East African Medical Journal Vol. 84 No. 8 August 2007
CHARACTERISTICS OF INJURIES PRESENTING TO A RURAL HEALTH CENTRE IN WESTERN KENYA
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W. ODERO, S. POLSKY, D. URBANE, R. CAREL and W.M. TIERNEY

ABSTRACT

Objectives: **To describe characteristics of injuries among patients presenting to a rural health centre in western Kenya, and identify the associated risk factors.**

Design: **A retrospective descriptive study.**

Setting: **A primary care Ministry of Health Rural Health Centre in western Kenya.**

Results: **Of the 315 injured patients, 62% were males and 38% females. Young adults aged 15-44 years were the most affected, comprising 63.5%. The five most common causes of injury were struck by object (36.6%), assault (34.4%), falls (11.6%), burns (6.2%) and road traffic accidents (4.7%). Quarrels and fights were the leading reasons for assaults among males (69.5%) and females (44.4%). Most injuries occurred at work (36.2%), when subjects were engaged in vital activities (19.5%) or during play/leisure time (19.2%). A third of injured adults aged 15 years and above had consumed alcohol prior to the injury event. Alcohol use was significantly associated with assaults (51.3%) than all other causes of injury (OR=4.51, p<0.0001).**

Conclusion: **The pattern and certain risk factors for non-fatal injuries among patients attending a rural health centre, such as place of occurrence, activity and alcohol use, can be identified through a facility-based electronic injury surveillance system. The information can be used to develop context-specific injury prevention interventions in the community.**

INTRODUCTION

Injuries account for nine percent of mortality worldwide and 12% of the global burden of disease in terms of disability-adjusted life years (DALYs) lost (1). In low-income countries injuries exert a heavy burden on the national economy and health care services (2). Yet the scope and pattern of injuries in these countries are not well documented, making it difficult to design and implement injury-reduction interventions. One study found that the most common causes of injury in sub-Saharan Africa are road traffic crashes, violence, falls, burns, and poisonings (3). Motor vehicle crashes are the leading cause of death in adolescents and young adults in most low-and middle-income countries (4,5). Occupational injuries are also important causes of morbidity and mortality. Worldwide, they account for 10% of unintentional injuries, more than 13 million DALYs (1), and over 100,000 work-related deaths annually (6). However, data on non-fatal occupational injuries and the associated risk factors are sparse, especially in sub-Saharan Africa (7,8).

In Kenya, while injuries are the third leading cause of death after malaria and HIV/AIDS (9), their magnitude and characteristics in rural parts of the country are poorly documented, and details regarding predisposing factors and subsequent

social and economic impacts are limited (3,10,11). The purpose of this study was therefore to identify the types of injuries encountered in a public rural primary care health centre in Western Kenya and describe the demographic, circumstantial and occupational factors associated with their occurrence. Such data are needed for developing and implementing context-specific community-based injury prevention programmes.

MATERIALS AND METHODS

The retrospective descriptive study reported here used injury data collected and stored in a computerised medical record system. The development, structure, implementation and use of the system have been described elsewhere (12). The study protocol was reviewed and approved by the Moi University Institutional Research and Ethics Committee.

A one page Injury Surveillance Encounter Form, adapted from the WHO surveillance guidelines (2) was routinely administered by clinical officers and nurses to all patients who presented with an injury at the Mosoriot Rural Health Centre - (Appendix 1). The Health Centre provides medical care to the surrounding rural community with a catchment population of approximately 40,000 people. During the period between November 2002 and June 2003, the care providers completed injury encounter forms for all patients attending the health facility. The data captured in the encounter forms included demographic information, time, place and mechanisms of injury. Details regarding the nature of the injury, place, and activity at the time of injury; further questions concerning the circumstances of traffic and assault-related injuries were also captured. The activity category included items such as paid and unpaid work, travel, sports, leisure (especially among children), and vital activities that comprised sleeping, resting, eating and drinking. The attending clinical officer also provided an assessment of alcohol use for every injury patient aged 15 years and above, by the presence or absence of the smell of alcohol in the patients' breath. This information was incorporated into each patient's computerised medical record and later extracted and analysed. Descriptive statistics for the key variables, in the form of frequency distributions, were computed using SPSS software version 11.0. Selected intergroup differences were compared using corrected chi-square test.

