

**PREVALENCE AND FACTORS ASSOCIATED WITH
INJURIES AMONG CHILDREN AGED 12 YEARS AND
BELOW ADMITTED TO HOSPITALS IN NYERI
COUNTY, KENYA**

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(Applied Epidemiology)

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AGRICULTURE AND TECHNOLOGY**

2016

**Prevalence and factors associated with injuries among children aged
12 years and below admitted to hospitals in Nyeri County, Kenya**

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**A thesis submitted in partial fulfillment for the degree of Master of
Science in Applied Epidemiology in the Jomo Kenyatta University of
Agriculture and Technology**

2016

DECLARATION

This thesis is my original work and has not been presented for a degree in any University.

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DEDICATION

This work is dedicated to my lovely wife Grace and son Githaiga for their sacrifice, support and inspiration during my studies.

ACKNOWLEDGEMENT

First and foremost I would like to thank the Almighty God for the blessings he has given me throughout my course. This work has been accomplished with inputs from many people and organizations that deserve mention. First I would like to thank my supervisors Prof. Simon Karanja and Prof. Mohamed Karama for their invaluable support and input throughout the process of my work. In the same context, I would like to acknowledge and appreciate the faculty of Kenya Field Epidemiology and Laboratory Training program (FELTP) who served to impart the necessary knowledge as well as provide technical and financial support during the period of my study.

I wish to express my gratitude to parents, guardians as well as the children admitted in the various hospitals for agreeing to participate in the study. Finally, special thanks to my research assistants Andrew Kinyanjui, Winfred Wanjiku and Jedidah Muthoni who in one way or another contributed to actualizing my research.

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ABBREVIATIONS AND ACRONYMS

| | |
|---------------|--|
| AIDS | Acquired immune deficiency syndrome |
| AIS | Abbreviated Injury Scale |
| AOR | Adjusted odds ratio |
| AP | Anatomical profile |
| APACHE | Acute physiological and chronic health evaluation |
| CDC | Centres for Disease Control and Prevention |
| CI | Confidence Interval |
| DALYs | Disability adjusted life years |
| DHIS | District Health Information System |
| ED | Emergency department |
| ERC | Ethical Review Committee |
| FELTP | Field Epidemiology and Laboratory Training Program |
| GCS | Glasgow Coma Scale |
| GCUIS | Global childhood unintentional injury surveillance |
| HIV | Human immunodeficiency virus |
| IP | In-patient |
| ISBI | International Society for Burn Injuries |
| ISS | Injury severity score |

| | |
|---------------|--|
| JKUAT | Jomo Kenyatta University of Agriculture and Technology |
| KEMRI | Kenya Medical Research Institute |
| KDHS | Kenya Demographic Health Survey |
| LMIC | Low and middle income countries |
| MoH | Ministry of Health |
| NHIF | National Hospital Insurance Fund |
| OECD | Organisation for Economic Co-operation & Development |
| OPD | Outpatient department |
| RTS | Revised Trauma Score |
| SES | Socio-economic status |
| SSC | Scientific Steering Committee |
| TBSA | Total Burn Surface Area |
| UIs | Unintentional injuries |
| UNICEF | United Nations Children's Emergency Fund |
| WHO | World Health Organization |
| YLL | Years of life lost |

DEFINITION OF OPERATIONAL TERMS

Injury: an injury is defined as “the physical damage that results when a human body is suddenly subjected to energy in amounts that exceed the threshold of physiological tolerance or else the result of a lack of one or more vital elements, such as oxygen” The energy in question can be mechanical, thermal, chemical or radiated.

Burns: Injuries to the body caused by hot liquids, fire, electricity or chemicals

First-degree or superficial burns are defined as burns to the epidermis that result in a simple inflammatory response. They are typically caused by exposure of the unprotected skin to solar radiation (sunburn) or to brief contact with hot substances, liquids or flash flames (scalds).

Second-degree or partial-thickness burns result when damage to the skin extends beneath the epidermis into the dermis. The damage does not, however, lead to the destruction of all elements of the skin.

Superficial second-degree burns are those that take less than three weeks to heal. Deep second-degree burns take more than three weeks to close and are likely to form hypertrophic scars.

Third-degree or full-thickness burns are those where there is damage to all epidermal elements including epidermis, dermis, subcutaneous tissue layer and deep hair follicles. As a result of the extensive destruction of the skin layers, third-degree burn wounds cannot regenerate themselves without grafting.

Drowning: Respiratory impairment resulting from submersion/immersion in liquid.

Fall: A sudden, unintentional change in position causing them to drop from height, or level ground and land at a lower level, on the ground, other than as a consequence of sudden onset of paralysis, epileptic seizure, or overwhelming external force.

Poisoning: Swallowing, inhaling, injecting, or absorbing any substance which interferes with normal body functions.

Road traffic injury (RTI): A pedestrian, vehicle passenger or cyclist presenting with a fatal or non-fatal injury resulting from road crash or motor vehicle trauma.

ABSTRACT

Injury and violence is a major killer of children throughout the world, responsible for about 950 000 deaths annually, in children and young people under the age of 18 years. The World Health Organization identifies burns, falls, road traffic injuries (RTIs), poisoning and drowning as the major causes of injuries in children. In Kenya, injuries are the 5th leading cause of morbidity among patients attending health facilities while in Nyeri County; they are the 3rd leading cause of mortality among those attending health facilities. The objective of this study was to determine the prevalence, characteristics and factors associated with injuries among children aged 12 years and below admitted in hospitals in Nyeri County. A cross-sectional study was conducted from June 2013 to August 2013. Systematic random sampling was used to enrol patients based on hospital monthly inpatient workload. Information on socio-demographic characteristics, clinical characteristics, length of hospital stay, and outcome was collected from parents/guardians using interviewer administered questionnaires. For the patients presenting with injuries, further information on cause and circumstances surrounding the injury was collected. Medical records of all the patients were reviewed to verify clinical and socio-demographic data. Univariate, bivariate and multivariate analyses were performed. Of the 415 patients enrolled into the study, 108 (26%) presented with injuries, with a median age of 39 months (range: 7-144), males being the majority at 67(62%). The leading causes of injuries were burns 41(38%), falls 38(35%), cuts 13(12%) and poisoning 9(8%). Eighty-six (80%) of the injuries occurred at home, 70(65%) during play and 67(62%) in the absence of an adult/care taker. Independent risk factors associated with injuries were; parents spending < 6 hours with the child in a day [AOR=2.6; 95% CI (1.5-4.3)]; age >5years [AOR=2.6; 95% CI (1.4-4.9)]; low SES [AOR=2.5; 95% CI (1.3-4.7)] and previous history of injury [AOR=4.0; 95% CI (1.6-10.1)]. Prevalence of injuries is high among males and patients above 5 years of age. Burns, falls, cuts and poisoning were the leading causes of injuries. By knowing the leading causes of childhood injuries and associated factors, we conclude that majority of paediatric injuries are preventable. Targeted interventions such as adequate supervision from parents/guardians and public health education on injury prevention are vital.

CHAPTER ONE

INTRODUCTION

1.1 Background Information

An injury is defined as physical damage to the body resulting from acute exposure to thermal, mechanical, electrical or chemical energy in amounts that exceed physiological threshold or from the absence of such essentials as heat or oxygen (Baker *et al.*, 1992).

Injuries are traditionally grouped according to two broad categories: intentional and unintentional. Conventionally, intentional injuries include interpersonal violence (spousal abuse, child abuse, and other assaults), self-inflicted injuries (attempted and completed suicides) as well as collective violence and war-related injuries. Motor vehicle injuries, poisonings, burns, falls, drowning, and other injury classifications in which intentionality is understood to be absent constitute the broad unintentional injuries category (Holder *et al.*, 2001).

Thus, whereas intentional injuries are associated with violence, unintentional injuries are not. Such a distinction may be valuable for conceptual and analytical clarity, but recent evidence points to a cluster of shared risks across intentional and unintentional injuries. Furthermore, intentionality cannot always be ascertained in particular circumstances, and violence may indirectly contribute to the prevalence of unintentional injuries (Berger & Mohan, 1996). The "intentionality divide" is thus established as a useful concept for injury prevention programs, but risk factors appear porous across it.

It is the acuteness of exposure that differentiates injury from disease. This distinction is somewhat arbitrary and certainly not rigid, but it is conceptually useful for classification, research, and policy purposes (Barss, 1998).

Childhood injury is a major public health problem that requires urgent attention. Globally over 875,000 children less than 18 years of age die annually as a result of injuries, mostly in low and middle income countries (LMIC), where injuries account for 13% of the total burden of morbidity among children <15 years of age (Murray & Lopez 1997; Deen *et al.*, 1999).

Majority of the deaths (90%) were due to unintentional injuries such as road traffic injuries (RTI), drowning, burns and poisoning. These are the leading cause of death for children aged 10–19 years. However, the problem is more common in low and middle income countries (LMIC) than in high income countries (HIC) with variations according to type of injury. For deaths due to burns, the rate in LMIC is almost 11 times higher than in HIC; for drowning six times higher; for poisons four times and for falls six times higher. In addition to those who die each year, millions more may develop a temporary or permanent disability, exacting a profound toll on the individual, family, and society (Peden, 2008; WHO, 2008).

A number of social, demographic and economic factors in LMIC are associated with vulnerability to injuries in childhood. For instance, age, gender and socioeconomic status are significant factors related to injury vulnerability. Injuries are preventable by changing the environment, individual behaviour, products, social norms, legislation and governmental and institutional policies.

They are a number of factors that increase vulnerability to injuries in children, key among them being that children have a unique profile of risks for injuries because they are unable to recognize and avoid many potential risks on their own. Secondly, children are also at risk of worse injury due to their smaller size and physiological immaturity. In addition, the burden of injury is greater among children since they have more years ahead of them to be affected by disability (Bartlett 2002; Nath *et al.*, 2007).

According to a report from the United Nations Children's Fund (UNICEF), childhood injuries declined by 50% in HIC between 1970 and 1995 due to changes in the environment, behaviour, products, legislation, governmental and institutional

policies. Unfortunately, several findings from LMIC have shown the opposite trend despite the increasing burden (Odero *et al.*, 1997; Kyobutungi *et al.*, 2008; Kendrick *et al.*, 2007).

Data collected and analyzed in some selected African states indicate the dire burden that injury exerts on these countries. In Zimbabwe, injuries were reported to account for 15% of all deaths for the year 1988 (Zwi *et al.*, 1993); while survey data on injuries from both Ghana and Kenya suggest that they have significant contribution to mortality (Forjuoh *et al.*, 1996).

Data from the Global Childhood Unintentional Injury Surveillance conducted in four developing countries (Bangladesh, Colombia, Egypt and Pakistan) 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 (Hyder *et al.*, 2009).

The high burden of injury in these regions is illustrated in studies done in the various countries. A prospective survey of two national trauma referral hospitals in Trinidad and Tobago showed patients below 15 years accounted for 31% of all Emergency Department(ED) visits (Kirsch *et al.*, 1996). In Tehran, Iran, 15.1% of hospitalized trauma patients at six major trauma hospitals were below 12 years of age (Karbakhsh *et al.*, 2008).

In Tanzania, an epidemiological survey done in rural and urban areas in 2002, to determine the injury morbidity including from motor traffic accident 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 14 years. Age was an important risk factor for many injuries but its influence varied 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 (Moshiro *et al.*, 2005).

The burden and pattern of childhood injuries are now beginning to be characterized in LMIC. In spite of the growing evidence on the increasing burden, little attention has been given to this growing epidemic in the developing world in terms of research, policy, or public health intervention (Nordberg, 2000; Smith & Barss, 1991).

In Kenya, injuries are the third leading cause of mortality after malaria and HIV/AIDS, and the fifth leading cause of morbidity among patients attending health care facilities. A study focused on describing the prevalence and magnitude of RTI fatalities in Kenya (Odero *et al.*, 2003) reported that the country has one of the highest road fatality rates in relation to vehicle ownership in the world.

In Kenya, injuries among children contribute a significant burden of disease measured as years of life lost (YLL) due to premature death and ranked second as a cause of death among individuals aged five years and above (Kyobutungi *et al.*, 2008).

1.2 Problem Statement

The burden of injuries among children is considerable the world over inflicting great economic losses on society, ranging from USD (516,938-9,550,704) per year (Jiang *et al.*, 2010) and USD (4-1,856) per case (Dalal *et al.*, 2009).

Mortality data are a powerful injury indicator, but deaths from injury comprise just a fraction of the impact of injuries on a population. Deaths from injuries are projected to increase from 5.1 million to 8.4 million (9.2% of all global deaths) and injuries are estimated to be the third leading cause of disability adjusted life years (DALYs) by the year 2020 (Murray *et al.*, 1997). Furthermore, 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 DALYs are very high in developing countries with an average rate of 55/1000 population for children under 15 years of age. Sub-Saharan countries have the highest rate at 88/1000 population

(Deen *et al.*, 1999). For instance, 87.9% of all road traffic deaths, and 88.3% of lost DALYs were from LMIC (Mathers *et al.*, 2001).

Kenya is facing challenges of a complex epidemiological transition marked by a rising burden of non-communicable diseases. Malaria, HIV/AIDS, and pulmonary tuberculosis continue to be major public health problems; however, non-communicable conditions such as cardiovascular diseases, cancer and injuries are emerging as important public health problems (WHO, 2009). Although known to disproportionately burden developing countries, the actual childhood proportion of the injury burden in these countries remains unclear (WHO 2008; Peden, 2008).

Injuries contribute significantly to the rising morbidity and mortality attributable to non-communicable diseases in the developing world. Unfortunately, active injury surveillance is lacking in many developing countries, including Kenya. Trauma care research is still in the developmental stages with relatively few trauma registries and published data without any existing policy document on injuries.

Childhood injuries have emerged as a leading global public health problem with direct and indirect economic burdens related to premature morbidity and mortality, with productivity losses alone estimated at 78 billion USD (Katherine *et al.*, 1995).

1.3 Justification

In the systematic approach to public health problems the initial steps include identifying the magnitude and the modifiable factors associated with the problem (Peden, 2008). Data on the scope and patterns of injury are essential for identifying priority issues, understanding the causes of injury and identifying groups at high risk of injury. With limited data, weak injury surveillance systems, problems of underreporting and differences in interpretation; it is difficult to advocate the burden of injury to policy makers. It is also impossible to decide how to prioritize and develop effective programmes.

However; research on childhood injuries in Kenya has been minimal and inconsistent with the magnitude of the problem. Most publications on injuries are based on

retrospective data from medical records which are not standardized and often incomplete which affects validity and generalization of the reports. A hospital-based study targeting county and sub-county hospitals therefore supplements information on the number of injuries and provides more accurate and detailed information on leading causes of injuries, socio-demographic and clinical characteristics of injury cases, circumstances surrounding the injuries as well as factors associated with injuries among children.

Resource allocation for interventions geared towards mitigation of the burden of injuries remains low in most parts of Africa (KDHS, 2008/09). While a number of communities and hospital-based studies have shed light on the situation of injuries in Kenya, a lot remains to be done (Obura, 1998; Mengech, 1997; Bishai *et al.*, 2003). There are few documented studies carried out to understand the local spectrum of injuries including the less common ones which in the urban Kenya context are fast becoming an important cause of death (Mengech, 1997; Muniu *et al.*, 1994).

Nyeri County has experienced significant urbanization and lifestyle transition. Data from the District Health Information System (DHIS) indicates that the county has reported an increased burden of injuries in the last two years.

Given the peculiarities of children and their potential to a heightened risk of injury; none of the documented past studies have focused on this group in Nyeri county and therefore information obtained from this study will help to create awareness on the burden of childhood injuries. Furthermore, it will identify risk and protective factors associated with childhood injuries so that injury prevention can focus on them. This will stimulate authorities to start registries and further community-based studies which are important for determining the magnitude of the problem necessary for planning implementation and evaluation of preventive measures.

1.4 Research Questions

1. What is the prevalence of injuries among children aged 12 years and below admitted to hospitals in Nyeri County, Central Kenya?
2. What are the characteristics of injuries among children aged 12 years and below admitted to hospitals in Nyeri County, Central Kenya?
3. What are the factors associated with injuries among children aged 12 years and below admitted to hospitals in Nyeri County, Central Kenya?

1.5 Study Objectives

1.5.1 General Objective

To determine the prevalence, characteristics and factors associated with injuries among children aged 12 years and below admitted to hospitals in Nyeri County, Central Kenya.

1.5.2 Specific Objectives

1. To determine the prevalence of injuries among children aged 12 years and below admitted to hospitals in Nyeri County.
2. To determine the characteristics of injuries among children admitted to hospitals in Nyeri County.
3. To determine factors associated with injuries among children admitted in hospitals in Nyeri County.

CHAPTER TWO

LITERATURE REVIEW

2.1 Prevalence of childhood injuries

Injuries remain a major global health problem. At least 90% of global injury mortality is attributed to unintentional injuries and 19% of the global injury burden is among children and adolescents, with road trauma, drowning, burns, falls and poisonings as leading causes (WHO, 2008; Peden, 2008; Rivara, 1999). The annual prevalence of medically treated injuries among 11- 15 year-old youths in 11 industrialised countries was 41.3% and among adolescents in 35 industrialised countries it ranged from (33%–64%) for boys and (23%–51%) for girls (Molcho *et al.*, 2006).

In an examination of 5,031 children presenting to a hospital in Agra, India, Tandon *et al* found that 14.2% of the presentations were due to injury (Tandon *et al.*, 1993). Another study of 5,191 trauma patients in Uganda found that 24.2% were children less than 14 years of age (Kobusingye *et al.*, 2000). A retrospective analysis of children less than 12 years presenting at a community health centre in Naraingarh India showed that unintentional injuries accounted for 5.5% (Singhi *et al.*, 2004).

2.2 Types and aetiology of injuries

Injuries are broadly classified into two main types: intentional and unintentional. The first type (intentional) refers to self-inflicted (suicide) and interpersonal (homicide), assault, domestic violence as well as war related injuries. 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 (WHO, 2008; Peden, 2008).

The aetiology of injury involves a complex interplay between human, equipment and environmental factors. Patterns of injury vary according to socio demographic factors including age, sex, residence and socioeconomic status, all of which are difficult to modify (Lescohier & Gallagher, 1996).

The five leading causes of unintentional injuries have also been documented in various regions in a bid to fulfil the criteria for causality. In a hospital-based study at a referral hospital in Northern Malawi, Yu et al 2009 reported that of all children presenting with injuries at Mzuzu Central Hospital, the distribution of the mechanisms of injuries was: falls (29.6%), road traffic injuries (22.0%), burns (21.4%) and poisoning (15.1%).

A review of childhood injuries at the Wesley Guild Hospital in Nigeria revealed that 9% of all patients visiting an emergency room during a four-year period were children representing with trauma (Adensunkanmi *et al.*, 1998).

Studies done in Kampala Uganda have shown that injury prevention efforts must address traffic road accidents and falls at roads, homes and schools. An analysis of surveillance data from the National paediatric emergency unit in Kampala on childhood injury confirmed roads, homes and schools as the leading locations of childhood injury. (Mutto *et al.*, 2011).

In a sampling of 6 months of 2003 emergency department (ED) data from the Central Hospital of Maputo , approximately 26% of all patients presented as a result of trauma, with leading causes of injury being falls, road traffic injuries, burns, and interpersonal violence(Mercy *et al.*, 2006).

Fire-related burn injuries resulted in the death of some 238,000 people in the year 2000 (Peden *et al.*, 2002). Ninety-five percent of these occurred in low to middle income countries with South-East Asia and Africa having the highest rates. Young children and the elderly are the most vulnerable to burn injuries (WHO, 2002).

Pedestrians and motorcyclists account for most of the injured and killed on the road, and 80% of all unintentional injuries and majority of all resulting deaths in children are related to road traffic injuries (Razzak *et al.*, 2004).

2.2.1 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. Burns may be distinguished and classified by their mechanism or cause, the degree or depth of the burn, the area of body surface that is burned, the region or part of the body affected, as well as the extent. A full-thickness burn will occur within 60 seconds if the skin is exposed to hot water at a temperature of 53° C. If, though, the temperature is increased to 61° C, then only 5 seconds are needed for such a burn. In children, burns occur in around a quarter to a half of the time needed for an adult to burn (Moritz *et al.*, 1947).

The World Health Organization estimates that globally, the annual death toll due to burns is over 310,000, with burns in LMIC accounting for 95% of all annual burn deaths (WHO, 2004). Among the survivors, many suffer from permanent disability and disfigurement with women and children being the most frequently affected (Peden *et al.*, 2002; Burd *et al.*, 2005).

Injuries and deaths from burns occur more in children below 5 years with hot liquids being the commonest cause. While much has been accomplished in the areas of primary and secondary prevention of fires and burns in many HIC, the same cannot be said of LMIC (Sethi, 2008).

