

Original article

Epidemiology and Pattern of Road Traffic Injuries in Ngaoundéré, Cameroon: a Retrospective Hospital Based Study Prior to the Implementation of a Formal Trauma Registry

Épidémiologie des lésions rencontrées au cours des accidents de la voie publique à Ngaoundere (Cameroun). Une étude hospitalière rétrospective avant la mise en place d'un registre des traumatismes

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ABSTRACT

Objectives. To report the epidemiology and pattern of road traffic related injuries in a semi-urban area in the northern part of Cameroon where no such data existed before.

Methods. This hospital based retrospective analysis was conducted over a period of five years in a level III institution in the Adamaoua region of Cameroon. The records of all patients received in the emergency department of Ngaoundéré hospital after a road traffic related injury were reviewed for epidemiological variables, type of vehicle involved, nature and severity of injuries, modalities of management and outcome.

Results. A total of 1257 victims of road traffic injuries could be analyzed. Their ages ranged from 2 to 84 years and males were more affected than females. Almost 60% of victims were motorcycle users. Each patient sustained a mean of 1.3 lesions. The head and lower limbs were the most affected body parts. The most frequent lesions were soft tissue injuries and bone fractures, involving mostly the lower limb. Most injuries were of minor or moderate severity and the admission rate was 28%. A total of 79 patients (6.3%) were reported dead. Most of them sustained a head injury.

Conclusion. The massive presence of motorcycles in the Adamaoua region seems to influence the pattern of road traffic injuries. A more comprehensive system of capturing injury cases needs to be developed in Ngaoundéré.

Key Word: road traffic injuries, trauma, Ngaoundere, Cameroon.

RÉSUMÉ

Objectifs. Identifier les caractéristiques épidémiologiques des accidentés de la voie publique, les types d'engin, les facteurs favorisants, les différentes lésions et les modalités de leur prise en charge.

Matériels et méthodes. L'étude rétrospective a couvert la période 2005-2010, soit au total 1496 traumatisés, dont 1257 cas d'accidents de la voie publique (AVP).

Résultats. Le sex-ratio Homme/Femme était de 2.36 et l'âge moyen des victimes de 43,5± 5 ans. Les engins mis en cause étaient : les motos (67.77%), les véhicules à quatre roues et plus (30.15%), le train (1.36%) et les bicyclettes (0.72%). Les principaux facteurs favorisants étaient : la méconnaissance du code de la route, l'excès de vitesse, l'état de dégradation des routes, l'état défectueux des moyens de déplacement, l'alcoolisme et la drogue. Les lésions les plus fréquentes étaient : les fractures (38.05%), les traumatismes crâniens et crânio-faciaux (13.28%), les contusions (12.10%) et les plaies des parties molles (11.38%). La conduite thérapeutique était fonction de la nature de la lésion. Nous avons enregistré 79 décès soit 6.28%.

Conclusion. Les AVP sont en augmentation constante du fait de l'adoption de la moto comme moyen principal de transport urbain.

Mots clés : Accident de la voie publique, urgence traumatologique, lésions, gravité.

INTRODUCTION

Injuries are gradually becoming a leading cause and mortality and disability worldwide [1]. Low income areas seem to be disproportionately affected and the burden of injury in these areas of the world is on the rise [2, 3, 4, 5, 6, 7, 8]. Within these populations, the poorest individuals seem to be even more exposed [4].

Data on epidemiology, pattern and management of injuries in sub-Saharan Africa are scarce. In Cameroon in particular, very few references can be quoted [8, 9, 10, 11]. The few available reports are related to hospital based data in the southern part of the country [9]. In the absence of basic data on injuries, no reasonable policy of management can be designed.

Road traffic accidents account for the majority of cases of injuries worldwide [2, 6, 12]. Their impact on the social and economic well-being of individuals, families and the society is very important [5, 12]. This situation is made worse by an uncontrolled demographic growth not followed by the corresponding appropriate development of transport infrastructures. In the absence of an organized policy based on a clear strategy to tackle this problem, all efforts in these areas are usually poorly coordinated. These efforts usually target sporadic events and are therefore totally ineffective.

