illiterate participants should include their thumbprints as well.

I have witnessed the accurate reading of the consent form to the potential participant, and the individual has had the opportunity to ask questions. I confirm that the individual has given consent freely.

Name of witness_____ AND Thumb print of participant

Signature of witness _____

Date _____

Day/month/year

Appendix II: Fomu ya idhini (Swahili Version)

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES ETHICAL REVIEW BOARD

FOMU YA IDHINI (SWAHILI VERSION)

Hii ni fomu ya idhini kwa wazazi/walezi wa Watoto waliolazwa hospitali ya taifa ya Muhimbili (MNH), taasisi ya moyo ya Jakaya Kikwete (JKCI) na taasisi ya mifupa Muhimbili (MOI).

UTANGULIZI: Jina langu ni Elton Roman, na ni daktari katika masomo ya shahada ya uzamili idara ya watoto hospitali ya taifa ya Muhimbili, Dar-Es-Salaam. Ninafanya utafiti kubaini viashiria vinavyoweza kutabiri vifo vya watoto wenye umri kati ya miaka 5-14 baada ya kuruhusiwa hospitali. Nitakupa taarifa na kukualika kua sehemu ya tafiti hii. Kabla hujafanya maamuzi, unaweza kuongea na mtu yeyote unae muamini kuhusu hii tafiti.

Kunaweza kua na maneno ambayo huyaelewi. Kama una maswali, tafadhali niulize. Unaruhusiwa kunikatisha mda wowote kama una swali au kuna kitu hujaelewa.

Sababu/kusudi ya tafiti hii: Tafiti hii inakusudia kubaini viashiria vinavyotabiri vifo vya watoto wa rika kuanzia miaka mitano hadi kumi na nne baada ya kuruhusiwa kutoka hospitali ya taifa Muhimbili, Taasisi ya moyo ya Jakaya na Taasisi ya mifupa Muhimbili. Lengo ni kubaini wingi wa vifo vya watoto wa rika la miaka 5-14 baada ya kuruhusiwa hospitali na vihatarishi vyake. Utafiti huu unalenga pia kuwajuza watoa huduma za afya kuongeza ubora wa huduma na ufuatiliaji wa wagonjwa baada ya kuruhusiwa hospitali.

Kushiriki tafiti hii kunahusisha nini?: Tafiti hii inahusisha dodoso lenye maswali mbalimbali kunasa taarifa za ugonjwa wa mtoto na taarifa binafsi. Dodoso hili litajazwa na mimi baada ya kuchukua taarifa kutoka kwa faili la hospitali la mtoto wako, na majibu ya vipimo vya maabara na vya picha. Kushiriki utahitaji kusaini hii fomu ya idhini na kujibu maswali yaliyopo kwenye hili dodoso. Zoezi hili litachukua kama dakika 5.

Tunaalika wazazi wote wa watoto waliolazwa wodi za watoto hospitali ya taifa ya Muhimbili, hospitali ya mifupa (MOI), na taasisi ya moyo ya Jakaya Kikwete (JKCI).

Kushiriki kwako kwenye hii tafiti ni kwa HIARI. Ni chaguo lako kushiriki au kutokushiriki. Huduma za matibabu za wodi yetu hazitaathiriwa na ushiriki wako, na zitatolewa kama kawaida. Pia unaweza kujiondoa mda wowote kama ukiamua hata kama ulishakubali kushiriki kwenye tafiti mwanzoni.

USIRI: Taarifa zote tunazo kusanya kwenye hii tafiti zitawekwa kwa siri. Taarifa binafsi zitafichwa na hakuna mtu ataweza kuziona. Hatutagawa taarifa za utambulisho kwa washiriki wa tafiti hii. Madodoso hayatakua na majina ya washiriki wa tafiti hii.

HATARI: Kwa kushiriki katika tafiti hii hutajiweka katika hatari ya aina yeyote utakua salama kama wazazi ambao hawajashiriki.

HAKI YA KUKATAA/KUJIONDOA: Hupaswi kushiriki tafiti hii kama sio hiari yako na kukataa kwako kushiriki hakutaathiri huduma utakazoapata wodini. Unaweza kujiondoa katika tafiti hii mda wowote unaotaka bila kupoteza haki zako za kuudumiwa wodini kama mgonjwa wetu. Huduma zako katika wodi hazitaathiriwa kwa njia yoyote.

FAIDA: Kunaweza kukawa hakuna faida za moja kwa moja kwa kokushiriki tafiti hii kwa sasa lakini kushiriki kwako katika tafiti hii kutatusaidia kupata majibu ya maswali ya tafiti hii na kutusaidia kubaini viashiria vinavyoweza tabiri vifo vya watoto wakiwa wamelazwa na hata baada ya kuruhusiwa wodini.

MAWASILIANO: Kama una maswali kuhusiana na utafiti huu au utahitaji kuripoti tatizo linalohusiana na utafiti huu unaweza wasiliana na wafuatao:

Prof. Francis Furia (Msimamizi)

Daktari bingwa wa watoto,

Profesa mshiriki,

Idara ya watoto,

Chuo kikuu cha Afya na Sayansi Shirikishi Muhimbili,

S.L.P 65001, Dar-Es-Salaam.

Namba ya simu: 0743-623381

Barua pepe: Fredrick.francis78@gmail.com

Dkt Stella Mongella (Msimamizi msaidizi)

Daktari bingwa wa magonjwa ya moyo kwa watoto,

Taasisi ya moyo ya Jakaya Kikwete,

S.L.P 65141, Dar-Es-Salaam.

Nambari ya simu: 0754-076022

Barua pepe: mongellasms@gmail.com

Dkt Elton Roman Meleki (Mpelelezi mkuu)

Daktari mkazi,

Idara ya watoto,

Chuo kikuu cha Afya na Sayansi Shirikishi Muhimbili,

S.L.P 65001, Dar-Es-Salaam.