Several studies have reported the causes and circumstances surrounding burn injury. A study done in Brazil to determine the circumstances surrounding occurrence of burn injury in patients admitted at a burn unit showed twenty three percent of the

hospitalized patients were children below 12 years with half of these children aged below 3 years. Males were more affected and all burns occurred at home. The kitchen and the backyard were the places where 85% of the burns happened (Rossi *et al.*, 1998).

Most children are likely to sustain burns from holding hot liquids on their hands in the presence of one or both parents (Naterrer *et al.*, 2009). A retrospective study carried on paediatric patients at a burns unit in India, showed majority of the burns occurred at home and scalds accounted for more than half of all burns followed by flame (29%), electric (14.5%), contact (0.9%) and chemical (0.9%) (Mukerji *et al.*, 2001).

Okoro *et al* did a prospective study in south eastern Nigeria, looking at burns in children below 18 years. He reported that 92.5% of patients sustained their injuries at home, with 88% occurring in the presence of competent adults. The male to female ratio was 1.4:1 with children aged 2 years and below mostly affected and this was attributed to their active and explorative nature (Okoro *et al.*, 2009).

Hemeda *et al* 2003 conducted a prospective study in Egypt among patients admitted to a burns unit. Of the patients admitted, 42% were children below 14 years. Eighty-percent of the children were burnt at home followed by outdoors (18%). Hot water was the commonest cause of burns(43%), followed by flame(25%) and electricity. In Uganda, burns constituted 18% of all unintentional childhood injuries presenting at a paediatric unit. The common causes of burns were hot liquid, fires and hot objects. Odds of burns were highest during the first year of life dropping progressively with age (Mutto *et al.*, 2011).

A study done by Dane *et al* 2010 in Kijabe Hospital found out that the median age of patients presenting with burns was 10 years with an interquartile range (IQR) of 3–20. Fifty-nine percent were male and scald burns were the most common, comprising 46%, followed by flame at 39%. The median total body surface area (TBSA) was 4% (IQR 2–8%). A study by Nderitu *et al* 2006 in Kenyatta National Hospital found out

that 48.6% of children presenting with burn injuries were under 5 years of age with scalds being the commonest type of burn.

2.2.2 Falls

Falling is part of a learning process for a growing child. Fortunately, most falls are of little consequence and most children fall many times in their lives without incurring damage, other than a few cuts and bruises. However, some falls are beyond the resilience of human body and leads to injury and death or permanent disability among children. World Health Organisation defines fall as an event which results in a person coming to rest inadvertently on the ground or floor or other lower level.

An expert group convened by the National Institute of Child Health and Human Development identified socio-demographic factors, physical development of the child, activity taking place before fall such as walking or climbing, location of the fall, height from which it occurs and characteristics of the surfaces within which the contact is made as the main factors relating to falls in childhood.

Globally, falls ranked 12th as a leading cause of death in children aged 5-9 years and was 13th leading cause of DALYs in children below 15 years of age (WHO, 2008). In 2004, nearly 47 000 children and youth under 20 years of age died as a result of a fall in the world. In Africa, the median incidence of falls among children and youth aged 22 years and below, was 41 per 100 000 population (Hyder *et al.*, 2007).

When it comes to falls, there are a lot of inequalities within and across regions but in most regions, they are the most common type of childhood injury seen in emergency departments, accounting for between 25% and 52% of assessments (Khambalia *et al.*, 2006).

The Global Burden of Disease report showed that 66% of fatal falls among children occurred from a height, while 8% resulted from falls on the same level. In the Islamic Republic of Iran, falls were a leading cause of death among children < 1 year of age (Soori *et al.*, 1998), while in Uganda; falls were the most common cause of severe injuries in children < 10 years of age(Kobusingye *et al.*, 2001).

In Kenya, falls were responsible for 25.3% of all injuries admitted at Kenyatta hospital (Gome *et al.*, 2005). A community study conducted in Dar es Salaam, Tanzania, found most falls occurred outdoor while playing, males were over represented and most falls occurred in the age group 1-4years.

2.2.3 Road traffic injuries (RTI)

World Health Organization defines RTIs as fatal or non-fatal injuries incurred as a result of a road traffic crash (Peden, 2008; WHO, 2004). In many places the road network is constructed without considering children yet they use the roads as pedestrians, bicyclists, motorcyclists and occupants of vehicles. They may live close to a road, play on a road, or even work on the roads. All these interactions with roads, together with a range of other risk factors associated with childhood, increase the susceptibility of children to road traffic injury (Peden, 2008).

The African region has the highest road fatality rates globally (24.1 deaths per 100,000 population), well above the global average of 18.0 deaths per 100,000, in spite of the fact that the region is the least motorized with 2% of the world's vehicles (WHO, 2011).

In 2004, road traffic injuries accounted for approximately 262 000 deaths globally among children and youth aged 0-19 years; almost 30% of all injury deaths among children. Globally, 21% of road traffic injuries were among children below 18 years of age. RTI was the leading cause of death among young people aged 15 to 19 years and the 2nd leading cause among children aged 5-14 years. These deaths accounted for nearly 2% of all deaths among children (WHO, 2008).

There have been downward trends in the numbers of road traffic deaths and injuries over the last couple of decades in several developed countries. However, this does not hold true for developing countries whereby rapid urbanization coupled with poor infrastructure has lead to an increase in road traffic accidents and 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 % (Museru *et al.*, 2002). This increasing trend in road traffic is similar in other African countries including Kenya which has an estimated road fatality rate of 20.9 per 100,000 population (WHO, 2011).

Traffic related injuries were reported in 14% of the children seen at the emergency departments of three hospitals in Maputo, Mozambique, with (81%) of the injuries resulting from pedestrians being struck by vehicles. In Uganda, RTIs was one of the leading causes of unintentional injuries at 25.3 %. Private-owned minibuses which operate as the main means of public transport were commonly involved in these accidents. Seventy-four percent of the reported injuries occurred to children while walking, and the commonest striking objects included motorcycles (31%), buses (21.6%) and passenger cars (19.6%) (Mutto *et al.*, 2011).

2.2.4 Poisoning

Poisoning refers to an injury resulting from being exposed to an exogenous substance that causes cellular injury or death. Poison can be inhaled, ingested, injected or absorbed. Poisoning may also be acquired in utero. The exposure may be acute or chronic and the clinical presentation will vary accordingly. Various substances ranging from medications to household chemicals, solvents, fuels and pesticides are toxic if ingested in sufficient quantities. Thousands of children are admitted to emergency departments because they have inadvertently consumed some type of household product, medicine or pesticide. Most of these “accidental” poisonings could have been prevented. Thus the home and surroundings can be a dangerous place for children.

The prevalence and types of poisoning vary considerably across the regions and within countries and depends on social economic status and cultural practices, as well as on local industrial and agricultural activities. In the LMIC children are commonly poisoned by kerosene especially during the hot season due to tendency for households to store kerosene in beverage containers which children easily confuse and accidentally consume.

Thirteen percent of accidental poisonings in the world occur 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. A survey conducted in 16 middle-income and high-income countries revealed that poisonings ranked fourth, among the different causes of unintentional injury death among children aged between 1-14 years (Taft *et al.*, 2002).

Kerosene poisoning was found to be responsible for 11% of all pediatric poisoning admissions at 8 different hospitals in Zimbabwe. The 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 (Tagwireyi *et al.*, 2006).

Lang *et al* conducted a retrospective study analyzing records of patients admitted at Kilifi District Hospital, Kenya. Among the patients admitted due to poisoning 48(62%) were due to kerosene, 2(2.6%) due to aspirin and 7(9%) 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 (Lang *et al.*, 2008).

2.2.5 Drowning

Drowning refers to the process of experiencing respiratory impairment from submersion/immersion in liquid (Van Beek *et al.*, 2005). This event may result in death or survival. Among reported cases of drowning, case fatality rates are high. Once a drowning is significant enough to warrant reporting, there is a high likelihood that the event has resulted in death or significant disability. For each fatality, it is estimated that there are between one and four nonfatal events serious enough to result in hospitalization (Meyer *et al.*, 2006).

According to the WHO Global Burden of Disease estimates, 388 000 people died in 2004 as a result of drowning around the world, of whom 45% were under the age of

20 years. Variability in drowning mortality rates within a region or within a country is also apparent. A possible explanation here is the exposure to open water.

Deaths due to drowning are almost exclusively an injury problem of LMIC. Ninety-seven percent of all drowning worldwide occur in LMIC, and thus Africa, where the drowning mortality rate is 13.1 per 100,000 people has been identified as a region at risk for drowning. Children are unquestionably most at risk for death from drowning; with more than 50% of all global drowning mortalities occurring in children below 14 years of age. This trend is emphasized in Africa, where the highest rate of drowning fatalities (18.9 per 100,000) occurs among children between 0-4 years (Peden *et al.*, 2002).

It has also 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. In Bangladesh, for example, a country with hundreds of rivers and tributaries, drowning was found to be the leading cause of death for children aged 1 to 9 years of age (Rahman *et al.*, 2005). A study by Kobusingye *et al* 2001 in rural and urban Uganda also revealed this important difference, and the rural community that was surveyed had extensive water surfaces surrounded by fishing communities.

2.3 Risk factors for childhood injuries

Risk factors for injury can be broadly divided into two; demographic factors such as age and sex, age of the mother and social economic factors such as poverty and maternal education. The pattern of childhood injuries appears to be similar with regards to causal factors with slight variations based on socio-economic and child-related factors. A child's head, chest, abdomen and limbs are all in a state of growth. Their relative softness makes a child physically more vulnerable to the impact of injury than an adult. Furthermore, the smaller physical stature of children can create problems, as it limits their ability to see or be seen over certain heights such as parked cars or large trucks a known risk factor in child pedestrian injuries. Children's sensory facilities are also less fully developed. Their ability to synthesize information, from their peripheral fields of vision and their auditory sense, is limited,

which can lead to their missing critical cues of danger, thus increasing their risk of injury (Whitebread *et al.*, 2000). The following are some of the risk factors associated with injuries in children

2.3.1 Socio-economic status

A broad range of socioeconomic factors associated with injury risk have been identified (Towner *et al.*, 2005). These factors include: social factors such as maternal education economic factors such as family income; factors related to family structure including maternal age, single parenting, and number of children in a household.

Poverty is one of the leading factors contributing to high injury incidence. The burden of childhood injury is heaviest in the poorer countries with lower family incomes. Poverty is a major risk factor for injury in all countries, regardless of income level. 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 (WHO, 2008; Peden, 2008).

A study done by Nantulya *et al* 2002 on road traffic injuries in developing world found out that in Kenya, the choice of transport used is often related to a family's income with those from low-income families more likely to be vulnerable road users.

A retrospective cohort study on safety standards and socioeconomic disparities in playground injuries showed that prior to upgrading the equipment there was a significant relationship between socio-economic status and equipment-related injuries with children at poorer schools being at increased risk (Relative risk: 1.52 (95%CI = 1.24-1.86). After unsafe equipment was upgraded, the relationship between injury and socioeconomic status was no longer significant (RR 1.13 [95% CI = 0.95-1.32) (Macpherson *et al.*, 2010).

2.3.2 Gender and Age

Death through injury is much more common for boys than for girls. According to WHO data, in children under 15 years, there are, on average, 24% more injury deaths among boys than there are among girls. In the Organisation for Economic Co-operation and Development (OECD) area as a whole, boys below 14 years of age were 70% more likely than girls to die from injuries in 1991-95. The difference between the sexes is greatest for older children, those aged 10 to 14 years, a phenomenon explained either by boys taking more risks or by parents or schools being more permissive with boys than girls (Towner & Towner, 2001).

From a young age, boys are more likely to be involved in road traffic crashes than girls. The difference in incidence rates between boys and girls increases with age until children reach 18 or 19 years of age, when the gender gap is similar to that seen in adulthood. Overall, the death rate for boys is 13.8 per 100 000 population, compared to a rate for girls of 7.5 per 100 000 population (World Report on child injury prevention, 2008).

Global childhood unintentional injury surveillance (GCUIS) study done in four low to middle income countries in children less than 12 years of age attending hospital emergency departments, showed that majority of the victims (65%) were male; and (60%) were aged 5 years and below.

A study done at Kenyatta National Hospital by Gome et al in 2005 showed that, of the patients admitted with trauma during a one year period, the age range was (3weeks- 12 years) with a mean age of 3.9 years. Males were more affected at 53.5%. Burns accounted for 34.8% falls 25.1%, foreign bodies 17.6% while 8% were as a result of road traffic accidents.

2.3.3 Maternal literacy

A prospective case-control study from Bangladesh showed significant associations between burns and maternal illiteracy, pre-existing health impairments in children and low economic status (Daisy *et al.*, 2001). In 2006, an epidemiological review of

burns by Forjuoh highlighted the importance of certain risk factors such as low maternal education and lack of supervision within developing countries and the need to address them to enhance preventive efforts. Injury morbidity and mortality are strongly associated with factors such as poverty, single parenthood, low maternal education, poor housing, large family size and parental drug and alcohol abuse (Towner & Towner, 2001; UNICEF, 2001).

2.3.4 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 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. The above situation is very common in the developing countries where the road network is still in the formative stage and therefore pedestrians including children are forced to share roads with motorists.

A study done in Uganda revealed that RTIs constituted 42% of injuries and almost a third of patients who suffered RTIs were students, demonstrating risks associated with the journey to and from school (Kobusingye *et al.*, 2002). Students constituted a large proportion of traffic victims in both rural (32%) and urban (24%) areas in Ghana as well (Mock *et al.*, 1999).

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 (Tagwireyi *et al.*, 2006; Lang *et al.*, 2008).

2.3.5 Other factors

A study done in four low to middle income countries among children aged 12 years and below attending hospital emergency departments in four urban centres observed that injuries occurred throughout the day, but mostly between 06:00 and 12:00, and

between 12:00 and 14:30 (34% and 21%, respectively); 63% of injuries occurred mainly while children were at play, while only 7% took place during school or other activities (Hyder *et al.*, 2009). Majority of the children arrived at the emergency department by taxi (33%) or private vehicle (28%), and a lesser proportion by ambulances (public or private). Most children were brought to the ED by their fathers (46%) or mothers (39%). Injuries that were not traffic-related occurred for the most part in and around homes. Children travelled an average of 20 km to the ED unless involved in a road traffic injury, in which case they travelled twice that distance. For all types of injury, respondents, relied on government welfare or out-of-pocket payments for health-care expenses, and only 1% had private insurance for emergency care (Hyder *et al.*, 2009).

2.4 Measures of injury severity

Injury severity generally describes the impact of an injury in terms of the extent of tissue (that is the pathologic evidence of trauma) and/or the physiologic response of the body to that damage. The appropriate classification of injuries by type and severity is fundamental to the study of injury severity. Scales of categorizing injuries are grouped into two types; scales which assess the patient's physiologic status, which may change over the duration of the injury's treatment period, and those which describe the injury in terms of its anatomical location, specific lesion and severity (Buckly *et al.*, 1994).

Anatomical scoring systems include the Abbreviated Injury Scale (AIS), Injury Severity Score (ISS) and the Anatomical Profile (AP). The physiological trauma severity scoring systems include the Glasgow Coma scale (GCS), the Trauma Score and Revised Trauma Score (RTS), the Circulation, respiration, Abdominal/Thoracic, Motor and Speech Scale (CRAMS) and the Acute Physiology and Chronic Health Evaluation (APACHE) scale (Fani-Salek *et al.*, 1999).

The Glasgow Coma Scale (GCS) was published in 1974 and is widely used for the assessment of a patient's level of consciousness. It provides a more accurate estimation of severity for patients with serious head injuries and enables reliable

predictions of outcome. The Glasgow Coma Scale is scored between 3 and 15, 3 being the worst and 15 the best. A Glasgow Coma Scale of 13 or higher correlates with a mild brain injury; 9 to 12, a moderate injury and 8 or less a severe brain injury (Sharma, 2005).

The Abbreviated Injury Scale (AIS) is a specialized trauma classification of injuries based mainly on anatomical descriptors of the tissue damage caused by the injury. It was originally developed for use by multidisciplinary vehicular crash investigators in the 1970s as a standardized injury severity assessment tool (Sharma, 2005). The Abbreviated Injury Scale has two components; the first being the injury descriptor which is a unique numerical identifier for each injury description; and the second being the severity score. The severity score ranges from 1 (relatively minor) to 6 (currently untreatable), and is assigned to each injury descriptor. The severity scores are consensus assessments assigned by a group of experts and implicitly based on four criteria: threat to life, permanent impairment, treatment period, and energy dissipation (Yates, 1990). The ISS is the most widely used anatomical scoring system in the world and provides an overall score for patients with multiple injuries. The ISS is based on the AIS and the two measures have been used widely in trauma centres to predict the probability of death, urgency of treatment and use of resources (Rosman *et al.*, 1996).

2.5 Injury prevention

Children who survive their injuries may require continuing care, with disabilities that impact not only their health, but also their education and their family's livelihoods. Research has shown that well-planned and implemented interventions such as improvements in home, road, and school safety, backed by effective law enforcement can reduce morbidity and mortality due to injuries (Kendrick *et al.*, 2007; Ruta *et al.*, 1993).

Recommendations for the prevention of burn injuries include the provision of stable lamps and stoves in LMIC contexts, effective training of personnel in evacuation processes following fires in the workplace, the installation of fire and smoke alarms

in public buildings, the greater use of flame-resistant fabrics, and the promotion of the use of cold water in the treatment of burns at the tertiary prevention level. Falls could be best prevented through the use of accommodating and soft materials, such as mud and sand, in the design of playgrounds; the provision and implementation of safety regulations for places in which children most frequently play; legislating for safer designs for fall-vulnerable structures, such as railings and grab bars on balconies (WHO, 2002).

CHAPTER THREE

MATERIALS AND METHODS

3.1 Study site

The study was carried out in three hospitals namely; Nyeri County Referral, Karatina sub-county and Othaya sub-county hospitals in Nyeri County of Central Kenya (figure 3.1). These three hospitals recorded the highest cases of injuries in the County as reported in the District Health Information System (DHIS, 2011-2012).

Nyeri County is one of the 47 Counties as defined in the constitution of Kenya 2010, situated in the Central Region. The county has a population of 693,558 persons (KNBS, 2009) with an annual growth rate of 0.48%. Thirty-four percent of the population is below 14 years of age. The County has five government hospitals constituting the county referral facilities, three of which were selected for the study. On average, the population can access a health facility within a radius of at least 7 Km.

Nyeri County Referral Hospital previously known as Nyeri Provincial General Hospital is the regional referral facility located in Nyeri town. The hospital has a bed capacity of 328. Othaya sub-county hospital is the main hospital in Othaya sub-county which is one of the constituent sub-counties of Nyeri and has a bed capacity of 100 patients. Karatina sub-county hospital is located in Karatina town and serves populations from Mathira sub-county and the neighbouring county of Kirinyaga and its environs. It has a bed capacity of 216 persons. Figure 3.1 is a map of Nyeri County showing the location of the three hospitals.

