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

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Abstract

Purpose: 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.

Methodology: 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.

Results: 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.

Policy recommendation: Based on the result findings, the study recommended that there was need for the facilities and the county to intensify data collection and analysis for action. Local prevention programs should focus on home environment as this is where most of injuries occur. It was further recommended that there was a need to establish 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.

Keywords: *prevalence of injuries, characteristics of injuries, factors associated with injuries and children*

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.

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.

There 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 analysed 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% of persons reported to have been injured were 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).

Statement of the problem

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, 2013). 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).

Research 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.

Material and Methods

Study Area

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. These three hospitals recorded the highest cases of injuries in the County as reported in the District Health Information Software (DHIS, 2011-2012).

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.

Study Population

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

Inclusion and Exclusion Criteria
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.

Exclusion criteria

- 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

Sampling and sample size determination

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 table 1.

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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**	

This ensured that patients seen in the larger hospitals had the same probability of getting into the study as those in the smaller hospitals.. 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 child 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.

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.

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 . 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 child 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.

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

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analysis was done. Descriptive analysis was done to determine prevalence of injuries as wells 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.

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 and Ethics Review Committee. Written informed consent and/or assent was obtained from all the study participants before commencement of the interviews.

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.

RESULTS

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. 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, mean age 29±5 years, 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 public transport (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 2 summarizes these socio-demographic characteristics.

Table 2 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)

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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 3

Table 3 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)

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.

Table 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 5. Fourteen percent of the children presenting with injuries reported experiencing a form of injury in the preceding 12 months as shown in Table 5

Table 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)

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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	
Primary	20.0(1/5)
Secondary	27.9(54/193)
Tertiary	26.3(45/171)

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 1. 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.

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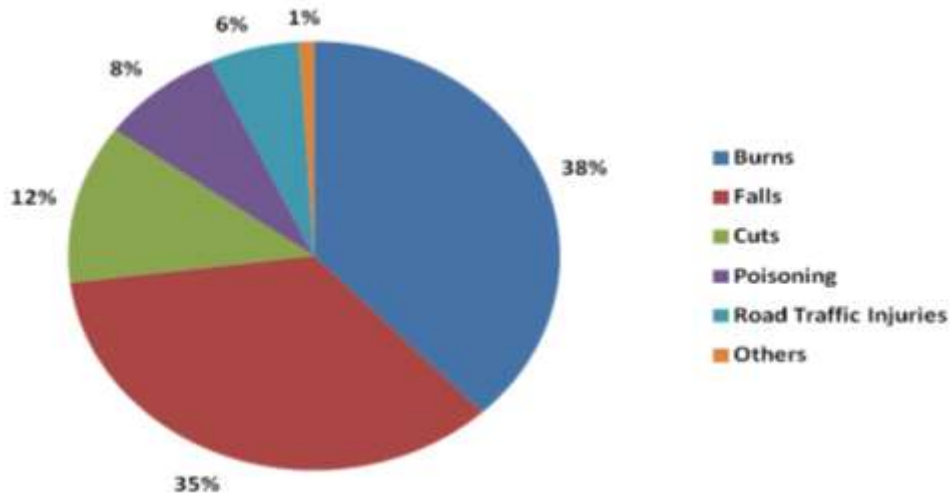
Figure 1: Leading causes of injuries among children aged ≤ 12 years admitted to the three hospitals in Nyeri County, 2013

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 6. Sixty-five percent (65%) of the parents/guardians reported often spending less than 6 hours a day with their children.

Table 6 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)**	

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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 2

Distribution of injuries by day of the week

Figure 2 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 3.

