RISK FACTORS ASSOCIATED WITH INJURIES AMONG CHILDREN BELOW 18 YEARS ATTENDING HEALTH FACILITIES IN DAR ES SALAAM, TANZANIA

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MMed (Pediatrics and Child Health) Dissertation

Muhimbili University of Health and Allied Sciences

October, 2012

RISK FACTORS ASSOCIATED WITH INJURIES AMONG CHILDREN BELOW 18 YEARS ATTENDING HEALTH FACILITIES IN DAR ES SALAAM, TANZANIA

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A Dissertation Submitted in (Partial) Fulfillment of the Requirements for the Degree of Master of Medicine (Pediatrics and Child Health) of Muhimbili University of Health and Allied Sciences

Muhimbili University of Health and Allied Sciences

April 2012

CERTIFICATION

The undersigned certify that they have read and hereby recommend for acceptance by Muhimbili University of Health and Allied Sciences a dissertation entitled: ***Risk Factors Associated With Injuries Among Children Below 18 years attending Health Facilities in Dar Es Salaam, Tanzania*** in partial fulfillment of the requirements for the degree of Masters of Medicine (Paediatrics and Child health) of the Muhimbili University of Health and Allied Sciences (MUHAS).

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DECLARATION AND COPYRIGHT

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

Signature……. Date……

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ACKNOWLEDGEMENT

First and foremost I would like to thank the Almighty God for the blessings he has given me throughout my course.

My sincere gratitude to my supervisors Dr A. Massawe and Dr E.J. Mmbaga for their commitment, sustained support and encouragement from the research proposal development, data processing and finalization of the study.

I would like to thank the Municipal's Health Directors of the three municipal hospitals of Dar es Salaam and Medical Directors of Mbagala, Sinza and Buguruni Health Centres for granting me permission to collect data at their facilities.

Special thanks to my research assistants; Robert Peter, Daniel Michael, Ntalaluka Abbas, Majengo Fadhil, Bundala Masumbuko, and Janet Katule, all the Doctors and nurses who helped in one way or another in making this research possible.

May I also take this opportunity to thank all members of the Department of Paediatrics and Child Health, MUHAS and MNH for their constructive ideas and support throughout this study.

I am also grateful to all my classmates, Alex Mphuru, Edward Mgelea, Isabella Sylvester, Julieth Kabengula, Fatou Secka, Winfred Kyambile, Richard Christopher, Gloria Mbwile, Charles Shija, and Frida Mghamba for sharing this experience together.

Last but not least, to my lovely wife, Judith Ibengwe for her endless encouragement during my studies.

DEDICATION

To my parents Mr. and Mrs. S. Moshiro for the foundation they have given me that has made me who I am today.

To my lovely wife for her emotional and physical support throughout the period of my studies.

ABSTRACT

Background

Injuries are the leading cause of death and disability among children and youth worldwide. Approximately 950,000 children die every year as a result of injuries and violence. WHO identifies burns, falls, Road Traffic Injuries (RTIs), poisoning and drowning as the major causes of injuries in Children. In Tanzania 2.5% and 4.3% person were reported to have been injured during the previous one year in urban and rural areas respectively. Among these, 37% were below 14 years. The risk factors for injuries that have been documented elsewhere include socioeconomic status, maternal education, maternal age, marital status, number of children in the house, and overcrowding. However, there is limited data on factors associated with injuries among children in our setting.

Objective

To determine risk factors associated with injuries among children below 18 years seen at various health facilities in Dar es Salaam, Tanzania

Materials and Methods

A hospital based case control study was conducted from August 2011 to October 2011 in six selected health facilities in Dar es Salaam. Data were collected using a structured questionnaire. Cases were children below 18 years who had suffered injuries. Controls were children below 18 years who had visited the same health facilities with other problems apart from injury. Recruitment was done at the outpatient department. Parents/guardians of selected cases and controls were interviewed by trained research assistants. Data analysis was performed using SPSS version 17. Univariate, and multivariate analyses were done for both child and parental/guardian factors. Logistic regression models were built to identify independent determinants of injuries. Both unadjusted and adjusted odds ratio with corresponding 95% confidence intervals were reported. All the analyses were two-tailed and significance was set at 5% level.

Results

A total of 492 cases and 492 controls were included in the study. Younger parents/guardians {Adjusted odds ratio (AOR)= 0.95; 95% CI (0.92-0.97)}, more than six people in the same house {AOR= 1.8; 95% CI (1.3-2.6)}, more than three children in the house {AOR= 1.6; 95% CI (1.1-2.2)}, absence of parent/guardian at time of injury occurrence {AOR= 1.6; 95% CI (1.1-2.3)} middle {AOR=1.5; 95%CI (1.0-2.1)} and low socio-economic status {AOR= 1.6; 95% CI (1.1–2.4)} were independent risk factors for injury. Falls (32%), burns (26%), Road Traffic Injuries (14%) and cuts (10%) were the major types of injuries identified. More than two thirds of these injuries occurred at home.

Conclusion and Recommendations

Inadequate supervision, overcrowding, having more than 3 children in the house, lower socio-economic status and low maternal age were significant risk factors. Falls, burns, RTIs and cuts were the main types of injuries in Dar es Salaam. Local programmes for injury prevention need to take into account improved household, child supervision and other identified risk factors to be able to curb the childhood injuries. Schools should also teach students on road safety. Further community studies are needed to identify magnitude of injuries for proper planning of interventions.

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LIST OF ABBREVIATIONS

APP	Acute Paediatric Poisoning
AOR	Adjusted Odds Ratio
DALY's	Disability Adjusted Life Years
EU	European Union
HIC	High Income Countries
ISBI	International Society for Burn Injuries
LMIC	Low and Middle Income Countries
MNH	Muhimbili National Hospital
MUHAS	Muhimbili University of Health Allied Sciences
OPD	Outpatient department
OR	Odds Ratio
RTIs	Road traffic injuries
SES	Socio-economic status
SPSS	Statistical Package for Social Sciences
SSA	Sub-Saharan Africa
UNICEF	United Nations Children's Fund
UIs	Unintentional injuries
WHO	World Health Organization

CHAPTER ONE

1.0 INTRODUCTION AND LITERATURE REVIEW

It is estimated that injuries accounted for 9% of all deaths and 12% of burden of disease worldwide in 2000. WHO report of 2008 estimates that 950,000 children under 18 years died of injury and violence in 2004. The majority of the deaths (90%) were due to unintentional injuries such as RTI, drowning, burns and poisoning. The problem is more common in low and middle income countries than in high income countries with variations according to type of injury. For deaths due to burns, the rate in low-income countries is almost 11 times higher than in high-income countries; for drowning six times higher; for poisons four times and for falls around six times higher.[1]

In developed countries where the burden of infectious disease is minimal, injury ranks as a leading cause of death for children. It accounts for almost 40% of all deaths in the age group between 1 to 14years.[2] For those countries with huge burden of infectious diseases and nutritional problems, the percentage of death due to injury is smaller. However, compared with other developed countries, it becomes considerably significant especially in poor communities.[3]

Most of the childhood injury burden rests in low-income and middle-income countries. Within these countries, poor children are disproportionately affected.[4] Some of the most vulnerable groups are those who live in chronic poverty.[5]

While in developed countries child injury deaths have significantly dropped by 50% between 1970 and 1995,[2] injury problem has been growing rapidly in poorer countries.[6] This trend has been attributed to epidemiologic, demographic and social-economic transition in these countries in the past few years. It is recognized that for every death, there are thousands of non-fatal injuries which are never reported and results in serious impairment. As a result, childhood injury Daily Adjusted Life Years (DALYs) are very high in developing countries with an average rate of 55/1000 population for children under 15 years. Sub-Saharan countries have the highest rate at 88/1000 population.[7]

Children are highly susceptible to injury due to curiosity and the drive to experiment and discover. However, their drive is not matched by the capacity to understand and respond to danger.[8] Therefore, regular supervision is necessary and this can be a challenge in poor families. Many young children are left to be cared for by older siblings when their parents have other responsibilities.

Factors that contribute to injuries include environment and social risk factors.[9] Financial problems, poor living conditions and health problems have been found to decrease child supervision and hence increase tendency to injury.[10] Also poor environment such as living in one bedroom where cooking takes place in the same room increases the risk for injuries such as burns.

In European Union (EU), children and adolescents injuries are the leading cause of death and estimated to be the main cause of chronic disability. In a study done in six European countries, it was found that crude annual incidence of emergency department attended child home injuries based on the average of the six member states over the 2 year period to be 44.9 (95% CI 29.1-60.7) per 1000 inhabitants.[11]

Data from the Global Childhood Unintentional Injury Surveillance conducted in four developing countries showed that, nearly 50% of children under the age of 12 years who had suffered unintentional injury severe enough to warrant presentation to an emergency department were left with some form of disability. Among children who had suffered burns, 8% were left with permanent disabilities, while children injured in traffic crashes were significantly more likely to be left with some form of disability.[12]

Ademola *et al* conducted an observational study in South Western Nigeria to describe the pattern of childhood injury. Among other findings, childhood injury was responsible for 10.6% of all attendances at the emergency room department.[13]

Another observational prospective convenience study was done in Mozambique between June and July 2007. Data on 335 children below 14 years presented to three hospitals in Maputo was collected. Prevalence of trauma related complaints were 12% with higher rates in boys (59%) and those between the age group 5-9 years (34.9%). Majority of the injuries (61.8%) occurred in the home environment.[14]

In Tanzania, an epidemiological survey was done in rural and urban areas in 2002, to determine the injury morbidity including from motor traffic accident. It was found that 2.5% and 4.3% persons reported to have been injured in the urban and rural areas respectively. Of those who reported injuries both in urban and rural areas, 37% were children below 14years. Age was an important risk factor for many injuries but its influence varies between specific injury groups. Children below 15 years were at greater risk of injuries due to falls. This was attributed to high risk environments such as lack of proper play facilities.[15]

1.1.1 Types of Injuries and their causes

Introduction

Injuries are broadly classified into two main types: intentional and unintentional. The first type refers to self-inflicted (suicide) and interpersonal (homicide) as well as war related injuries. In children, most intentional injuries are due to abuse or interpersonal.