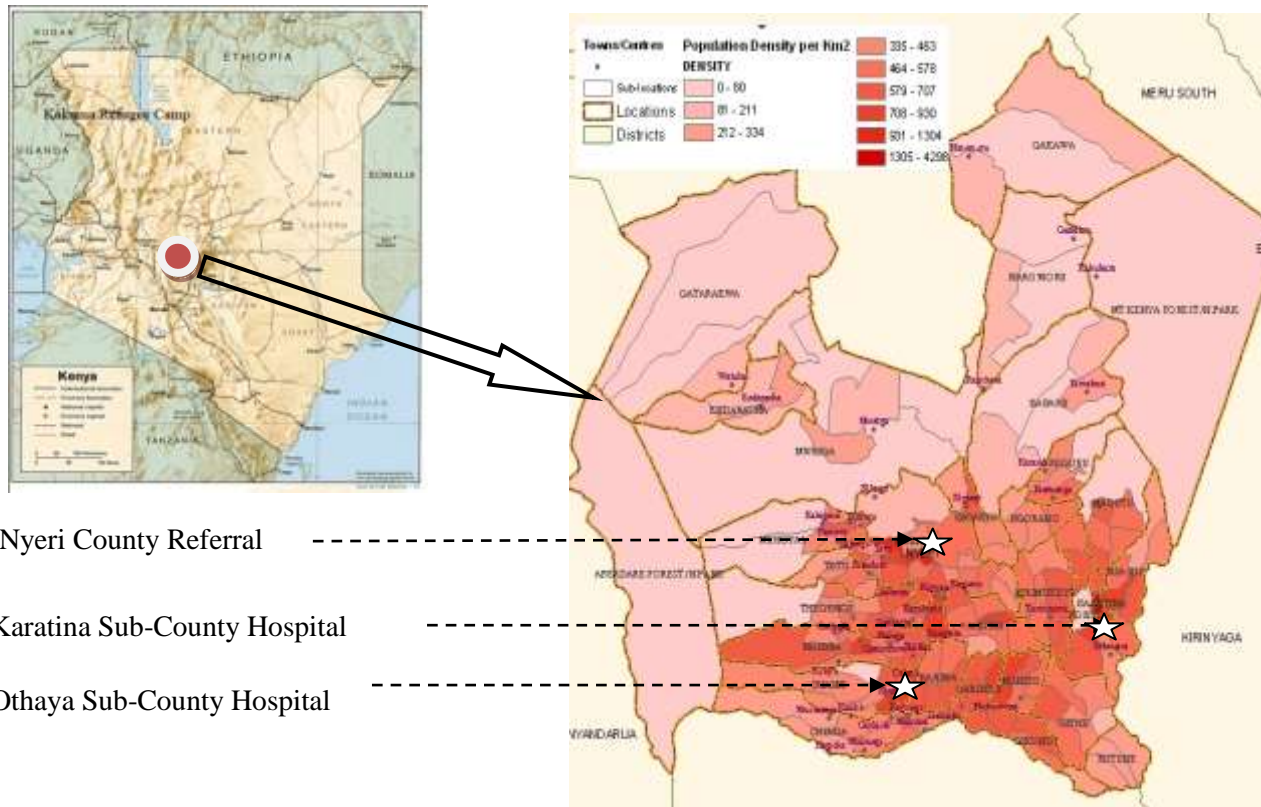


Figure 3.1 Map of Nyeri County, Kenya showing the location of the three hospitals where the study was carried out (source; survey of Kenya)

3.2 Study design

A hospital based descriptive cross-sectional study among children aged 12 years and below admitted in three public hospitals in Nyeri County to determine prevalence, characteristics and factors associated with injuries.

3.3 Study population

The study population consisted of children aged 12 years and below admitted to the three hospitals with various clinical diagnoses for treatment.

3.3.1 Inclusion criteria

- Children aged ≤ 12 years admitted in the hospitals during the study period
- Resident of Nyeri County for at least one year prior to the study
- Children with a consenting parent or guardian.

3.3.2 Exclusion criteria

Excluded from the study were:

- Children without a consenting parent or guardian.
- Children above 12 years of age
- Children with birth injuries
- Children on follow-up visits previously enrolled into the study

3.4 Sampling and sample size determination

3.4.1 Sampling procedure

To achieve the minimum sample size of 385 persons, all patients meeting the inclusion criteria and presenting to the three county hospitals for admission were recruited into the study through systematic random sampling. Since the sampling was

done in three hospitals with varying patient work load, probability proportional to size (PPS) sampling technique was used where guided by the historical data in the hospitals a ratio of 1:2:3 was used to determine how many patients each hospital contributed to the sample size as shown in the Table 3.1.

Table 3.1 Sampling and sample size determination across the three hospitals in Nyeri County.

| Hospital | Average no. of admissions per month | Total No. of admissions in 2 months | Minimum sample size per hospital | Sampling Interval |
|------------------------------|--|--|---|--------------------------|
| Nyeri County Referral | 300 | 600 | 193 | 3 |
| Karatina Sub-County Hospital | 180 | 360 | 128 | 3 |
| Othaya Sub-county Hospital | 90 | 180 | 64 | 3 |
| Total | 570 | 1140 | 385 | |

This ensured that patients seen in the larger hospitals had the same probability of getting into the study as those in the smaller hospitals and vice versa. The sampling frame consisted of total daily admissions of all children aged 12 years and below in a hospital presenting with various clinical conditions. The three hospitals had varying monthly admissions but on average they ranged from 300 admissions in Nyeri County referral hospital to 90 admissions in Othaya sub-county hospital.

Approximately 300 children aged 12 years and below are admitted per month in Nyeri County referral hospital making it 600 admissions for the projected study period of 2 months. This was divided by the minimum adjusted sample size (193) to give the sampling interval of (3). A random number was picked as the starting point and then every third patient who met the inclusion criteria was included in the

sample until the required sample size was reached. The same process was followed for Karatina and Othaya sub-county hospitals.

3.4.2 Sample size calculation

A minimum sample of 385 was determined using modified Cochran formula 1977 (Cochran,1977), with finite population correction, based on the assumptions of 50% prevalence of injuries among children in this age bracket, 95% confidence interval, 5% absolute precision.

$$n=z^2 *p*(1-p)/d^2$$

Where:

n = Sample size with finite population correction,

Assumptions considered

z =value of the standard distribution corresponding to a significance level of alpha (1.96 for a 2 sided test at the 0.05 level)

P = Expected prevalence (The proportion in the target population estimated to have the characteristics being measured. Since the proportion is unknown 50% was used. Thus $P= 0.5$)

d = Level of Precision (error reduction) set at 5%. (Thus $d= 0.05$)

$q=1-p$

$$n=1.96*1.96*0.5*0.5/0.05^2$$

$n=385$ (minimum sample size required)

3.5 Data collection

Data was collected between the months of June and August. Following consent and enrolment, parents/guardians were interviewed using a pre-tested semi-structured questionnaire (appendix 1). The interviews were conducted by the principal investigator assisted by some trained research assistants. For all patients, information on socio-demographic characteristics, general clinical data, nature of injury and circumstances surrounding the injury was obtained by interviewing parents/guardians or whoever had accompanied the patient to hospital. The patient's file was further reviewed to verify vital signs, duration of admission, socio-demographic characteristics, current treatment, co-morbidities and outcome.

3.6 Data analysis

Data was analyzed using Epi-info statistical software. Data was entered into an Epi-info database with a programmed check code to verify the entries and avoid mistakes and double entries. Back up was created in an external hard disk in case of damage and/or loss of original data and it was password protected. The entered data were checked for completeness and consistency before analysis was done. Descriptive analysis was done to determine prevalence of injuries as well as to summarize categorical variables as frequencies and proportions and continuous variables as means or medians. Bivariate and multivariate analyses were carried out to compare the association between two or more variables. Bivariate analysis was used to elicit factors associated with injuries with odds ratio as the measure of association. Factors that were found to be significantly associated with the outcome, at P-value less than 0.05 were subjected to multivariate analysis to determine those that were independently, significantly associated with injuries in children.

3.7 Ethical considerations

Protocol approval was obtained from the Jomo Kenyatta University of Agriculture and Technology (JKUAT) Board of Postgraduate Studies. Scientific and Ethical approval to conduct the study was obtained from the Kenya Medical Research

Institute (KEMRI) Scientific Steering Committee (SSC No 2452, Appendix 6) and Ethics Review Committee (Appendix 7) respectively. Written informed consent and/or assent was obtained from all the study participants before commencement of the interviews (Appendix 3, 4 and 5).

The purpose of the research, potential benefits and risks to be incurred were explained to the study participants. Participation in this study was voluntary and participants were free to withdraw at any stage of the study without any repercussions. Confidentiality was maintained during data collection, storage and analysis and only the principal investigator had access to the questionnaires and data. The names and addresses of study participants were not written on the questionnaires; instead, unique codes were used.

CHAPTER FOUR

RESULTS

4.1 Socio-demographic characteristics of the injury cases

A total of 415 patients meeting the inclusion criteria were recruited in the three hospitals i.e. Nyeri County Referral, Karatina Sub-county and Othaya Sub-county hospitals. Of the 415 patients recruited, there were a total of 108 recorded cases of injury; representing a cumulative prevalence of 26%.

The median age of the patients with injuries was 39 months (range: 7-144, IQR: 52.5) There were more male with injuries 67(62%) compared to females. Sixty-six percent of the injuries were reported among children aged 0-5 years followed by those aged 5-9 years at 22.2% while those above 9 years represented 12 % of the cases. The mean age of the mothers was 29±5 years. Half of the children admitted with injuries had no formal education, mostly due to the fact that they had not attained 3 years, which is the minimum age required for school admission. In this study, 88(82 %) of the respondents were mothers, 9(8%) were fathers while the rest were friends and relatives of the patients.

For most patients, the mode of transport to the hospitals was by matatu 64(59%) and motorbikes; 21(19%). Referral by ambulance was only used by 2(1.9%) of the patients. The most common mode of hospital payment for the patients admitted with injuries was through out of pocket 73(67%) compared to 28(26%) that used national hospital insurance fund (NHIF). Table 4.1 summarizes these socio-demographic characteristics.

Table 4.1 Socio-demographic characteristics of children aged ≤ 12 years admitted with injuries to hospitals in Nyeri County, 2013

| Variable | Frequency (%) | 95% CI |
|--|----------------------|---------------|
| Gender | | |
| Male | 67(62) | (52.2-71.2) |
| Female | 41(38) | (28.8-47.8) |
| Level of Education of the child | | |
| Pre-schoolers | 55(50.9) | (42.0-61.6) |
| Kindergarten/Nursery | 22(20.4) | (10.9-26.1) |
| Primary | 31(28.7) | (3.3-14.1) |
| Age(months) | | |
| 0-24 | 37(34.3) | (25.4-44.0) |
| 25-59 | 34(31.5) | (22.9-41.1) |
| 60-108 | 24(22.2) | (14.8-31.2) |
| 109-144 | 13(12.0) | (6.6-19.7) |
| Birth order | | |
| 1-2 | 78(72.2) | (62.8-80.4) |
| 3-4 | 24(22.2) | (14.8-31.2) |
| 5+ | 6(5.6) | (2.1-11.7) |
| Relationship of the child with the respondent | | |
| Mother | 88(81.5) | (72.9-88.3) |
| Father | 9(8.3) | (3.9-15.2) |
| Relative | 9(8.3) | (3.9-15.2) |
| Friend | 2(1.9) | (0.2-6.5) |
| Place of injury | | |
| Home | 86(79.6) | (70.8-86.8) |
| School | 10(10.3) | (2.1-11.7) |
| Road | 9(8.3) | (3.9-15.2) |
| Working | 3(2.8) | (0.6-7.9) |
| Mode of transport to hospital | | |
| Ambulance | 2(1.9) | (0.2-6.5) |
| Matatu | 64(59.3) | (49.4-68.6) |
| Motorbike | 21(19.4) | (12.5-28.2) |
| Private car | 5(4.6) | (1.5-10.5) |
| Taxi | 10(9.3) | (4.5-16.4) |
| Walking | 6(5.6) | (2.1-11.7) |

Majority of the parents/guardians (58%) were within the age group of (25-35) years with those above 35 years and below 25 years represented in almost equal proportions at 19% and 21% respectively. More than 90% of the parents/guardians had attained primary school-level education, half were farmers while a fifth were engaged in running small businesses as a source of livelihood as shown in Table 4.2

Table 4.2 Socio-demographic characteristics of parents/guardians of children admitted with injuries to the three hospitals in Nyeri County, 2013

| Variable | Frequency (%) | 95% CI |
|---|---------------|-------------|
| Maternal age(years) | | |
| 15-24 | 22(21.4) | (13.9-30.5) |
| 25-35 | 60(58.3) | (48.1-67.9) |
| 35+ | 21(19.4) | (13.1-29.5) |
| Level of formal education of parent/Guardian | | |
| None | 2(1.9) | (0.2-6.5) |
| Primary | 55(49.1) | (39.3-58.9) |
| Secondary | 45(41.7) | (32.3-51.5) |
| Tertiary | 8(7.4) | (3.3-14.1) |
| Occupation of the Parent/Guardian | | |
| Business/Trader | 23(21.3) | (14.0-30.2) |
| Casual labourer | 3(2.8) | (0.6-7.9) |
| Farmer | 55(50.9) | (41.1-60.7) |
| Formal Employment | 9(8.3) | (3.9-15.2) |
| Housewife | 11(10.2) | (5.2-17.5) |
| Informal employment | 5(4.6) | (1.5-10.5) |
| Others | 2(1.9) | (0.2-6.5) |

4.1.1 Socio-economic characteristics of the households

Forty nine percent of the parents/guardians reported a monthly household income of less than 63 USD, 87% owned <5 acres of family land while 75(69%) used firewood as their main source of fuel for cooking. Only 1% of the families reported using kerosene as their main source of cooking fuel, 7(6.5%) use liquid petroleum gas.

Seventy-eight percent of the children lived in semi-permanent houses; eighty-nine percent reported owning both a radio and a mobile phone as shown in Table 4.3

Table 4.3 Socio-economic characteristics among the households of Children, Nyeri County, 2013

| Variable | Frequency(n) | 95% CI |
|---|---------------------|---------------|
| Proportion of households with selected items | | |
| Mobile phone | 96(88.9) | (81.4-94.1) |
| Radio | 97(89.2) | (82.5-94.8) |
| Motorcycle | 6(5.6) | (2.1-11.7) |
| Electricity | 42(38.9) | (29.8-48.8) |
| Household monthly income | | |
| <5000 | 52(48.1) | (38.4-58.0) |
| 5000-10,000 | 26(24.1) | (17.2-34.3) |
| >10,000 | 18(16.7) | (10.2-25.1) |
| Don't know | 11(10.2) | (5.2-17.5) |
| Fuel used for cooking | | |
| Charcoal | 25(23.4) | (15.6-32.2) |
| Kerosene | 1(0.9) | (0.0-5.1) |
| Firewood | 75(69.4) | (59.8-77.9) |
| LPG/Gas | 7(6.5) | (2.6-12.9) |
| Main type of lighting | | |
| Electricity | 43(39.8) | (30.5-49.7) |
| Kerosene lamp | 39(36.1) | (27.1-45.9) |
| Solar | 12(11.1) | (5.9-18.6) |
| Tin | 11(10.2) | (5.2-17.5) |
| Tilley | 1(0.9) | (0.0-5.1) |
| Others | 2(1.9) | (0.2-6.5) |
| Size of family land in acres | | |
| None | 16(14.8) | 79(19.0) |
| <1 | 39(36.1) | 129(31.1) |
| 1-5 | 39(36.1) | 162(32.0) |
| >5 | 4(3.7) | 12(2.9) |
| DK | 10(9.3) | 33(8.0) |

4.2 Prevalence of injuries among the study participants

Of the 415 children recruited from the three hospitals there were a total of 108 recorded cases of injuries; representing a cumulative prevalence of 26%. The prevalence across the three hospitals ranged from (18-37%) as shown in Table 4.4

Table 4.4 Prevalence of childhood injuries in the three hospitals in Nyeri County, 2013

| Hospital | Prevalence n (%) |
|---------------------------------------|------------------|
| Nyeri County Referral Hospital(n=222) | 59(26.5) |
| Karatina sub-county Hospital(n=120) | 22(18.3) |
| Othaya sub-county Hospital(n=73) | 27(36.9) |

Prevalence of injury was higher in males (27.3%) compared to (24.3%) among the females with no statistical significance. Prevalence was also noted to increase with advancing age. In children between the age group of (0- 24) months, prevalence was 16.8% compared to prevalence of 68.4% among those in the age-group (109-144) months.

However, in this study the injury prevalence decreased with increasing birth order where prevalence in small families (1 child) was 28.7% compared with 15.3% in families with > 4 children as shown in Table 4.5. Fourteen percent of the children presenting with injuries reported experiencing a form of injury in the preceding 12 months as shown in Table 4.5

Table 4:5 Prevalence of childhood injuries stratified by potential risk factors, in the three hospitals in Nyeri County, 2013

| Variable | Prevalence,% |
|--|---------------------|
| Gender | |
| Male | 27.3(67/169) |
| Female | 24.3(41/245) |
| Birth order | |
| 1-2 | 29.2(78/267) |
| 3-4 | 20.7(24/116) |
| 5+ | 19.3(6/31) |
| Level of education of the child | |
| None | 18.7(55/294) |
| Kindergarten/Nursery | 30.0(19/64) |
| Primary | 62.0(31/50) |
| Positive Hx of injury in the last 12 months | 62.5(15/24) |
| Age of the child(years) | |
| ≤ 5 years | 21.6(74/342) |
| >5 years | 52.3(34/65) |
| Age of the child(months) | |
| 0-24 | 16.8(37/220) |
| 25-59 | 29.8(34/114) |
| 60-108 | 44.4(24/54) |
| 109-144 | 68.4(13/19) |
| Maternal age(years) | |
| 15-24 | 25.6(22/86/) |
| 25-35 | 24.3(60/247) |
| 35+ | 33.9(21/62) |
| Level of education of parent/guardian | |
| None | 20.0(1/5) |
| Primary | 27.9(54/193) |
| Secondary | 26.3(45/171) |
| Tertiary | 22.2(8/36) |

4.2.1 Distribution of injuries by sex in the three hospitals

Males outnumbered females in all the reported injuries apart from poisoning. The ratio of male: female was highest in falls at 3:1 as depicted in Figure 4.1. Overall the prevalence of males was higher but not statistically significant in this study.

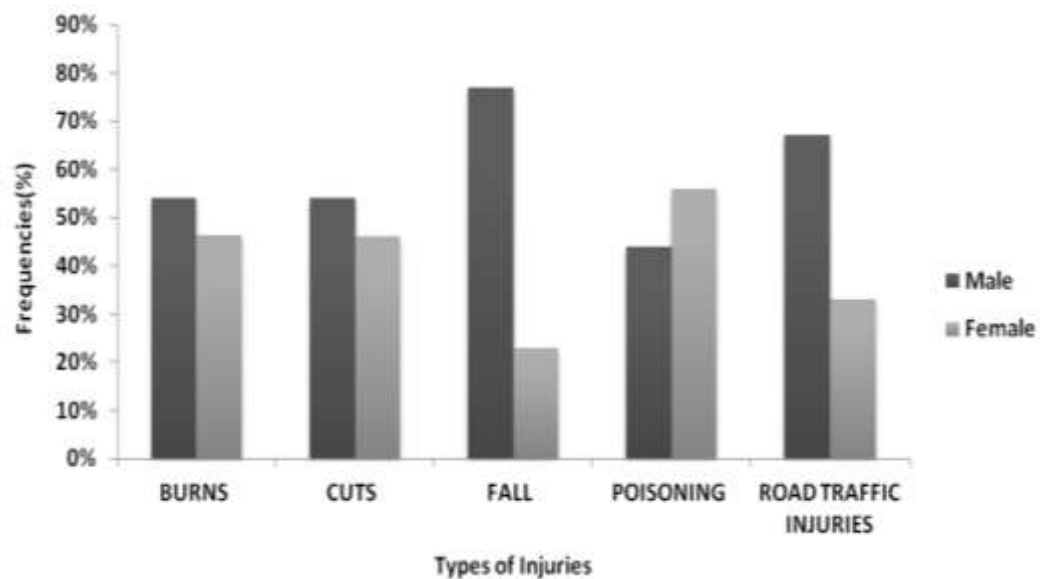


Figure 4.1 Distribution of causes of injuries by sex, among children aged ≤ 12 years admitted to the three hospitals in Nyeri County, 2013

4.2.2 Distribution of injury by age

Figure 4.2 shows the distribution of the five leading causes of injuries among the children by age group. Burns were mostly reported in the age category (0-24) months followed by ages (25-59) months and (60-108) months in equal proportions. Majority of the falls were reported in the age-group (25-108) months while majority of the poisoning (89%) were reported in children below 60 months of age as shown in figure 4.2

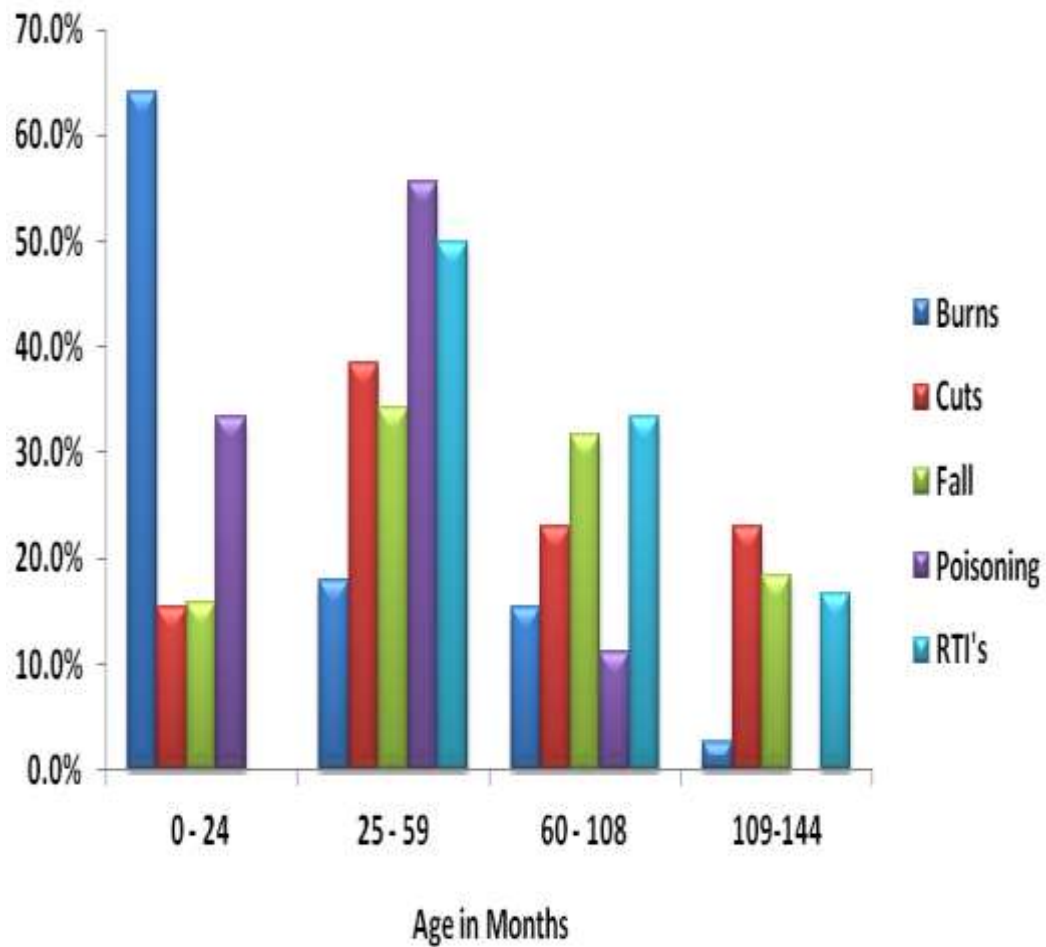


Figure 4.2 Distribution of injuries by age among children aged ≤ 12 years admitted to the three hospitals in Nyeri County, 2013

Figure 4.3 shows the leading injuries as reported in the three hospitals. Nyeri County referral hospital reported the highest proportion of injuries during the study period. Karatina and Othaya sub-county hospitals contributed almost equally to the burden of injuries.