Activity of the child at the time of injury
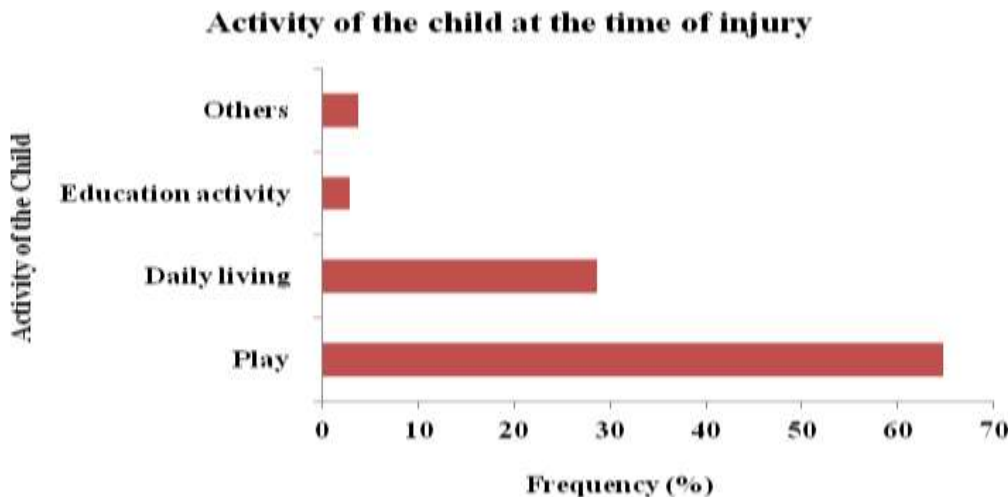
Figure 3 Activity of the child at the time of injury, Nyeri County, 2013

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

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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 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.
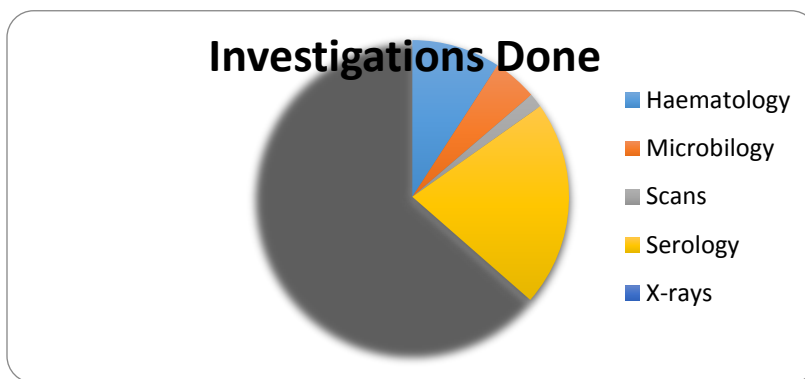
Figure 4: Investigations done to the children aged ≤ 12 years admitted to hospitals in Nyeri County, 2013

 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 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.

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Table 7 Bivariate analysis of factors associated with injuries among children admitted to hospitals, Nyeri County, 2013

Variable	Category	Crude OR	95% CI Lower	95% CI Upper	P-value
History of injury in the last 12 months	No*(Ref)*	1.0			
	Yes	5.34	2.26	12.60	**<0.001**
Gender	Female*(Ref)*	1.0			
	Male	1.18	0.75	1.86	0.23
Level of Education of the child	None*(Ref)*	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 *(Ref)*	1.0			
	> 5	4.09	2.36	7.09	**<0.001**
Age of the child in Months	<=24*(Ref)*	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*(Ref)*	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+*(Ref)*	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*(Ref)*	1.0			
	Primary	1.31	0.56	3.08	0.27
	None	0.71	0.08	6.40	0.61

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	Secondary	1.25	0.53	2.94	0.31
Occupation of the Parent/guardian	Farmer*(Ref)*	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*(Ref)*	1.0			
	Low	1.85	1.07	3.18	**0.01**
Marital Status of the Parent/guardian	Married*(Ref)*	1.0			
	Single	2.10	1.13	3.88	**0.01**

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)].

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

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).

The age distribution and the leading causes of injuries in this study are similar to studies conducted elsewhere. Further, 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 2008 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. 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.

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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.

Recommendation

The following recommendations were made;

- 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.