The northern part of Cameroon has witnessed over the past two decades a massive change in the type of vehicles used for urban transport to the advantage of motorcycle. This mode of transportation seems to have influenced the frequency and the pattern of traffic related injuries over the past decades [13, 14, 15, 16, 17].

This study aimed at describing the epidemiological profile of road traffic injury victims in the city of Ngaoundéré in the Adamaoua region of Cameroon. We also intended to describe the pattern and severity of injuries as well as the modalities of their management and their outcome.

METHODS

This retrospective study was conducted over a period of five years, between January 2005 and December 2009, in the emergency department of the Ngaoundéré regional hospital. This level III institution is located in a semi-urban area of the Adamaoua region in the northern part of Cameroon. Ngaoundéré is the regional capital and has a rapidly

growing population with an estimated tenfold increase in the population over the past 40 years. The present population is estimated to be over 400.000 people, 70% of which are Muslims. The main urban transportation vehicle is the motorcycle which is widespread over the town.

Ngaoundéré regional hospital is one of the two major hospitals of the city. It has a total admission capacity of 154 beds. Emergency cases are received in a casualty department with a capacity of 10 beds where patients can be admitted for up to 24 hours. Minor surgical procedures not requiring general or regional anaesthesia can be performed in the casualty unit. Cases requiring admission are sent to the surgical ward managed by two general surgeons with a capacity of 34 beds, or to the intensive care unit which can accommodate up to 6 patients. Morphological work-up can be performed in the radiology department which is equipped with standard X-ray and ultrasound. This unit is covered by two radiologists. Cases requiring surgery can be taken to the theatre where 2 patients can be operated upon at the time.

In this hospital based study, data were gathered from the emergency department, admission ward and operative room registries and were augmented by the analysis of patient files when necessary. We include in this study every patient received at the casualty department with an injury sustained after a road traffic accident. Road traffic accident was defined in this study as an event during which a road vehicle collides with another vehicle, a pedestrian, an animal or any geographical or architectural obstacle. Injuries sustained during interpersonal violence, domestic injuries, self inflicted injuries and all other causes of injuries were excluded. Data were collected using a data collection sheet and included age, sex, profession, type of vehicle, position of patient, location and nature of injury, management procedure and outcome. Whenever possible, severity of injury was estimated using both Injury Severity Score and Revised Trauma Score.

Data were analysed using Epi-info® 2003. Bi-variate 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 the study [18].

In the absence of a local ethical review board, this study was administratively approved by Ngaoundéré regional Hospital.

RESULTS

A total of 1496 injury related admissions were recorded in the emergency department over the study period. 1257 (84%) of these were Road traffic injuries. The remaining 239 cases were excluded from the analysis. A mean of 251.4 cases were received yearly.

As shown on **figure 1**, the annual distribution of RTA cases was regular over time with two non-significant peaks in 2006 and 2009. The ages of our patients ranged from 02 to 85 years, with a mean of 43.5 ± 5.6 years.

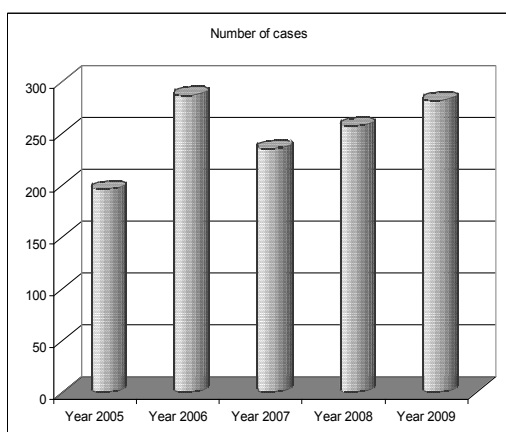


FIGURE 1: YEARLY DISTRIBUTION OF ROAD TRAFFIC INJURY CASES OVER THE YEARS DURING THE STUDY PERIOD.