Nambari za simu: 0713-038141

Barua pepe: ellierolland@gmail.com

Kama kuna maswali kuhusu haki zako kama mshiriki unaweza wasiliana na:

Mkurugenzi Uchapishaji na Utafiti,

Chuo kikuu cha Afya na Sayansi Shirikishi Muhimbili,

Kamati ya uchapishaji na tafiti,

S.L.P 65001, Dar-Es-Salaam.

Nambari ya simu: 222152489

<u>CHETI CHA IDHINI:</u> Nimesoma taarifa hapo juu au nimesomewa na mtu na nimesikia.

Nimepata nafasi ya kuuliza maswali kuhusiana na tafiti hii, nimejibiwa vyema na nimeridhika.

Natoa ruhusa kwa hiari yangu kushiriki kama mshirik katika tafiti hii.

Jina la mshiriki_____

Saini yamshiriki_____

Tarehe (siku/mwezi/mwaka)_____

<u>Kama hajui kusoma na kuandika</u>

Shahidi anaejua kusoma na kuandika (kama inawezekana mtu huyu anatakiwa kuchaguliwa na mshiriki na hatakiwi kuwa mhusika wa aina yoyote katika tafiti hii). Washiriki wasiojua kusoma na kuandika lazima kuweka alama ya wino ya kidole pia.

Nimeshuhudia usomaji sahihi wa fomu ya ruhusa ilio somwa kwa mshiriki mtarajiwa, na mtu huyu amepata nafasi ya kuuliza maswali. Naweza kuthibitisha kwamba mtu huyu ametoa ruhusa kwa hiari yake.

Jina la Shahidi_____

Alama ya kidole ya ☐ **mshiriki**

Sahihi ya Shahidi_____

Tarehe (siku/mwezi/mwaka)_____

Appendix V: Assent for the Adolescents

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES

SCHOOL OF MEDICINE

ASSENT FORM FOR STUDY "PREDICTORS OF POST-DISCHARGE MORTALITY AMONG CHILDREN AGED 5-14 YEARS ADMITTED TO PAEDIATRICS WARDS AT MNH, JKCI AND MOI"

INTRODUCTION

My name is Elton Roman Meleki, and I am a resident in the paediatrics department at Muhimbili National Hospital Dar-es-Salaam. I'm researching to determine the predictors of post-discharge mortality among children aged 5-14 years who are discharged from MNH, JKCI, and MOI. I am going to give you information and invite you to be part of this research.

Research is a way to learn about people, diseases, and the environment and if you decide you want to be a part of this study, you and/or your caretaker will be asked a few questions. You may be asked some questions on demographic information. This information will be recorded in our questionnaire. Some other information will be taken from your file and this will include the history of your disease and results from your blood investigations and/or imaging investigations. We will follow you up to three months after you are discharged to understand your general health condition, and if you were taken back to the hospital after discharge or readmitted.

We will follow you up by making a phone call to your caretaker and ask questions about your general health condition. The information that you and your caretaker will provide will be confidentially handled and protected in such a way that nobody will be able to access your information, but only the general information that will be used purposely for health-related issues.

If you don't want to be in this research study, you will continue to receive the treatment and care you need. It is not a compulsion to be in this study and if you wish to disengage at any point in time, you may do so. If you enroll as a participant, please sign your name

I, ……want to be in this research study

…… …….

Sign your name here Date

Appendix: VI- Fomu ya ridhaa kwa mtoto

CHUO KIKUU CHA AFYA NA SAYANSI SHIRIKISHI MUHIMBILI

SHULE YA UTABIBU

FOMU YA RIDHAA KUSHIRIKI KATIKA UTAFITI WA KUBAINI VIASHIRIA VYA VIFO VYA WATOTO UMRI MIAKA 5-14 WANAOLAZWA KATIKA WODI ZA WATOTO HOSPITALI YA MUHIMBILI, TAASISI YA MIFUPA MUHIMBILI NA TAASISI YA MOYO YA JAKAYA"

Utambulisho

Jina langu ni Elton Roman, na ni daktari katika masomo ya shahada ya uzamili idara ya watoto hospitali ya taifa ya Muhimbili, Dar-Es-Salaam. Ninafanya utafiti kubaini viashiria vinavyoweza kutabiri vifo vya watoto wenye umri kati ya miaka 5-14 baada ya kuruhusiwa katika hospitali ya taifa Muhimbili, taasisi ya mifupa Muhimbili na taasisi ya moyo ya Jakaya

Utafiti ni njia ya kujifunza juu ya watu, magonjwa na mazingira na ikiwa unaamua unataka kuwa sehemu ya utafiti huu wewe na/au mlezi wako ataulizwa maswali machache. Unaweza kuulizwa maswali machache kuhusiana na taarifa zako binafsi. Hizi taarifa nitazijaza kwenye dodoso. Baadhi ya taarifa zako nyingine nitazichukua kutoka kwa faili lako na hizi zitajumuisha historia ya ugonjwa, majibu ya vipimo vya damu na/au vya picha. Nitakufuatilia kwa miezi mitatu baada ya kuruhusiwa kujua hali yako ya kiafya kiujumla na kama uliwahi rudishwa hospitali au kulazwa tena. Tutakufuatilia kwa njia ya mawasiliano ya simu na mlezi wako na tutamuuliza kuhusu hali yako ya afya kiujumla. Taarifa atakazotoa mlezi wako zitatunzwa kwa usiri na zitalindwa na hamna mtu atakayeweza kupata taarifa zako.

Kushiriki kwako ni kwa hiari na sio lazima kama hutaki. Ikiwa utaamua kuatokuendelea kushiriki baada ya kuanza, ni sawa pia.

Ikiwa utaamua kuwa katika utafiti huu tafadhali Saini jina lako.