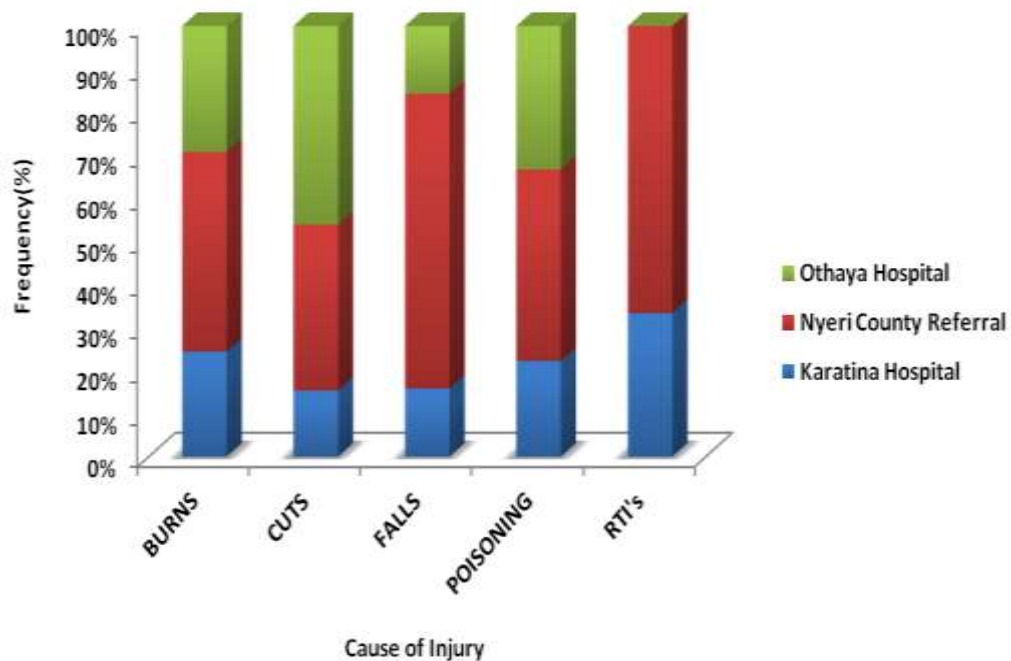


Figure 4.3 Distribution of injuries among children aged ≤ 12 years in the three hospitals in Nyeri County, 2013.

4.3 Leading causes of injuries

A total of 108 injury cases were recorded during the study period. Among those admitted with injuries; the leading causes were burns 41(38%), falls 38(35%), cuts 13 (12%), accidental poisoning 9 (8%); and road traffic injuries 6(6%) as shown in figure 4.4. A large majority of injuries 86 (80.0%) were reported to have occurred at home while 5.6% and 8.3 % occurred at school and road respectively.

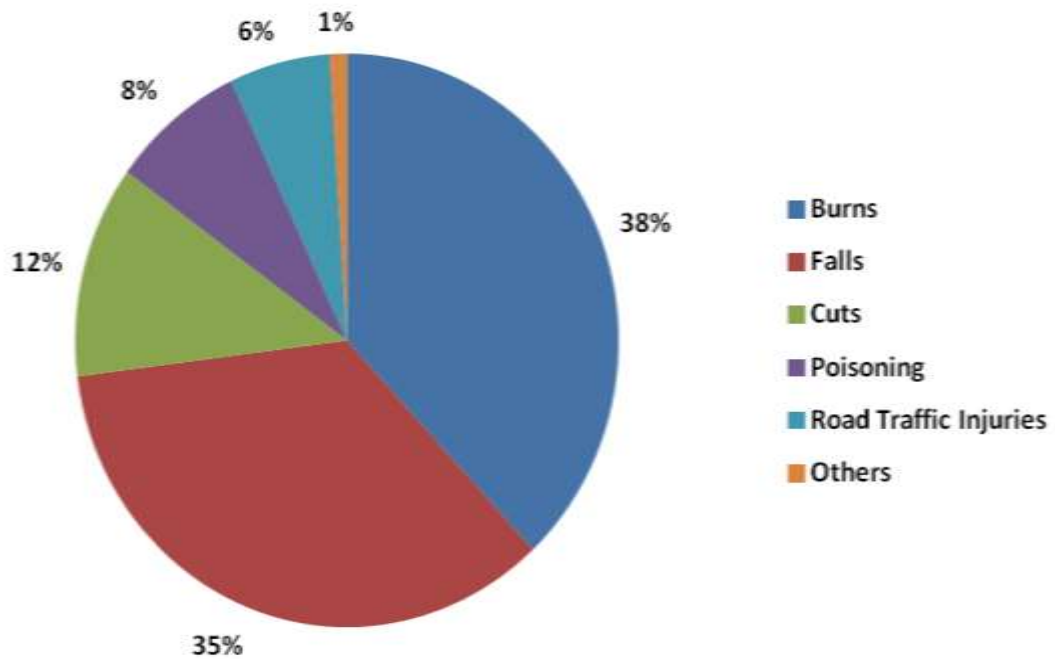


Figure 4.4 Leading causes of injuries among children aged ≤ 12 years admitted to the three hospitals in Nyeri County, 2013

4.3.1 Falls

A total of 38 children suffered falls during the study period, representing 35.2% of all injuries. Males were most affected at 29(76%) as well as children above 2 years of age. Most of the falls occurred at home (68.0%) followed by school (15.8%) and road (10.5%). Seventy-three percent of the falls occurred in the afternoon and early evening. Seventy-one percent (71%) of the children suffered the injury during play .Majority of the children fell from height (78.9%) with 20.1% falling from a level ground. Most of the complications resulting from falls were fractures of the femur (21%) and humerus (29%) as well as dislocation of the hip and elbow joints (18%) as shown in Table 4.6

Table 4.6 Characteristics of children aged ≤ 12 years admitted due to falls

| Variable | Frequency (%)n=38 | 95% CI |
|--|--------------------------|---------------|
| Place of fall | | |
| Home | 26(68.4) | (51.3-82.5) |
| Road | 4(10.5) | (2.9-28.4) |
| School | 6(15.8) | (6.0-31.3) |
| Others | 2(5.3) | (0.6-17.7) |
| Activity of the child at the time of injury | | |
| Daily living | 9(23.7) | (11.4-40.2) |
| Leisure/Play | 27(71.1) | (54.1-84.6) |
| Educational activity | 1(2.6) | (0.1-13.8) |
| Sports | 1(2.6) | (0.-13.8) |
| Sex | | |
| Female | 9(23.7) | (59.8-88.6) |
| Male | 29(76.3) | (11.4-40.2) |
| Any existing co-morbidities | | |
| Yes | 4(10.6) | (2.9-24.8) |
| No | 34(89.4) | (75.2-97.1) |
| Age of the child(months) | | |
| 0-24 | 6(15.8) | (6.0-31.3) |
| 25-59 | 13(34.2) | (19.6-51.4) |
| 60-108 | 12(31.6) | (17.5-48.7) |
| 109-144 | 7(18.4) | (7.7-34.3) |
| Adult present at the time of injury | | |
| Yes | 7(18.4) | (7.7-34.3) |
| No | 31(81.6) | (65.7-92.3) |
| Location of the fall | | |
| Height | 30(78.9) | (62.7-90.4) |
| Level Ground | 8(20.1) | (9.6-37.3) |
| Complication related to the fall | | |
| Fracture Humerus | 11(28.9) | (15.4-45.9) |
| Fracture Femur | 8(21.1) | (9.6-37.3) |
| Dislocation of hip and elbow joints | 7(18.4) | (7.7-34.3) |
| Radio-ulnar fractures | 3(7.9) | (1.7-21.4) |
| Soft tissue injury | 3(7.9) | (1.7-21.4) |
| Others | 4(10.5) | (2.9-24.8) |

4.3.2 Burns

Burns were the leading cause of injury with the highest recorded number of cases during the study period 41(38.2%).Sixty-three percent (63%) of the children who sustained burns were below 2 years of age, 17% were above 5 years of age. Ninety-five percent of burn injuries occurred at home; with a male to female ratio of 1:1 .Sixty-six percent of the children sustained burns during play.

Eighty-five percent (85%) of the burns were due to hot liquids compared to 9.8 % from open fire. Majority (61%) of children suffered burns in the presence of a competent adult member of the household. As for the nature of burn injuries, 39% and 54% were 1st degree and 2nd degree superficial respectively, with the median total burn surface area (TBSA) being 5 %(range: 1-22). Eighty percent (80%) of the burns occurred on the extremities, mostly affecting the upper and lower limbs with minimal involvement of the face (7%) and the trunk (7%).

Fifty-eight percent of the patients received pre-hospital first aid care before admission. The main types of cooking fuel used in the households with patients suffering burn injuries were firewood (58.5%) and charcoal (29.3%) as shown in the Table 4.7.

Table 4.7 Characteristics of children aged ≤12 years admitted due to burns

| Variable | Frequency | 95% CI |
|---|------------------|---------------|
| Place of Burn | | |
| Home | 39(95.1) | (83.5-99.4) |
| Work | 1(2.4) | (0.1-12.9) |
| Others | 1(2.4) | (0.1-12.9) |
| Activity of the child at the time of burns | | |
| Daily living | 13(31.7) | (18.1-48.1) |
| Leisure/Play | 27(65.9) | (49.4-79.9) |
| Sports | 1(2.4) | (0.1-12.9) |
| Sex | | |
| Male | 22(53.7) | (37.4-69.3) |
| Female | 19(46.3) | (30.7-62.6) |
| Existing co-morbidities | | |
| Yes | 4(11.8) | (0.1-12.9) |
| No | 37(90.2) | (87.1-99.9) |
| Age(months) | | |
| 0-24 | 26(63.4) | (46.9-77.9) |
| 25-59 | 8(19.5) | (8.8-34.9) |
| 60-108 | 6(14.6) | (5.6-29.2) |
| 109-144 | 1(2.4) | (0.1-12.9) |
| Degree of burns | | |
| 1 st Degree | 15(38.5) | (23.4-55.4) |
| 2 nd degree superficial | 21(53.8) | (37.2-69.9) |
| 2 nd degree deep | 3(7.7) | (1.6-20.9) |
| Not specified | 2(4.9) | - |
| Anatomical site of the burn injury | | |
| Head/Neck | 1(2.4) | (0.1-12.9) |
| Abdomen | 3(7.3) | (1.5-19.9) |
| Chest | 1(2.4) | (0.1-12.9) |
| Extremities | 33(80.5) | (65.1-91.2) |
| Face | 3(7.3) | (1.5-19.9) |

4.3.3 Poisoning

Nine children were admitted to the three hospitals secondary to ingestion of various poisons during the study period representing 8.3% of all injuries. Eighty-nine percent of these children were below 5 years. Home was where all the ingestion of these poisons had occurred, 56% of cases happening in the presence of a competent adult member of the household. Furthermore, two-thirds of the poisoning was due to

ingestion of agrochemicals and prescription medicines in equal measure. The rest of the patients ingested kerosene and other chemicals such as detergents (10%) as shown on Table 4.8.

Table 4.8 Characteristics of children aged ≤12 years admitted due to poisoning

| Variable | Frequency n (%) | 95% CI |
|---|------------------------|---------------|
| Place of injury | | |
| Home | 8(88.9) | (51.8-99.7) |
| Work | 1(11.1) | (0.3-48.2) |
| Activity of the child at the time of injury | | |
| Daily living | 4(44.4) | (13.7-78.8) |
| Leisure/Play | 4(44.4) | (13.7-78.8) |
| Sex | | |
| Male | 4(44.4) | (13.7-78.8) |
| Female | 5(55.6) | (21.2-86.3) |
| History of sibling injury in the last 6 months | | |
| Yes | 2(22.2) | (2.8-60.0) |
| No | 7(77.8) | (40.0-97.2) |
| Age(months) | | |
| 0-24 | 3(33.3) | (7.5-70.1) |
| 25-59 | 5(55.6) | (21.2-86.3) |
| 60-108 | 1(11.1) | (0.3-48.2) |
| Adult present at the time of injury | | |
| Yes | 4(44.4) | (13.7-78.8) |
| No | 5(55.6) | (21.2-86.3) |
| Type of poison | | |
| Agrochemical | 3(33.3) | (7.5-70.1) |
| Prescription drug | 3(33.3) | (7.5-70.1) |
| Kerosene | 2(22.2) | (2.8-60.0) |

4.3.4 Road traffic injuries (RTI)

A total of 6 patients were admitted across the three hospitals having sustained road traffic injuries during the study period. There were more males (66.7%) compared to females. Fifty percent of the patients were in the age group (25-59) months, followed

by those aged (60-108) months. Many of the accidents occurred during travel to or from school (33.1%) or playing with peers by the road side (33.1%). Half the cases were pedestrians compared to 33.3% who were passengers as shown in Table 4.9. One RTI death occurred secondary to severe head injury. There was no use of safety gear among the 6 reported cases of RTI.

Table 4.9 Characteristics of children aged ≤12 years admitted due to road traffic injuries

| Variable | Frequency (%)n=6 | 95% CI |
|--|-------------------------|---------------|
| Place of injury | | |
| Home | 1(16.7) | (0.4-64.1) |
| Activity of the child at the time of injury | | |
| Daily living | 1(16.7) | (0.4-64.1) |
| Play | 2(33.3) | (4.3-77.7) |
| Educational activity | 1(16.7) | (0.4-64.1) |
| Of those involved in RTA, were they? | | |
| Passengers | 2(33.3) | (4.3-77.1) |
| Pedestrians | 3(50.0) | (11.8-88.2) |
| Sex | | |
| Male | 4(66.7) | (23.3-95.7) |
| Female | 2(33.3) | (4.3-77.7) |
| Age(months) | | |
| 0-24 | 0(0) | - |
| 25-59 | 3(50.0) | (11.8-88.2) |
| 60-108 | 2(33.3) | (4.3-77.1) |
| Anatomical site of the injury | | |
| Head/Neck | 1(16.7) | (0.4-64.1) |
| Face | 2(33.3) | (4.3-77.1) |

4.3.5 Cuts

Thirteen children (12%) suffered cuts during the study period. Eighty five percent of these cuts occurred at home, 77% during play. As noted with the other causes of injury; males were predominantly affected (53.8%) though not statistically

significant. Eighty five percent (85%) of the cuts happened in the absence of a competent adult with those aged 25-59 months being the most affected. Eighty-five percent of the reported cuts were on the extremities, mostly affecting the upper and lower limbs as shown on Table 4.10.

Table 4.10 Characteristics of children aged ≤12 years admitted due to cuts

| Variable | Frequency (%)n=13 | 95% CI |
|--|--------------------------|---------------|
| Place of injury | | |
| Home | 11(84.6) | (54.6-98.1) |
| Work | 1(7.7) | (0.2-36.0) |
| Others | 1(7.7) | (0.2-36.0) |
| Activity at the time of injury | | |
| Daily living | 3(23.1) | (5.0-53.8) |
| Play | 10(76.9) | (46.2-95.0) |
| Gender | | |
| Male | 7(53.8) | (19.2-74.9) |
| Female | 6(46.2) | (25.1-80.8) |
| Age(months) | | |
| 0-24 | 2(15.4) | (1.9-45.4) |
| 25-59 | 5(38.5) | (13.9-68.4) |
| 60-108 | 3(23.1) | (5.0-53.8) |
| 109-144 | 3(23.1) | (5.0-53.8) |
| Adult present at the time of injury | | |
| Yes | 2(15.4) | (1.9-45.4) |
| No | 11(84.6) | (54.6-98.1) |
| Anatomical site of the burn injury | | |
| Head/Neck | 2(15.4) | (1.9-45.4) |
| Extremities | 11(84.6) | (54.6-98.1) |

4.4 Circumstances surrounding the injuries

Sixty-six percent of the injuries occurred in the afternoon and early evening. Only one injury was recorded in the early morning as shown in Table 4.11. Sixty-five percent (65%) of the parents/guardians reported often spending less than 6 hours a day with their children.

Table 4.11 Distribution of injuries by time of day, among children admitted to the three hospitals in Nyeri County, 2013

| Time of the day | Frequency (%) | 95% CI |
|--------------------------------|-------------------|-------------|
| Afternoon (1200-1559) | 33(30.6) | (22.1-40.2) |
| Early evening (1600-1959) | 38(35.2) | (26.2-45.0) |
| Early morning (midnight -0659) | 1(0.9) | (0.0-5.1) |
| Late evening (2000-2359). | 13(12.0) | (6.6-19.7) |
| Morning (0700-1159) | 21(19.4) | (12.5-28.2) |
| Don't Know | 2(1.9) | (0.2-6.5) |
| Total | 108(100.0) | |

Although half of the injuries occurred on Friday, Saturdays and Sundays there was no particular trend across the days of the week as shown in figure 4.5



Figure 4.5 Distribution of injuries by day of the week, in the three in hospitals in Nyeri County, 2013

Majority of the children 70(65%) inflicted injuries during play, followed by daily living 31(28.7%) as they engaged in day to day activities. Only one child was reported to have sustained injury during sporting activities in this study as shown in figure 4.6.

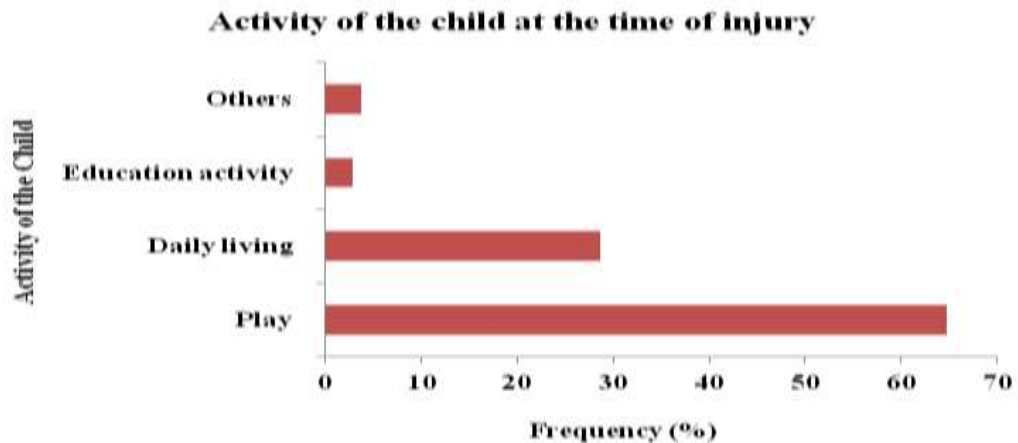


Figure 4.6 Activity of the child at the time of injury, Nyeri County, 2013

4.6 Clinical characteristics

The median duration of hospital stay for the children admitted with injuries was 5 days (range: 1-40). Seventy-six percent of the injuries irrespective of type occurred on the extremities, 6% on the face, 4% on the head and 9% on the trunk. Among the children admitted with injuries; 91(84%) were given analgesics which can be attributed to the pain associated with most injuries while 15(14%) and 47(44%) were put on intravenous and oral antibiotics respectively. Six (5.6%) of the injured had co-existing co-morbidities, with 11(10%) reporting history of sibling injury in the preceding 6 months. Twenty-six percent of the patients had surgery, 3(11 %) being major. Figure 4.7 shows various medical investigations including imaging services provided to children admitted with injuries as part of diagnostics. Thirty-nine percent (39%) of the patients had an x-ray taken to confirm the degree of injury mostly in those presenting with falls and road traffic injuries. Other tests such as serology were mainly routine blood works done to all patients on admission. Forty-eight percent of the children were given first aid before arrival to the hospital as part of pre-hospital care.