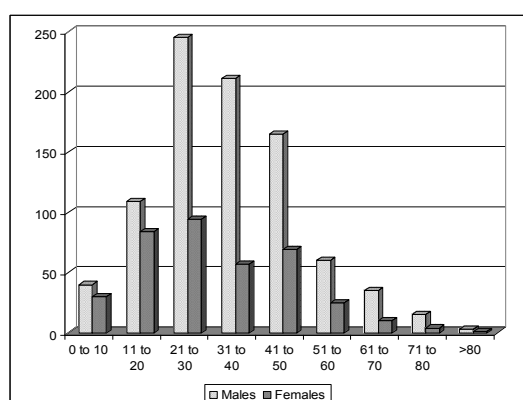


FIGURE 2: AGE AND SEX DISTRIBUTION OF CASES OF ROAD TRAFFIC INJURIES IN NGAOUNDÉRE, CAMEROON.

As **figure 2** illustrates, 48.28% of all cases were aged between 21 and 40 years. The majority of patients (70.22%) were male with a sex-ratio of 3.22/1.

Table 1 below displays the distribution of RTA victims according to their professional category. According to this table, commercial motorcycle riders and students were the most frequently involved groups.

TABLE I: DISTRIBUTION OF ROAD TRAFFIC INJURIES IN NGAOUNDÉRE ACCORDING TO PROFESSIONAL CATEGORY.

Profession	Number	Percentage (%)
Commercial motorcycle riders	438	34.8
Students	237	18.9
Traders	136	10.8
Government workers	127	10.1
Commercial motor vehicle drivers	58	4.6
Farmers	88	7
Jobless	122	9.7
Retired	34	2.7
Unknown	17	1.4
Total	1257	100

We analysed the distribution of patients according to the type of vehicle involved (the vehicle used by the patient at the time of the accident). As shown on **figure 3**, a large majority ($n=749$) of patients were motorcycle users. These included 438 (58.5%) riders and 311 (41.5%) of passengers. Tourist cars were also frequently involved ($n=205$), but the position of the patient (either driver or passenger) was usually not determined by the records.

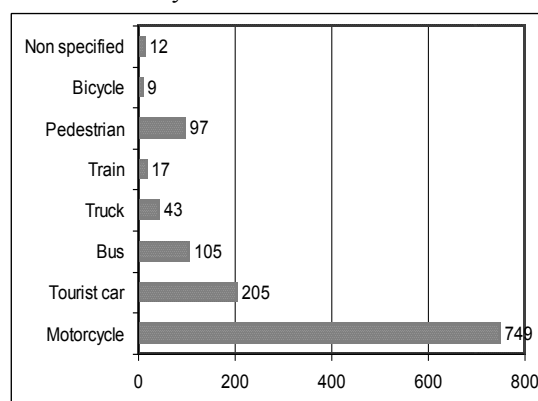


FIGURE 3: DISTRIBUTION OF CASES OF ROAD TRAFFIC ACCIDENTS IN NGAOUNDÉRE ACCORDING TO THE TYPE OF VEHICLE USED BY THE ACCIDENT VICTIM.

A total of 1460 lesions were observed in 1117 patients, giving a mean of 1.3 lesions per patient. The records of the remaining 140 patients (11.13%) did not specify the lesion in a usable format. A total of 12

patients were considered polytrauma patients defined as patients who have sustained a life threatening injury in more than one system. Injury Severity Score (ISS) could be estimated in 798 patients (63.5%). It ranged from 0 to 36 with a mean of 7.23. If we considered that an ISS of 12 or less was considered as minor or moderate injury, then 683 (85.6%) patients for whom ISS could be estimated sustained a minor or moderate injury. The Revised Trauma Score (RTS) could be estimated in only 92 patients (7.3%) because of the absence of a respiratory rate and Glasgow Coma Scale in the records of a large majority of patients.

