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Hospital-based injury data from level III institution in Cameroon: Retrospective analysis of the present registration system

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ABSTRACT

Background: Data on the epidemiology of trauma in Cameroon are scarce. Presently, hospital records are still used as a primary source of injury data. It has been shown that trauma registries could play a key role in providing basic data on trauma. Our goal is to review the present emergency ward records for completeness of data and provide an overview of injuries in the city of Limbe and the surrounding area in the Southwest Region of Cameroon prior to the institution of a formal registration system.
Methods: A retrospective review of Emergency Ward logs in Limbe Hospital was conducted over one year. Records for all patients over 15 years of age were reviewed for 14 data points considered to be essential to a basic trauma registry. Completeness of records was assessed and a descriptive analysis of patterns and trends of trauma was performed.
Results: Injury-related conditions represent 27% of all registered admissions in the casualty department. Information on age, sex and mechanism of injury was lacking in 22% of cases. Information on vital signs was present in 2% (respiratory rate) to 12% (blood pressure on admission) of records. Patient disposition (admission, transfer, discharge, or death) was available 42% of the time, whilst location of injury was found in 84% of records. Road traffic injury was the most frequently recorded mechanism (36%), with the type of vehicle specified in 54% and the type of collision in only 22% of cases. Intentional injuries were the second most frequent mechanism at 23%.
Conclusion: The frequency of trauma found in this context argues for further prevention and treatment efforts. The institution of a formal registration system will improve the completeness of data and lead to increased ability to evaluate the severity and subsequent public health implications of injury in this region.

Introduction

Injury is becoming one of the leading causes of death and disability in low-income countries, disproportionately affecting sub-Saharan Africa.[1,2] Management of injury in African settings is especially challenging due to limited resources and complex cultural contexts. Published epidemiological data on injuries are lacking in most African countries; to date, no such information is available from Cameroon. Without reliable data, strategies for the prevention and treatment of injuries remain extremely limited.

Ideally, community-based surveys (CBS) should be conducted to provide a comprehensive, population-based estimation of injury incidence and mortality.[3] As the expense and time required to conduct CBSs can be prohibitive in a resource-limited setting, information from police reports, post-mortem records, and comprehensive analysis of hospital or pre-hospital records are often relied upon to give an improved understanding of incidence, mortality, and epidemiologic patterns of injury. In Cameroon, police inquiries are not systematically carried out; post-mortem analysis is considered a cultural taboo and is usually rejected by relatives of victims of injuries; and there is no pre-hospital transport and management system in our region. Given this scarcity of data sources, the best currently available resource is hospital-based information.

In settings where hospital records are used as a primary source of injury data, trauma registries can play a fundamental role in

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providing data on epidemiology of injury, as well as provide a tool for injury quality improvement.[4,5] Trauma registries have been shown to improve injury surveillance and serve as the fundamental tool of trauma care quality improvement, both in individual institutions and system-wide policy.[6–8] In fact, trauma registries are a recommendation of the Essential Trauma Care project of the WHO, which is designed for implementation in low income countries.[9]

Despite the growing international consensus of the importance of trauma registries, formal trauma registries are a rarity in sub-Saharan Africa.[5] Instead, retrospective review of administrative hospital records is often used to provide information about epidemiology of injury. Even in high-income settings, it has been shown that administrative data lack accuracy when compared to trauma registries from the same institution.[10] In low- and middle-income countries, where other sources of injury data are rare, the inaccuracy of administrative data becomes even more relevant.

To date, there is very limited data on the incidence and pattern of injury in Cameroon. This study sought to analyse the available administrative data available from the emergency ward logs in a 200-bed regional hospital in Cameroon with respect to completeness and suitability to serve as an injury surveillance tool. The data available are also used to explore an overview of the epidemiological profile of injury in this institution.

Methods

This retrospective review was performed between July 1, 2007 and June 30, 2008 using hospital records from Limbe Regional Hospital in the city of Limbe, located in the Southwest Region of Cameroon. Limbe is a rapidly growing city, with an estimated 12-fold increase in population during the last 40 years, now approaching 100,000 people. Limbe Hospital is a 200-bed hospital in a semi-urban setting with an Emergency Department that is functional 24 h per day. No formal pre-hospital care system exists; patients are usually brought to the hospital either by their relatives or bystanders who witnessed the accident or injury. Patients with serious injuries are referred to the major city of Douala, located 70 km from Limbe, with two large referral hospitals possessing more specialized services.