Mimi,…….nataka kuwa katika utafiti huu

…… ……

Andika Saini yako hapa Tarehe

Appendix VII: Questionnaires

A: QUESTIONNAIRE: Participant's hospital registration number: ……

1. Date of admission ….
2. Discharge date ….
3. Date of data collection….
4. Age of the child (in years)
5. Sex of the child/children
   i. Male
   ii. Female
6. Does the child have health insurance?
   i. Yes
   ii. No

PARENTS/GUARDIAN INFORMATION

1. Contacts/Address ……. (at least 3 available contacts of both parents including one designated proxy)
2. Age in years of the parent/caregiver……
3. What is your highest level of education?
   i. No formal education
   ii. Primary education incomplete
   iii. Primary education completed
   iv. Secondary school incomplete
   v. Secondary school completed
   vi. Higher education

4. Marital status
    i. single
    ii. Married
    iii. Separated/Divorced
    iv. Widowed
    v. Co-habiting
5. Employment status
    I. Employed
    II. Self-employed
    III. Un-employed
    IV. Farmer
    V. Others. (specify)

INFORMATION ABOUT THE DISEASE (TO BE COLLECTED FROM THE IN-PATIENT PROGRESS NOTES AND LABORATORY RESULTS OBTAINED FROM THE ELECTRONIC SYSTEM)

6. Main complaints on admission (1=No, 2=Yes)

Main complain(s)	Response
Fever	1. Yes 2. No
General body malaise/prostration	1. Yes 2. No
Reduced urine output	1. Yes 2. No
Blood in urine	1. Yes 2.No
Weight loss	1. Yes 2.No
Cough	1. Yes 2.No
Excessive night sweats	1. Yes 2.No
Awareness of heartbeats	1. Yes 2.No
Convulsions/Loss of consciousness	1. Yes 2.No
Body swelling	1. Yes 2.No
Pain	1. Yes 2.No
Surgical complaints	1. Yes 2. No
Recurrent blood transfusion	1. Yes 2.No
Trauma	1. Yes 2.No
Dyspnea	1. Yes 2.No
Others	Specify……

7. Duration of illness (in days/months) before admission……
8. Vitals on admission: (if not documented put 00)

   a/ Temperature on admission…….

   b/ Respiratory rate on admission……

   c/ Pulse rate on admission……

   d/ Oxygen saturation on admission…….

9. Physical findings on examination during the admission date (1=No, 2=Yes)

Clinical sign	Response
Pallor	
Cyanosis	
Organomegally (Hepatomegaly and/or splenomegaly)	
Edema	
Heart Murmur	
Bleeding signs (purpura, petechiae, ecchymosis, or active bleeding noted)	
Physical dysmorphism	
Displaced apex beat	
Finger clubbing	
Finger clubbing	
Focal Neurological deficit (including cranial nerve palsies)	
Abnormal breath sounds (Crepitations, rhonchi, bronchial breath sounds, reduced)	
GCS score (state the score)	
Surgical wound/ surgical site infection	
Others ….	

10. Full blood picture results (if not done=0)

Laboratory parameter	Value
WBC	
ANC	
ALC	
HB	
Platelets	

11. Blood chemistry results (if not done=0)

Laboratory parameter	Value
Creatinine	
Blood Urea Nitrogen (BUN)	
Sodium	
Potassium	
ALT	
AST	
HIV serology	
Others (state them and their values	

12. Duration of stay in hospital (in days) ….
13. Discharging diagnosis/diagnoses……
14. Discharge type
    I. Absconded
    II. Against medical advice
    III. Normal discharge after completion of in-hospital care
    IV. Deceased

FOLLOW-UP QUESTIONNAIRE AFTER DISCHARGE FROM HOSPITAL

1. Date of phone call……
2. Post-discharge duration at which the call was made …… (in months/days)
3. Initials of the study participants…… (make sure it matches the code above)
4. The relationship of the phone respondent to the child ……..
5. Is the child alive?

   i/Yes (skip questions 5 and 6)

   ii/No (if No complete the questionnaire at QN 6, and begin verbal autopsy)

   iii/ I don't know (ask for someone with the information if present)
6. What was the date the child died? …….
7. What is his/her general condition currently?

   I. Good

   II. Bad

   III. Fair
8. Has he/she been readmitted to another hospital in between?

   i. Yes

   ii. No (if No skip the next two questions)
9. How many times has he/she been re-admitted? ……

10. What were the symptoms that necessitated re-admission? (Mention)

Symptom	Response (1=Yes, 2=N0)
Fever	
General body Malaise	
Respiratory complaints (Cough and/or DIB)	
Palpitations	
Admitted for blood transfusion	
Diarrhea	
Vomiting	
Constipation	
Convulsions	
Pain (Including joint pain, abdominal pain/discomfort)	
Others (List them)	

11. Have you visited any outpatient department after discharge from the hospital?

iii. Yes

iv. No (if No, skip the next question)

12. What were the reasons for visiting the outpatient department after discharge?

Symptom	Response (1=Yes, 2=N0)
Fever	
General body Malaise	
Respiratory complaints (Cough and/or DIB)	
Symptoms of anemia	
Diarrhea	
Vomiting	
Constipation	
Convulsions	
Pain (Including joint pain, abdominal pain/discomfort)	
Others (List them)	

Appendex IX: Dodoso La Kiswahili

Nambari ya hospitali ya mshiriki:-…….

1. Tarehe ya kulazwa …….
2. Tarehe ya kuruhusiwa ……
3. Tarehe ya kukusanya taarifa ……..
4. Umri wa mtoto (kwa miaka) …….
5. Jinsia ya mtoto
   I. Wa kiume
   II. Wa Kike
6. Je mtoto ana bima ya afya?
   I. Ndio
   II. Hapana

TAARIFA ZA MZAZI/MLEZI

1. Mawasiliano/Anuani (angalau namba tatu za simu zinazopatikana za wazazi wote wawili na ndugu mmoja wa karibu)
2. Umri wa mzazi/mlezi (katika miaka)
3. Una kiwango gani cha juu cha elimu?
   I. Sina elimu rasmi
   II. Sijamaliza elimu ya msingi
   III. Nilimaliza elimu ya msingi tu
   IV. Sijamaliza elimu ya sekondari
   V. Nilimaliza elimu ya sekondari tu
   VI. Elimu ya juu