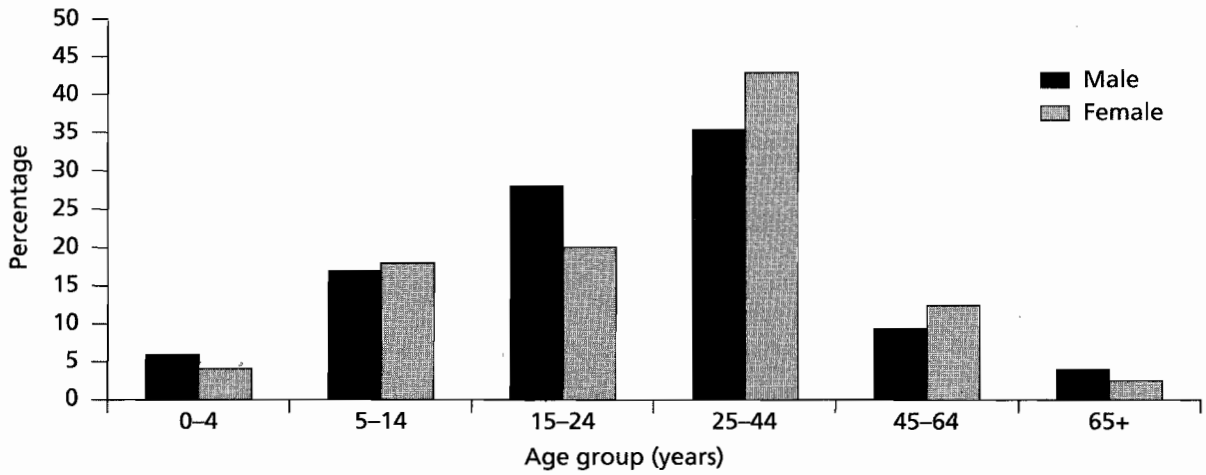
RESULTS

The demographic characteristics of the 315 injured subjects, comprising 194 (61.6%) males and 121 (38.4%) females, are shown in Figure 1. The mean age was 27.4 years with the youngest child being less than a year old and the oldest adult was 76 years. Overall, 63.5% of all injuries involved people aged 15-44 years, with most injuries (38.4%) occurring in the age group 25-44 years, and 25.1% in the age group 15-24 years; only 10.5% were aged 45-64 years.

Overall, injury occurrence was higher among males than females (Table 1). The five most common mechanisms of injury for both sexes were struck against/by an object (36.6%), assault (34.4%), falls (11.6%), burns (6.2%) and traffic accidents (4.7%).

Figure 1

Age distribution by sex



Falls were twice as common among males as females (14.1% and 6.7% respectively; OR = 1.98). Conversely, burns were more frequent in females than in males, probably reflecting greater domestic exposure to cooking fires by girls and women.

Over a third of all injuries occurred at work. As shown in Table 2, the most common activities at the time subjects were injured were: working (36.2%), vital activities (19.5%), playing/leisure (19.2%), and travelling (17.4%). Females were more affected by work-related injuries than males (40.2% and 33.9%, respectively).

Of the subjects who were struck against or by an object, 58.4% were working at the time injury occurred, 16.8% were engaged in vital activities (such as sleeping, resting, eating or drinking), and 11.9% were at leisure. Among males, 21.1% were injured during play or leisure time, while among females only 15.9% happened during such activities. Children aged under 15 years were the most affected by play/leisure-related injuries, and accounted for 58.5% of all subjects involved in this activity.