All patients presenting to the emergency ward who were arriving at Limbe Regional Hospital for initial treatment of an injury during the study period aged 15 years or older were included in the study. Injury was defined as any physical damage to the body due to an acute transfer of energy.[4] For the purposes of exploring patterns of injury, patients who did not have age, sex, or mechanism of injury were excluded from the analysis. These items are analogous to the data fields of age, sex and "e-code," which, if missing, are similarly grounds for exclusion in the National Trauma Data Bank, the largest database currently available in the United States for injured patients.[11] Patients who had visited another health care facility prior to Limbe regional hospital were also excluded from the analysis.

Data were gathered from the Emergency Ward admission registry and call duty reports of nurses and doctors using a one-page data abstraction form consisting of 14 variables ideally included in a basic trauma registry.[12] Variables abstracted include: age, sex, profession, residence, mechanism, mode of transport involved and position of patient (either driver or rider, passenger or pedestrian) in cases of road traffic accident, transport time before arrival to hospital, systolic blood pressure and respiratory rate on arrival, location of injury, Glasgow coma scale, description of lesions and disposition of patient at time of discharge from the casualty department (admission, transfer, discharge, or death). When possible, the data available were used to calculate the severity using both the Injury Severity Score (ISS) and the Revised Trauma Scale (RTS).

Data were analysed using Epi-info® 2003; bivariate analysis was done using the Chi square test; results were considered significant for p-values less than 0.05. The "Strengthening the Reporting of Observational Studies in Epidemiology" (STROBE) guidelines were used in reviewing and reporting these results.[13] This study was approved by Limbe Hospital.

Results

A total of 1713 injury cases were recorded over the one-year study period, representing 28% of the total number of emergency consultations in Limbe Hospital. After review of records for presence of age, sex, and injury mechanism variables, 368 patients (21%) were excluded from further analysis. Additionally, 34 (2%) patients were excluded because they attended another health institution prior to coming to Limbe regional hospital. Another 227 cases were patients below 15 years of age. Data from the remaining 1084 patients were analysed.

When records were reviewed for presence of vital signs, initial blood pressure was available in call duty records for only 139 patients (13%); pulse was available for only 73 patients (7%); and respiratory rate for 27 patients (2%). Of the 346 patients sustaining a head injury, Glasgow coma scale could be estimated in only 23 cases (7%). Description of lesions could allow calculation of ISS score in only 86 cases (8%); out of these, 71 (83%) experienced an ISS score of less than 16 (minor injury). RTS could be calculated in only 27 patients (2%).

Transport time to the hospital after the injury was specified in only 38 patients (4%). Patient disposition after treatment in the Emergency Ward was recorded in 774 patients (45%). Of these, 593 (77%) were discharged home less than 24 h after presentation; 122 (16%) patients were admitted to the hospital ward for further treatment 37 (5%) patients were referred to a higher level of care; and 22 deaths (3%) were recorded.

Of the 1084 patients included, there were 768 males and 316 females, yielding a ratio of 2.43–1. More than 73% of patients were aged between 20 and 49 years (Fig. 1). The most frequent mechanisms were road traffic injuries (36%), followed by assaults (23%) (Table 1). Injuries recorded as "others" included drowning and near-drowning, rape and self-inflicted injuries such as attempted suicide. Women sustained a significantly higher number of assaults (39% vs. 16%) ($p < 0.001$) and domestic accidents (25% vs. 2%) ($p < 0.001$), whilst men were involved in a significantly higher number of road traffic crashes (42% vs. 24%) ($p < 0.005$) and work related injuries (20% vs. 3%) ($p < 0.001$).

Location of injury was indicated in 899 cases (83%); 544 patients had more than one location recorded. A total of 1545 injuries were recorded with a mean of 1.72 injuries per patient. The most frequent locations were face, eye and ENT (ear nose and throat); more than 51% of patients had injuries in these areas. Of the remaining patients, 39% had injuries involving the head and 39% had injuries involving the lower limbs (Table 2).