Unintentional Injuries (UIs) are those that are unplanned, not intended to happen. It is the preferred term for accidental injury. It refers to the result of an accident. UIs are characterized by lack of evidence of pre-determined intent. In this, they differ from intentional injuries.

The most common causes of injuries in children, as identified by WHO include burns, falls, poisoning, road traffic accidents and drowning as described below.[1]

1.1.1.1 Burns

According to the International Society for Burn Injuries (ISBI), a burn occurs when some or all of the different layers of cells in the skin are destroyed by a hot liquid (scald), a hot solid (contact burns) or a flame (flame burns). Skin injuries due to ultraviolet radiation, radioactivity, electricity or chemicals, as well as respiratory damage resulting from smoke inhalation, are also considered to be burns.

According to WHO, it is estimated that more than 300,000 people died from burns in year 2004, of whom 30% were under the age of 20 years. Many more suffered from permanent

disability and disfigurement. Low and middle income countries suffered the most with more than 95% of burn injuries originating from these countries. South East Asia, the Eastern Mediterranean and Africa are the most affected.[16] Burns are also a leading cause of disability and disfigurement accounting for 10 million DALYs lost globally each year.[17]

Burn injuries are estimated to have caused 4% of all unintentional injury deaths in the WHO European region. They rank 13th as the leading cause of death in children 0-19 years within this region. Deaths occur more in children below 5 years. Hot liquid is the commonest cause of burn injury.[18]

While much has been accomplished in the areas of primary and secondary prevention of fires and burns in many developed or high-income countries (HICs), the same cannot be said of LMICs.

A study done in Brazil to determine the circumstances surrounding occurrence of burn injury in patients admitted at Ribeirao Preto Medical School burn unit. Twenty three percent of the hospitalized patients were children below 12 years. Half of these children were below 3 years. Males were more affected and all burns occurred at home. The kitchen and the backyard were the places where the majority of accidents (84.6%) happened.[19]

Okoro *et al* did a prospective study in south eastern Nigeria, looking at childhood burns of children below 18 years. He reported that 49 (92.5%) of patients sustained their injuries at home and 88% of them, the injury occurred in the presence of competent adults. This suggests that there was poor sense of safety among adults and the need for safety consciousness among Nigerians. The male to female ratio was 1.4:1. The age group below 2 years were mostly affected and this was attributed to their active and explorative nature.[20]

Hemeda *et al* conducted a prospective study in Egypt whereby a total of 880 patients were admitted to the Burn Unit of Ain Shams University in Cairo. Of the patients admitted, 42% were children below 14 years. Most children were burnt at home (80%) followed by outdoors (18%).[21] In Uganda, burns constituted 18% of all unintentional childhood injuries as reported by Mutto et al.[22]

Burn injury was found to be a major problem in children less than 5 years admitted at municipal hospitals in Dar es Salaam, Tanzania with prevalence of about 5%. Children less

than 2 years were found to be more vulnerable. More than 97% of the burn injuries were unintentional and 68% occurred in the kitchen and the rest in the living room. This, the author explained, indicated that most people have only single rooms used as kitchen, living and bedroom and hence increase the likelihood of injuries in children.[23]

Several studies have reported the causes of burns injury. In Switzerland, it was found out that boys aged between 15 months to 5 years were more likely to be burned by a cup of hot liquid on their hands in the presence of one or both parents.[24]

A retrospective study was carried out in India based on 110 paediatric patients 0-14 years seen at the burn unit, Choithram Hospital. Majority of the burns occurred at home (95%). Scalds accounted for more than half (57.5%) of all burns followed by flame (29%), electric (14.5%), contact (0.9%) and chemical (0.9%).[25]

Overheated liquids was responsible for 91% of burns in children less than 3 years in Brazil, while in Nigeria, the most common cause of burns was hot water (58.5%). In Egypt, Hemeda et al reported children to be commonly burnt by hot water (42.7%), flame (25.2%) and electricity (16.2%).[19-21]

In Uganda, the common cause of burns was hot liquid, fires and hot objects at 67.8%, 11.8% and 3.4% respectively. Odds of burns were highest during the first year of life dropping progressively with age.[22]

Scalds (78.4%) and flame (21.6%) were the causes of burns in children under 5 years in a hospital based study conducted in Dar es Salaam.

1.1.1.2 Road traffic injuries (RTIs)

WHO defines RTIs as fatal or non-fatal injuries incurred as a result of a road traffic crash. In 2004, road traffic injuries accounted for approximately 262 000 deaths among children and youth aged 0-19 years – almost 30% of all injury deaths among children. Highest rates of RTIs were found in Africa and Eastern Mediterranean regions. Globally, 21% of road traffic deaths were among children.[1]

RTIs kill 16 400 children aged 20 years and below in the European Region each year. These deaths comprise 38% of all unintentional injury deaths in this age group.[26]

There have been downward trends in the numbers of road traffic deaths and injuries over the last couple of decades in several developed countries. This does not hold true for developing countries whereby rapid urbanization together with poor infrastructure has lead to increase in road traffic accidents and eventually deaths. In Tanzania, it is estimated that for the past 20 years there has been an increase of road traffic injuries by more than 50%.[27]

Traffic related injuries were reported in 48 children (14%) among 335 children seen at the emergency departments of three hospitals in Maputo, Mozambique. In Uganda, RTIs was one of the leading cuases of UIs at 25.3%.[14, 22]

There is no recent data of traffic injuries involving children reported in Tanzania. In 1999, Museru *et al* reported that traffic injuries contributes 15.2% of all injuries that occur in school aged children in Dar es Salaam. Males were commonly affected (56%) with most accidents involving pedestrians (95%) aged between 5-9 years. Most children (73%) were injured while going or coming back from school. The authors concluded that the design of roads in Dar es Salaam contributes to vulnerability of road users and that there is a lack of knowledge of road safety among children.[28]

Road traffic injuries in developing countries mostly affect pedestrians, passengers and cyclists as opposed to drivers, in whom most of the deaths and disabilities in the developed world occur. In developing countries, where most injuries occur in urban areas, pedestrians, passengers and cyclists combined account for around 70% - 90% of deaths due to road traffic injuries.[29, 30]

Most of injuries (81%) in Maputo were a result of pedestrians being struck by vehicles. Private-owned minibuses which operate as the main means of public transport, were commonly involved (48%) in these accidents.[14]

Surveillance data from the National Pediatric Emergency Unit in Uganda revealed that majority of injuries (73.5%) occurred to children while walking. The commonest striking objects included motorcycles (31%), buses (21.6%) and passenger cars (19.6%).[22]

1.1.1.3 Poisoning

Poisoning refers to an injury those results from being exposed to an exogenous substance that causes cellular injury or death. Poison can be inhaled, ingested, injected or absorbed.

WHO estimates 345,814 people of all ages died worldwide as a result of accidental poisoning in 2004.[26] Among these accidental poisonings, 13% occurred in children and young people under the age of 20 years. The global death rate from poisonings for children younger than 20 years was 1.8 per 100 000 population. The rate was four times higher in LMIC compared to HIC with rates at 2.0 per 100 000 population and 0.5 per 100 000 population respectively.

Various substances ranging from medications to household chemicals, solvents, fuels and pesticides are toxic if ingested in sufficient quantities. Thus the home and surroundings can be a dangerous place for children. In LMIC children commonly are poisoned by kerosene especially during the hot season.

Children less than 1 year have the highest rates of fatal poisoning, particularly those in LMIC. Mortality rates decrease with age until 14 years. Globally, boys have higher rates than girls.[26]

The prevalence and types of poisoning vary considerably across the world and depends on social economic status and cultural practices, as well as on local industrial and agricultural activities.