Of the patients who were assaulted, 32.2% were engaged in various vital activities, others were either working (25.6%), travelling (18.9%) or at leisure (14.4%). Men were significantly affected with injuries resulting from fighting compared to women (OR = 2.84, $p<0.05$). The leading reason for the assault was quarrel/fight (69.5% among males and 44.4% among females). Domestic violence was roughly equally distributed in both sexes, being reported by 14% of males and 16% of the females. Sexual assault was reported by only three female patients (Table 3).

Table 1

Leading causes of injury by sex

	Males		Females		Total	
Cause of injury	No.	(%)	No.	(%)	No.	(%)
Struck by an object (cuts, bruises)	60	35.1	41	39.1	101	36.6
Assault	59	34.5	36	34.3	95	34.4
Fall*	24	14.0	8	6.7	32	11.6
Burns *	9	5.3	8	7.6	17	6.2
Traffic accident	9	5.3	4	3.8	13	4.7
Instrument	2	1.1	2	1.9	4	1.4
Hanging	2	1.1	1	0.9	3	1.1
Drowning	1	0.6	-	-	1	0.4
Unknown/Other	5	2.9	5	5.7	10	3.6
Total	171	100	105	100	276	100

* Significant differences between sexes

Table 2

Distribution of subjects by type of activity at the time of injury and sex

	Males		Females		Total	
Activity	No.	(%)	No.	(%)	No.	(%)
Work	61	33.9	43	40.2	104	36.2
Vital activity	32	17.8	24	22.4	56	19.5
Play/Leisure	38	21.1	17	15.9	55	19.2
Travelling	34	18.9	16	15.0	50	17.4
Learning	2	1.1	-	-	2	0.7
Other	13	7.2	7	6.5	20	7.0
Total	180	100	107	100	287*	100

*No information was available for 14 males and 16 females

Table 3

Distribution of subjects who were assaulted by reason for the assault and sex

Reason	Males		Females		Total	
	No.	(%)	No.	(%)	No.	(%)
Fight*	41	69.5	16	44.4	57	60
Domestic violence	8	13.6	6	16.7	14	14.7
Sexual assault	-	-	3	8.3	3	3.2
Burglary	1	1.7	1	2.8	2	2.1
Other	9	15.2	10	27.8	19	20
Total	59	100	36	100	95	100

* Significant difference between sexes

Table 4

Distribution of subjects (15 years and above) by mechanism of injury and suspected use of alcohol

Mechanism	Alcohol use suspected		Not suspected		No information		Total	
	No.	(%)[1]	No.	(%)	No.	(%)	No.	(%)
Assault	40	51.3	35	44.9	3	3.8	78	100
Struck by an object	10	15.4	53	81.5	2	3.1	65	100
Fall	3	37.5	5	62.5	-	-	8	100
Traffic accident	3	27.3	7	63.7	1	9.0	11	100
Burns	3	33.3	6	66.7	-	-	9	100
Other	2	13.3	12	80.0	1	6.7	15	100
Total	61	32.8	118	63.4	7	3.8	186	100

[1] Percents of the row total

Table 4 shows the distribution of 186 subjects older than 15 years, for whom the use of alcohol was assessed by the smell of alcohol on the subjects' breath. A third of all injured adults were suspected to be under the influence of alcohol. Over 50% of assaulted adults were suspected to have consumed alcohol. Assaulted patients were almost five times more likely to have consumed alcohol than those with other injuries (OR = 4.51). The association between alcohol use and assault was statistically significant (X^2 =21.30, $p<0.0001$). Other high rates of injuries where alcohol use was suspected were falls (37%), burns (33%), and traffic injuries (27%). In contrast, only 15% of the persons who were struck by an object had consumed some alcohol before the injury event.

DISCUSSION

The Mosoriot Rural Health Centre can be considered quite characteristic of other rural health facilities in Kenya with a similar level of care. Most patients presenting to the health centre with different types of injuries are male, and people in the age group 15 to 44 years. Injury occurrence in the patients is largely associated with work, vital activities, play/leisure, travel and alcohol use.