4. Hali ya ndoa
    I. Sijaoa/sijaolewa
    II. Nimeoa/nimeolewa
    III. Tumetengana/tumetalakiana
    IV. Mjane/mgane
    V. Tunaishi Pamoja
5. Hali ya ajira
    I. Nimeajiriwa
    II. Nimejiajiri
    III. Sina ajira
    IV. Mkulima
    V. Nyinginezo (taja)

DODOSO LA UFUATILIAJI BAADA YA RUHUSA

1. Tarehe ya maongezi ya simu ….
2. Ni muda gani tangu mgonjwa apatiwe ruhusa mawasiliano yalifanyika (katika siku/miezi)
3. Kifupisho cha utambulisho wa mgonjwa husika …. (Iendane na namba ya utambulisho ya dodoso apo juu)
4. Uhusiano wa aliepokea simu na mtoto …..
5. Je mtoto yupo hai?
    I. Ndio
    II. Hapana (kamilisha dodoso kwa kuuliza swali nambari 6)
    III. Sifahamu (omba kuwasiliana na mwenye taarifa za mtoto kama yupo)
6. Ni tarehe gani mtoto alifariki? (DD/MM/YYYY)

7. Ikoje hali yake ya kiafya kwa sasa?
   I. Nzuri
   II. Mbaya
   III. Inaridhisha
8. Ameshawahi kulazwa hospital ingine hapa katikati tangu aruhusiwe? Ndio/Hapana
9. Ni mara ngapi amelazwa? ……..
10. Ni dalili gani zilipelekea ulazima wa kulazwa tena?

Dalili	Jibu 1=Ndio 2=Hapana
Homa	
Mwili kuchoka au kulegea	
Dalili za njia ya mfumo wa hewa (kukohoa na/au kuhema kwa shida)	
Kwajili ya kuongezewa damu	
Mapigo ya moyo kwenda mbio	
Kuharisha au kupata choo laini	
Kutapika	
Kukosa choo au kupata choo kigumu	
Degedege	
Maumivu (Kujumuisha maumivu ya viungo, na sehemu zingine za mwili)	
Nyinginezo	

11. Amewahi hudhuria idara ya wagonjwa wa nje/dharura baada ya kuruhusiwa ukitoa siku za kliniki alizopangiwa?
    I. Ndio
    II. Hapana

12. Nini zilikua sababu za kuhudhuria idara ya wagonjwa wa nje/ dharura nje ya ratiba ya kliniki aliyopangiwa?

Dalili	Jibu 1=Ndio 2=Hapana
Homa	
Mwili kuchoka au kulegea	
Dalili za njia ya mfumo wa hewa (kukohoa na/au kuhema kwa shida)	
Kwajili ya kuongezewa damu	
Mapigo ya moyo kwenda mbio	
Kuharisha au kupata choo laini	
Kutapika	
Kukosa choo au kupata choo kigumu	
Degedege	
Maumivu (Kujumuisha maumivu ya viungo, na sehemu zingine za mwili)	
Nyinginezo	

Appendix V: Verbal Autopsy for the Deceased

This will be conducted using a modified standard WHO verbal autopsy tool to determine the cause of death.

INSTRUCTIONS 1. This form is to be filled if a child dies during the study duration 2. Questions that are not to be read to respondents are in bracket 3. Hints to the interviewer are in italics below the relevant question. They are not to be read to the respondent 4. if the child died in the study hospital where information can be accessed then fill in section A only 5. if the child died at any other place than the study hospital- then continue to section B	
1. Child screening number	……
2. Date when this form was filled	DD/MM/YYYY
3 What is your/the respondent's relationship to the deceased? (*First verify if the respondent is a family member, and only if he/she is not a family member choose other categories like health worker or public official*)	1=Parent 2=Uncle 3=Aunty 4=Friend 5=Health care worker 6=Public health official 7=Refused to answer 8=Another relationship 9= Other family member, specify…….
4 Date when the child died	DD/MM/YYYY 7=Refused to answer 8= Don't know
5 What was the first or given name of the deceased?	……
6 What was the surname of the deceased?	……..

7 What was the sex of the deceased	1=Male 2=Female
8 When was the deceased born? (collected from the file) (*If NA=7/7/1707, Don't know= 9/9/1909)*	…….
9 When did (s)he die? (document from the previous part of the questionnaire) (*If NA=7/7/1707, Don't know= 9/9/1909)*	……
10 How old was the child? (In years) (recorded it from the first part)	……..
11 Where did the deceased die? *(If the baby died in the hospital where the study is being conducted fill in section A only and end the form) (if the baby died at any other place outside the study hospital continue to section B)*	1=Hospital 2=Other health facility 3=Home 4=On route to hospital 5=Other, specify…. 7=Refused to answer 8=I don't know
SECTION A	
12. Disease or condition directly leading to death	……
13. Approximate interval between onset and death	……days
14. Antecedent cause	…….. 9-Not applicable

15. Approximate interval between onset of antecedent cause and death	……days 9-Not applicable
Other significant conditions leading to death	……days 9-Not applicable
SECTION B	
16. What was the cause of death of the child?	1=Road traffic accidents 2= non-Road traffic accidents 3=Drowning 4=Poisoning 5=Bite or sting by venomous animal 6=Injury by burn or fire 7=Injury due to violence 8=Electrocution 9=Chocking or aspiration 10. Chronic or acute illness 11. Others, specify…
17. Was the child ill before death?	1=Yes 2=No 7=refused to answer 8=I don't know
18. How old was the child when the fatal illness started? (This is to be deduced by the interviewer from previous information)	……. Years 7=refused to answer 8=I don't know
For how many days was (s)he ill before death? *(If less than a day or 24hrs enter 00, refuse to enter 77, don't know enter 88*)	……. Months/Days 7=refused to answer 8=I don't know