Many developed countries of Europe and America have been able to decrease the incidence of poisoning due to introduction of child resistant containers. However, poisoning is still the 3rd leading cause of unintentional injury across Europe accounting for 7% of unintentional injuries despite the above interventions.[1]

In developing countries, poisoning is still a major problem. In a study conducted in 4 developing countries, poisoning was found to contribute 4% of all childhood injuries. It mostly affected males (65%) aged 1 – 4 years (56%). They also reported that 32% had ingested medicines followed by those who ingested cleaning agents (21%).[12]

A retrospective study was conducted at Charles de Gaulle Paediatric University Hospital in Ouagadougou from January 2005 to December 2006 to determine the epidemiology, aetiology and outcome of Acute Pediatric Poisoning (APP). APP was common among children aged 1 to 4 years and boys outnumbered girls in a ratio of 1.2:1. Household products accounted for 44.7% of APP and kerosene and other petroleum products topped the list of these household products. Drugs and food accounted for 22.7% and 22% of APP respectively.[31]

A retrospective study done in Nigeria looked at the medical records of all patients admitted at Emergency pediatric unit and pediatric medical ward with history of kerosene poisoning. Of all admissions between January 1999 and Dec 2005, 55 cases (1.2%) were due to kerosene poisoning. The affected age ranged from 4 month to 8 years with peak age at 18 months. The author concluded that kerosene poisoning was a significant cause of mortality and morbidity.[32]

Kerosene poisoning was found to be responsible for 11% of all pediatric poisoning admissions at 8 different hospitals in Zimbabwe. Median age of admission was 2 years with over 85% between 0-5 years old. Accidental poisoning occurred throughout the year contrary to other studies reported in the region.[33]

Lang *et al* conducted a retrospective study analyzing records of patients admitted from January 2005 to December 2006 at Kilifi District Hospital, Kenya. A total of 9775 patients were admitted and of these, 77 (0.8%) were cases of poisoning. Forty eight (62%) were due to kerosene, 2 cases due to aspirin and 7 cases due to organophosphates. The author acknowledged that children that made to the hospital represent a small percentage of all sick children because distances are great and travel is expensive.[34]

In Tanzania, no recent data is available as regards to poisoning. However, in 1977 Kimati found out that poisoning was responsible for 37% of all pediatric admissions due to accidents in Dar es Salaam.[35]

1.1.1.4 Falls

Falling is part of a learning process for every growing child. Fortunately, most falls are minor and don't require medical attention. On the other hand, some falls are beyond the resilience of human body and leads to injury and death or permanent disability.

WHO defines fall as an event which results in a person coming to rest inadvertently on the ground or floor or other lower level.

An estimated 424 000 people of all ages died of falls in 2004, many of them adults.[1] In 2004, nearly 47 000 children and youth under 20 years died as a result of a fall. Falls ranked as 12th leading cause of death in 5-9 years and 15-19 years old and was 13th leading cause of DALY's in children below 15 years.[26]

In Europe, more than 1500 people under 20 years of age die as a result of severe falls each year. Falls ranked as the fourth leading cause of injury death for this group. Falls also ranked as the eighth leading cause of burden or DALYs lost. However, there are a lot of inequalities within the region.

In a prospective hospital based study done in Lebanon, 214 pediatric injuries were recorded using a questionnaire. Falls accounted for 42% of all injuries.[36] Another study done in four developing cities identified falls as the most common cause of UIs (58.6%) among children who were presented to the emergency department. Most falls occurred in males and took place inside the home (38%) or during play (75%).[12]

Falls accounted for 25% of all childhood injury in Nigeria. Home was the commonest site of falls (55.3%), followed by school (38%).[37] In Kenya, falls were responsible for 25.3% of all injuries admitted at Kenyatta hospital.[38]

In a community study that was conducted in Dar es Salaam, Tanzania, males were found to be over represented with falls occurring more in age group 1-4years. Most of these falls occurred outdoor (62%) while playing (51%).[39]

Several studies have reported different mechanism of falls. In Lebanon, Nigeria and Kenya, children who fell from low level or ground level represented 38%, 75% and 11% respectively. Other reported mechanisms of falls from the same studies include falling

from height, furniture and staircase.[37, 38, 40] Another study conducted in four developing countries also identified most children felling from ladders or staircase (23%) and from beds or furniture (19%).[12] In Tanzania, recent community study indicates that most infants fall from furniture while those between 1-4 years fell from stairs.[39]

1.1.1.5 Drowning

Water is an important medium of life. To most children, water means fun, play and adventure be it in the pool, pond, lake or simply along the road after a rain storm. However, water can be a dangerous medium especially to small children.

Drowning refers to an event in which a child's airway is immersed in a liquid medium, leading to difficulty in breathing. This event may result in death or survival.

WHO estimates that in 2004, 388 000 people died as a result of drowning around the world, of whom 45% were under the age of 20 years. Majority of these deaths (98.1%) occurred in LMIC. Fatal drowning ranked 13th as the overall cause of death among children under 15 years, with the 1-4 year age group appearing at greatest risk.[26]

For those who survive drowning, many are left with long-term consequences and disability. Non fatal drowning is responsible for 1.1% of all DALYs lost for children less than 15 years of age in LMIC

Variability in drowning mortality rates within a region or within a country is controlled by exposure to open water. It has been shown that people living in rural areas are more likely to drown than those living in urban areas due to exposure of rural people to unprotected water surfaces. A study done in rural and urban Uganda by Kobusingye *et al*. revealed this important difference, and the rural community that was surveyed had extensive water surfaces surrounded by fishing communities.[41]

Dar es Salaam is surrounded by the Indian Ocean on the eastern side with few rivers such as Msimbazi draining into the ocean. Furthermore, there are man-made water reservoirs such as swimming pools, wells and those reservoirs found in construction sites. However, few incidences of drowning are reported in this city.

1.1.2 Risk factors of injuries

Introduction

Risk factors for injury can be broadly divided into two; demographic factors such as age and sex and social economic factors such as poverty and maternal education.

1.1.2.1 Demographic

Gender

Worldwide patterns show that injuries are common in males than in females. However, burns are the only type of injury that occurs more frequently among girls than boys. This is related to cultural practices due to involvement of girls in cooking and hence predisposing them to fire related injuries.[6, 18, 20, 21]

At the same time, there is a strong male predominance in RTI with male to female ratio ranging from 3:1 to 5:1. Males outnumber females for fall related injuries. This is the case in most countries.[37]

Age

Age is associated with injury in countries across all income levels although the rates of injury deaths are substantially higher in LMICs. SSA has the highest mortality rates for burns, RTI and poisoning in children aged 0-19 years.

Children's developmental stages as well as the activities and environments associated with these stages have a bearing on the incidence and characteristics of injuries.[42] In SSA, up to half of the total burden of RTIs is in children under 15 years, particularly the 5-14 years age group.[30] Increased mobility and risk taking, reduced supervision and shared road spaces are some of the factors that contribute to this pattern.

Children under five years of age also represent the highest risk category for burn injury, with risk decreasing as they get older.[26] On the other hand, ingestion of kerosene and traditional medicines are responsible for most of the deaths and injuries in SSA. Younger

children are particularly vulnerable given their physiology and curiosity and inadequate storage facilities for toxic chemicals such as kerosene.

1.1.2.2 Social economic

Poverty is a major risk factor for injury in all countries, regardless of income level.[1] It affects both exposure to the risk of injury and its outcome. For example, poverty has an impact on housing conditions, choice of transport and child care.

Parental education level, occupation and marital status as well have been associated with injury. However, these studies have not been consistent and most of them were done in developed countries.[43, 44] Hong *et al* reported low parental education and occupation as significant risk factors for injury.[45] In Ghana, maternal education was found to be protective against likelihood of a child sustaining injury.[46] On the other hand, Hong Wang conducted a case control study in China and found that parental factors such as education and occupation did not have any influence on injury.[47]

Furthermore, parental age has also been associated with risk of injury in children. Hjern et al. showed that children of young mothers have higher odds of poisoning and falls.[48] In Denmark, Bjarne *et al*. reported that the risk of childhood injury is high up to maternal age of 30 years where it start to decrease.[49] These findings suggest that parental experience is an important protective factor for childhood injuries.

In developed countries, a 20 year review of literature by Laflamme has showed that low socioeconomic status is detrimental to child's safety with great variations in magnitude between countries. They also reported great variations on SES between types of injuries.[50] Another study in Australia reported that there was no association between socioeconomic status and injuries in general. However it was noted that children in the poor quartile had more risk to specific injuries such as burns and RTI.[51]

A number of studies in SSA also have identified care giver and family factors that increase the risk of childhood injury. These include number of children in the household and total number of household members.[52] Studies conducted by Nathens et al in America, and Bjarne et al in Denmark revealed an increase of risk of injury as the number of siblings increase.[53, 49]

Caregiver's ability to supervise children is limited as a result of poverty, unemployment, and demanding working conditions in Africa. Additionally, the HIV/AIDS pandemic has increased care giving burden. It has strained support networks and reduced household resources. Research in Tanzania, South Africa and Botswana revealed how, unable to afford quality child care, parents leave children home alone or under the supervision of inexperienced adults and children while they attend to work or other activities.[35, 54, 55]

1.1.2.3 Environmental

Researchers have identified a number of environmental hazards contributing to different types of child injuries. These include characteristics and management of the agent as well as traits of the physical environment.

Road and traffic injuries are common in the region, where people walk along the roads, and where the frequent absence of playgrounds and sidewalks forces pedestrians to share the road with drivers, cyclists, street vendors and animals.

A study done in Uganda revealed that almost one third of patients who suffered RTIs were students. RTIs constituted 42% of these injuries, demonstrating risks associated with the journey to and from school.[56] Students constituted a large proportion of traffic victims in both rural (32%) and urban (24%) areas in Ghana as well.[57]

Kerosene, often used in home-made lumps and portable stoves, is most commonly involved in child poisoning. It is also a major cause of burns in children. Storage of kerosene in bottles previously used for beverages further increases the risk, particularly in young children.[33, 34]

1.2 STATEMENT OF THE PROBLEM

At least 19% of global unintentional injuries occur in children and adolescents [2]. Many of these injuries are preventable. However, injuries in developing countries still receive little attention.