Our findings show that being struck by an object is the most frequent cause of injury in this rural setting, followed by assaults and falls. In contrast, hospital-based studies at the Moi Teaching and Referral Hospital in Eldoret and the Rift Valley Provincial General Hospital, Nakuru, both located in urban areas in the same Province as Mosoriot Health Centre, show road traffic crashes as the leading cause of injury-related admissions (10,11). Thus injury statistics from hospitals cannot be extrapolated to rural health centres, reinforcing the need for collecting local data at such centres. Studies in other African countries (8,13-16) report similar injury patterns which strongly suggests that injury prevention activities should focus on unsafe work and home environments in the rural

areas of low-income countries (17). In a country like Kenya, with a high rate of unemployment and where a large segment of the population is self-employed, usually in subsistence farming and the unregulated informal sector, the concept of work-related injury is not clearly defined and uniformly used. Since the scope of the definition of the informal sector used in the International Classification of Status of Employment (ICSE) and the International Labour Organisation (ILO) statistics (18) excludes household enterprises engaged in non-market production and agricultural activities, it may be difficult to apply the concept of "work-related accidental injuries" to the workers involved in activities commonly undertaken in rural areas. It is also evident that causes of injuries among rural workers depend heavily on the type of social and economic activities specific to the geographic regions and industries, and types of agricultural practices such as subsistence farming, fishing and cattle grazing. These issues have been extensively discussed in several reports (3,7,18,19).

Despite great differences in economic activities between countries and regions, certain characteristics which have substantial effects on work-accident occurrence are quite common to this sector. These include unsafe work-practices, lack of awareness of occupational risks, poorly maintained machines and tools, insufficient training, poor ergonomics, and inappropriate tools or use of tools. These factors have been shown to be strongly correlated with type and rate of work accidents (18). Other studies have also shown that alcohol use is an important factor in assaults and work-related injuries in Africa (20,21), though this aspect was not objectively evaluated in our study.

Our findings illustrate the value of data routinely collected in a health centre in describing the characteristics and risk factors of different injuries that occur in the catchment population. Such information is needed for establishing appropriate community-based injury prevention and safety promotion activities. Studies elsewhere have shown the urgency for such prevention initiatives, particularly in low-income countries (7,22,23).

In conclusion, this study points to the need to establish local injury data surveillance systems that can help in raising awareness about the burden and characteristics of injuries, and facilitate the development of proactive safety measures and context-specific injury prevention programmes in rural settings.

ACKNOWLEDGEMENTS

This project was supported by the National Institutes of Health through the Fogarty International Centre (grant number 1-D43-TW01082), for which we are grateful. We wish to thank the staff of Mosoriot Rural Health Centre, and all patients who participated in this study.

REFERENCES

1. Peden M.M.K. and Sharma G. The injury chart book: A geographical overview of the global burden of injuries. Geneva: World Health Organisation, 2002.
2. Holder Y.P.M., Paden M., Krug E., *et al.* Injury surveillance guidelines. Geneva: World Health Organisation; 2001.
3. Nordberg E. Injuries as a public health problem in sub-Saharan Africa: Epidemiology and prospects for control. *East Afr. Med. J.* 2000; **77(12 Suppl):** S1-S43.
4. Kobusingye O.C., Guwatudde D., Owor G. and Lett R.R. Citywide trauma experience in Kampala, Uganda: A call for intervention. *Inj. Prev.* 2002; **8:** 133-136.
5. Odero W., Garner P. and Zwi A. Road traffic injuries in developing countries: A comprehensive review of epidemiological studies. *Trop. Med. Int. Hlth.* 1997; **2:** 445-460.
6. Leigh J., Macaskill P., Kuosma E. and Mandryk J. Global burden of disease and injury due to occupational factors. *Epidemiology.* 1999; **10:** 626-631.
7. Loewenson R.H. Health impact of occupational risks in the informal sector in Zimbabwe. *Int. J. Occup. Environ. Hlth.* 1998; **4:** 264-274.
8. Marais S. and Kritzinger A. Farm worker injuries on Western Cape fruit farms: The role of the lay health worker. *Curationis.* 2005; **28:** 86-92.
9. Odero W., Khayesi M. and Heda P.M. Road traffic injuries in Kenya: Magnitude, causes and status of intervention. *Inj. Control Saf. Promot.* 2003; **10:** 53-61.
10. Masiira-Mukasa N. and Ombito B.R. Surgical admissions to the Rift Valley Provincial General Hospital, Kenya. *East. Afr. Med. J.* 2002; **79:** 373-378.
11. Odero W.O. and Kibosia J.C. Incidence and characteristics of injuries in Eldoret, Kenya. *East. Afr. Med. J.* 1995; **72:** 706-710.
12. Hannan T.J., Rotich J.K., Odero W.W., *et al.* The Mosoriot medical record system: Design and initial implementation of an outpatient electronic record system in rural Kenya. *Int. J. Med. Inform.* 2000; **60:** 21-28.