Did (s)he die suddenly? (*Suddenly means unexpectedly died within 24hours of irregular health*)	1=Yes 2=No 7=refused to answer 8=I don't know
What was the last weight of the deceased? (*Do not ask this question to the mother. Transcribe from the last anthropometric visit or hospital visit. For don't know or not available enter 88)*	…….
General signs and symptoms associated with final illness	
Did (s)he have a fever?	1=Yes 2=No 7=refused to answer 8=I don't know
How many days did the fever last? (*Less than a day=00; use 1 week=7 days to determine the number of days. For refused enter 77, for don't know enter 88*)	……..
Did the fever continue until death?	1=Yes 2=No 7=refused to answer 8=I don't know
Did (s)he have a cough?	1=Yes 2=No 7=refused to answer 8=I don't know
Did (s)he make a whooping sound when coughing?	1=Yes 2=No 7=refused to answer 8=I don't know
Did (s)he have any difficulty in breathing?	1=Yes 2=No 7=refused to answer 8=I don't know

For how many days did the difficulty in breathing last? (*Less than a day=00; use 1 week=7 days to determine the number of days. For refused enter 77, for don't know enter 88*)	……
Did (s)he have fast breathing?	1=Yes 2=No 7=refused to answer 8=I don't know
Did (s)he have breathlessness?	1=Yes 2=No 7=refused to answer 8=I don't know
For how many days Did (s)he have breathlessness? (*Less than a day=00; use 1 week=7 days to determine the number of days. For refused enter 77, for don't know enter 88*)	……..
Did you see the lower chest wall/ribs pulled in as the child breathed in?	1=Yes 2=No 7=refused to answer 8=I don't know
During the illness that led to death did his/her breathing sound like any of the following?	1=Stridor 2=Grunting 3=Wheezing 7=Refused to answer 8=I don't know
Did (s)he have more frequent loose/liquid stool than usual? (*Ask the respondent about his understanding of what is diarrhea and if unclear explain to the respondent*)	1=Yes 2=No 7=refused to answer 8=I don't know
How many loose stools did the child have on the day that loose stools were most frequent? (*For refused enter 77, don't know 88, and not applicable 99)*	No, of stools ,,,,,,,

How many days before death did the frequent loose stool start? (*Less than a day=00; use 1 week=7 days to determine the number of days. For refused enter 77, for don't know enter 88*)	…….
At any time during the final illness was there blood in stools?	1=Yes 2=No 7=refused to answer 8=I don't know
Did (s)he vomit in the week preceding death?	1=Yes 2=No 7=refused to answer 8=I don't know
Was (s)he unconscious during the illness that led to death?	1=Yes 2=No 7=refused to answer 8=I don't know
Was (s)he unconscious for more than 24 hours before death?	1=Yes 2=No 7=refused to answer 8=I don't know
During the illness that led to death did (s)he bleed from anywhere?	1=Yes 2=No 7=refused to answer 8=I don't know
Did the child have convulsions during the illness that led to death?	1=Yes 2=No 7=refused to answer 8=I don't know
During the illness that led to the child's death, did his/her body become stiff with the back arched backwards?	1=Yes 2=No 7=refused to answer 8=I don't know
During the illness that led to death did the child become cold to touch?	1=Yes 2=No 7=refused to answer 8=I don't know
How many days before death did the child become cold to touch?	……..

(*Less than a day=00; use 1 week=7 days to determine the number of days. For refused enter 77, for don't know enter 88*)	
During the illness that led to death did the child become lethargic after a period of normal activity?	1=Yes 2=No 7=refused to answer 8=I don't know
Did (s)he have yellowish coloration of eyes?	1=Yes 2=No 7=refused to answer 8=I don't know
During the illness that led to death did the child have yellow skin, palms/soles?	1=Yes 2=No 7=refused to answer 8=I don't know
Did (s)he receive treatment for the illness that led to death?	1=Yes 2=No 7=refused to answer 8=I don't know
If yes, what kind of treatment did the child receive?	1=Intravenous fluids 2=Blood transfusion 3=Food through a tube passed through the nose 4=Injectable antibiotics 5=Oral antibiotics 6=Antipyretics 7=Refused to answer 8=Don't know 9=Analgesics 10=Operation for the illness 11=Anti-retroviral therapy 12=others, specify…
Did the healthcare worker tell you the cause of death?	1=Yes 2=No 7=refused to answer 8=I don't know
What did the healthcare worker say?	,,,,,,,,,,,,,,,, 7= refused to answer 8= I don't know 9=not applicable
When was the most recent (last) clinic visit?	,,,,,,,,,,

UCHUNGUZI WA MAREHEMU KWA MAHOJIANO (Verbal autopsy-Swahili Version)

Hii itafanywa kwa kutumia maswali yaliyopo kwenye dodoso la shirika la afya duniani ili kubaini sababu za kifo.

MAELEKEZO 1.Hii fomu itajazwa pale mtoto atakapokua amefariki ndani ya muda wa tafiti 2.Maswali ambayo hayapaswi kusomwa yako kwenye mabano 3. vidokezo kwajili ya mtafiti vimeandikwa kwa mfumo wa italiki. Havipaswi kusomwa kwa mhojiwa 4.Kama mtoto amefariki katika hospital ambapo utafiti unafanyika na taarifa zinapatikana, jaza sehemu A tu. 5. Kama mtoto alifariki sehemu ingine nje ya hospital tafiti inapofanyika, endelea kujaza na sehemu B	
1. Nambari ya uchunguzi ya mtoto	……
2. Tarehe fomu imejazwa	DD/MM/YYYY
3 Kuna uhusiano gani kati ya mhojiwa na marehemu? (*kwanza hakiki mhojiwa ni mwanafamilia, na kama sio chagua vipengele vingine kama mtumishi wa uma, au mtumishi wa afya*)	1=Mzazi 2=Mjomba 3=Shangazi 4=Rafiki 5=Mtoa huduma wa afya 6=Mtumishi wa afya ya jamii 7=amekataa kujibu 8=uhusiano mwingine 9=mwanafamilia mwingine, elezea…….
4 Tarehe mtoto amefariki (chukua kwenye dodoso la awali)	DD/MM/YYYY
5. Jina la mwanzo au jina alilopewa marehemu ni lipi?	……