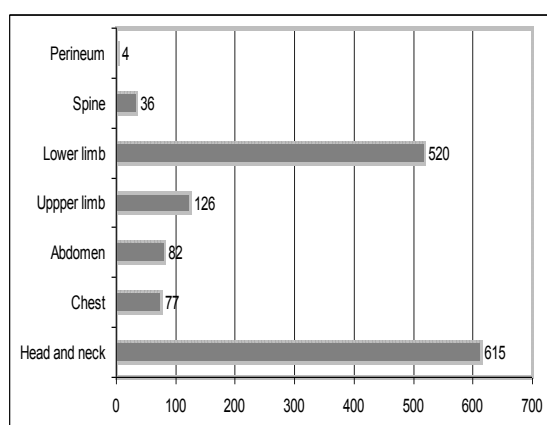


FIGURE 4: DISTRIBUTION OF CASES OF ROAD TRAFFIC INJURIES IN NGAOUNDÉRÉ ACCORDING TO LOCATION OF INJURY.

When analyzing the location of injury, as shown on figure 4, almost half of the patients suffered an injury of head and neck and 41.4% sustained an injury to the lower limb.

Table II below shows a detailed analysis of the lesions identified in our patients. The most frequently encountered lesions were soft tissue injuries at all locations, head injury with no brain involvement and fracture involving a long bone, mostly in the lower limb. Cervical and dorsal spine injuries rarely involved the spinal cord. Most chest and abdominal involvements were a blunt injury. In the abdomen, plain organ rupture involved the spleen in 17 cases and the liver in 4 cases. The remaining 5 patients had a combined hepato-splenic injury. A large majority of joint dislocation concerned the ankle.

TABLE II: NATURE OF LESIONS SUSTAINED BY OUR PATIENTS AND THE PROPORTION OF PATIENTS WHO SUSTAINED THEM.

Nature of lesion	Number	Percentage (%)
Soft tissue injury (all locations)	555	38
Traumatic brain injury	85	5.8
Head injury with no evidence of brain involvement	152	10.4
Facial injury	25	1.7
Cervical spine fracture or dislocation with quadriplegia	4	0.3
Cervical spine injury with no cord involvement	26	1.8
Other spinal injuries	36	2.5
Bone fracture upper limb	67	4.6
Bone fracture lower limb	278	19.0
Blunt chest injury	62	4.2
Penetrating chest injury	4	0.3
Blunt abdominal injury with plain organ rupture	26	1.8
Penetrating abdominal injury with hollow organ rupture	12	0.8
Abdominal impact with no organ damage	44	3.0
Rupture of the urethra	4	0.3
Joint dislocation	56	3.8
Sprain	17	1.2
Crush injury to a limb	7	0.5

As shown on Table III, the limb segments most commonly involved in fractures were the leg and thigh. Multiple fractures were not uncommon.

TABLE III: LOCATION OF FRACTURES IN PATIENTS WITH AN INJURY TO THE LIMB.

Bone	Number	Percentage (%)
Upper limb: 67		
Shoulder girdle	26	38.8
Arm	9	13.4
Forearm	16	24.0
Hand	8	11.9
Multiple	8	11.9
Lower limb: 278		
Pelvic girdle	19	6.8
Thigh (femur)	59	21.3
Leg	101	36.3
Foot	37	13.3
Multiple	62	22.3

The treatment modality for lesions could be traced from records in 892 patients who had 1067 lesions treated.

TABLE IV: SOME OF THE COMMON SURGICAL TREATMENT MODALITIES APPLIED DURING THE MANAGEMENT PROCESS OF OUR PATIENTS IN NGAOUNDERE.

Surgical treatment modality	Number	Percentage (%)
Disinfection/debridement/suture	576	53,98
Cast immobilization	147	13,78
Laparotomy	41	3,84
Thoracotomy	9	0,84
Chest tube drainage	12	1,12
Open reduction/internal fixation of fracture	108	10,12
External fixation of fracture	22	2,06
Reduction and splinting	39	3,66
Figure of 8 bandaging	21	1,97
Limb amputation	34	3,19
Vascular repair or anastomosis	2	0,19
Nerve repair	6	0,56
Tendon repair	28	2,62
Others	22	2,06
Total	1067	100,00

As illustrated by **Table IV**, disinfection/debridement/suture was used as the sole treatment modality 576 times. Fractures were most commonly treated by cast immobilization. Fewer cases underwent internal fixation. The overall laparotomy and thoracotomy rates were low.