The rate of unintentional injuries for children in sub-Saharan Africa has reached 53.1 per 100,000, the highest for regions across all income levels.[1] A survey that was done in Dar es Salaam and Hai district in 2002 identified that one third of victims of injuries are children below 14 years.[15] Despite this high burden, child injury prevention and control programs and policies are limited or non-existent in many countries in the region including Tanzania.

The success of injury prevention seen in developed countries is a result of scientific-based programmes. Low and middle income countries need to develop prevention programmes based on their circumstances and those that will need minimum resources to implement. Previous research on the social, environmental, and behavioral risk factors for childhood injuries have shown that there are great variations across countries, groups and types of injuries.[1]

1.3 RATIONALE OF THE STUDY

There are very few studies that have reported the risk factors of injury in children. Most of those studies were done more than 15 years ago.

Population has been on the increase in Dar es Salaam. This rapid urbanization may cause the change in the pattern of injury, especially in children. This study aims at determining whether childhood injury are on the increase and if the risk factors have changed compared to previous studies done in Dar es Salaam

Information obtained from this study will help to create awareness of the problem of injury in children. Furthermore, it will identify risk factors associated with childhood injuries so that injury prevention can focus on them. This will also stimulate authorities to start injury registry in Tanzania and also to stimulate further community studies which are important for determining the magnitude of the problem which is necessary for priority setting and planning.

1.4 STUDY OBJECTIVES

1.4.1 Broad objective

To determine risk factors associated with injury among children below 18 years attending health facilities in Dar es Salaam, Tanzania.

1.4.2 Specific objectives

- To describe the sociodemographic characteristics among cases and controls
- To determine the risk factors for injuries among children aged below 18 years attending selected health facilities in Dar es Salaam, Tanzania
- To determine the types of injuries among children aged below 18 years attending selected health facilities in Dar es Salaam, Tanzania

CHAPTER TWO

2.0 METHODOLOGY

2.1 Study Area

This study was conducted in Dar es Salaam, which is one of the fastest growing cities in Africa. It has an estimated population of 3.6 million inhabitants, among these, 47% are children below 18 years. Due to its large population, unplanned housing and overcrowding, individuals in this area are much more prone to injuries. The city is comprised of three Municipalities; Kinondoni, Ilala and Temeke. Each Municipality has one Municipal Hospital. Furthermore, Dar es Salaam hosts a National Hospital, which is among the 4 referral hospitals in the country.

Kinondoni Municipality has 4 health centres, two of them are Government owned. Temeke Municipality has 3 health centers, both of them owned by the Government. Ilala has 4 health centre, two Government owned. This study was conducted at all 3 Municipality hospitals mentioned above and one health center from each Municipality selected by convenience.

2.2 Study setting

All three hospitals had outpatient and inpatient services. All new patients including emergencies were first seen at the outpatient clinic whereby an attending doctor had to decide if there was a need for admission or referral to another facility. In all of the facilities, children under the age of five years were attended separately from adults.

2.3 Study design

A hospital based case control study was conducted between May 2011 and December 2011 including 3 Municipal Hospitals and 3 selected health centres in Dar es Salaam. Cases were patients below 18 years presenting with any type of injury. Controls were patients who presented to the same hospital with other problems apart from injury.

2.4 Study Population

All children below 18 years attending the selected health facilities in Dar es Salaam with injuries were eligible.

2.4.1 Inclusion Criteria

Cases

Children below 18 years presented with injuries to any one of the selected health facilities. Injury was defined as physical damage that results when human body is subjected to mechanical, thermal, electrical or chemical energy.

Controls

Children below 18 years presented with other problems apart from injury at the same health facilities.

2.4.2 Exclusion Criteria

Cases

Birth injuries

Refusal to participate by either Parents/guardians or children

Controls

Refusal to participate by either Parents/guardians or children

2.5 Sample size estimation:

Sample size was calculated using the following formula by Joseph Fleiss

$n = m/4\ [\ 1+ \sqrt{1+2(c+1)/(mcb)}]^2$

$m = [Z_{\infty}\sqrt{(c+1)pq} + Z(1+\beta)\sqrt{cp1q1 + p2q2}]^2 /c(p2-p1)^2$

With

$p2 = p1*OR/[1+p1(OR-1)]$

$p = (p2 + cp1)/(1+c)$

$q = 1 – p$

OR : odds ratio worth detecting

C : ratio of controls/cases

Z_{∞} : alpha risk

$Z_{1-\beta}$: power

p1 : proportion/probability of exposure among controls

Since the study was looking at multiple risk factors for injury, one risk factor which gave the highest sample size was selected. In a study done in Brazil to assess the effect of parity on burn injury, the proportion of controls with more than 3 children was found to be 18%.[58]

Plugging the following values into the formula,

Confidence interval = 95%

Power = 90%

Case: control Ratio = 1:1

Proportion of controls with exposure = 18%

Odds ratio worth detecting = 2

The minimum estimated sample size: 241 pairs + 24(10% of total) = 265pairs (265 cases and 265 controls making a total of 530)

2.6 Sampling procedure

Sequential recruitment procedure was used to recruit both cases and controls. The method resulted into unbiased random sample due to independent probability of reporting to health facilities among different patients.

2.7 Research Tool

Data was collected using a structured questionnaire. Information regarding the circumstances surrounding the injury was obtained by interviewing parents/guardians or whoever brought the patient to hospital. The main outcome variable was injury.

The following predictors of injuries were included in the questionnaire: sex, age, maternal education, maternal age, marital status, number of children, numbers occupying the household, social economic characteristics including source of energy and light, presence of chemicals within reach of children.

2.8 Data collection

Each selected hospital had two research assistants who assisted with data collection. A one week training was organized and research assistants were trained on the objectives of the study, data collection methods, data collection tool and ethical issues. Pre-testing of the questionnaire was done at Muhimbili National Hospital before commencing data collection. Twenty five patients were selected for pre-testing the questionnaire.

Cases were recruited at OPD. All doctors and nurses who worked at data collection sites had prior information regarding the study. An attending doctor on duty together with research assistants identified children with injuries fitting the inclusion criteria. Parent/guardian who brought the child to hospital was informed of our study. Research assistants interviewed those who consented after the child had completed treatment. For those who were admitted, interview was conducted in the ward. Recruitment of both cases and controls was done around the clock.

2.9 Data Quality Control

Questionnaires were checked and edited for any inconsistencies or discrepancies. An investigator visited the data collection sites at least twice every week to supervise data collection and to collect completed questionnaires.

2.10 Data Analysis

Data entry was done using Microsoft Excel 2007 and analysis computed using Statistical Package for Social Sciences (SPSS) version 15. Frequencies for all categorical variables were run and Chi squire test was used to examine differences between proportions. Continuous variables were summarized by calculating means and standard deviations. Differences between means were examined using t-test. Odds Ratios (ORs), Adjusted Odds Ratio (AOR) and 95% confidence intervals were computed using the Logistic regression model to ascertain the independent risk factors for injury. Only those risk factors which

had p value less or equal to 0.2 were selected for logistic regression model. All statistical tests were two-tailed and significance level set at 5%.

Principal component analysis was used to generate wealth scales using a number of items such as TV, radio and house characteristics, type of toilet, and types of roofing material. The scale had a Chronbach's alpha of 0.823 as a measure of internal consistency. Wealth index was then generated and three relative wealth groups (rich, middle and poor) were formed.

2.11 Ethical clearance

Ethical clearance was obtained from Muhimbili University of Health Allied Sciences (MUHAS) Ethical Committee and further from respective municipal health directors and Medical Doctors in charge of the hospitals that were involved. Written informed consent was obtained from each parent/guardian of the child after thorough explanation of the purpose of the study and its future implications in the field of health. Parents/guardians were given an option of whether to participate in the study or not. No parent/guardian or a child who refused to participate when invited by a member of the research team.

2.12 Ethical consideration

The aims and benefits of the study were explained to the parents/guardians. Children were treated according to the health care protocol. Parents/ guardians signed a written informed consent prior to participate in the study. Parents/ guardians who refused to participate in the study were never denied the right to be treated as consent was sought after treatment.

CHAPTER THREE

3.0 RESULTS

3.1 Social-demographic characteristics of the study participants

The study sample consisted of 984 participants recruited at Sinza Health Centre, Buguruni Health Centre, Mbagala rangi tatu Health Centre, Amana, Temeke and Mwananyamala Hospitals in Dar es Salaam. There were a total of 492 cases with injury(s) and 492 control children without injury. The mean age for cases was 55.2 ± 45 months while that of controls was 54.8 ± 45 months and this did not attain statistical significance at 5% level (p=0.8).

There were more male injuries (58%) compared to females. The age group 1-4 was more affected with injuries 61.2% followed by age 5-9 at 23.2% while those with less than 1 year were the minority at 3.3%.

Table 1 summarises the characteristics of the parents/guardians of both cases and controls. Parents/guardians of cases were younger (55.5%) compared to controls (47.2%) and this difference was statistically significant (p=0.005). Fifty nine percent (59.1%) of the parents whose children had injuries had primary level of education compared to 56.1% of controls. This difference was not significant. The distribution of marital status did not significantly differ between the cases and the controls. Parents/guardians of cases were more likely to be farmers than those of controls (6.1% versus 3.0%) (p=0.06).