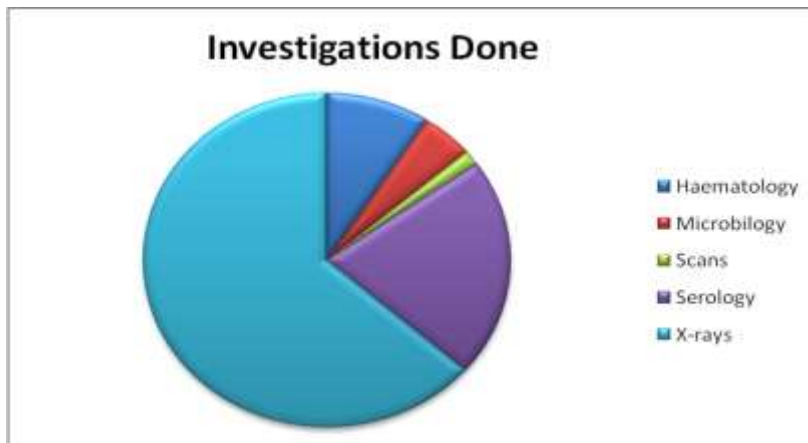


Figure 4.7 Investigations done to the children aged ≤ 12 years admitted to hospitals in Nyeri County, 2013

4.7 Bivariate Analysis

In bivariate analysis, sex was not significantly associated with higher odds of injuries. However, child factors that were found to be significantly associated with injuries included history of injury in the preceding 12 months, level of education of the child, age above 5 years, and low socio-economic status as shown in Table 4.12.

Parental/guardian factors that were found to be associated with injury included socio-economic status, parents spending <6hrs with the child in a day and marital status. Maternal age, level of education of the parent and occupation were found to have no association with injury ($P > 0.05$)

Table 4.12 Bivariate analysis of factors associated with injuries among children admitted to hospitals, Nyeri County, 2013

| Variable | Category | Crude OR | 95% CI | | P-value |
|--|------------------------|----------|--------|-------|------------------|
| | | | Lower | Upper | |
| History of injury in the last 12 months | No(<i>Ref</i>) | 1.0 | | | |
| | Yes | 5.34 | 2.26 | 12.60 | <0.001 |
| Gender | Female(<i>Ref</i>) | 1.0 | | | |
| | Male | 1.18 | 0.75 | 1.86 | 0.23 |
| Level of Education of the child | None(<i>Ref</i>) | 1.0 | | | |
| | Primary level | 3.95 | 1.81 | 8.64 | <0.001 |
| | Kindergarten/Nursery | 1.78 | 0.96 | 3.25 | 0.04 |
| Age of the child in years | ≤5 (<i>Ref</i>) | 1.0 | | | |
| | > 5 | 4.09 | 2.36 | 7.09 | <0.001 |
| Age of the child in Months | ≤24(<i>Ref</i>) | 1 | | | |
| | 25-59 | 2.10 | 1.23 | 3.59 | <0.05 |
| | 60-108 | 3.96 | 2.08 | 7.52 | <0.001 |
| | 109-144 | 10.72 | 3.83 | 30.01 | <0.001 |
| Birth order | ≥5(<i>Ref</i>) | 1.0 | | | |
| | 1-2 | 1.79 | 0.71 | 4.51 | 0.11 |
| | 3-4 | 1.13 | 0.42 | 3.06 | 0.42 |
| Parents/guardian spends < 6hrs with children | No | 1.0 | | | |
| | Yes | 3.04 | 1.89 | 4.89 | <0.001 |
| Maternal age(Years) | 35+(<i>Ref</i>) | 1.0 | | | |
| | 15-24 | 0.74 | 0.38 | 1.45 | 0.19 |
| | 25-35 | 0.69 | 0.39 | 1.20 | 0.096 |
| Level of education of the Parent/guardian | Tertiary(<i>Ref</i>) | 1.0 | | | |
| | Primary | 1.31 | 0.56 | 3.08 | 0.27 |
| | None | 0.71 | 0.08 | 6.40 | 0.61 |
| | Secondary | 1.25 | 0.53 | 2.94 | 0.31 |
| Occupation of the Parent/guardian | Farmer(<i>Ref</i>) | 1.0 | | | |
| | Business | 0.93 | 0.55 | 1.59 | 0.41 |
| | Housewife | 2.56 | 1.11 | 5.91 | 0.02 |
| | Casual | 0.28 | 0.08 | 0.96 | 0.01 |
| Socio-economic Status | High(<i>Ref</i>) | 1.0 | | | |
| | Low | | 1.07 | 3.18 | 0.01 |
| Marital Status of the Parent/guardian | Married(<i>Ref</i>) | | | | |
| | Single | 2.10 | 1.13 | 3.88 | 0.01 |

4.8 Multivariate analysis to determine independent factors associated with injuries in children.

On multivariate analysis independent risk factors associated with injuries were; parents spending < 6 hours with the child in a day [AOR=2.6; 95% CI (1.5-4.3)]; age >5years [AOR=2.6; 95% CI (1.4-4.9)]; Low SES [AOR=2.5; 95% CI (1.3-4.7)] and previous history of injury [AOR=4.0; 95% CI (1.6-10.1)].

CHAPTER FIVE

DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

5.1 Discussion

5.1.1 Prevalence and socio- demographic characteristics

The main objective of the study was to determine prevalence, characterize the cases and establish factors associated with childhood injuries. From our study the prevalence of injury among children admitted in the three hospitals was 26%, with the leading causes of childhood injuries reported as falls, burns, cuts and poisoning. This is similar to a study conducted in the emergency department from the Central Hospital of Maputo, which showed that approximately 26% of all patients presented as a result of injury, with leading causes of injury being falls, road traffic injuries and burns (Mercy *et al.*, 2006).

This was a hospital-based study and therefore might not be entirely representative of the general population but the prevalence of injury in this study is well within other studies carried out in the same settings. A study conducted in an Indian hospital by Tandon *et al* reported that 14.2% of the presentations were due to injury (Tandon *et al.*, 1993). A similar study of trauma patients in Uganda found that 24.2% were children less than 14 years of age (Kobusingye *et al.*, 2000). The prevalence reported in these studies are well within the prevalence of our study and also within the inter-hospital prevalence of between 18-37%. The study therefore confirms the high burden of injury among this age-group that most of the time is largely ignored because of lack of data or incomplete data to inform decisions.

The age distribution and the leading causes of injuries in this study are similar to studies conducted elsewhere. The median age of the children admitted with injuries in this study is similar to the findings of a study by Gome *et al* 2005 in Kenyatta National Hospital that reported that the age range of patients admitted with injuries was 3.9 years (range 3 weeks-12 years). In this study there was variation in which different age-groups suffered different injuries. Children below two years of were

found to be mostly affected by burns with the numbers decreasing with advancing age. However, in other injuries such as falls and RTI the numbers increased with advancing age. Generally the prevalence of injury among children in this study was seen to be increasing with advancing age which is congruent with other studies done globally including the world report on child injury prevention. We must realize that a child's physical and cognitive abilities, degrees of dependence, activities and risk behaviours all change substantially as they grow older (Agran *et al.*, 2003)

In this study, males outnumbered females in all the injuries apart from poisoning, with the highest male: female ratio reported in fall injuries. The world report on child injury prevention reports that from a young age, boys are more likely to be involved in injuries than girls. The report further says that the difference in incidence rates between boys and girls increases with age until 18 or 19 years of age, when the gap is similar to that seen in adulthood. Similar findings have been reported in studies conducted elsewhere that found boys to account for most of childhood injuries. The Global childhood unintentional injury surveillance (GCUIS) study reported that among children less than 12 years of age attending hospital emergency departments, 65% were male. The reason for these differences is that boys are more active and experimental, and tend to participate in all activities and risk-prone games compared to girls, hence are more likely to suffer from injuries. However, their curiosity to explore their surroundings is generally not matched by their capacity to gauge or respond to danger. Secondly, boys are socialized to participate in various activities including dangerous work early in life making them more prone to injuries. An assessment of patients' socio-demographics and other information from this study allow several conclusions to be drawn some of which are necessary in understanding the problem as well as adopting the appropriate injury prevention strategies.

5.1.2 Leading causes of injuries

This study identified burns as the leading cause of childhood injury in the three hospitals recording the highest number of cases. The findings are similar to other studies elsewhere that have reported burns to contribute between 13% to 23% of all injuries (Mukerji *et al.*, 2001; Mutto *et al.*, 2011). Majority (95%) of burns in our

study occurred at home among children aged 2 years and below. Studies done in Nigeria and Egypt reported a significant proportion of burns occurring at home especially in children below 3yrs of age in presence of adults (Okoro *et al.*, 2009; Hemeda *et al.*, 2003). These children are the ones who need utmost supervision and care.

In comparison, this study revealed that most children got burnt at home and two-thirds of them were below 2 years. Sixty-one percent of the burns occurred in presence of a competent adult member of the household. This is an indication that there is a challenge in the design of our fire places and kitchens and the environment is not favorable for children and most times even in the presence of competent adults to watch over and supervise them, they are exposed to danger. In particular, heating or cooking on open fires that are not enclosed or that stand at ground level pose significant dangers to children. This is similar to findings by (Natterer *et al.*, 2011; Okoro *et al.*, 2009) that have reported that 80-90% of burns occur in the presence of an adult. The other 40% that got burnt in the absence of adult members of the household is a pointer to sub-optimal supervision which exposed the children to the risk of burn injuries. A vast majority of burns in our study were scalds followed by open fire injuries. Similar findings were drawn from studies done in South Africa, Nigeria, Egypt and Uganda (Parbhoo *et al.*, 2010; Okoro *et al.*, 2009; Hemeda *et al.*, 2003; Mutto *et al.*, 2011). The many scald burns resulting from hot liquids is a pointer to easy access for children to cooking appliances or pots with boiling liquids.

Falls were the 2nd leading cause of injury in this study accounting for a third 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 (WHO, 2008; El-Chemaly *et al.*, 2007).

In a community survey conducted by Kamala et al 2011 in Tanzania, falls were seen to occur almost exclusively at home among young children. Males were overrepresented as expected with male to female ratio of 3:1. Globally, males tend to outnumber females in falls. 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 (Adensunkanmi *et al.*, 1998). This was also revealed in our study where the male: female ratio was 3:1. Findings from our study also revealed that children between the ages of 2-5 years were the most affected by fall injuries, with two-thirds of the injuries occurring at home during play. This is similar to studies done in Tanzania and Uganda that reported that most falls occurred outdoors during play in age group 1-4 years (Kobusingye *et al.*, 2001; Kamala *et al.*, 2011)

In Sub Saharan Africa, road traffic injuries (RTI) are on the increase mainly due to rapid urbanization. This study revealed 6% of all injuries were as a result of RTI. The prevalence of road traffic injuries in this study was much lower compared to others previously reported in Dar es Salaam and Maputo whereby RTI contributed 15.2% and 14% of childhood injuries respectively (Museru *et al.*, 2002). Another study done in Uganda revealed 25.3% of all unintentional injuries resulted from road traffic injuries (Mutto *et al.*, 2011).

In contrast to these findings, injuries resulting from road traffic injuries were much lower which could be attributed to the fact that most of road traffic injuries in our settings are seen among older age group mostly in those above 18 years. A prospective study done by Saidi in Kenyatta National hospital reported that road traffic injury admissions formed 31% of all admissions; with the mean age of the patients being 30 years, and 20% of the patients aged below 20 years. Males comprised four-fifths of the admissions (Saidi, 1999).

A possible explanation to the contrasting findings could be that some other injuries resulting from road traffic Injuries died before arrival to hospital or were treated as outpatient cases. Most of the road traffic injury cases are usually fatal requiring specialized theatre, imaging and at times intensive care services which were mostly available in Nyeri County Referral and Karatina Sub-county Hospitals. During the study, Othaya Hospital was being upgraded into a modern and more specialized facility and most of the injuries requiring specialized care were referred.

The World Health Organization reports that poisoning contributes about 13% of all childhood injuries globally, with children aged between 1-4 years most commonly affected and with a great variation among countries in the developing world (WHO, 2008). In this study, poisoning accounted for 8% of all injuries, affecting mostly female children. Hyder et al reported similar findings where poisoning contributed 4% of childhood injuries, predominantly occurring in females aged 1-4 years (Hyder *et al.*, 2009). In our study, poisoning through agrochemical ingestion was the most common followed by prescription drugs and kerosene, whereas reports from other countries (Manzar *et al.*, 2010) reveal kerosene to be the most common cause followed by drug ingestion and insecticides. The difference could be explained by the fact that in our study only a third of parents/guardians of patients admitted with injuries were using kerosene as their main source of lighting, which minimized the possibilities of kerosene poisoning. However, kerosene poisoning is still a problem in developing countries where it is commonly used as a main source of energy for cooking and lighting. In Kenya, families use beverage containers such as empty soda or juice bottles for storing kerosene. As a result, young children sometimes ingest kerosene accidentally confusing it for a beverage.

This study shows that majority of the injuries occurred in the afternoon and early evening, with no particular distribution across the days of the week. The occurrence of the injuries in the said time period could be attributed to children coming back from school in the afternoon and in the absence of supervision by parents subjecting themselves to risks associated with injuries mostly during play.

5.1.3 Factors associated with injuries

Several risk factors for injury have been identified worldwide with some variations between developed and developing countries. In this study, the male to female ratio was 1.1:1, with age group 9-12 years being the most affected. However, despite males outnumbering the females in most injuries sex was found not to be a risk factor in this study.

In Sub Saharan Africa, child supervision is declining due to multiple factors. It is known that most childhood preventive measures of injury focus on supervision. This study examined the relationship between injuries and the tendency of parents leaving their children at home unsupervised. The odds of injury increased if parents reported leaving their children at home alone or without presence of a competent adult for a period longer than 6 hours. This risk increased 2.6 times after adjusting for potential confounders. 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 (Nathens *et al.*, 2000). It was also noted that children who had a history of previous injury were 4.0 times more at risk of injury which could also point to a vicious cycle resulting from lack of or inadequate supervision by the parents/guardians.

As reported by Nathens et al 2000, 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 (Nathens *et al.*, 2000). 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. This may be explained by the fact that young mothers lack experience as well as awareness of the environment that could endanger their children. Most times, these children were left under the care of their older siblings who also happened to be children, and rarely took time to supervise their younger siblings.

Several studies have reported the influence of social demographic characteristics such as maternal education, maternal age, occupation and marital status on injury risk (Hong *et al.*, 2000). However; this is not consistent in all settings. In this study, maternal education and maternal age were found not to influence vulnerability to injury in general. Similar findings were reported by Hong Wang in China. This is in contrast to other studies conducted elsewhere where parental education and maternal age have been strongly linked to risk of childhood injury (Laursen *et al.*, 2008)

A possible hypothesis to this observation could be that in this 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 potential confounders. There was a tendency of decreasing risk of injury with increased socio-economic status. Similar findings were reported in Australia and Europe where direct association between socioeconomic status and injury in general was reported. Socioeconomic status influences a number of things including type of housing, type of fuel for cooking and lighting, 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 wealthy households to have caretakers.

5.2 Conclusion

- Prevalence of injury is at 26%
- Prevalence was high among males and is seen to increase with age. This should be a concern to the public health authorities given the epidemiologic transitioning being witnessed in the region
- Burns falls and cuts were identified as the leading causes of injuries.
- Factors significantly associated with injury include; inadequate supervision, history of previous injury, low socio-economic status and advancing age.
- Home environment was the commonest place of injuries with majority of injuries occurring in the absence of a parent/guardian
- The Male: Female ratio was highest in falls at 3:1 and seventy-nine percent of the children presenting with fall injuries, fell from a height.

5.3 Recommendations

- Need for the facilities and the county to intensify data collection and analysis for action

- Targeted interventions such as adequate supervision from parents/guardians and public health education on injury prevention are vital.
- Local prevention programs should focus on home environment as this is where most of injuries occur. This can be achieved by use of more innovative and safer means of cooking and lighting in the house such as modern jikos and solar lamps to avoid large-scale use of kerosene for lighting. Parents should also avoid keeping prescription medicine within the reach of children as well as avoid storage of kerosene in beverage containers
- Need to conduct further studies, possibly population-based studies to better understand & quantify the magnitude of injuries
- Need for the establishment an injury surveillance system and repository for injuries, which ideally will be utilized at all the hospitals in the County. The surveillance system could then be used to enhance injury data collection, establish prevention and treatment strategies, and measure outcome

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APPENDICES

APPENDIX 1: Questionnaire in English

Prevalence and factors associated with injuries among children aged ≤ 12 years admitted to hospitals in Nyeri County, 2013

1. Questionnaire Code _____
2. Name of Hospital _____
3. Ward admitted _____
4. Date of admission ____/____/____
5. IP Number _____
6. Date of the interview ____/____/____

Demographic Data

7. Sex Male Female
8. Home District _____
9. Age(years) _____ *if <1 year, write in months (e.g. 7/12)*
10. Division _____
11. Village _____
12. Sub-location _____
13. Level of formal education of the child?
- [] None
- [] Kindergarten/Nursery
- [] Lower-primary
- [] Upper-primary
- [] Others(specify)-----
14. Relationship of the child with the respondent?
- [] Mother
- [] Sibling
- [] Relative
- [] Friend
- [] Father
- [] House help
- [] Others(specify)-----

-

15. Relationship of the child to the household head?

Son

Daughter

Relative

Others (specify).....

16. Age of the mother in years? -----

17. Marital status of the parent/care taker?

Single

Married

Cohabiting

Divorced

Separated

Widowed

18. Level of formal education of the parent/caretaker?

None

Primary

Secondary

Tertiary

19. Level of education of the mother **if not the accompanying parent/guardian?**

None

Primary

Secondary

Tertiary

20. Number of children in the family of the child? _____

21. Birth order of the child in the family? _____

| | | | |
|---|------|-----------------|------|
| 22. Time parents/caretaker spends with the child in a 12-hour day? a)< 3 hrs b)3-6 hrs c)>6 hrs | | | |
| 23. Occupation of the parent/guardian? | Tick | | Tick |
| Farmer | | Business/Trader | |
| Casual labourer | | Student | |
| Formal salaried employment | | Informal | |
| Others(specify) | | | |

| | | | |
|---|------|---------------------|------|
| 24. Mode of transport to the health facility? | Tick | | Tick |
| Ambulance | | Private car | |
| Public vehicle- "Matatu" | | Motorbike | |
| Bicycle | | Walking | |
| Police vehicle | | Other(specify)----- | |

General Clinical Information (For all the sampled children)

1. Vital signs on admission? Heart Rate_____ Respiratory Rate_____
2. Glasgow coma scale (G.C.S) on admission_____ AVPU(if the one indicated)_____
3. History of Loss of consciousness? [] Yes [] No Don't Know []
4. What is diagnosis of the child on admission? (as indicated in the file)_____
5. Type of tests done/requested on admission?
 - a. X-rays []
 - b. Scans []
 - c. Serology []
 - d. None []
 - e. Others(specify)-----

6. Time taken before you were attended at the hospital?(minutes)_____

7. If referred, what was the referring facility?

- a. GOK
- b. Private health facility
- c. FBO
- d. Private Clinician
- e. Others (specify)-----

8. Any history of the siblings' injury in the last 6 months? [] Yes No[]
Don't Know[]

Socio Economic Status (for all the sampled children)

1. How much is the household income per month (Kshs)?

[] <5000

[] 5000-10,000

[] >10,000

[] Don't Know

2. Household livestock numbers(**for those who do not own the numbers will be zero**)

| | Number | | Number |
|------------------------|--------|---------|--------|
| Cattle | | Pigs | |
| Goats | | Poultry | |
| Sheep | | Donkeys | |
| Do not have any | | | |

3. The size of land in acres? A) < 1 B) 1-5 C) >5 D)None E) Don't Know

4. **Main** material of the house floor?