Outcome after emergency department could be traced in 1213 patients (96.5%).

As **figure 5** shows below, a large majority of patients were discharged back home. Admission rate was 28%. All patients requiring a neurosurgical attention were referred to another centre.

The mortality rate reported in this study was limited to deaths that occurred during the patient's stay in the emergency department. The mortality rate was 6.3%. Of the 79 patients who were reported dead, 48 (61%) had a cranio-cerebral involvement, 32 were motorcycle riders (7.4 mortality rate), 17 motorcycle passengers (5.5% mortality rate) and 9 were pedestrians (10% mortality rate). The majority of these patients (n=68) had an ISS of 16 or above.

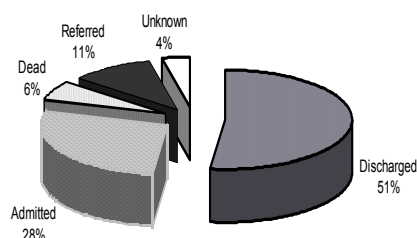


FIGURE 5: OUTCOME OF ROAD TRAFFIC ACCIDENT VICTIMS IN THE EMERGENCY DEPARTMENT IN NGAOUNDERÉ REGIONAL HOSPITAL.

DISCUSSION

Data on epidemiology and pattern on injuries in low income countries are still very scarce despite the fact that the burden of injuries in on the rise in these areas of the world [2, 3, 4, 5, 6, 7, 8]. Injury epidemiology and control is still generally considered under-researched and relatively neglected in these areas [2]. Road traffic accidents have been shown to be the most prominent cause of injuries worldwide [2, 6, 12]. Though developing countries account for an estimated 48% of motorized vehicles, they are the place where 91% of road traffic related fatalities occur every year [19, 20]. Kenya has experienced a four fold increase in the rate of road traffic fatalities over the past 30 years [21]. The contribution of motorcycles to road traffic fatalities and injuries over the past two decades seems to be on the rise [13,22] and the pattern of injuries related to this type of vehicle appear to be very specific [13, 17, 23].

A recent report indicated that the fatality rate on a road in Cameroon was estimated to be 35 times higher than on similar roads in the United States [8]. In this country however, the few available reports focus on epidemiology of injuries in general in the southern part of the country [9, 10]. This study is the first report dedicated specifically to road traffic related injuries, and the first ever on injuries in general in the northern part of Cameroon.

The number of cases reported in the Ngaoundéré Regional hospital is relatively low when compared to rates reported in other studies conducted under similar conditions [11, 24]. This is explained by the fact that the study targeted only one of the health institutions of the city. In fact, this finding stresses the need for cities like Ngaoundéré to consider putting in place a system to capture as many traffic injuries as possible, like the ones already being used in countries like Ghana and Kenya [6, 21]. This will permit a more comprehensive understanding of the burden of road traffic related injuries in the region. More globally, there is need to develop an organized system of collection of accurate data in low income countries, which will help decision makers recognize traffic injuries as a priority problem. Such a system is ideally community based, but when this is not possible, hospital based data using tools such as a formal trauma registry have shown their ability to significantly contribute to data collection [17, 25, 26, 27, 28].

In many previous studies performed in similar settings have identified male sex and young age as predisposing factors to injuries in general and traffic related injuries in particular [5, 11, 14, 15, 29, 30, 31, 32, 33]. This is also true in Ngaoundéré where the population is generally young and road traffic injuries usually target the most active component of the population. One of the rare exceptions is reported by Marmor et al. who described a unique sex-ratio of 1:1 in Israel [22].