Table 1 Distribution of social demographic characteristics of parents/guardian among the cases and controls

Variable	Total	Cases n(%)	Control n(%)	*χ^2	P value
Maternal age(yrs)					
15 – 24	237	119 (24.2)	118 (24.0)	10.6	0.005
25 – 34	505	273 (55.5)	232 (47.2)		
35+	242	100 (20.3)	142 (28.9)		
Total	984	492	492		
Education					
No education	83	38 (7.7)	45 (9.1)	1.3	0.5
Primary	567	291 (59.1)	276 (56.1)		
Secondary+	334	163 (33.2)	171 (34.8)		
Total	984	492	492		
Marital status					
Single	163	73 (14.9)	90 (18.3)	3.1	0.20
Married	713	369 (75)	344 (69.9)		
Separated	108	50 (10.2)	58 (11.8)		
Total	984	492	492		
Occupation					
Peasant	45	30 (6.1)	15 (3.0)	9.0	0.06
Employed	232	121 (24.6)	111 (22.6)		
Petty trader	390	186 (37.8)	204 (41.5)		
House wife	293	147 (29.9)	146 (29.7)		
Others	24	8 (1.6)	16 (3.2)		
Total	984	492	492		

***P value from $\chi 2$ test for differences in proportions;**

3.2 Risk factors of injuries

In the bivariate analysis, age and sex were not significantly associated with higher odds of injuries. There were more injuries (34.3%) in those household with 3-4 children compared to controls (24.4%). The difference was statistically significant (p=0.001).There was also a significant difference between total number of people in the household and injury. Significantly large proportion of injury cases (37.6%) reported to be living in households with more people (>6 people) as compared to controls (24.4%) (p=0.001).

Of those parents whose children had injury, 39.6% reported the tendency to leave their children at home alone when they attended to other business. Also 55.7% of those with injury reported the tendency to leave their children at home under supervision of other children. Both these findings were statistically significant (p= 0.001) (Table 2).

Table 2 Bivariate analyses of risk factors for injury in children below 18 years in Dar es Salaam; Child Factors

Variable	Category	Total	Cases n(%)	Control n(%)	χ^2	P value
Age (yrs)	<1	35	16 (3.2)	19 (3.8)	0.40	0.9
	1 – 4	601	301 (61.2)	300 (61.0)		
	5 – 9	223	114 (23.2)	109 (22.2)		
	10 – 17	125	61 (12.4)	64 (13.0)		
	Total	984	492	492		
Sex	Male	568	285 (57.9)	283 (57.5)	0.01	0.9
	Female	416	207 (42.1)	209 (42.5)		
	Total	984	492	492		
No of children	1 -2	674	305 (62.0)	369 (75.0)	25	0.001
in the house	3 – 4	289	169 (34.3)	120 (24.4)		
	5+	21	18 (3.7)	3 (0.6)		
	Total	984	492	492		
Number of	3 – 5	679	307 (62.4)	372 (75.6)	20	0.001
People in house	6 +	305	185 (37.6)	120 (24.4)		
	Total	984	492	492		
Child left home	Yes	311	192 (39.6)	119 (24.2)	26.4	0.001
Alone	No	665	293 (60.4)	372 (75.8)		
	Total	976	485†	491		
Child left with	Yes	453	270 (55.7)	183 (37.2)	33.5	0.001
Caretakers	No	524	215 (44.3)	309 (62.8)		
	Total	977	485†	492		

***P value from χ2 test for differences in proportions; †-discrepancy due to missing responses**

Parental/guardian factors that were identified as risk factors for injury included maternal age ($p=0.005$), social economic status ($p=0.001$) and occupation of parents ($p=0.06$). Education and marital status of parents/guardians had no association with injury ($p>0.2$). (Table 3)

Table 3 Bivariate analyses of risk factors for injury in children below 18 years in Dar es Salaam; Parent/Guardian factors

Variable	Category	Total	Cases n(%)	Controls n(%)	χ^2	P value
Maternal age (yrs)	15 – 24	237	119 (24.2)	118 (24.0)	10.6	0.005
	25 – 34	505	273 (55.5)	232 (47.2)		
	35+	242	100 (20.3)	142 (28.8)		
	Total	984	492	492		
Education	Illiterate	82	38 (7.7)	45 (9.1)	1.3	0.50
	Primary	567	291 (59.1)	276 (56.1)		
	Secondary+	334	163 (33.2)	171 (34.8)		
	Total	984	492	492		
Marital Status	Single	163	73 (14.9)	90 (18.3)	3.1	0.20
	Married	712	369 (75)	344 (69.9)		
	Separated	108	50 (10.2)	58 (11.8)		
	Total	983	491†	492		
Occupation	Peasant	45	30 (6.1)	15 (3.0)	9.0	0.06
	Employed	232	121 (24.6)	111 (22.6)		
	Petty trader	389	186 (37.8)	204 (41.5)		
	House wife	293	147 (29.9)	146 (29.7)		
	Others	24	8 (1.6)	16 (3.2)		
	Total	983	491†	492		
SES	Poor	318	176 (37.5)	142 (29.4)	13.4	0.001
	Middle	319	163 (34.7)	156 (32.2)		
	Wealthier	316	130 (27.8)	186 (38.4)		
	Total	953	469†	484		

†-discrepancy due to missing responses

Children left at home alone had 1.6 times higher odds of injury as compared to those with proper supervision after adjusting for confounders{OR = 1.6; 95% CI (1.1 - 2.3)}. For those children who were left with a child caretaker, the adjusted risk of injury was 1.6 times higher compared to controls {AOR = 1.6; 95% CI (1.1 – 2.2)}.

Those households with 3-4 children had 1.7 times increase probability of injury compared to those with 1-2 children {OR=1.7; 95% CI (1.3 - 2.2)}. Also households with more than 6 individuals had almost twice the likelihood of childhood injury as compared to those households with less than 6 people {OR=1.8; 95% CI (1.4 – 2.4)} and when this was adjusted, the odds remained the same (Table 4)

Table 4 Logistic regression of independent risk factors for injuries among children aged less than 18 years in Dar Es Salaam; Child factors.

Variables	**Category**	**OR(95%CI)**	***AOR(95%CI)**
Age(years)	<1	1	1
	1 – 4	1.2 (0.6 – 2.3)	1.0 (0.5 – 2.2)
	5 – 9	1.2 (0.6 – 2.5)	0.8 (0.4 – 2.0)
	10 – 17	1.1 (0.5 – 2.4)	0.8 (0.3 – 2.1)
Sex	Female	1	1
	Male	1.0 (0.8 – 1.3)	0.9 (0.7 – 1.3)
Child left home alone	No	1	1
	Yes	2.0 (1.5 – 2.7)	1.6 (1.1 – 2.3)
Child left with caretaker	No	1	1
	Yes	2.1 (1.6 – 2.7)	1.6 (1.1 – 2.2)
Number of children in the house	1 – 2	1	1
	3 – 4	1.7 (1.3 – 2.2)	1.3 (1.1 – 2.2)
	5 +	7.2 (2.1 – 24)	7.0 (1.7 – 28)
Number of people in the house	3 – 5	1	1
	6+	1.8 (1.4 – 2.4)	1.8 (1.3 – 2.6)

OR-Odds ratio; AOR- Adjusted odds ratio; CI- Confidence Interval

*All variables are adjusted for others in the table

Mothers whose age was between 15-24 years had 1.4 times increased likelihood of having a child with injury compared to those aged 35 years and above. When adjusted for other factors, the odds increased to two-fold and this was statistically significant {AOR=2.3; 95% CI (1.4 – 3.7)}. Also those between age 25 – 34 years had 1.6 times increased likelihood of having an injured child compared to those aged 35 years or above {AOR=2.1; 95% CI (1.4 – 3.0)}.

When assessed as an independent risk factor, social economic status was found to be protective against childhood injury. That is those with relatively poor social economic status were 1.7 times more likely to suffer injuries compared to those that were relatively wealthier (OR=1.7; 95% CI (1.3 – 2.4)}. This was statistically significant after adjusting for potential confounders {AOR=1.6; 95% CI (1.1 – 2.4)} (Table 5).

Table 5 Logistic regression of independent risk factors for injuries among children aged less than 18 years in Dar Es Salaam; Parental factors