- a) Earth/sand/mud.....[]
- b) Dung.....[]
- c) Tiles.....[]
- d) Cement.....[]
- e) Other (specify)..... []

5. What type of house do the parents/guardian live in? Permanent [] Semi-permanent[]

6. Does the parent's/caretaker's household have? Yes

Electricity.....[]

Radio.....[]

Television.....[]

Refrigerator.....[]

Solar.....[]

Mobile Phone.....[]

Bicycle.....[]

Car/truck.....[]

Motorcycle.....[]

7. What is the **main** type of fuel your household mainly use for cooking?

- a) Electricity[]
- b) LPG/Natural gas.....[]
- c) Biogas.....[]
- d) Kerosene.....[]
- e) Charcoal.....[]
- f) Firewood.....[]
- g) Other (specify)..... []

8. **Main** source of lighting for the household?

- Electricity
- Tilley lamp
- Tin Lamp
- Kerosene lamp
- Solar
- Others (specify) -----

9. **Main** source of water for the household?

- Borehole Dam
- Tap River/Creek
- Well
- Others (Specify) -----

Injury Related Factors (Obtain from patient, parent, clinician and medical records where available)-(Only children with injuries should be interviewed for this section)

1. Have you suffered any form of injury in the past 12 months(**only for children with injuries**)

Yes

No

Don't know

2. If yes, was the injury similar to the one presented today? Yes No

3. Category of injury presented today? Intentional Unintentional

4. Type of injury?(**Tick as appropriate**)

| | | | |
|-----------------------|--------------------------|------------------|--------------------------|
| Road traffic accident | <input type="checkbox"/> | Drowning | <input type="checkbox"/> |
| Burns | <input type="checkbox"/> | Poisoning | <input type="checkbox"/> |
| Fall | <input type="checkbox"/> | Violence/Assault | <input type="checkbox"/> |
| Cuts | <input type="checkbox"/> | Foreign body | <input type="checkbox"/> |
| Others(specify) | | | |

5. Anatomical site of the injury?(**Tick as appropriate**)

| | | | |
|-------------|--------------------------|-----------------|--------------------------|
| Head / Neck | <input type="checkbox"/> | Face | <input type="checkbox"/> |
| Chest | <input type="checkbox"/> | Extremities | <input type="checkbox"/> |
| Abdomen | <input type="checkbox"/> | Others(specify) | <input type="checkbox"/> |

6. Was there an adult accompanying the patient at the time of injury? Yes No DK

7. What is the approximate distance from injury location to hospital? _____Kms

8. Date when the injury occurred? _____

9. Day of the week when the injury occurred? Mon Tue
 Wed Thur
 Fri Sat
 Sun DK

10. Time of the day when the injury occurred?

Early morning (midnight -0659)

Morning (0700-1159)

Afternoon (1200-1559)

Early evening (1600-1959)

Late evening (2000-2359).

Don't Remember

11. Was the child given first aid before arrival to the hospital? Yes No
 DK

12. If yes, who provided the first Aid? Relative Neighbour Well wisher
 other.....

13. Any existing co-morbidities/impairments in the child? Yes No DK

| 14. Place of injury? | Tick | | Tick |
|--|------|---|------|
| Home(living room,Kitchen,outside house) | | School | |
| Town | | Road(whether walking along the road or crossing the road) | |
| Work | | Others (Specify) | |

15. Activity of the child during the time of the injury? **(Tick as appropriate)**

| | | | |
|--------------|--|--|--|
| Leisure/play | | Educational activity(e.g., going to and from school) | |
| Sports | | Daily living | |
| Travelling | | Others(specify) | |

16. If a burn injury, indicate?

- a) The cause of burn? Hot liquid Fires
 Hot objects Chemical
 Electricity Others (specify) ---

b) The total burn surface area(TBSA)_____

c) The degree of burn? (1=1st degree 2=Superficial 2nd degree 3=Deep superficial 2nd degree 4=3rd degree)

17. If a fall, indicate?

a. Where the fall occurred? Height(stairs,furnitures,trees,first floor and above)

Level ground other (specify) -----

b. The related injury (e.g. # femur)? -----

18. Any use of safety gear among those involved in road traffic injuries (helmets) Yes

No DK

19. In case of RTA, environmental conditions during accident?

Rainy Muddy Foggy Normal

Don't Remember

20. Of those involved in RTA, what was their mode of transport during the accident?

Small car/ Pick up/Van

Motorbike

Bicycle

Handcart

Matatu

other (specify).....

Don't Know

21. Of those involved in Road Traffic Accidents, were they?

Passengers

Pedestrians

Riders

Others

22. If poisoning, what was the type of poison?

- a) Kerosene
- b) Prescription Drug
- c) Agrochemicals
- d) Other chemicals(specify)-----

23. How do you store kerosene in your house?

- a. In a jerry can
- b. Bottle of beverage
- c. Other(specify)-----

24. Has the patient had any surgery performed/planned for surgery? Yes No

25. If yes, is/was the surgery?

Minor

Major

The section below is for all children interviewed (injured or not)

1. Projected/Actual cost of treatment in Kshs? -----
2. Expected mode of payment? Out of pocket
 NHIF
 other insurance
 Waived
 Others (specify) -----
3. Does/Did the household have to sell anything to pay for medical treatment for the injured child?
 Yes No DK
4. What drugs has the patient been prescribed? (**observe the treatment sheet**)?
 Oral antibiotics Intravenous fluids
 Topical antibiotics Intravenous antibiotics
 Analgesics Anti-fungals
 Steroids Others (specify) -----
5. What is the date of discharge? -----
6. What is the length of stay in the hospital (LOS)? -----(Days)

7. In the last 12 months has the child had any injury?

Yes No Don't Remember Don't Know

8. If yes, what was the type of injury sustained by the child (**indicate the code as below**)? _____

1=Burns 2=Road traffic Injury 3=Fall 4=Drowning 5=Poisoning
6=Violence 7=others

9. Outcome of the patient?

Discharged and well Discharged but Disabled Referred
 Dead

Name of the interviewer_____

Time interview ended_____

APPENDIX 2: Questionnaire in Kiswahili (Translated)

Kuwepo na mambo yanayohusu kulazwa hospitalini kwa watoto wenye majeraha wanaofikishwa kwenye hospitali katika Kaunti ya Nyeri, 2013

HABARI ZA KUTAMBULISHA

1. Nambari ya Karatasi_____
2. Jina la Hospitali_____
3. Nambari ya Wadi_____
4. Sahihi ya Mtafiti_____
5. Tarehe ya Mahojiano
____/____/____

HABARI ZA KIJAMII

6. Jinsia Kiume Kike
7. Umri (miaka) _____
8. Tarehe ya kuzaliwa (siku/mwezi/mwaka)____/10. Kijiji_____
8. Wilaya ya Nyumbani_____
9. Kata_____

| |
|---|
| 11. Kiwango cha elimu ya mtoto? <input type="checkbox"/> Hakuna |
| <input type="checkbox"/> Shule ya msingi ya chini (Lower primary) |
| <input type="checkbox"/> Shule ya msingi ya juu (Upper-primary) |
| <input type="checkbox"/> Nyingine (<i>Elezea</i>)----- |
| 12. Uhusiano wa mtoto na mwenye kuhojiwa/ mhusika |
| <input type="checkbox"/> Mama <input type="checkbox"/> Baba <input type="checkbox"/> Rafiki |
| <input type="checkbox"/> Ndugu <input type="checkbox"/> Mfanyikazi wa nyumbani <input type="checkbox"/> Mwingine (<i>Elezea</i>)----- |
| 13. Uhusiano wa mtoto na kichwa cha nyumba? |
| <input type="checkbox"/> Mwana <input type="checkbox"/> mmoja wa jamii |

| | | | |
|---------------------------------|-------|--|--|
| <input type="checkbox"/> Binti | | <input type="checkbox"/> Mwingine (<i>Elezea</i>)..... | |
| 14. Hali ya ndoa ya mtunzi? | | <input type="checkbox"/> Mseja (Single) | <input type="checkbox"/> Ameolewa/owa |
| | | <input type="checkbox"/> Ametalikiwa | <input type="checkbox"/> Wameachana |
| 15. Kiwango cha elimu ya mtunzi | | <input type="checkbox"/> Miano | <input type="checkbox"/> Wanaishi kinyumba |
| | | <input type="checkbox"/> Hajasoma | |
| | | <input type="checkbox"/> Shule ya msingi | |
| | | <input type="checkbox"/> Shule ya unili | |
| 16. Kazi ya mtunzi? | Alama | | Alama |
| Mkulima | | Biashara | |
| Kazi ya kibarua | | Bila kazi | |
| Kazi rasmi ya mshahara | | Mwanafunzi | |
| Kazi isiyo rasmi | | Nyingine (elezea)----- | |

Hali ya Kijamii

12. Jamii hupata pesa ngapi kwa mwezi (Kshs)?

Chini ya 5000

5000-10,000

Zaidi ya 10,000

13. Jamii inamiliki mifugo kiasi gani?

| | Idadi | | Idadi |
|---------|-------|---------|-------|
| Ng'ombe | | Nguruwe | |
| Mbuzi | | Kuku | |
| Kondoo | | Punda | |

14. Ukubwa wa ardhi wanayomiliki kwa ekari? A) chini ya 1 B) chini ya 5 C) Zaidi ya 5

15. Sakafu ya nyumba imetengezwa kwa?(*Tazama*)

- a) Sakafu asili.....[]
- b) Udongo/changawawe /tope.....[]
- c) Kinyesi cha mifugo.....[]
- d) Sakafu iliyotayarishwa.....[]
- e) Matofali[]
- f) Saruji (Cement)..... []
- g) Zulia (Carpet).....[]

16. Idadi ya vyumba katika makaazi?.....

17. Katika makaazi yako kuna? Ndio La

- | | | |
|------------------------|-----|-----|
| A. Umeme..... | [] | [] |
| B. Redio..... | [] | [] |
| C. Televisheni..... | [] | [] |
| D. Refrigerator..... | [] | [] |
| E. Umeme wa Jua..... | [] | [] |
| F. Simu ya rununu..... | [] | [] |

18. Kunaye mmoja wa nyumba yako anayemiliki?

- | | Yes | No |
|-----------------------|-----|-----|
| a) Baiskeli | [] | [] |
| b) Pikipiki | [] | [] |
| c) Gari ama lori..... | [] | [] |

19. Mnatumia nishati ya aina gani kupika?

- h) Umeme
- i) Gesi.....
- j) Gesi asilia (Biogas).....
- k) Mafuta taa.....
- l) Makaa.....
- m) Kuni.....
- n) Nyingine (*Elezea*).....

20. Taa zinatumia nishati ipi?

- | | |
|------------------|--------------------|
| [] Umeme | Nishati ya jua [] |
| [] Taa ya mvuke | Taa mafuta [] |

21. Maji yanatokana na?

- | | |
|-------------|--------------|
| [] Bomba | Kidimbwi [] |
| [] Mifreji | |
| [] Mto | |
| [] Kisima | |

Maswala yanayohusu majeraha

22. Namna ya jeraha? [] Kwa kunuia [] Bila kunuia []

23. Aina ya jeraha?(*Weka alama ifaavyo*)

| | | | |
|--------------------------|--|---------------|--|
| Ajali ya barabarani | | Kuzama majini | |
| Kuungua | | Kunywa sumu | |
| Kuanguka | | | |
| Nyingine(<i>Eleza</i>) | | | |

24. Sehemu ya mwili iliyopata jeraha?(*Weka alama ifaavyo*)

| | | | |
|-----------------|--|----------------|--|
| Kichwa / Shingo | | Uso | |
| Kifua | | Ncha za viungo | |
| Tumbo | | | |

Ishara za uzima wa mwili - BP _____ HR _____ RR _____ G.C.S _____

Maswala yanayohusu majeraha (Pata habari kutoka Kwa majeruhi, mtuzi, mhudumu wa afya na rekodi za matibabu)

25. Kunaye mtu mzima aliyeandamana na majeruhi wakati wa tukio? [] Ndio La []

26. Ni umbali gani kutoka eneo la majeraha yalitokea hadi hospitalini ? _____Kms

27. Tarehe majeraha yalipopatikana? _____

28. Siku ya juma majeraha yalipopatikana

[] Jumatatu

[] Jumanne

[] Jumatano

[] Alhamisi

[] Ijumaa

[] Jumamosi

[] Jumapili

29. Saa ambazo majeraha yalipopatikana?

[] Asubuhi mapema (saa sita usiku -0659)

[] Asubuhi (0700-1159)

[] Adhuhuri (1200-1559)

[] Alasiri (1600-1959)

[] Jioni (2000-2359).

30. Huduma ya kwanza ilitolewa kabla majeruhi kufikishwa hospitalini? [] Ndio La []
31. Iwapo ndio, nani aliyeitoa? [] Mmoja wa jamaa [] Jirani Mpita njia []
32. Kulikuwepo na magonjwa mengine sababishi? [] Ndio La []
33. Kama ni ajali ya barabarani, kuungua, kuanguka, eleza kiwango ya majeraha.-----
34. Iwapo ni jeraha la kuchomeka, eleza?

- d) Iliunguzwa na nini? [] Maji moto Moto []
- [] Chombo chenye joto Kemikali []
- [] Umeme

e) Eneo zima la kuchomeka (TBSA)_____

35. Iwapo ni kuanguka, eleza?

- c. Kuuanguka kutoka wapi? [] Urefu wa juu Sehemu tambarare[]
- d. Jeraha linalohusiana? -----

36. Mda uliochukua kabla ya kupatiwa huduma (dakika)_____

37. Ikiwa ulitumwa kwengine, ulitumwa kutoka kitua aina gani

Kituo cha serikali

Kituo cha kibinafsi

FBO

38. Waliopatwa na ajali ya barabarani walikuwa na vifaa vya kujikinga (kofia, mishipi ya usalama) Ndio La

39. Iwapo ni ajali ya barabarani, hali za eneo zilikuwaje?

[] Mvua

[] Tope

[] Kawaida

40. Waliopatwa na ajali ya barabarani walikuwa wakisafiri kwa?

[] Gari dogo/ gari la kubeba mizigo

[] Pikipiki

[] Baiskeli

[] Mkokoteni

[] Matatu

41. Waliopatwa na ajali ya barabarani walikuwa...?

Abiria

Wapitanjia

Waendesha pikipiki/baiskeli

Nyingine

| 42. Mfumo waliopelekwa nao hospitali? | Alama | | Alama |
|---------------------------------------|-------|-------------------|-------|
| Gari la kubeba wagonjwa | | Gari la kibinafsi | |
| Gari la umma (matatu) | | Pikipiki | |
| Baiskeli | | Kutembea | |

| 43. Mahali majeraha yalitukia? | Alama | | Alama |
|--------------------------------|-------|------------------|-------|
| Nyumbani | | Shuleni | |
| Mjini | | Barabarani | |
| Kazini | | Kwingine (eleza) | |

49. Kama alilazwa kuna upasuaji uliofanywa? [] Ndio [] La

50. Iwapo alilazwa, upasuaji ulikuwa?

[] Mdogo

[] Mkubwa

51. Iwapo alilazwa, alibaki huko kwa mda wa siku ngapi?

52. Kwa kipindi cha miezi sita, motto amewahi kupata majeraha mengine?

Ndio

a

kumbuki

Sahihi _____

APPENDIX 3: Consent Form in English

My name is Nelson Mwangi Muriu. I am a student at Jomo Kenyatta University of Agriculture and Technology (JKUAT) undertaking a Master of Science Degree in Applied Epidemiology. I am conducting a study on prevalence and factors associated with injuries among children aged 12 years and below admitted to hospitals in Nyeri County, Central Kenya.

Purpose of the study

The purpose of the study is to understand the burden of various childhood injuries reported in these hospitals, why some children are more prone to injuries than others, and write a report which will help us understand more about the injuries. I will also find out the factors associated with the leading injuries.

Procedure

I am going to give you information about the study and then invite your child to participate in the study. I intend to ask you questions about you and your child and for the children with injuries, I intend to explore circumstances around their occurrence.

Risks

There is a small risk of being involved in the study which is the potential loss of confidentiality or privacy. This can happen if information which identifies you is shared. However, we have made efforts of ensuring that your personal information is protected by not using your name and making sure that information is stored securely. When distributing the data or publishing I will omit all identifying information.

Benefits

Although there are no direct benefits of taking part in this study, the knowledge gained will be shared with the Ministry of Public health and Sanitation and other

stake holders so as to come up with ways to prevent injuries in children. There shall be no financial reward or pay for participating in the study. Participants will have no risk involved but only to sacrifice a few minutes of their time.

Voluntary Participation

Your decision to have your child participate in this study is entirely voluntary and you are free to choose not to consent or opt out at any stage of the study. The entire interview is expected to take about 45 minutes of your time.

Confidentiality

The information that I collect from this research will be kept confidential. We shall assign your child’s questionnaire a unique identifier instead of their name to ensure the information they provide cannot be traced back to them.

If you have any questions or clarifications about the research or you need an independent clarification as regards any aspect of the study you may contact the Secretary, KEMRI Ethics Review Committee (ERC) -020-272-2541 ext 3331 or write to: KEMRI Ethics Review Committee (ERC) P.O.Box 54840-00200 Nairobi. [Email-erc@kemri.org](mailto:email-erc@kemri.org).

You could also contact the principal investigator on 0721619407

Declaration

I..... having been given information and time to ask questions, have understood the consent I am giving and by my signature or thumb print below give consent for the study to be carried out on my child.

Interviewee signature/ thumbprint.....Date.....

Witness signature/ thumbprint..... Date.....

Principal investigator: Nelson Muriu. Sign..... Date

APPENDIX 4: Consent Form (Swahili Version)

Stakabadhi ya Idhini Maalum kutoka kwa Mzazi/ Mlezi/ Mtunzi wa Mtoto

Jina langu ni Nelson Mwangi Muriu. Mimi ni mwanafunzi katika Chuo cha JKUAT na nasoma Shahada ya Uzamifu katika Sayansi ya Applied Epidemiology. Ninafanya utafiti kuhusu kuwepo na mambo yanayohusu kulazwa hospitalini kwa watoto wenye majeraha wanaofikishwa kwenye hospitali katika Kaunti ya Nyeri, Kenya.

Kusudi la Utafiti

Kusudi la utafiti huu ni kupata uelewavu wa uzito wa majeraha ya watoto yanayoripotiwa kwenye hospitali hizi, kwa nini watoto wengine hupatwa na majeraha kwa urahisi kuliko wengine, na kuandika ripoti itakayosaidia kuelewa zaidi juu ya majeraha.

Utaratibu

Nitakupa taarifa kuhusu utafiti huu na kuuliza mtoto wako kushiriki katika utafiti. Ninanua kukuuliza maswali kuhusu majeraha ya mtoto wako na hali ya mambo wakati wa tukio lenyewe.

Adhari

Kutakuweko na adhari kidogo itakayohusika kwenye utafiti ihayohusu kupotea kwa usiri na taarifa za kibinafsi. Hili litatukia iwapo taarifa zinazoweza kukutambulisha zitatolewa kwa watu wengine. Hata hivyo, tumefanya juhudi kuhakikisha ya kuwa, taarifa zako za kibinafsi zimelindwa by kuficha jina lako na kuhakikisha taarifa zako zimehifadhiwa kwa usalama. Wakati wa kusambaza habari au kuchapishwa nitaondoa habari zote za kukutambulisha.

Manufaa

Ingawa hakuna manufaa ya moja kwa moja kutokana na utafiti huu, maarifa yatakayo patikana yatagawanywa na Wizara ya Afya ya Umma na washika dau wengine ili kuwezesha kupatikana kwa mbinu za kuzuia majeraha ya watoto. Hapatakuwa na zawadi yoyote ya kifedha wala malipo ya kushiriki kwenye utafiti huu. Washiriki hawatapatika na hasara yoyote japo tu kutoa mda wao wa dakika chache tu.

Kushiriki kwa Kujitolea

Uamuzi wako wa kumshirikisha mtoto wako kwenye utafiti huu ni kwa kujitolea na unao uhuru wa kuchagua kutoshiriki au kuacha kushiriki kwenye sehemu yoyote ya utafiti huu. Mahojiano yote yafaa kuchukua mda wa takriban dakika arobanne na tano tu za wakati wako.

Kuhifadhi Siri

Habari zote ambazo nitakusanya kutokana na utafiti huu zitawekwa kwa siri. Tutaipa karatasi ya maswali ya mtoto wako kitambulishi maalum badala ya jina lake ili kuhakikisha ya kuwa habari zote watakazozitoa haziwezi kutambulika kuwa zimetoka kwake.