REFERENCES

Baker, S., O'Neill, B., Ginsburg, M.J., & Li, G. (1992). *The Injury Fact Book*. 2nd ed. New York, NY: Oxford University Press.

Cochran, W. G. (1977). Sampling techniques, *3rd edition*. New York: Wiley and sons.1977

Dalal, K., & Rahman, A. (2009). Out-of-pocket payments for unintentional injuries: a study in rural Bangladesh. *International journal of injury control and safety promotion*, *16*(1), 41-47.

Deen, J. L., Vos, T., Huttly, S. R., & Tulloch, J. (1999). Medical research council laboratories, Farafenini Field, the Gambia. Injuries and non-communicable diseases: emerging health problems of children in developing countries. *Bull World Health Organ*, *77*, 518-24.

Forjuoh, S. N. (2006). Burns in low-and middle-income countries: a review of available literature on descriptive epidemiology, risk factors, treatment, and prevention. *Burns, 32*(5), 529-537.

Holder, Y., Peden, M., Krug, E., Lund, J., Gururaj, G., & Kobusingye, O. (2001). *Injury surveillance guidelines*. Geneva: World Health Organization.

Hyder, A. A., Sugerman, D. E., Puvanachandra, P., Razzak, J., El-Sayed, H., Isaza, A., & Peden, M. (2009). *Global childhood unintentional injury surveillance in four cities in developing countries: a pilot study*. Bulletin of the World Health Organization, *87*(5), 345-352.

Karbakhsh, M., Zargar, M., Zarei, M. R., & Khaji, A. (2008). Childhood injuries in Tehran: a review of 1281 cases. *The Turkish journal of pediatrics*, *50*(4), 317.

Katherine E, Cramer (1995). Paediatric Poly trauma patient. *Clinical Orthopaedic and related research*; *318,* 125-135

Kendrick, D., Coupland, C., Mulvaney, C., Simpson, J., Smith, S. J., Sutton, A., & Woods, A. (2007). Home safety education and provision of safety equipment for injury prevention. *Cochrane Database Syst Rev*, *1*(1)
.

Kirsch, T. D., Beaudreau, R. W., Holder, Y. A., & Smith, G. S. (1996). Pediatric injuries presenting to an emergency department in a developing country. *Pediatric emergency care*, *12*(6), 411-415.

Kyobutungi, C., Ziraba, A. K., Ezeh, A., and Yé, Y. (2008). The burden of disease profile of residents of Nairobi's slums: Results from a Demographic Surveillance System. *Population health metrics*, *6*(1), 1.

Moshiro, C., Heuch, I., Åstrøm, A. N., Setel, P., Hemed, Y., & Kvåle, G. (2005). Injury morbidity in an urban and a rural area in Tanzania: an epidemiological survey. BMC public health, *5*(1), 1.

Nordberg, E. (2000). Injuries as a public health problem in sub-Saharan Africa: epidemiology and prospects for control. *East African medical journal*, *77*(12 Suppl), S1-43.

Odero, W., Garner, P., & Zwi, A. (1997). Road traffic injuries in developing countries: a comprehensive review of epidemiological studies. *Tropical Medicine and International Health*, *2*(5), 445-460.

Odero, W., Khayesi, M., & Heda, P. M. (2003). Road traffic injuries in Kenya: magnitude, causes and status of intervention. *Injury control and safety promotion*, *10*(1-2), 53-61.

Peden, M. M. (2008). *World report on child injury prevention*. Geneva: World Health Organization.

Smith, G. S., & Barss, P. G. (1991). Unintentional injuries in developing countries: the epidemiology of a neglected problem. *Epidemiologic reviews*, *13,* 228-266.

World Health Organization (2008). The global burden of disease: 2004 update. Geneva: World Health Organization

World Health Organization. (2013). *WHO global status report on road safety 2013*: *supporting a decade of action*. Geneva: World Health Organization.

Zwi, A. (1993). The public health burden of injury in developing countries.*Trop Dis Bull*, *90(*1), R5-R45.