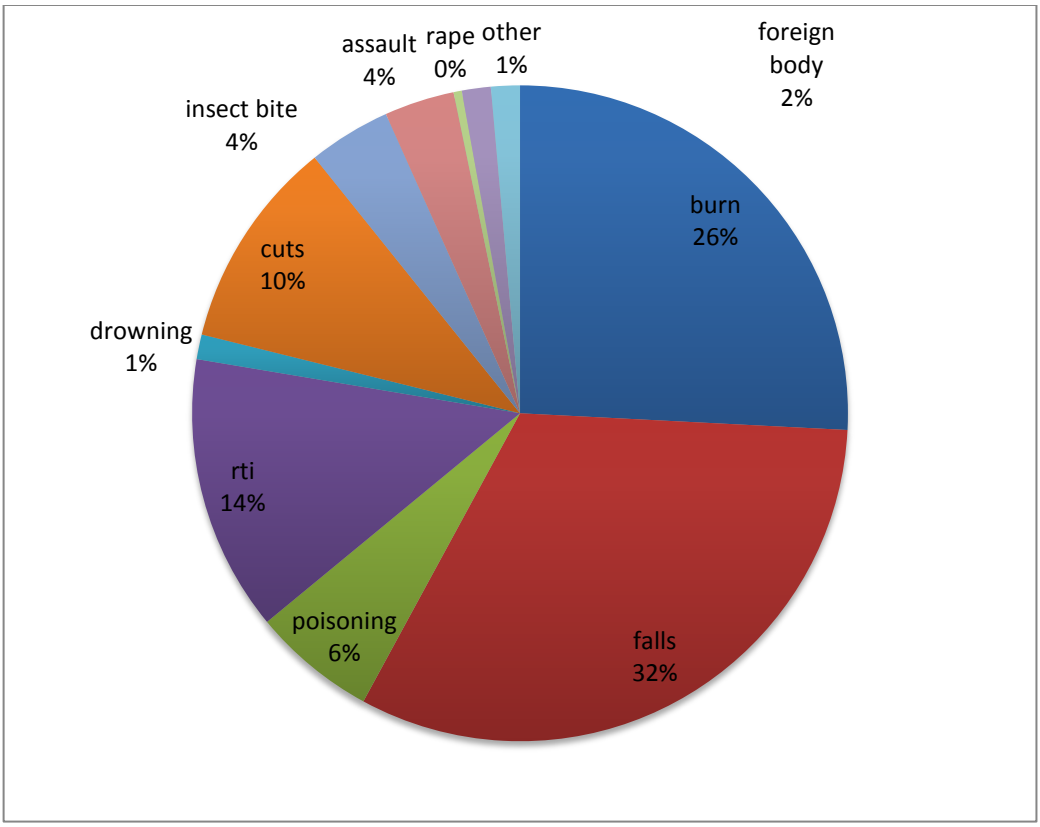
Variables	**Category**	**OR(95%CI)**	**AOR(95%CI)**
Maternal age (yrs)	35+	1	1
	15 – 24	1.4 (0.9 – 2.0)	2.3 (1.4 – 3.7)
	25 – 34	1.6 (1.2 – 2.2)	2.1 (1.4 – 3.0)
Occupation	Peasant	1	1
	Employed	0.5 (0.2 – 1.0)	0.9 (0.4 – 1.8)
	Petty trader	0.4 (0.2 – 0.8)	0.5 (0.2 – 1.1)
	House wife	0.5 (0.2 – 0.9)	0.6 (0.3 – 1.2)
Marital status	Single	1	1
	Married	1.3 (0.9 – 1.8)	1.3 (0.9 – 2.0)
	Separated	1.0 (0.6 – 1.7)	1.1 (0.6 – 2.0)
Social economic status	Wealthier	1	1
	Middle	1.5 (1.1 – 2.0)	1.5 (1.0 – 2.1)
	Poor	1.7 (1.3 – 2.4)	1.6 (1.1 – 2.4)

OR-Odds ratio; AOR- Adjusted odds ratio; CI- Confidence Interval

3.3 Types of Injury

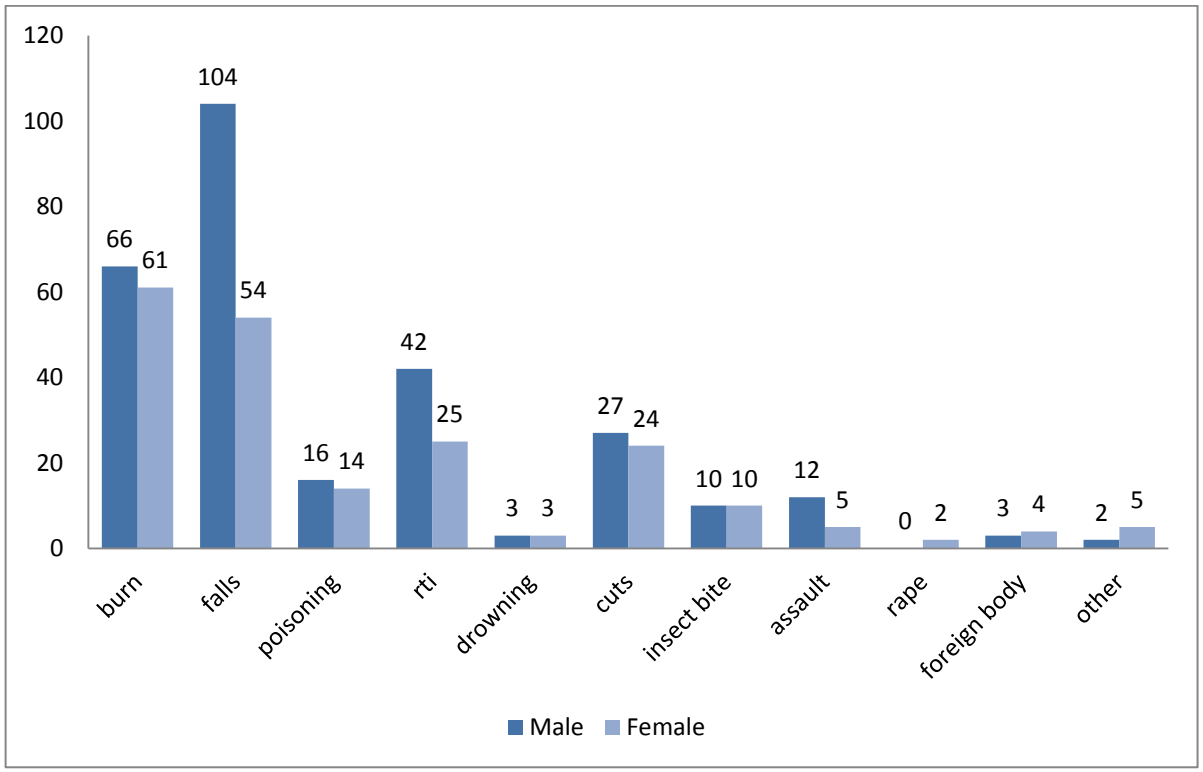
A total of 492 children suffered injuries during the period of study. Falls represented the highest number of injured children (32.1%) followed by burns, RTI and cuts (25.8%, 13.6% and 10.4% respectively). Accidental poisoning was another type of injury that recorded a significant number of children representing 6.1% of all injuries. Seventeen children reported to be assaulted representing 3.5% of all injuries. These assaults were mainly by their peers. There were 7 children who had swallowed a foreign body and two female children reported to have been raped. Six children were reported to have drowned representing 1.2% as shown in Figure 1.

Figure 1: Distribution of types of injuries among children aged less than 18 years in Dar es Salaam



Males outnumbered females in most of the injuries. The ratio of male: female was highest in falls at 2:1 as depicted in Figure 2. A large majority of injuries (70.0%) were reported to have occurred at home while 7.1% and 9.4% occurred at school and sport areas/venues, respectively.

Figure 2 Number of male and female cases recruited with injuries



3.3.1 Falls

A total of 158 patients suffered falls during the study period, representing 32.1% of all injuries. Children between 1-4 years were mostly affected with falls as noted in Table 2.

Most of these falls occurred at home (81.0%) followed by those occurring at school (8.9%) and play-ground at 8.8% while only 1.3% occurred on the road. Many children fell off the ground (37.3%) while those falling from furniture were 33.5% as shown in Table 6.

Table 6 Distribution of characteristics of children aged less than 18years who suffered falls; n = 158

Variable	Frequency	Percentage
Age (years)		
< 1	5	3.2
1 – 4	108	68.4
5 – 9	35	22.1
10 – 17	10	6.3
Place of fall		
Home	128	81.0
School	14	8.9
On the road	2	1.3
Playground	14	8.8
Fell from		
Stairs	34	21.5
1st floor	5	3.2
Furniture	53	33.5
Off the ground	59	37.3
Others	7	4.4

3.3.2 Burns

Half of those who sustained burns were below 2years old. Only 6.3% were above 4years old. Almost all burn injuries occurred at home (98.4%). Male to female ration was 1:1 in all age groups. Approximately 44.1% of children were burnt with a hot food followed by 40.9% who were burnt with hot water. Majority of children suffered burns in the presence of an adult caregiver/parent (60.6%) compared to 25.2% who suffered burns when they were alone.

Table 7 Distribution of characteristics of children aged less than 18 years who suffered burns; n = 127

Variable	Frequency	Percentage
Age (years)		
0 – 2	63	49.6
2 – 4	56	44.1
5 – 17	8	6.3
Place of injury		
Home	125	98.4
School	2	1.6
Agent which caused burn		
Hot water	52	40.9
Hot food	56	44.1
Charcoal/gas	17	13.4
Others	2	1.6
Presence of adult during burn		
Child alone	32	25.2
Parent/guardian	77	60.6
Another child	18	14.2

3.3.3 Road traffic injuries (RTI)

A total of 67 patients suffered Road traffic injuries. There were more males (62.7%) compared to females. The age group between 5-9 years was the most affected 47.7%, followed by those who were above 10 years and between 0-4 years 28.4% and 23.9% respectively. Many of the accidents occurred when children were either going or coming from school (37.1%) or playing with peers. Also 80.7% were pedestrians as compared to only 19.3% who were passengers when RTIs occurred.

Furthermore, 53.7% reported they were struck by a motorcycle, while 38.8% reported they were hit by a car. Only 7.5% were struck by a bicycle (Table 8).

Table 8 Distribution of characteristics of children aged less than 18 years who suffered RTIs

Variable	Frequency	Percentage
Sex		
Male	42	62.7
Female	25	37.3
Total	67	100
Age(yrs)		
1 – 4	16	23.9
5 – 9	32	47.7
10 – 17	19	28.4
Total	67	100
Activity at the time of RTI		
to/from school	23	37.1
Playing	18	29
Other	21	33.9
Total	62†	100
Type of involvement		
Pedestrian	46	80.7
Passenger	11	19.3
Total	57†	100
Type of vehicle involved		
Car	26	38.8
Motorcycle	36	53.7
Bicycle	5	7.5
Total	67	100

†-discrepancy due to missing responses

3.3.4 Poisoning

There were 30 children who took poisons representing 6.1% of all injuries. Almost all children (86.7%) were between 1 year and 4 years. Furthermore, 46.7% took kerosene while 43.3% had ingested prescribed medicines. The rest of the patients ingested other chemicals such as detergents (10%) (Table 9).