13. Butchart A., Nell V., Yach D., *et al.* Epidemiology of non-fatal injuries due to external causes in Johannesburg Soweto. Part II. Incidence and determinants. *S. Afr. Med. J.* 1991; **79:** 472-479.
14. Mbakaya C.F., Onyoyo H.A., Lwaki S.A. and Omondi O.J. A survey on management perspectives of the state of workplace health and safety practices in Kenya. *Accid. Anal Prey.* 1999; **31:** 305-312.
15. Mock C.N., Adzotor E., Denno D., Conklin E. and Rivara F. Admissions for injury at a rural hospital in Ghana: Implications for prevention in the developing world. *Amer. J. Public Hlth.* 1995; **85:** 927-931.
16. Moshiro C., Heuch I., Astrom A.N., *et al.* Injury morbidity in an urban and a rural area in Tanzania: An epidemiological survey. *BMC Public Health.* 2005; **5:** 11.
17. Smith G.S. and Barss P. Unintentional injuries in developing countries: The epidemiology of a neglected problem. *Epidemiol. Rev.* 1991; **13:** 228-266.
18. Takala J. Introductory report: decent work - safe work. XVIIth World Congress on safety and health at work; 2005.
19. Bangasser P. The ILO and the informal sector: An institutional history. Geneva: International Labour Organisation, 2000.
20. Chinyadza E., Moyo I.M., Katsumbe T.M., *et al.* Alcohol problems among patients attending five primary health care clinics in Harare city. *Cent. Afr. J. Med.* 1993; **39:** 26-32.
21. Peden M., van der Spuy J., Smith P. and Bautz P. Substance abuse and trauma in Cape Town. *South Afr. Med. J.* 2000; **90:** 251-255.
22. Shahnavaz H. Workplace injuries in the developing countries. *Ergonomics.* 1987; **30:** 397-404.
23. Mock C.N., Gloyd S., Adjei S., *et al.* Economic consequences of injury and resulting family coping strategies in Ghana. *Accid. Anal. Prey.* 2003; **35:** 81-90.

APPENDIX 1

Injury surveillance encounter form

Record #:.....# ER Registry Date: ..... Arrival Time: ..... am/pm
First Name : .....Middle Name..... Last Name.....
Date of Birth: __/__/__ Age: ___ years Sex: 1. ☐ Male 2 ☐ Female
Father's Name..... Mother's Name.....
District..... Location.....Sub-Location ..... Village.....
Occupation :..... Reason for visit: 1. ☐ Injury 2. ☐ Illness 3. ☐ Preventive Care (MCH/FP)

Date of Injury: (dd/mm/yy) __/__/__/ **Time of Injury**____:____ am/pm
Exact place where injury occurred: (*Name of street/road, village, farm, estate, building or house number*)
.....