Patient's occupation was not specified in 21% of cases; the distribution of those for whom this information was available shows a majority of self-employed ($n = 207$), unemployed ($n = 156$), civil servants ($n = 143$) and unskilled labourers ($n = 122$) (Fig. 2). In 1033 (95%) of cases, the municipality of residence was indicated; of these, 859 (83%) resided in Limbe municipality (the location of the hospital of study). When assessed by month of the year, peaks in injury frequency were found during January, July, August and December (Fig. 3).

In the selective analysis of cases of road traffic injuries ($n = 395$), the type of vehicle involved was specified in 214 cases (54%) and the type of collision in 86 cases (22%). Cars were involved in 53

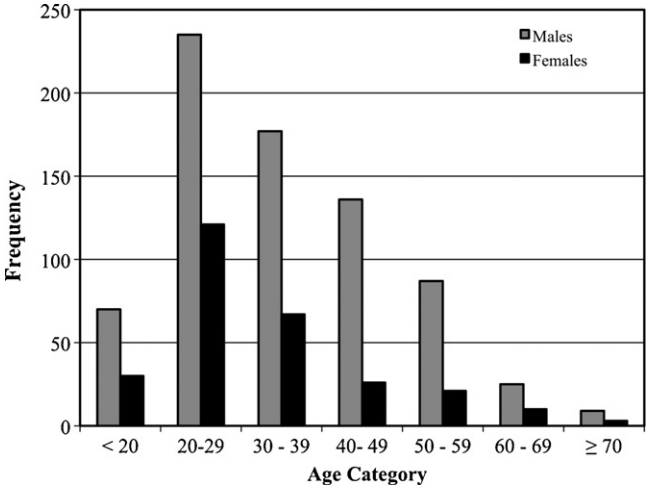

Fig. 1. Distribution of trauma patients by age and sex.

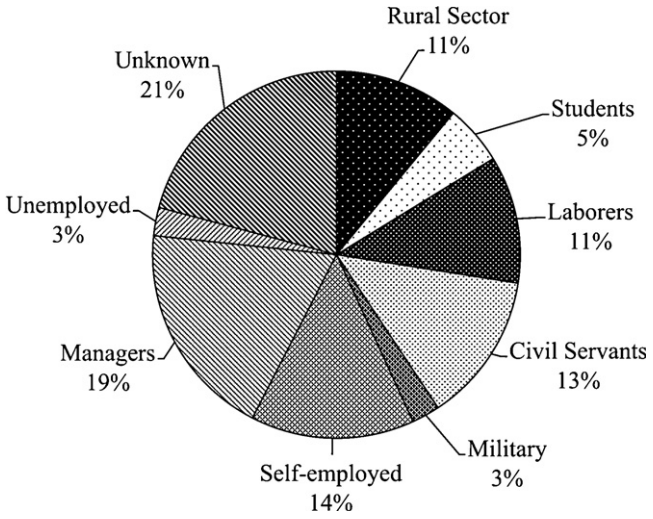

Fig. 2. Distribution of trauma patients by profession.

Table 1
Distribution of patients by mechanism of injury.

Mechanism	Males	Females	Total	Proportion (%)
Road traffic injury	319	76	395	36.44
Assault	124	124	248	22.88
Work-related injury	155	9	164	15.13
Fall	93	13	106	9.78
Domestic injury	17	78	95	8.76
Burns	7	12	19	1.75
Other	53	4	57	5.26
Total	768	316	1084	100

cases (25%) and motorcycles in 129 cases (60%); the remaining cases concerned buses, trucks, hand-pushed vehicles, bicycles and domestic animals on the road. The most frequent type of collision was car versus motorcycle.

Most domestic accidents ($n = 95$) were related to kitchen activities, lacerations from sharp objects (nails, broken bottles or glass), and collision with blunt objects, such as furniture. Work related injuries did not include commercial motorcycle riders working as transporters and other professional drivers (these were recorded as road traffic accidents). Of all injuries recorded as work-related, unskilled labourers were involved in 104 cases (63%). Of note, work related injuries concerned the hand in 93 cases (57%). Injuries resulting from falls constituted 10% of injuries and were in most cases related to farming activities (fall from a tree); the estimated height was not specified.