Table 9 Distribution of characteristics of children aged less than 18 years who suffered Poisoning; n = 30

Variable	Frequency	Percentage
Age		
1 – 4	26	86.7
5 – 9	1	3.3
10 – 17	3	10.0
Sex		
Male	16	53.3
Female	14	46.7
Types of Poisoning		
Kerosene	14	46.7
Ingested medicines	13	43.3
Other Chemicals	3	10

CHAPTER FOUR

4.0 DISCUSSION

4.1 Social demographic characteristics

The main objective of this study was to determine the types of childhood injury and risk factors associated with them in patients attending health facilities in Dar es Salaam, Tanzania.

A total of 492 patients who suffered injuries were recruited in the period of two months. The majority were between 1-4 years which reflect the fact that this study was conducted in health centres where minor injuries, which are common in young children, are mostly seen. Boys have been found to account for most of childhood injuries in many studies as well as the current study.[7,15,19,20,24] The reason for this is that boys are more active, and tend to participate in all activities compared to girls. They are more likely to suffer from injuries such as falls.

4.2 Types of Injury

Falls were the leading cause of injury in this study accounting for 32% of all injuries. This is similar to what had been reported by other studies worldwide. Falls have contributed to between 25% and 56% of all childhood injuries.[13,26,36,37] Findings of this study also revealed that most of the falls involved young children at home. In a community survey conducted by Benjamin *et al*, they reported that falls tend to occur almost exclusively at home among young children in Tanzania.[39] Males were overrepresented as expected with male to female ratio of 2:1. Globally, males tend to outnumber females in falls.[13,37,39]. Possible explanation for this gender difference is that males tend to be overactive, tend to have risk taking behavior as well as being less supervised as compared to females.

This study revealed a quarter of children with injuries suffered burns. These findings are similar to other reports elsewhere. They have reported burns to contribute between 13% to 23% of all injuries.[13,22,25] Almost all of these burns occurred at home and half of the children were below 2years. Studies done in India, Nigeria and Egypt have also reported a significant proportion of burns occurring at home especially in children below 3yrs.[19-21, 25]

These children are the ones who need utmost supervision and care. The fact that most of our children got burnt at home and half of them were below 2 years means that supervision was not optimum. The majority of burns in our study were scalds of which comparable findings have been reported in India, Brazil, Nigeria, Egypt and Uganda.[19-22, 25]

Furthermore, other studies have reported that 80-90% of burns occur in the presence of an adult.[19, 20, 24] In contrast, this study had only 62% children burnt while one of their parents or guardians was around. This could explain the slightly higher percentage of burns in our children due to lack of supervision

In Sub Saharan Africa, RTI are on the increase mainly due to rapid urbanization. This current study revealed 14% of all injuries are RTIs. The same findings have also been reported previously in Dar es Salaam and Maputo whereby RTI contributed 15.2% and 14% of childhood injuries respectively.[14,28] Another study done in Uganda revealed 25.3% of all unintentional injuries being contributed by road traffic injuries.[22] This is slightly higher compared to our findings. The reason could be most of road traffic injuries in Dar es Salaam are seen directly at Muhimbili Orthopaedic Institute which was not included in this study.

Pre-school and school aged children between 5-9 years are more prone to road traffic injuries as pedestrian. This is because children are more likely to walk to or from school. Furthermore, because of lack of play area, children are forced to play on the streets. In Dar es Salaam, pedestrians are not well protected from motorized transport due to poor infrastructure and lack of separation of pedestrians from motorized transport. Previous findings from developing countries in SSA including Tanzania have reported the dominance of pedestrians as vulnerable road users to transport injuries.[14, 22, 28, 30]

The big number of motorcycle related traffic injuries that we have reported, reflect the surge of motorcycles in Dar es Salaam which are being used as convenient and quick transport. However, the passenger motorcycle services are not well regulated in Tanzania. Comparable results have been reported in Uganda where motorcycle passenger services has been growing as well.[22]

WHO reports that poisoning contributes about 13% of all childhood poisoning globally. Children between 1-4 years are commonly affected.[26] In developing countries, there is great variation of poisoning among individual countries. This study has reported significant amount of poisoning accounting for 6% of all injuries, affecting mostly male children. Hyder *et al*. reported similar findings where poisoning contributed 4% of childhood injuries, predominantly occurring in male children aged 1-4 years.[12] Kerosene poisoning is still a problem in developing countries where it is commonly used as a source of energy for cooking.[31-34] The current study revealed similar findings. In Tanzania, families use transparent containers such as empty water bottles for storing kerosene. As a result, young children sometimes ingest kerosene accidentally thinking it is water.

Although not reported by WHO as one of the common childhood injuries, childhood cuts proved to be significant in this study. It represented 10.5% of all injuries with almost equal number of males to females. The number of cuts was significant because of involvement of primary health care centres where most of these minor injuries are seen.

4.3 Risk factors for injury

Several risk factors for injury have been identified worldwide with some variations between developed and developing countries. However, male to female ration was 1.3:1, with age group 1-4 being mostly affected.

It has been reported elsewhere that burns tend to affect women more than men. This is due to domestic duties such as cooking that predisposes them to burns.[19, 20, 24] That was not the case in this study as male to female ratio in burns was the same. This could be explained by the fact that we had more than 50% of patients below 2 years hence they have not started domestic duties. It is well known that males are more predisposed to falls and road traffic injuries than females.[37] This study had the same findings with male to female ration of 1.9:1 and 1.6:1 for falls and RTI respectively.

In Sub Saharan Africa, child supervision is declining due to multiple factors. HIV pandemic has also contributed to many orphaned children. It is known that most childhood preventive measures of injury focus on supervision. This study examined the relationship

between injury to the tendency of parents leaving their children at home unsupervised. The odds of a child being injured increased if parents reported the tendency to leave them alone at home. The risk increased to 1.6 times after adjusting for other risk factors. Likewise, the odds of injury was 1.6 for those children left at home to be cared for by their older siblings.

Similar findings have been reported in South Africa and Botswana. Women tend to leave their children at home while attending to other necessary duties. They rely on other children to provide care.[50,53] As reported by Monica et al, not only are these other activities important, but most of times women don't have a choice. This is because there are no supportive structures for working families such as day care or if they are there, then they can't afford them.[53] The implication of this is that, prevention needs to consider different circumstances as not all children who are left at home are a result of parental/guardian neglect

One of the risk factors that were looked at in this study was how the number of children in the house influences injury. It has been reported elsewhere that the more children they are in the house, the higher the risk for them getting injured. Nathens et al reported an increased risk of 1.5 times if a child has an older sibling. The risk tends to increase as the number of older siblings increases.[49,53] In the current study, there was a 1.6 times increased risk of injury in families with 3-4 children compared to those with less than 3 children after controlling for other risk factors. As the number of children increases, there is tendency to pay less attention and less supervision to each individual child. Interaction between the children themselves exposes them to injury as well.

The number of people in the household also has been reported to influence childhood injury. In this study, we have showed that those households with more than 5 individuals have almost two-fold increase in the risk of injury compared to those households with less than 5 individuals. The risk remained the same after adjusting for other risk factors

In this study, maternal age was associated with injury in general. The risk of injury increased twofold for children whose mothers were aged between 15-24 and between 25-34 years after adjusting for other factors. Similar findings have been reported by Bjarne *et al*. and Hjern *et al*. that young maternal age is associated with increased risk of injury.[48,49]

This may be explained by the fact that young mothers lack experience as well as awareness of the environment that could endanger their children

Several studies have reported the influence of social demographic characteristics such as maternal education, occupation and marital status on injury risk.[45] However, this is not consistent in all settings. In this study, maternal education and maternal occupation were found not to influence injury in general. Similar findings were reported by Hong Wang in China.[47] This is in contrast to other studies conducted elsewhere where parental education has been strongly linked to injury risk.[49] This could be explained that in our study we considered only maternal education and maternal occupation, therefore possibly, father's factors could play a big role especially when he is the only bread winner.

In this study, social economic status was found to be associated significantly with injuries after controlling for various confounders. There was a tendency of decreasing risk of injury with increase in wealth. Similar findings were reported in Australia and Europe where direct association between socioeconomic status and injury in general was reported.[50,51] Socioeconomic status influences a number of things including type of housing, overcrowding, environment and mode of transport. All these factors have an impact on risk of injury. Furthermore, children of wealthier families are generally few and under closer supervision probably due to the ability of wealth households to have caretakers. Therefore wealth is frequently cited as underlying cause of injury which does not act directly.

4.4 STUDY LIMITATIONS

Since this was a hospital based study, the injuries reported here reflect those which are relatively severe to necessitate visit to health facility. Therefore, findings won't reflect the true picture of the general population. Moreover, due to the nature of study design, we could not provide information on the prevalence of injuries.

CHAPTER FIVE

5 CONCLUSION

1. Inadequate supervision, overcrowding, having more than 3 children in the house, low maternal age and poverty were identified as significant risk factors associated with injury in general.
2. Falls, burns, RTIs and cuts were the main types of injuries found in this study. Home environment was the common place of injury occurrence.