6 Ubini wa marehemu?	……..
7 Marehemu alikua jinsia gani?	1=kiume 2=kike
8 Marehemu alizaliwa tarehe ngapi? (Usiulize hili swali. Chukua kwenye taarifa za mgonjwa wodini)	…….
9 marehemu alifariki lini? (Usiulize tena. Chukua taarifa kwenye dodoso la awali)	……
10 Alikua na umri gani? (katika miaka) (Usiulize hili swali. Chukua taarifa kutoka kwenye taarifa zake awali)	……..
11 Marehemu alifariki wapi? *(kama mtoto alifariki katika hospitali ambapo tafiti inafanyika jaza sehemu A tu) (kama mtoto alifariki nje ya hospital ambapo tafiti inafanyika endelea kujaza sehemu B)*	1=Hospitali 2=vituo vingine vya afya 3=nyumbani 4=njiani Kwenda hospital 5=nyingine, ainisha…. 7=amekataa kujibu 8=hafahamu
SECTION A	
12.Ugonjwa au hali iliyopelekea kifo chake	……
13.Makadirio ya muda tangu ianze mpaka kifo	……siku
14.Sababu iliyotangulia	……..

	9-haihusiani
15.Makadirio ya muda tangu sababu iliyotangulia mpaka kifo	……siku 9-haihusiani
Hali zingine za kiafya zilizopelekea kifo	…….
SECTION B	
16.Nini kilisababisha kifo cha mtoto?	1=ajali ya barabarani 2= ajali isiyo ya barabarani 3=kuzama kwenye maji 4=sumu 5=kung'atwa na mnyama/mdudu mwenye sumu kali 6=majeraha ya moto 7=majeraha ya vurugu 8=umeme 9=kukabwa chakula au kupaliwa 10. Maradhi ya muda mfupi/mrefu 11. Mengineyo, taja…
17.Je mtoto alikua mgonjwa kabla ya mauti?	1=ndio 2=hapana 7=kakataa kujibu 8=hafahamu
18.Alikua na umri gani mtoto wakati maradhi yaliyopelekea mauti yalipoanza ? (Usimuulize mzazi. Taarifa hii itohoe kutoka kwenye taarifa za awali)	……. miaka
19.Kwa siku ngapi mtoto aliuguwa kabla ya kufariki??	……. miezi 7=kakataa kujibu 8=hafahamu

(kama ni chini ya masaa 24 andika 00, akikataa kujibu andika 77, akisema sifahamu andika 88)	
20.Je alifariki ghafla? (*ghafla maana yake ni alifariki ndani ya masaa 24 ya kubadilika kiafya*)	1=ndio 2=hapana 7=kakataa kujibu 8=hafahamu
21.Upi ulikua uzito wake wa mwisho marehemu? (*usiulize ili swali kwa mama, tohoa kutoka kwenye vipimo vyake vya mwisho au mahudhurio yake ya mwisho hospital. Kama haifahamiki au taarifa hakuna andika 88)*	…….
Dalili zenye uhusiano na maradhi yake ya mwisho	
22.Je alikua ana homa?	1=ndio 2=hapana 7=kakataa kujibu 8=hafahamu
23.Ni kwa siku ngapi homa ilidumu? (*chini ya siku moja=00; tumia wiki moja=siku 7kutambua idadi ya siku. Aliekataa kujibu= 77, kwa sijui= 88*)	……..
24.Je homa iliendelea hadi kifo?	1=ndio 2=hapana 7=kakataa kujibu 8=hafahamu
25.Je alikua na kikohozi?	1=ndio 2=hapana 7=kakataa kujibu 8=hafahamu

26.Je alitoa sauti ya kubweka akikohoa?	1=ndio 2=hapana 7=kakataa kujibu 8=hafahamu
27.Je alikua na shida ya kupumua?	1=ndio 2=hapana 7=kakataa kujibu 8=hafahamu
28.Ni kwa siku ngapi kuhema kwa shida kulidumu? (*chini ya siku moja=00; tumia wiki moja=siku 7kutambua idadi ya siku. Aliekataa kujibu= 77, kwa sijui= 88*)	……
29.Je alikuwa anapumua haraka?	1=ndio 2=hapana 7=kakataa kujibu 8=hafahamu
30.Je alikua anakosa pumzi?	1=ndio 2=hapana 7=kakataa kujibu 8=hafahamu
31.Ni kwa siku ngapi alikuwa na hali ya kukosa pumzi? (*chini ya siku moja=00; tumia wiki moja=siku 7kutambua idadi ya siku. Aliekataa kujibu= 77, kwa sijui= 88*)	……..
32.Je uliona sehemu ya chini ya kifua ikitumbukia au mbavu kutumbukia akivuta hewa ndani?	1=ndio 2=hapana 7=kakataa kujibu 8=hafahamu
33.Wakati wa maradhi yaliyopelekea kifo chake, hema yake ilisikika kama moja wapo ya hizi?	1=Straida 2=mguno akihema 3=vifilimbi 7=kakataa kujibu 8=hafahamu

34.Je alipata mara kwa mara choo cha maji maji au kuarisha? (*muulize mhojiwa uelewa wake juu ya kuhara na kama haelewi muelezee vizuri*)	1=ndio 2=hapana 7=kakataa kujibu 8=hafahamu
35.Aliharisha mara ngapi kwenye siku ambayo aliharisha sana? (*chini ya siku moja=00; tumia wiki moja=siku 7kutambua idadi ya siku. Aliekataa kujibu= 77, kwa sijui= 88*)	Idadi ya kuharisha ,,,,,,,
36.Siku ngapi kabla ya kifo kuharisha kulianza? (*chini ya siku moja=00; tumia wiki moja=siku 7kutambua idadi ya siku. Aliekataa kujibu= 77, kwa sijui= 88*)	…….
37.Kuna muda wowote kipindi cha maradhi yake ya mwisho alipata damu kwenye choo?	1=ndio 2=hapana 7=kakataa kujibu 8=hafahamu
38.Je alitapika wiki iliyotangulia kifo chake?	1=ndio 2=hapana 7=kakataa kujibu 8=hafahamu
39.Je alipoteza fahamu kwenye maradhi yaliyopelekea kifo chake?	1=ndio 2=hapana 7=kakataa kujibu 8=hafahamu
40.Je alipoteza fahamu Zaidi ya masaa 24 kabla ya kifo?	1=ndio 2=hapana 7=kakataa kujibu 8=hafahamu