There were 248 (23%) cases due to interpersonal violence. The exact mechanism and the weapon used was not specified in 146 cases (59%); cases where this information was specified included a majority of injuries from a knife or a cutlass ($n = 49$), human bites ($n = 34$) and gunshots injuries ($n = 13$). Selective analysis of lesions shows that patients presenting with an assault suffered a significantly higher number of head and facial injuries ($p < 0.001$). Patients presenting after a road traffic accident involving a motorcycle presented with a significantly higher number of lower limb injuries ($p < 0.005$)

Table 2
Distribution of injuries by affected body area.

Location	Frequency	Proportion (%)
Head	346	38.49
Cervical spine	27	3
Face	459	51.05
Chest	93	10.34
Abdomen and pelvis	85	9.45
Thoracic or lumbar spine	13	1.45
Upper extremity	146	16.24
Lower extremity	348	38.71
Other	28	3.11
Total	768	316

Discussion

The contribution of injuries to mortality and disability is on the rise in sub-Saharan Africa due to the rapid growth of motorized transport and industrialization without any related increase in safety measures and education. Given the growing importance of injuries as a public health problem in sub-Saharan Africa and the limitation of resources available to institute formal surveillance programmes, the completeness of available hospital data needs to be examined as a potential source of information on injuries. The World Health Organization (WHO) defines "accuracy rate" in injury surveillance as the number of injuries captured by the surveillance system minus the missing and miscoded data, expressed as a percentage of total injuries reported. It is recognized that most systems will perform at a rate slightly less than 100%, but if the accuracy rate is "much less" than 100%, this is suggestive of a "significant problem".[4] Applying this standard to the accuracy of minimum data presented in this report (age, sex, and mechanism) yields an accuracy rate of only 79%.

The limitations of hospital record keeping have been acknowledged in other low-resource settings, as well. In Haiti, records for the month of August were reviewed for two separate years; it was found that mechanism of injury was documented in just 39% and

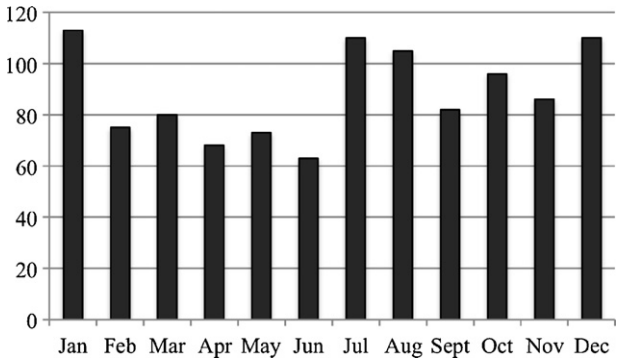

Fig. 3. Distribution of trauma patients by month of the year.

57% of the time in 1999 and 2002, respectively.[8] In Uganda, a similar retrospective analysis of clinical records used the Modern Rural Trauma Project triage criteria to define ''inadequate clinical assessment.'' A record was deemed inadequate if it was found to include fewer than four parameters thought to be essential (blood pressure, pulse, respiratory rate, neurological status, mechanism of injury, and anatomical site of injury).[14] Over 70% of records indicated ''inadequate'' assessment of the injured patient by these criteria, a frequency which is consistent with the findings in this report. Even in a formal trauma registry at a level II US trauma centre, Glasgow Coma Scale was found to be erroneously entered 56% of the time.[15]

Whilst it may be tempting to dismiss retrospectively collected data from hospital records, it is important to recognize two important points. First, missing data are an issue even in highly developed trauma registries from high-income countries. The National Trauma Data Bank (NTDB) included only 74–87% of reported cases from the years 2000 to 2004 due to issues of missing or inconsistent data; in 2003, Glasgow Coma Scale information was recorded only 19% of the time.[11,16] Secondly, as evidenced by the NTDB experience, significant amounts of missing data have not precluded analysis and publication of available data, from which, with caution, meaningful conclusions can be drawn.[17] This point is especially relevant in a low-income setting, as there is currently no other available data from Cameroon.