5.1 RECOMMENDATIONS

1. Local prevention programs should focus on home environment as this is where most of injuries occur.
2. Schools need to teach students on road safety
3. We need large prospective studies, possibly community studies to quantify the magnitude of injuries.

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ANNEX I.

QUESTIONAIRE (ENGLISH VERSION)

Serial No._____

Status 1. CASE

2. CONTROL

Date of interview:_____

Name of Hospital/centre:_____

Name of interviewer :_____

1. Age____
2. Sex
   a. Male
   b. Female
3. Age of Parent/Guardian
   a. Father…..
   b. Mother…..
4. Parents/Guardian level of education
   a. No formal education
   b. Primary level
   c. Secondary level
   d. College
5. Marital status
   a. Single
   b. Married
   c. Divorced
   d. Widowed
6. Occupation
   a. Peasant
   b. Employed

c. Petty trader
d. House wife

7. Number of children in the household……
8. Number of individuals in the household…..
9. Where did the injury occur?
    a. Home and home surroundings (*go to q10*)
    b. School and schoolyard (*go to q11*)
    c. Road/Street (*go to q11*)
    d. Play area (*go to q11*)
10. Where did the injury occur at home?
    a. Living room
    b. Kitchen
    c. Outside the house
    d. Others
11. What was the Cause of Injury
    a. Burn (*go to q12)*
    b. Fall (*go to q14*)
    c. Poisoning *(go to q15)*
    d. RTI *(go to q16)*
    e. Drowning *(go to q19)*
    f. Cuts *(go to q19)*
    g. Insect bite *(go to q19)*
    h. Assault *(go to q19)*
    i. Others *(go to q19)*
12. What was the specific cause of burn
    a. Hot water
    b. Hot food
    c. Fire/Gas
    d. Others…..

13. Who was with the child at the time of suffering burn?
    a. Alone
    b. Parent/Guardian
    c. Another child

14. Where did the child fell from
    a. From stairs
    b. From 1st floor and above
    c. From furniture
    d. From level ground
    e. others
15. Type of poison
    a. Kerosene
    b. Prescription Drug
    c. Other chemicals, mention….

16. Activity at the time of Road traffic injury
    a. Going to/from school
    b. Playing with peers
    c. Other activities
17. Where did the injury occur
    a. While walking along the road
    b. While crossing the road
    c. As a passenger
18. Hitting object
    a. Car
    b. Motorbike
    c. Bicycle
19. Where did the drowning occur
    a. Swimming pool

b. Ocean
c. Man made well
d. others

20. Do you own any of the following items?
    a. Motor car
    b. Bicycle
    c. Motorbike
    d. TV
    e. Radio
    f. Refrigerator
    g. Electric iron
21. House floor material
    a. Earth
    b. Wood
    c. Tiles
    d. Cement
    e. Others
22. Roofing material of the house
    a. Concrete
    b. Corrugated sheets
    c. Wood/grass
    d. Earth
23. What is your main source of cooking fuel
    a. Electricity/propane
    b. Firewood
    c. kerosene/charcoal
    d. Other
24. What is your main source of light?
    a. Electricity
    b. Candles
    c. Lantern
    d. Others

25. Type of toilet
    a. Western type
    b. Asian type
    c. Pit
    d. Others
26. Do you own the house you live in?
    a. Yes
    b. No
27. How do you store kerosene
    a. In a gallon
    b. Bottle of beverage
    c. Other
28. Have you ever left you child home alone
    (Without supervision)
    a. No
    b. Few times (1-2 days per week)
    c. Often (4-5 days per weeks)
29. Have you ever left you child with another
    Child care taker?
    a. No
    b. Few times (1-2 days per week)
    c. Often (4-5 days per weeks)
30. Intent of injury
    a. Unintentional
    b. Intentional
    c. Not known
31. Outcome of injury
    a. Admitted
    b. Treated and discharged home
    c. Referred to another hospital

ANNEX II: Informed Consent Form (English version)

INFORMED CONSENT FORM

ID-NO…….

Consent to Participate in a Study

Greetings! My name is **Dr. Robert Moshiro ,** I am working on a research with the objective of determining the **Childhood injuries and associated risk factors in children below 18 years attending health facilities in Dar es salaam, Tanzania**

Purpose of the study

The study is conducted in partial fulfillment of the requirements for the degree of Master of Medicine in Internal Medicine with the aim of learning more about the childhood injuries and associated risk factors for children attending municipal hospitals in Dar es Salaam. You have been randomly selected as a possible participant in this study because you reside in this area.

What Participation Involves

Should you agree to participate, you will be asked some questions concerning the injury your child has sustained.

Confidentiality

I assure you that any information obtained in connection with you in this study and that can be identified with you will remain confidential and the final report will be sent to the Muhimbili University of Health and Allied Sciences without disclosing your identity. All information collected on forms will be entered into computers with only the study identification number and confidentiality will be observed.

Risks

We don’t anticipate any harm from participating in this study.

Right to withdraw from the study and Alternatives

Taking part in this study is completely voluntary. You can decide to withdraw your participation at any time, even if you have already given in your consent. Refusal to participate or withdrawal from the study will not involve penalty.

Benefits

We hope that the results obtained from this study will provide a useful tool to assist in the prevention of injuries in children.

Who to Contact

If you have questions about this study please contact the **Principal Investigator**, **Dr Robert Moshiro** of Muhimbili University of Health and Allied Sciences, P. O. Box 65001, Dar es Salaam.

If you have questions about your rights as a participant, you may call

Prof. E. F. Lyamuya, Chairperson of the Senate Research and Publications

Committee, P. O. Box 65001, Telephone : 255 22 2152489 Dar es Salaam

and **Dr. A. Massawe** who is the supervisor of this study (Tel 0754304251.)

Signature:

Do you agree?

Participant agrees …….. Participant does NOT agree…….

I ……. have read the contents in this form. My

questions have been answered. I agree to participate in this study.

Signature of participant ……

Signature of PI or designee……. Date…….

ANNEX III: Informed Consent Form (Kiswahili version)

FOMU YA RIDHAA

Namba ya utambulisho…….

Ridhaa ya kushiriki kwenye utafitiisha

Hujambo! Ninaitwa **Dr. Robert Moshiro,** nashughulika kwenye utafiti wenye lengo la **kutathimini ajali za watoto pamoja na mazingira yanayochangia kuwepo kwa ajali hizo**

Madhumuni ya Utafiti

Utafiti huu unafanyika kama sehemu ya shahada ya uzamili ya tiba ya Chuo Kikuu cha Afya na Sayansi ya Tiba Muhimbili. Utafiti unalenga kuchunguza aina za ajali zinazowapata watoto pamoja na mazingira yanayochangia kuwepo au kuongezeka kwa ajali hizo. Tafadhali kuwa mkweli na muwazi kwa vile matokeo ya utafiti huu yanaweza yakatoa maamuzi na mapendekezo ya baadaye.

Nini kinahitajika ili kushiriki

Kama umeamua kushiriki, nitakuuliza maswali kuhusu ajali aliyopata mtoto wako. Pia nitakuuliza maswali mengine ya ziada yanayokuhusu wewe kama mlezi wa mtoto huyu.

Usiri wa taarifa

Taarifa zozote zile zitakazopatikana katika utafiti huu ambazo zinaweza zikakutambulisha wewe zitabaki kuwa siri, taarifa ya mwisho ya utafiti huu itapelekwa chuo kikuu cha Muhimbili pasipo kutambulisha taarifa zako binafsi.

Athari za kushiriki

Hatutegemei kutokea athari yoyote kwa kushiriki kwenye utafiti huu.

Haki ya kujitoa au vinginevyo

Ushiriki katika utafiti huu ni wa hiari. Unaweza kuacha kushiriki katika utafiti huu muda wowote hata kama ulikwishatoa idhini yako. Kukataa kushiriki au kujitoa kutoka kwenye utafiti huu hakutahusisha adhabu yoyote.

Faida

Matokeo ya utafiti huu yataweza kutusaidia kuwa na ufahamu wa kutosha kuhusu ajali zinazowapata watoto pamoja na namna ya kuzizuia au kuzipunguza.

Madhara

Hutegemewi kupata madhara yoyote kutokana na ushiriki wako katika utafiti huu.

Nani wa kuwasiliana naye

Kama una maswali kuhusiana na utafiti huu, wasiliana na Mtafiti mkuu wa utafiti huu, **Dr Robert Moshiro** wa Chuo Kikuu cha Afya na Sayansi ya Tiba Muhimbili, S. L. P. 65001, Dar es Salaam.

Kama una swali kuhusu haki zako kama mshiriki unaweza kumpigia simu **Prof. E. F. Lyamuya**, Mwenyekiti wa kamati ya Utafiti na Uchapishaji, S.L.P 65001, Simu: 255 22 2152489 Dar es Salaam au msimamizi wa utafiti huu **Dr A. Massawe (0754304251)**.

Sahihi:

Je umekubali?

Mshiriki amekubali ……..... Mshiriki hajakubali…….....

Mimi ..... nimesoma maelezo ya fomu hii.

Maswali yangu yamejibiwa.Nakubali kushiriki katika utafiti huu.

Sahihi ya mshiriki……

Sahihi ya mtafiti mkuu au mwakilishi……

Tarehe ya kutia sahihi ya idhini ya kushiriki……..