Iwapo una maswali au unahitaji ufafanuzi kuhusu utafiti huu au unahitaji ufafanuzi ulio huru kulingana na sehemu yoyote ya utafiti huu, wasiliana na Katibu, KEMRI Ethics Committee (ERC)(kamati ya Nidhamu ya taasisi ya KEMRI) Nambari ya simu 020 272 2541 au andika kwa sanduku la posta 54840-00200, Nairobi. Barua pepe – erc@kemri.org.

Hati ya Kueleza Habari

Mimibaada ya kujulishwa na kupatiwa nafasi ya kuuliza maswali, nimeelewa idhini ninayopeana na

kwa sahihi yangu au alama ya kidole hapa chini ninatoa idhini kwa utafiti huu kufanywa kwa mtoto wangu.

Sahihi ya mhusika/ Alama ya kidole gumba

Sahihi ya Shahidi/ Alama ya kidole gumba Tarehe.....

Sahihi ya Mtafiti wa Kwanza.....Tarehe

APPENDIX 5: Consent form (Translated in Kikuyu)

Rutha Rwa Muciari/ Mureri wa mwana utakinyitie miaka

Rîtwâ rîakwa njîtagwo Nelson Mwangi Mũriu. Ndi mūrutwo wa *Jomo Kenyatta University of Agriculture and Technology* na ndirathomera ndigirii ya *Master* ya gîthomo gîa Sayansi ya Mîrimũ ya mũingî. Ndîracaria ũmenyo wa gîtũmi gîa cîana igurarîtio na gutwarwo thibitarî na gukoma thiniî wa County ya Nyerî, Kenya.

Gîtũmi gîa gũcaria umenyo

Gîtũmi gîa wîra ũyũ nî kũgîa na ũmenyo ũkoniî nguraro cia ciana nini iria itwarîtwo mathibitarî-inî maya, na nî kîi gîtũmi gîa cîana îmwê kũgurario gũkîra îria îngî na nîgũo twandîke ũhoro ũrîa ũgûtũma gũtaũkîrwo nî ũhoro ũkoniî ngurario îcio. Nîtũkũmenya mitino îrîa îrehage ngurario ndiganu.

Mutaratara

Nî ngũkũhe ũhoro ũkoniî wîra ũyũ na tuîte mwana waku acokie ciũria harî wîra ũyũ. Ndi na bata kũria cîũrîa cîgũkonie na cikoniî mwana waku na harî cîana cîgũrarîtio, nũngwenda kũria nîkîi kîahanîkire kahînda ga kũgurario.

Ũũru

Nî harî na ũũru wetîkîra kũruta mawoni maku na ũrũ ucio nî rîrîa ũhoro waku wa hitho ũkumũkana. Kũngîhanîka ũguo rîrîa ũhoro ũrîa ũngîhota gũgũtambũra ũgigaywo kũrîa andũ angî. No na ningî, nîtũthondekete ũrîa ũhoro waku ũtegutembũrwo harî mũingî na kũhitha rîtwâ rîaku na ũhoro ũrîa ũkũruta haha nî ũkũigwo wega. Rîrîa tũraruta ũhoro ũyũ nîtũkweheria marîtwâ kana ũhoro ũrîa ũngîhota kũmenyeke nîwe mwene ũhoro ucio.

Uhoro wa Kuguna

Ona gûtũika hatirî na kũgũnîka rîrîa ũraruta ũhoro ũyũ, ũmenyo ni ũkeheo kũrî thirikari kũhîtũkîra kũrî Rũhonge rwa ũtheru wa mũingî na andũ agî nî getha

gũkorwo na njîra ya kũnyihia ngurario cia ciana. Hatirî na kîheo gîa mbeça nî ùndũ wa gũkorwo ùkîruta ũhoru ũyũ. Mũndũ ũrîa ùkũruta ũhoru no kahinda gake kanini ekũruta.

Kũheana ũhoru na Kuîrutîra

Gũtîkîra kũruta ũhoru nî gwa kũîrutîra kaîmana na no ũtîge kũrũta ũhoru o rîrîa ũngîenda harî wîra ũyũ. Ũhoru ũyũ ùkũrutwo gwa kahinda ka ndagîka mîrongo îna na ithano.

Ũhoru Waku Wi Hitho

Ũhoru rîa ngũruta hari we nî ùkũigwo hitho-inî. Iratathi rîrîa rî na ciũria na macokio maku rîkũheo namba no ti rîtwa rîaku nîguo ndũkahote gũcoka kumenyeka umîtie kurî we. Angîkorwo wîna ciũria kana nî ùkwenda kũteterithia ũhoru ũyũ no ũtũme ciũria ciaku kũrî Mwandîki wa kamîtî ya kũrora ũmma ya KEMRI (Secretary, KEMRI Ethics Review Committee (ERC) kurî namba ya thimũ 020 272 2 541 kana wandike marũa kũrî îthandũkũ rîa posta P.O. Box 54840-00200, Nairobi kana ũhũrire mũtwîria mũnene harî namba ya thimũ 0721 619407.

Kwirũtira


Nii thutha wa kũmenyithio na kuheo kahinda kũria ciũria nîndataũkîrwo atî rũtha rũrîa ndîraruta nî gũkîra thaîni kana kirore gikwa nî rwa gũtîkîria mwana wakwa naniî tũhoywo ũhoru.

Thaîni/ Kirore gia mũndũ îria ũroorio ciuria

Thaîni/ Kirore gia Mîira Tarîki

Mũtũîria Uhoru: Nelson Mũriu: Thaîni..... Tarîki

APPENDIX 6: KEMRI SSC Approval



KENYA MEDICAL RESEARCH INSTITUTE

P.O. Box 5840-00200, NAIROBI, Kenya
Tel: (254) (020) 2722541, 2713340, 0722-205301, 0733-400003; Fax: (254) (020) 2722699
E-mail: doctor@kemri.org info@kemri.org Website www.kemri.org

ESACIPAC/SSC/101426 **13th February, 2013**

Nelson Muriu


Thro' **Director, CCR** *Forwarded*
NAIROBI *(Hand) 13/02/2013*

REF:SSC No. 2452 (Revised) – Prevalence and factors associated with injuries in children attending selected hospitals in Nyeri County, Kenya

Thank you for your letter received on 7th February, 2013 responding to the comments raised by the KEMRI SSC.

I am pleased to inform you that your protocol now has formal scientific approval from SSC.


The SSC however, advises that work on the proposed study can only start after ERC approval



Sammy Njenga, PhD
SECRETARY, SSC

In Search of Better Health

APPENDIX 7: KEMRI ERC Approval



KENYA MEDICAL RESEARCH INSTITUTE

P.O. Box 54840-00200, NAIROBI, Kenya
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E-mail: director@kemri.org info@kemri.org Website: www.kemri.org

KEMRI/RES/7/3/1 **May 22, 2013**

TO: NELSON MURIU, (PRINCIPAL INVESTIGATOR)
STUDENT NO : TM312/1025/2011

THROUGH : DR. RASHID JUMA; *Forwarded via 24/05/2013.*
THE DIRECTOR, CCR
NAIROBI

Dear Sir,

RE: SSC PROTOCOL NO. 2452 – REVISED (RE-SUBMISSION): PREVALENCE AND FACTORS ASSOCIATED WITH INJURIES IN CHILDREN ADMITTED IN SELECTED HOSPITALS IN NYERI COUNTY, KENYA.

Reference is made to your letter dated May 12, 2013. The ERC Secretariat acknowledges receipt of the revised proposal on April May 20, 2013.

This is to inform you that the Ethics Review Committee (ERC) reviewed the document listed above and is satisfied that the issues raised at the 213th meeting held on March 19, 2013 have been adequately addressed.

The study is granted approval for implementation effective this **22nd day of May 2013**. Please note that authorization to conduct this study will automatically expire on **May 21, 2014**. If you plan to continue with data collection or analysis beyond this date, please submit an application for continuing approval to the ERC Secretariat by **April 10, 2014**.

Any unanticipated problems resulting from the implementation of this protocol should be brought to the attention of the ERC. You are also required to submit any proposed changes to this protocol to the ERC prior to initiation and advise the ERC when the study is completed or discontinued.


You may embark on the study.

Yours faithfully,
EAB


Dr. ELIZABETH BUKUSI,
ACTING SECRETARY,
KEMRI ETHICS REVIEW COMMITTEE

*21/06/13
Moted
request accepted
D.A.*

MEDICAL SUPERINTENDENT
KARATINA DISTRICT HOSPITAL
P O BOX 133, KARATINA.



Accepted and allowed



27 MAY 2013
Accepted & allowed

In Search of Better Health

APPENDIX 8: Published manuscript

Prevalence and factors associated with injuries among children aged 12 years and below admitted to hospitals in Nyeri County, Kenya-2013

Nelson M. Muriu^{1,2&}, S.Karanja², Z.Gura¹, M.Karama³, J.Kibachio¹

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Nelson Mwangi Muriu, Jomo Kenyatta University of Agriculture and Technology, Field Epidemiology and Laboratory Training Programme, P.O Box 20781, Nairobi, KNH grounds, Kenya

[Email-nelmwangi@yahoo.com](mailto:nelmwangi@yahoo.com)

Abstract

Injury and violence is a major killer of children throughout the world, responsible for about 950 000 deaths annually, in children and young people under the age of 18 years. The World Health Organization identifies burns, falls, road traffic injuries (RTIs), poisoning and drowning as the major causes of injuries in children. In Kenya, injuries are the 5th leading cause of morbidity among patients attending health facilities while in Nyeri County; they are the 3rd leading cause of mortality among those attending health facilities. The objective of this study was to determine the prevalence, characteristics and factors associated with injuries among children admitted in hospitals in Nyeri County. A cross-sectional study was conducted from June 2013 to August 2013. Systematic random sampling was used to enroll patients

based on hospital monthly inpatient workload. Information on socio-demographic characteristics, clinical characteristics, length of hospital stay, and outcome was collected from parents/guardians using interviewer administered questionnaires. For the patients presenting with injuries, further information on cause and circumstances surrounding the injury was collected. Medical records of all the patients were reviewed to verify clinical and socio-demographic data. Univariate, bivariate and multivariate analyses were performed. Of the 415 patients enrolled into the study, 108 (26%) presented with injuries, with a median age of 39 months (range: 7-144), males being the majority at 67(62%). The leading causes of injuries were burns 41(38%), falls 38(35%), cuts 13(12%) and poisoning 9(8%). Eighty-six (80%) of the injuries occurred at home, 70(65%) during play and 67(62%) in the absence of an adult/care taker. Independent risk factors associated with injuries were; parents spending < 6 hours with the child in a day [AOR=2.6; 95% CI (1.5-4.3)]; age >5years [AOR=2.6; 95% CI (1.4-4.9)]; low SES [AOR=2.5; 95% CI (1.3-4.7)] and previous history of injury [AOR=4.0; 95% CI (1.6-10.1)]. Prevalence of injuries is high among males and patients above 5 years of age. Burns, falls, cuts and poisoning were the leading causes of injuries. By knowing the leading causes of childhood injuries and associated factors, we conclude that majority of paediatric injuries are preventable. Targeted interventions such as adequate supervision from parents/guardians and public health education on injury prevention are vital.

Background

An injury is defined as physical damage to the body resulting from acute exposure to thermal, mechanical, electrical or chemical energy in amounts that exceed physiological threshold or from the absence of such essentials as heat or oxygen (Baker *et al.*, 1992).

Injuries are traditionally grouped according to two broad categories: intentional and unintentional. Conventionally, intentional injuries include interpersonal violence (spousal abuse, child abuse, and other assaults), self-inflicted injuries (attempted and completed suicides) as well as collective violence and war-related injuries. Motor vehicle injuries, poisonings, burns, falls, drowning, and other injury

classifications in which intentionality is understood to be absent constitute the broad unintentional injuries category (Holder *et al.*, 2001).

Injuries are a leading cause of death in children less than 18 years of age. World Health Organization report of 2008 estimates that 950,000 children under 18 years of age died of injury and violence in 2004. The majority of the deaths (90%) were due to unintentional injuries such as road traffic injuries (RTI), drowning, burns and poisoning. The problem is more common in low and middle income countries (LMIC) than in high income countries (HIC) 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 (Peden, 2008; WHO, 2008).

Over 875,000 children less than 18 years of age die annually in the world as a result of unintentional injuries, mostly in LMIC where injuries account for 13% of the total burden of morbidity among children less than 15 years of age (Murray & Lopez 1997; Deen *et al.*, 1999). In addition to those who die each year, millions more may develop a temporary or permanent disability, exacting a profound toll on the individual, family, and society (Hyder *et al.*, 2009).

They are a number of factors that increase vulnerability to injuries in children, key among them being that children have a unique profile of risks for injuries because they are unable to recognize and avoid many potential risks on their own. Secondly, children are also at risk of worse injury due to their smaller size and physiological immaturity. In addition, the burden of injury is greater among children since they have more years ahead of them to be affected by disability (Bartlett 2002; Nath *et al.*, 2007).

Injuries are preventable by changing the environment, individual behaviour, products, social norms, legislation and governmental and institutional policies.

Injuries contribute significantly to the rising morbidity and mortality attributable to non-communicable diseases in the developing world. Unfortunately, active injury

surveillance is lacking in many developing countries, including Kenya. Trauma care research is still in the developmental stages with relatively few trauma registries and published data without an existing policy document on injuries.

Methods

The study was conducted in three hospitals in Nyeri County, namely Nyeri County referral hospital, Karatina and Othaya Hospitals .Nyeri County has a population of 693,558 persons (KNBS, 2009) with a population density of 208 people per Km ², and an annual growth rate of 0.48 %.Thirty-four percent of the population is below 14 years of age and the poverty level stands at 32.7 %. The County has 5 government public hospitals, three of which were selected for this study. Nyeri County referral hospital acts as the major referral facility in the county.

We conducted a cross sectional study to determine prevalence and factors associated with leading injuries among children admitted to three hospitals in Nyeri County. The study population consisted of children aged 12 years and below admitted to the three hospitals with various clinical diagnoses for treatment

Sampling procedure and sample size determination

A minimum sample of 385 was determined using modified Cochran formula 1977 [Cochran,1977], with finite population correction, based on the assumptions of 50% prevalence of injuries among children in this age bracket, 95% confidence interval, 5% absolute precision.

To achieve the minimum sample size of 385 persons, all patients meeting the inclusion criteria and presenting to the three county hospitals for admission were recruited into the study through systematic random sampling. Since the sampling was done in three hospitals with varying patient work load, probability proportional to size (PPS) sampling technique was used where guided by the historical data in the hospitals a ratio of 1:2:3 was used to determine how many patients each hospital contributed to the sample size as shown in Table 1.

The three hospitals have varying monthly admissions but on average they ranged from 300 admissions in Nyeri County referral hospital to 90 admissions in Othaya sub-county hospital.

Approximately 300 children aged 12 years and below are admitted per month in Nyeri County referral hospital making it 600 admissions for the projected study period of 2 months. This was divided by the minimum adjusted sample size (193) to give the sampling interval of (3). A random number was picked as the starting point and then every third patient who met the inclusion criteria was included in the sample until the required sample size was reached. The same process was followed for Karatina and Othaya sub-county hospitals.

Data was collected using a pre-tested semi-structured, interviewer administered questionnaire. Information on socio-demographics characteristics, general clinical information, and length of stay, circumstances surrounding the injuries and treatment outcome for all the enrolled patients was collected. The patient's files and registers were reviewed to verify socio-demographic and clinical data.

Data was cleaned, entered and analyzed using Epi Info version 3.5.3 (CDC, Atlanta). Means and proportions were calculated for continuous and categorical variables respectively. We carried out descriptive analysis to determine frequencies, proportions and means. We determined the prevalence of injuries, types of injuries and calculated proportions of various circumstances that were associated with the incident of injury. Thereafter, bivariate analysis was conducted to determine factors associated with injuries using 95% Confidence interval. Bivariate analysis was used to determine measure of association (odds ratio) between injuries and associated factors. Factors that were found to be significantly associated with the outcome at P-value equal to or less than 0.05 were entered in multivariate logistic regression model. Statistical significance of the associations was determined by Chi-square, with a P-value of less than 0.05 considered significant.

Ethical Considerations

Approval and clearance for this study was received from KEMRI Scientific steering committee (SSC) and Ethical Review Board, and hospitals administrative authorities, before commencement of the study. Written informed consent was sought and obtained from the participants before administration of the questionnaires. Participation was voluntary.

RESULTS

Prevalence of injuries

A total of 415 patients meeting the inclusion criteria were recruited, consented and interviewed at the three hospitals. One hundred and eight (108) children aged 12 years and below were admitted in the three hospitals with a diagnosis of injuries presenting a prevalence of 26 % (Table 4). The prevalence across the three hospitals ranged from (18-37%). Fourteen percent of the children presenting with injuries and three percent of those presenting with other illnesses reported experiencing an injury in the preceding 12 months. Among those admitted with injuries; the leading causes of injuries was burns 41(38%), falls 38(35.2%), cuts 13 (12%) and accidental poisoning 9 (8.3%) as shown in figure 1.

The prevalence of injuries was slightly higher in males compared to females at a ratio of 1.1:1. Among school going children, prevalence was 31(62%) in primary-school children compared to 19(30%) among those attending kindergarten. Prevalence of injuries among pre-schoolers was 55(18%). Children between the ages of 9-12 years showed the highest injury prevalence at 13(68%), followed by those aged 5-9 years at 44% as shown in Table 3. Both increasing birth order and maternal age were seen to be associated with decreased injury prevalence.

Socio-Demographic characteristics of study participants

The median age of the patients with injuries was 39 months (range: 7-144, IQR: 52.5) while that of the patients. The mean age of the mothers was 29±5 years. Half of the patients with injuries had no formal education, mostly due to the fact that they had not attained age of school admission. In this study, 87(82 %) of the respondents

were mothers, 9(8%) were fathers while the rest were friends and relatives of the children (Table 2).

Forty nine percent of the parents/guardians reported a monthly household income of less than 63 USD, 87% owned <5 acres of family land while 73(68%) used firewood as their main source of fuel for cooking. Only 1% of the families reported using kerosene as their main source of cooking fuel, 7(6.5%) use liquid petroleum gas. Seventy-eight percent of the children lived in semi-permanent houses; eighty-nine percent reported owning both a radio and a mobile phone. For most children, the mode of transport to the hospitals was by public transport at 63(59%) and motorbikes at 21(19%).Referral by ambulance was only used by 4(3.7%) of the patients.

Clinical Characteristics

The median duration of hospital stay for the children admitted secondary to injuries was 5 days (range: 1-40). Seventy-six percent of the injuries irrespective of type occurred on the extremities, 6% on the face, 4% on the head and 9% on the trunk. Among the children admitted with injuries; 91(84%) were given analgesics which can be attributed to the pain associated with most injuries while 15(14%) and 47(44%) were put on intravenous and oral antibiotics respectively. Six (5.6%) of the injured had co-existing co-morbidities, with 11(10%) reporting history of sibling injury in the preceding 6 months. Twenty-six percent of the patients had surgery, 3(11 %) being major surgeries.

Circumstances surrounding the injuries

Sixty-five percent of the parents/guardians reported spending less than 6 hours a day with their children, compared to 33% of children admitted due to other conditions. Half of the injuries occurred on Friday, Saturdays and Sundays. No single day of the week were injuries seen to be particularly prevalent (Table 6). Majority 71(65.8%) of the injuries occurred in the afternoons and early evening (Table 5). Forty seven percent of the injured children were given first aid treatment prior to hospital arrival.

On bivariate analysis, sex was not significantly associated with higher odds of injuries. However, child factors that were found to be significantly associated with injuries included history of injury in the preceding 12 months, level of education of the child, age above 5 years, and low socio-economic status (Table 7).

Parental/guardian factors that were found to be associated with injury included socio-economic status, parents spending <6hrs with the child in a day and marital status. Maternal age, level of education of the parent and occupation were found to have no association with injury ($P>0.05$)

Factors that were found to be significantly associated with injuries included; parents spending < 6 hours with the child in a day [AOR=2.6; 95% CI (1.5-4.3)]; children above 5years of age [AOR=2.6; 95% CI (1.4-4.9)]; low socio-economic status(SES [AOR=2.5; 95% CI (1.3-4.7)] and previous history of injury in the preceding 12 months [AOR=4.0; 95% CI (1.6-10.1)].Increasing birth order[AOR=0.3; 95% CI (0.1-0.9)] was found to be protective.

Discussion

The main objective of the study was to determine prevalence, characterize the cases and establish factors associated with childhood injuries. From our study the prevalence of injury among children admitted in the three hospitals was 26%, with the leading causes of childhood injuries reported as falls, burns, cuts and poisoning. This is similar to a study conducted in the emergency department from the Central Hospital of Maputo, which showed that approximately 26% of all patients presented as a result of injury, with leading causes of injury being falls, road traffic injuries and burns (Mercy *et al.*, 2006).