41.Katika kipindi cha maradhi yake yaliyopelekea kifo alitoka damu sehemu yeyote?	1=ndio 2=hapana 7=kakataa kujibu 8=hafahamu
42.Katika kipindi cha maradhi yake yaliyopelekea kifo alipata degedege?	1=ndio 2=hapana 7=kakataa kujibu 8=hafahamu
43.Katika kipindi cha maradhi yake yaliyopelekea kifo, mwili ulikakamaa na mgongo kujikunja kuelekea nyuma?	1=ndio 2=hapana 7=kakataa kujibu 8=hafahamu
44.Katika kipindi cha maradhi yake yaliyopelekea kifo je alikuwa wa baridi kwa kumgusa?	1=ndio 2=hapana 7=kakataa kujibu 8=hafahamu
45.Siku ngapi kabla ya kifo mtoto alikuwa wa baridi kwa kumgusa? (*chini ya siku moja=00; tumia wiki moja=siku 7kutambua idadi ya siku. Aliekataa kujibu= 77, kwa sijui= 88*)	……..
46.Katika kipindi cha maradhi yake yaliyopelekea kifo, alilegea ghafla baada ya kuwa na shughuli kawaida?	1=ndio 2=hapana 7=kakataa kujibu 8=hafahamu
47.Je alikuwa na manjano kwenye macho?	1=ndio 2=hapana 7=kakataa kujibu 8=hafahamu
47.Kipindi cha maradhi yake aliwahi kuwa na manjano kwenye Ngozi, viganja vya mikono au miguu?	1=ndio 2=hapana 7=kakataa kujibu 8=hafahamu

48. Je alipata matibabu yoyote kwa ayo maradhi yaliyopelekea kifo chake?	1=ndio 2=hapana 7=kakataa kujibu 8=hafahamu
49.Na kama ndio, ni matibabu gani alipokea?	1=dripu la maji 2=kuongezewa damu 3=kulishwa chakula kwa mpira 4=antibiotiki za misipa 5=antibiotiki za kumeza 6=dawa za homa 7=kakataa kujibu 8=hafahamu 9=dawa za maumivu 10=upasuaji kwajili ya maradhi 11=dawa za kufubaza virusi vya ukimwi 12=nyinginezo, taja…
50.Je mtoa huduma wa afya alikuelezea kilichosababisha kifo chake?	1=ndio 2=hapana 7=kakataa kujibu 8=hafahamu
51.Ni kitu gani mtoa huduma wa afya alisema?	,,,,,,,,,,,,,,,, 7=kakataa kujibu 8=hafahamu 9-haihusiani
52.Lini ni mahudhurio yake ya mwisho ya kliniki?	,,,,,,,,,,

Appendix VI: Ethical Clearance

UNITED REPUBLIC OF TANZANIA
MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY
MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES
OFFICE OF THE DIRECTOR - RESEARCH PUBLICATIONS AND INNOVATIONS

In reply quote;
Ref. No.DA.282/298/01.C/1662 Date: 05/05/2023

MUHAS-REC-04-2023-1662

ELTON ROMAN MELEKI
School of Medicine
MUHAS

RE: APPROVAL FOR ETHICAL CLEARANCE FOR A STUDY TITLED: PREDICTORS OF POST-DISCHARGE MORTALITY AMONG CHILDREN AGED 5-14 YEARS ADMITTED TO PEDIATRIC WARDS AT MNH, JKCI, AND MOI: A PROSPECTIVE OBSERVATIONAL COHORT STUDY.

Reference is made to the above heading.

I am pleased to inform you that the Chairman has on behalf of the University Senate, approved ethical clearance of the above-mentioned study, on recommendations of the Senate Research and Publications Committee meeting accordance with MUHAS research policy and Tanzania regulations governing human and animal subjects research.

APPROVAL DATE: 05/05/2023
EXPIRATION DATE OF APPROVAL: 04/05/2024

STUDY DESCRIPTION:
Purpose:
The purpose of this prospective observational cohort study is to determine the post- discharge mortality rate and its predictors among children aged 5-14 years admitted to pediatric wards at MNH, JKCI, and MOI.

The approved protocol and procedures for this study is attached and stamped with this letter, and can be found in the link provided: https://irb.muhas.ac.tz/storage/Certificates/Certificate%20-%2014055.pdf and in the MUHAS archives.

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The PI is required to:

1. Submit bi-annual progress reports and final report upon completion of the study.
2. Report to the IRB any unanticipated problem involving risks to subjects or others including adverse events where applicable.
3. Apply for renewal of approval of ethical clearance one (1) month prior its expiration if the study is not completed at the end of this ethical approval. You may not continue with any research activity beyond the expiration date without the approval of the IRB. Failure to receive approval for continuation before the expiration date will result in automatic termination of the approval for this study on the expiration date.
4. Obtain IRB amendment (s) approval for any changes to any aspect of this study before they can be implemented.
5. Data security is ultimately the responsibility of the investigator.
6. Apply for and obtain data transfer agreement (DTA) from NIMR if data will be transferred to a foreign country.
7. Apply for and obtain material transfer agreement (MTA) from NIMR, if research materials (samples) will be shipped to a foreign country,
8. Any researcher, who contravenes or fail to comply with these conditions, shall be guilty of an offence and shall be liable on conviction to a fine as per NIMR Act No. 23 of 1979, PART III section 10 (2)
9. The PI is required to ensure that the findings of the study are disseminated to relevant stake holders.
10. PI is required to be versed with necessary laws and regulatory policies that govern research in Tanzania. Some guidance is available on our website https://drp.muhas.ac.tz/.