Rare previous attempts to improve on the data collection systems in low income settings include the South African Trauma Bank registry that was designed for use in specifically developing countries in sub-Saharan Africa.[18]

Despite missing data, some important findings can be appreciated from the epidemiological exploration of the hospital data reported here. The peak of incidence observed in December/January and July/August is probably related to the fact that these periods correspond to Christmas break and academic summer holidays, respectively. As found in other sub-Saharan African settings, road traffic injuries were the most frequently occurring injury documented and were more common amongst men.[19,21] Most studies published report a slightly higher road traffic injury frequency of around 50% of all injury cases.[7,19,22–24] This difference may represent the semi-urban setting in which Limbe hospital is found, as compared to reports mostly from large urban centres. Motorcycle-related road traffic injuries were notably frequent, a trend which has also been found recently in Nigeria.[21] The association between motorcycle mechanism of injury and lower extremity trauma seen in this sample has also been observed in other studies.[25,26] Of note, interpersonal violence was the second most frequent form of injury, at 23%, which is higher than reports from other countries from the same region.[19,20]

Although useful, these findings must be interpreted with the existing limitations in mind. Firstly, in any hospital-based system, a strong selection bias is inherent, as care-seeking at hospitals has been shown to be limited to only a fraction of the injured persons in some populations.[27] Additionally, in the absence of any organized system for financing health care, patients have to pay for hospital care using their own resources in an environment that is already characterised by generalized poverty. It is reasonable to suspect that many injured individuals may not seek care at a hospital because they are unable to afford the cost of care. Their numbers cannot be estimated; this has been previously described as a major factor in the under-reporting of injury cases.[28] Thus, even if all hospital records are complete, containing the essential information necessary for analysis, these inherent limitations would be present. In this sample, 21.5% of records did not have baseline information necessary for analysis, and were therefore excluded from epidemiologic exploration, which is another source of potential bias.

The net effect of these limitations results in an under-reporting of injury in this city by the hospital records presented. Trauma is generally considered under-reported in sub-Saharan Africa, especially in the absence of a formal and specific registration system.[1,28] Understanding that the 1713 cases of trauma reported here are likely an underestimation of the actual number of injured individuals in Limbe, a conservative estimation of the city's injury rate can be made using the population of Limbe (120,000 people). The resultant rate of 14.3 per 1000 population per year is three times that of the rate derived from hospital data in Kampala, Uganda (population 1,000,000) where 4515 cases of trauma were recorded during one year.[19] The magnitude of injury reflected in these restricted data from our institution give a compelling case for increased attention to improving efforts in the prevention and treatment of injury.

As described here and elsewhere, commonly-used administrative registration systems are extremely limited in their usefulness as injury surveillance tools.[8] Thus, the findings of this study are reflective of the multiple deficits in injury surveillance and management in a low-income environment. Experience in other similar settings demonstrates that institution of a formal trauma registry is extremely likely to improve the quality and completeness of data collected.[8] Such registries have been implemented in many regions of the world, including many developing countries, but so far, none exists in Cameroon.[6–8,23,24,29] Given the extent of injury cases seen in Limbe Hospital and the limitations of the administrative record system, institution of a trauma registry for formal injury surveillance and quality improvement purposes is strongly warranted.

Conclusion

Despite limitations of the current hospital registration system, there is a strong indication that injuries are an important problem that is grossly underestimated in Cameroon. Institution of a formal trauma registry, as has been done in similar settings, is likely to improve the quality and completeness of injury surveillance data, both in terms of epidemiologic information and clinical parameters. Even if it does not improve the overall capture-rate of injury cases nor eliminate sources of bias, a trauma registry will probably increase the quality and detail of information available, as well as provide information allowing the calculation of injury severity estimations, which can facilitate clinical decision-making as well as monitoring of quality improvement efforts. The high frequency of injuries and relative lack of information available on recorded injuries in the current system found in this study serves as the impetus for implementation of a formal trauma registry in our institution. This study provides a baseline for the future analysis of our new registration system.

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None.

Conflict of interest

No conflict of interest to disclose.

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