This was a hospital-based study and therefore might not be entirely representative of the general population but the prevalence of injury in this study is well within other studies carried out in the same settings. A study conducted in an Indian hospital by Tandon *et al* reported that 14.2% of the presentations were due to injury (Tandon *et al.*, 1993). A similar study of trauma patients in Uganda found that 24.2% were

children less than 14 years of age (Kobusingye *et al.*, 2000). The prevalence reported in these studies are well within the prevalence of our study and also within the inter-hospital prevalence of between 18-37%. The study therefore confirms the high burden of injury among this age-group that most of the time is largely ignored because of lack of data or incomplete data to inform decisions.

The age distribution and the leading causes of injuries in this study are similar to studies conducted elsewhere. The median age of the children admitted with injuries in this study is similar to the findings of a study by Gome et al 2005 in Kenyatta National Hospital that reported that the age range of patients admitted with injuries was 3.9 years (range 3 weeks-12 years). In this study there was variation in which different age-groups suffered different injuries. Children below two years of were found to be mostly affected by burns with the numbers decreasing with advancing age. However, in other injuries such as falls and RTI the numbers increased with advancing age. Generally the prevalence of injury among children in this study was seen to be increasing with advancing age which is congruent with other studies done globally including the world report on child injury prevention. We must realize that a child's physical and cognitive abilities, degrees of dependence, activities and risk behaviours all change substantially as they grow older (Agran *et al.*, 2003)

In this study, males outnumbered females in all the injuries apart from poisoning, with the highest male: female ratio reported in fall injuries. The world report on child injury prevention reports that from a young age, boys are more likely to be involved in injuries than girls. The report further says that the difference in incidence rates between boys and girls increases with age until 18 or 19 years of age, when the gap is similar to that seen in adulthood. Similar findings have been reported in studies conducted elsewhere that found boys to account for most of childhood injuries. The Global childhood unintentional injury surveillance (GCUIS) study reported that among children less than 12 years of age attending hospital emergency departments, 65% were male. The reason for these differences is that boys are more active and experimental, and tend to participate in all activities and risk-prone games compared to girls, hence are more likely to suffer from injuries. However, their curiosity to

explore their surroundings is generally not matched by their capacity to gauge or respond to danger. Secondly, boys are socialized to participate in various activities including dangerous work early in life making them more prone to injuries. An assessment of patients' socio-demographics and other information from this study allow several conclusions to be drawn some of which are necessary in understanding the problem as well as adopting the appropriate injury prevention strategies.

This study identified burns as the leading cause of childhood injury in the three hospitals recording the highest number of cases. The findings are similar to other studies elsewhere that have reported burns to contribute between 13% to 23% of all injuries (Mukerji *et al.*, 2001; Mutto *et al.*, 2011). Majority (95%) of burns in our study occurred at home among children aged 2 years and below. Studies done in Nigeria and Egypt reported a significant proportion of burns occurring at home especially in children below 3yrs of age in presence of adults (Okoro *et al.*, 2009; Hemeda *et al.*, 2003). These children are the ones who need utmost supervision and care.

In comparison, this study revealed that most children got burnt at home and two-thirds of them were below 2 years. Sixty-one percent of the burns occurred in presence of a competent adult member of the household. This is an indication that there is a challenge in the design of our fire places and kitchens and the environment is not favorable for children and most times even in the presence of competent adults to watch over and supervise them, they are exposed to danger. In particular, heating or cooking on open fires that are not enclosed or that stand at ground level pose significant dangers to children. This is similar to findings by (Natterer *et al.*, 2011; Okoro *et al.*, 2009) that have reported that 80-90% of burns occur in the presence of an adult. The other 40% that got burnt in the absence of adult members of the household is a pointer to sub-optimal supervision which exposed the children to the risk of burn injuries. A vast majority of burns in our study were scalds followed by open fire injuries. Similar findings were drawn from studies done in South Africa, Nigeria, Egypt and Uganda (Parbhoo *et al.*, 2010; Okoro *et al.*, 2009; Hemeda *et al.*,

2003; Mutto *et al.*, 2011). The many scald burns resulting from hot liquids is a pointer to easy access for children to cooking appliances or pots with boiling liquids.

Falls were the 2nd leading cause of injury in this study accounting for a third 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 (WHO, 2008; El-Chemaly *et al.*, 2007).

In a community survey conducted by Kamala et al 2011 in Tanzania, falls were seen to occur almost exclusively at home among young children. Males were overrepresented as expected with male to female ratio of 3:1. Globally, males tend to outnumber females in falls. 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 (Adensunkanmi *et al.*, 1998). This was also revealed in our study where the male: female ratio was 3:1. Findings from our study also revealed that children between the ages of 2-5 years were the most affected by fall injuries, with two-thirds of the injuries occurring at home during play. This is similar to studies done in Tanzania and Uganda that reported that most falls occurred outdoors during play in age group 1-4 years (Kobusingye *et al.*, 2001; Kamala *et al.*, 2011)

In Sub Saharan Africa, road traffic injuries (RTI) are on the increase mainly due to rapid urbanization. This study revealed 6% of all injuries were as a result of RTI. The prevalence of road traffic injuries in this study was much lower compared to others previously reported in Dar es Salaam and Maputo whereby RTI contributed 15.2% and 14% of childhood injuries respectively (Museru *et al.*, 2002). Another study done in Uganda revealed 25.3% of all unintentional injuries resulted from road traffic injuries (Mutto *et al.*, 2011).

In contrast to these findings, injuries resulting from road traffic injuries were much lower which could be attributed to the fact that most of road traffic injuries in our settings are seen among older age group mostly in those above 18 years. A prospective study done by Saidi in Kenyatta National hospital reported that road

traffic injury admissions formed 31% of all admissions; with the mean age of the patients being 30 years, and 20% of the patients aged below 20 years. Males comprised four-fifths of the admissions (Saidi, 1999).

A possible explanation to the contrasting findings could be that some other injuries resulting from road traffic Injuries died before arrival to hospital or were treated as outpatient cases. Most of the road traffic injury cases are usually fatal requiring specialized theatre, imaging and at times intensive care services which were mostly available in Nyeri County Referral and Karatina Sub-county Hospitals.

The World Health Organization reports that poisoning contributes about 13% of all childhood injuries globally, with children aged between 1-4 years most commonly affected and with a great variation among countries in the developing world (WHO, 2008). In this study, poisoning accounted for 8% of all injuries, affecting mostly female children. Hyder et al reported similar findings where poisoning contributed 4% of childhood injuries, predominantly occurring in females aged 1-4 years (Hyder *et al.*, 2009). In our study, poisoning through agrochemical ingestion was the most common followed by prescription drugs and kerosene, whereas reports from other countries (Manzar *et al.*, 2010) reveal kerosene to be the most common cause followed by drug ingestion and insecticides. The difference could be explained by the fact that in our study only a third of parents/guardians of patients admitted with injuries were using kerosene as their main source of lighting, which minimized the possibilities of kerosene poisoning. However, kerosene poisoning is still a problem in developing countries where it is commonly used as a main source of energy for cooking and lighting. In Kenya, families use beverage containers such as empty soda or juice bottles for storing kerosene. As a result, young children sometimes ingest kerosene accidentally confusing it for a beverage.

Several risk factors for injury have been identified worldwide with some variations between developed and developing countries. In this study, the male to female ratio was 1.1:1, with age group 9-12 years being the most affected. However, despite males outnumbering the females in most injuries sex was found not to be a risk factor in this study (Table 7).

In Sub Saharan Africa, child supervision is declining due to multiple factors. It is known that most childhood preventive measures of injury focus on supervision. This study examined the relationship between injuries and the tendency of parents leaving their children at home unsupervised. The odds of injury increased if parents reported leaving their children at home alone or without presence of a competent adult for a period longer than 6 hours. This risk increased 2.6 times after adjusting for potential confounders. 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 (Nathens *et al.*, 2000). It was also noted that children who had a history of previous injury were 4.0 times more at risk of injury which could also point to a vicious cycle resulting from lack of or inadequate supervision by the parents/guardians.

As reported by Nathens et al 2000, 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 (Nathens *et al.*, 2000). 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. This may be explained by the fact that young mothers lack experience as well as awareness of the environment that could endanger their children. Most times, these children were left under the care of their older siblings who also happened to be children, and rarely took time to supervise their younger siblings.

Several studies have reported the influence of social demographic characteristics such as maternal education, maternal age, occupation and marital status on injury risk (Hong *et al.*, 2000). However; this is not consistent in all settings. In this study, maternal education and maternal age were found not to influence vulnerability to injury in general. Similar findings were reported by Hong Wang in China. This is in contrast to other studies conducted elsewhere where parental education and maternal age have been strongly linked to risk of childhood injury (Laursen *et al.*, 2008)

In this study, social economic status was found to be associated significantly with injuries after controlling for potential confounders. There was a tendency of decreasing risk of injury with increased socio-economic status. Similar findings were reported in Australia and Europe where direct association between socioeconomic status and injury in general was reported. Socioeconomic status influences a number of things including type of housing, type of fuel for cooking and lighting, 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 wealthy households to have caretakers.

Conclusion

Prevalence of injury is high especially among males and is seen to increase with age. Burns, falls, cuts and poisoning were the leading causes of injuries. Home environment was the commonest place of injuries. Factors significantly associated with injury include; inadequate supervision, history of previous injury, low socio-economic status and advancing age

By knowing the epidemiology and factors associated with paediatric trauma, we conclude that majority of paediatric injuries are preventable and paediatric epidemiological trends differ from those in adults. Therefore, preventive strategies should be made in paediatric patients on the basis of these epidemiological trends and associated factors. Targeted interventions such as adequate supervision from parents/guardians and public health education on injury prevention are vital.

Study limitations

This study was conducted among children aged 12 years and below admitted in three selected hospitals in Nyeri County of Central Kenya. Children seeking care in other hospitals, children being discharged after outpatient care in the study sites, those with severe cases who did not survive long enough to seek care and those who did not seek care at all due to various reasons were not captured in this study. Hence the findings would not be adequately generalizable to the population.

Competing interests

The authors declare no competing interest.

Authors' contributions

All the authors listed in this article made contributions during the design of the study, data collection and interpretation, provided critique for intellectual content and gave final approval of the version submitted.

Acknowledgments

We would like to acknowledge the management of the three hospitals, The County Department of Health-Nyeri, Kenya Field epidemiology and laboratory Training Program (FELTP) and Jomo Kenyatta University of Agriculture and Technology for facilitating the carrying out of the study.

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Table 1 Sampling and sample size determination across the three hospitals in Nyeri County.

| Hospital | Average no. of admissions per month | Total No. of admissions in 2 months | Minimum sample size per hospital | Sampling Interval |
|------------------------------|--|--|---|--------------------------|
| Nyeri County Referral | 300 | 600 | 193 | 3 |
| Karatina Sub-County Hospital | 180 | 360 | 128 | 3 |
| Othaya Sub-county Hospital | 90 | 180 | 64 | 3 |
| Total | 570 | 1140 | 385 | |

Table 2 Socio-Demographic characteristics among children admitted with injury in selected hospitals in Nyeri County, 2013

| Variable | Frequency (%) | 95% CI |
|--|----------------------|---------------|
| Gender | | |
| Male | 67(62) | (52.2-71.2) |
| Level of Education of the child | | |
| Pre-schoolers | 55(50.9) | (42.0-61.6) |
| Age(months) | | |
| 0-24 | 37(34.3) | (25.4-44.0) |
| 25-59 | 34(31.5) | (22.9-41.1) |
| Birth order | | |
| 1-2 | 78(72.2) | (62.8-80.4) |
| Relationship of the child with the respondent | | |
| Mother | 88(81.5) | (72.9-88.3) |
| Place of injury | | |
| Home | 86(79.6) | (70.8-86.8) |
| Mode of transport to hospital | | |
| Ambulance | 2(1.9) | (0.2-6.5) |
| Matatu | 64(59.3) | (49.4-68.6) |

Table 3 Prevalence of injuries by potential risk factors, among children admitted in selected hospitals in Nyeri County, 2013

| Variable | Prevalence,% |
|---|---------------------|
| Gender | |
| Male | 27.3(67/169) |
| Female | 24.3(41/245) |
| Birth order | |
| 1 | 28.7(37/129) |
| 2 | 29.8(41/138) |
| 3 | 25.0(19/76) |
| 4 | 10.0(4/40) |
| >4 | 24.0(6/25) |
| Level of Education(child) | |
| None | 18.7(55/294) |
| Kindergarten/Nursery | 30.0(19/64) |
| Primary | 62.0(31/50) |
| Positive hx of injury in the last 12 months | 62.5(15/24) |
| Age of the child (years) | |
| < 5 years | 21.1(71/334) |
| >5 years | 52.3(34/65) |
| Maternal age in years | |
| 15-24 | 25.6(22/86/) |
| 25-34 | 20.1(46/229) |
| 35+ | 31.2(25/80) |
| Level of education of parent/Caretaker | |
| None | 20.0(1/5) |
| Primary | 27.9(54/193) |
| Secondary | 25.1(43/171) |
| Tertiary | 22.2(8/36) |

Table 4 Prevalence of injuries in the three County Hospitals

| Hospital | Prevalence n (%) |
|--------------------------------|-------------------------|
| Nyeri County Referral Hospital | 59(26.8) |
| Karatina Sub-County Hospital | 22(18.0) |
| Othaya Sub-county Hospital | 27(37.0) |

Table 5 Distribution of injuries by time of day, among children 12 years and below admitted in three selected hospitals in Nyeri County, 2013

| Time of the day | Frequency (%) | 95% CI |
|--------------------------------|----------------------|---------------|
| Afternoon (1200-1559) | 33(30.6) | (22.1-40.2) |
| Early evening (1600-1959) | 38(35.2) | (26.2-45.0) |
| Early morning (midnight -0659) | 1(0.9) | (0.0-5.1) |
| Late evening (2000-2359). | 13(12.0) | (6.6-19.7) |
| Morning (0700-1159) | 21(19.4) | (12.5-28.2) |
| Don't Know | 2(1.9) | (0.2-6.5) |
| Total | 108(100.0) | |

Table 6 Distribution of injuries by day of the week, among children 12 years and below admitted in selected hospitals in Nyeri County, 2013

| Day of the week | Frequency | Percent |
|------------------------|------------------|----------------|
| Friday | 18 | 16.7 |
| Monday | 12 | 11.1 |
| Saturday | 20 | 18.5 |
| Sunday | 19 | 17.6 |
| Thursday | 8 | 7.4 |
| Tuesday | 11 | 10.2 |
| Wednesday | 16 | 14.8 |
| Don't Know | 4 | 3.7 |
| Total | 108 | 100.0 |

Table 7 Bivariate analysis of factors associated with childhood injuries in selected hospitals in Nyeri County, 2013

| Variable | Category | Crude OR | 95% CI | | P-value |
|--|------------------------|----------|--------|-------|---------|
| | | | Lower | Upper | |
| History of injury in the last 12 months | No(<i>Ref</i>) | 1.0 | | | |
| | Yes | 5.34 | 2.26 | 12.60 | <0.001 |
| Gender | Female(<i>Ref</i>) | 1.0 | | | |
| | Male | 1.18 | 0.75 | 1.86 | 0.23 |
| Level of Education(child) | None(<i>Ref</i>) | 1.0 | | | |
| | Primary level | 3.95 | 1.81 | 8.64 | <0.001 |
| | Kindergarten/Nursery | 1.78 | 0.96 | 3.25 | 0.04 |
| Age of the child(years) | ≤5 (<i>Ref</i>) | 1.0 | | | |
| | > 5 | 4.09 | 2.36 | 7.09 | <0.001 |
| Age of the child(Months) | ≤24(<i>Ref</i>) | 1 | | | |
| | 25-59 | 2.10 | 1.23 | 3.59 | <0.05 |
| | 60-108 | 3.96 | 2.08 | 7.52 | <0.001 |
| | 109-144 | 10.72 | 3.83 | 30.01 | <0.001 |
| Birth order | ≥5(<i>Ref</i>) | 1.0 | | | |
| | 1-2 | 1.79 | 0.71 | 4.51 | 0.11 |
| | 3-4 | 1.13 | 0.42 | 3.06 | 0.42 |
| Parents/guardian spends < 6hrs with children | No | 1.0 | | | |
| | Yes | 3.04 | 1.89 | 4.89 | <0.001 |
| Maternal age(years) | 35+(<i>Ref</i>) | 1.0 | | | |
| | 15-24 | 0.74 | 0.38 | 1.45 | 0.19 |
| | 25-35 | 0.69 | 0.39 | 1.20 | 0.096 |
| Level of education(Parent/guardian) | Tertiary(<i>Ref</i>) | 1.0 | | | |
| | Primary | 1.31 | 0.56 | 3.08 | 0.27 |
| | None | 0.71 | 0.08 | 6.40 | 0.61 |
| | Secondary | 1.25 | 0.53 | 2.94 | 0.31 |
| Occupation of the Parent/guardian | Farmer(<i>Ref</i>) | 1.0 | | | |
| | Business | 0.93 | 0.55 | 1.59 | 0.41 |
| | Housewife | 2.56 | 1.11 | 5.91 | 0.02 |
| | Casual | 0.28 | 0.08 | 0.96 | 0.01 |
| Socio-economic Status | High(<i>Ref</i>) | | | | |
| | Low | 1.0 | 1.07 | 3.18 | 0.01 |
| Marital Status of the Parent/guardian | Married(<i>Ref</i>) | | | | |
| | Single | 2.10 | 1.13 | 3.88 | 0.01 |

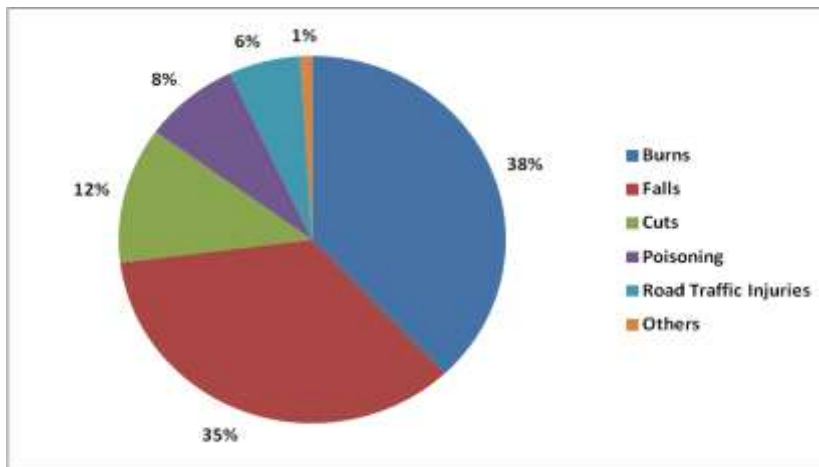


Figure 1: Distribution of types of injuries among children aged 12 years and below admitted in selected hospitals in Nyeri County, 2013

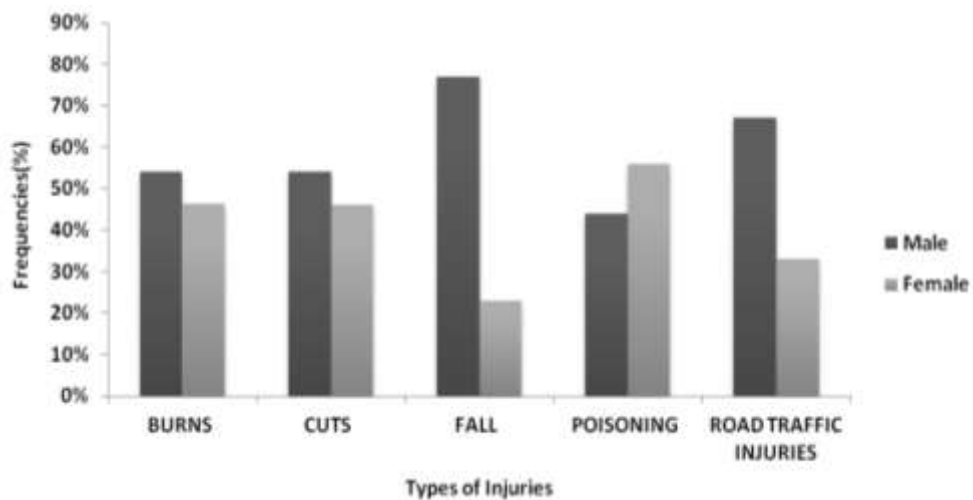


Figure 2: Distribution of injuries by Sex among children aged 12 years and below admitted in selected hospitals in Nyeri County, 2013