Intent:
1. ☐ Unintentional (accidental, RTA) 2. ☐ Intentional (assault, violence) 3. ☐ Self-inflicted (suicide, attempted suicide)
4. ☐ Legal intervention (police, security personnel) 98. ☐ Other .....99. ☐ Don't know

Place: *Where were you when you got injured?*
1. ☐ Home
2. ☐ Street/Road
3. ☐ School/ Educational area
4. ☐ Industry/ Construction area
5. ☐ Farm
6. ☐ Commercial area/office/shop/hotel
7. ☐ Sports/athletics area
98. ☐ Other .....
99. ☐ Don't know

Activity: *What were you doing when you got injured?*
1. ☐ Working -paid work
2. ☐ Working –unpaid work
3. ☐ Travelling
4. ☐ Studying
5. ☐ Sports/athletics
6. ☐ Leisure/playing
7. ☐ Vital activity- resting/ s sleeping/eating/drinking
98. ☐ Other.....
99. ☐ Don't know

Mechanism: *How was the injury caused?*
1. ☐ Traffic accident
2. ☐ Assault
3. ☐ Fall on same level/ tripped
4. ☐ Fall from height/ tree/roof/stairs
5. ☐ Blunt force/object
6. ☐ Fire/Hot fluid
7. ☐ Knife/sharp/ penetrating object
8. ☐ Strangulation
9. ☐ Drowning
10. ☐ Poisoning
11. ☐ Firearm/Gun
12. ☐ Machinery
13. ☐ Struck by or against object
98. ☐ Other .....
99. ☐ Don't know

Traffic injuries

Type of User:
1. ☐ Pedestrian
2. ☐ Driver
3. ☐ Passenger
4. ☐ Motorcyclist
5. ☐ Bicyclist
98. ☐ Other.....
99. ☐ Don't know

Transport used:
1. ☐ Pedestrian
2. ☐ Bicycle
3. ☐ Motorcycle
4. ☐ Car
5. ☐ Pick-up
6. ☐ Truck/Lorry
7. ☐ Bus
8. ☐ Minibus/matatu
9. ☐ Tractor
98. ☐ Other.....
99. ☐ Don't know

Other Vehicle involved:
1. ☐ None
2. ☐ Bicycle
3. ☐ Motorcycle
4. ☐ Car
5. ☐ Pick-up
6. ☐ Truck/Lorry
7. ☐ Bus
8. ☐ Minibus/matatu
9. ☐ Tractor
98. ☐ Other.....
99. ☐ Don't know

Assaults

Relationship of victim to assailant
1. ☐ Spouse/ partner
2. ☐ Parents
3. ☐ Other relative
4. ☐ Friends
5. ☐ Stranger
6. ☐ Police
98. ☐ Other .....
99. ☐ Don't know

Context: *(What was the reason?)*
1. ☐ Fight/quarrel
2. ☐ Robbery
3. ☐ Sexual assault
4. ☐ Drug-related
5. ☐ Other crimes
6. ☐ Gang-related
7. ☐ Political
98. ☐ Other.....
99. ☐ Don't know

Self-inflicted

Precipitating factors:
1. ☐ Family conflicts
2. ☐ Physical problem/ disease or pregnancy
3. ☐ Psychological/ Psychiatric condition
4. ☐ Financial
5. ☐ Death in family
6. ☐ Sexual or Physical Assault
98. ☐ Other.....
99. ☐ Don't know

Use of alcohol: 1. ☐ Suspected or evidence 2. ☐ Not suspected or no evidence 3. ☐ No information available
4. ☐ Not applicable (child, under 16 years)

Nature of injury:
1. ☐ Fracture 2. ☐ Sprain 3. ☐ Cut or open wound 4. ☐ Bruises, superficial wound
5. ☐ Haematoma/Swelling 6. ☐ Burn 7. ☐ Cerebral Concussion 8. ☐ Injury other organs
98. ☐ Other .....99. ☐ Don't know

Injury Severity: 1. ☐ No apparent injury 2. ☐ Superficial injury 3. ☐ Moderate (requires sutures) 4. ☐ Severe (requires surgery)

DIAGNOSIS: ..... **ICD-10 CODE**.....
Patient Disposition: 1. ☐ Treated and sent home 2. ☐ Admitted 3. ☐ Referred to .....hospital
4. ☐ Died 98. ☐ Other..... 99. ☐ Don't know
Patient notes:
.....
.....

Name of Clinician: .....**Date:** .....