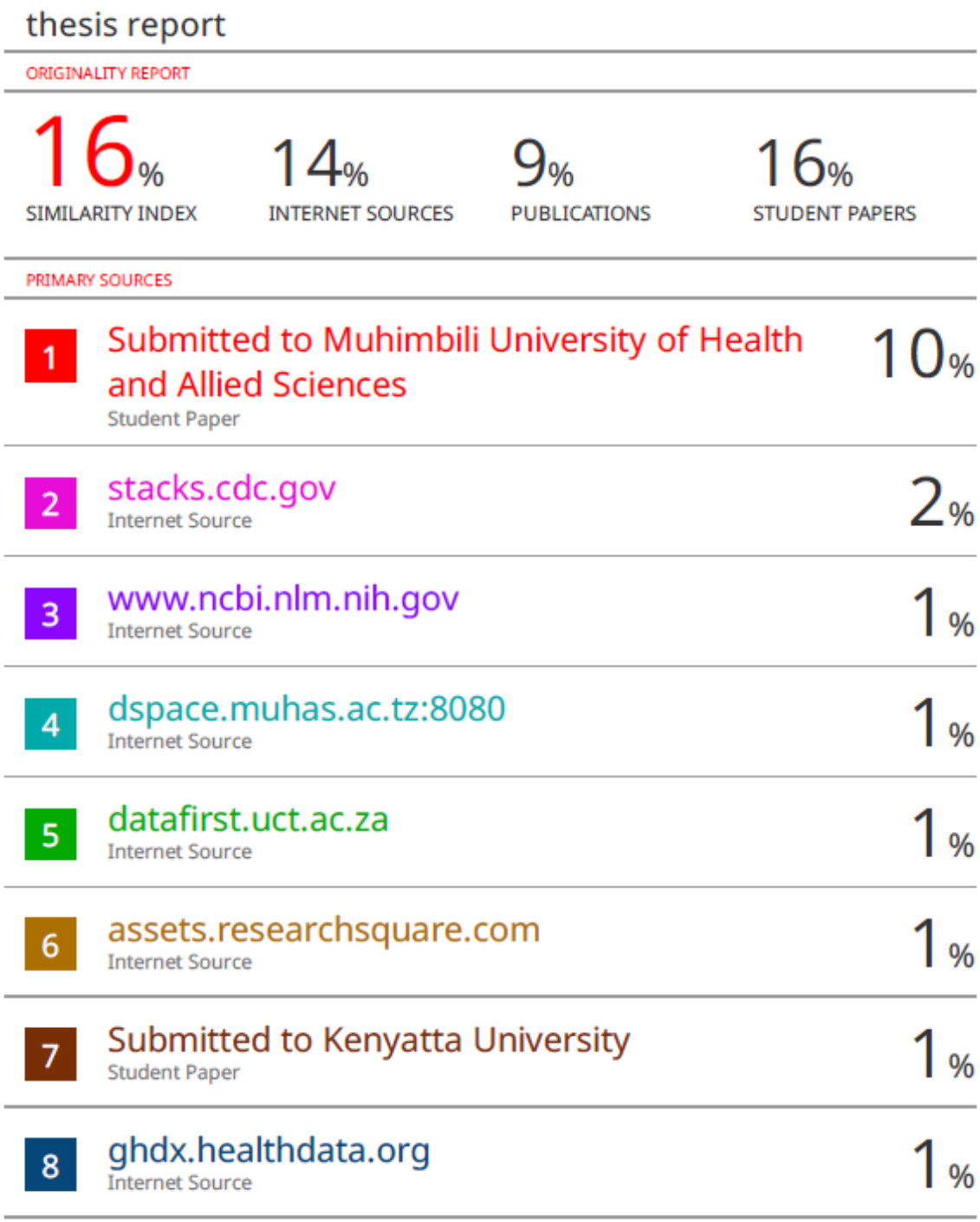
Dr. Kasusu Nyamuryekung'e
Ag. Chairman, MUHAS Research and Ethics Committee

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Appendix VII: Plagiarism check



thesis report

ORIGINALITY REPORT

16%	14%	9%	16%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

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Appendix VIII: The published methodology

The study protocol has been published in PLOS ONE journal and the link to the article is https://doi.org/10.1371%2Fjournal.pone.0287243

PLOS ONE

STUDY PROTOCOL

A study protocol for predictors of post-discharge mortality among children aged 5–14 years admitted to tertiary hospitals in Tanzania: A prospective observational cohort study

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Data Availability Statement: No datasets were generated or analysed during the current study. All

Abstract

Introduction

Globally, millions of children and adolescents die every year from treatable and preventable causes. Sub-Saharan Africa accounted for 55% of deaths of children aged 5–14 years in 2017. Despite this high burden, minimal effort has been directed toward reducing mortality among older children and adolescents in comparison to under-fives. Mortality rates of children post-discharge vary between 1–18% in limited-resource countries and are reported to exceed in-hospital mortality. In Tanzania, there is limited data regarding post-discharge mortality and its predictors among children aged 5–14 years.

Objectives

This study aims to determine the post-discharge mortality rate and its predictors among children aged 5–14 years admitted to pediatric wards at MNH, MOI, and JKCI.

Methods and analysis

This will be a prospective observational cohort study that will be conducted among children aged 5–14 years admitted to pediatric wards at Muhimbili National Hospital, Jakaya Kikwete Cardiac Institue, and Muhimbili Orthopedic Institue in Dar-Es-Salaam, Tanzania. Data will be collected using a structured questionnaire and will include socio-demographic characteristics, clinical factors, and patients' outcomes. Post-discharge follow-up will be done at months 1, 2, and 3 after discharge via phone call. Data will be analyzed using SPSS version 23. The association of demographic, social economic, and clinical factors with the outcome of all causes, 3 months post-discharge mortality will be determined by Cox regression, and survival rates will be displayed through Kaplan-Meier curves.

The pdf document of the published study protocol is attached below.



Published study protocol.pdf