The majority of professions involved in this study are usually those practiced by people with little or no formal education. Socio-economic factors, including level of education, are known to have an influence on the choice of mode of transport [4]. However, no matter the level of education, people are generally aware of the risks related to different modes of transport and the final choice is eventually related to the level of income which is generally low for people with no formal education [4].

The type of vehicles involved in road traffic injuries seem to vary widely from one area to another. Generally, while pedestrians, passengers and drivers remain the most commonly involved road users in developed countries [4, 16, 34, 35] and middle income countries [14, 31, 36, 37, 38], low income regions have witnessed a constant change in the nature of vehicle involved to the massive advantage of motorcycles [4, 13, 15, 17, 33, 39]. Even in more developed countries, motorcyclists generally seem to remain a vulnerable group of road users [23, 40]. The relatively limited number of pedestrians involved in our study is probably related to the low density of the population. People have to travel relatively long distances to their destination and rather than walking, they would prefer to use the services of a commercial motorcyclist which are generally considered fast and affordable. Collisions between a motorcycle and a pedestrian have made the later to become more exposed [11, 41], but this usually results in minor injuries which will probably not be captured by a hospital based data collection system. Some low income countries have however shown a greater vulnerability of pedestrians [6, 10, 25], sometimes involving mostly older patients [32] and children [42]. The low rate of bus victims in our study is another indication that motorcycle has become the preferred method of transport. All these factors make motorcycle riders a particularly vulnerable group of

road users as show in Ngaoundéré. They have even been reported to be more exposed than their passengers [17].

The head face and limbs are commonly reported as body areas more exposed to road traffic injuries in all areas of the world [17, 32, 40, 43, 44]. Few studies report the trunk as a generally vulnerable area [22]. An increasing number of reports point the lower limb as a vulnerable area and this seems to correlate with the increasing use of motorcycles as mode of transport [11, 23, 42, 45].

Most patients seem to develop soft tissue injuries such as bruises and lacerations [9, 11], often involving the cranio-facial region and the lower limbs [43]. Fractures are also a frequently reported lesion, most often involving the lower limbs [11, 33, 43]. Just as what is described in our findings, the most frequently encountered fractures bones are the tibia and the femur [17, 45]. Fractures involving the facial skeleton are rather rare in non fatal traffic injuries [43]. Foot fractures seem to become a typical finding in motorcycle accident victims [46]. Most of our fractures were managed conservatively. While we note that close reduction and splinting is the most common treatment modality for tibial fractures, Oluwadiya et al reported only 15% of open reduction and internal fixation in similar settings [45]. This treatment if more often required for fractures involving the foot [46].

Langley et al reporting the severity of road traffic injuries in a developed country describe a 59% of injuries of moderate severity and identify pedestrians as more vulnerable to severe critical injuries [47]. Few reports in African settings show some interest towards the severity of injuries [9, 10].

Admission rates after traffic injuries vary much from one report to another and from one region of the world to another. [10, 22, 35, 48, 49]. Beyaztas et al. report an admission rate of 41% in a study in which the majority of patients were involved in tourist car accident [35]. This rate is very different from the 16% and 17% reported respectively by Moghadam and Marmor under similar conditions [22, 49]. Our admission rate seems to be special to our pattern of injury which combines a majority of motorcycles, tourist cars and pedestrian.

The fatality rate on African road has been reported to be clearly on the rise over the past years [39]. It is reported that most road traffic related deaths occur in

rural or semi-rural areas like Ngaoundéré [6]. Pedestrians and motorcyclist seem to be more exposed to death than other road users [15, 16, 32, 38, 50]. The high mortality rate amongst motorcycle riders reported in our study has not been reported. The association between head injury and death is also frequently reported [17, 50].

CONCLUSION

This study is a model of a comprehensive report of hospital based data with an attempt to address not only epidemiology, but also aspects related to severity and most current management plans. It reinforces the most recent reports which all call the attention of decision makers on the influence of motorcycles on the pattern and severity of injuries in low income settings. In particular, it stresses the vulnerability of motorcycle riders and the need for further action to analyze the problem.

The Ngaoundéré study also calls attention on the need for programs targeting specifically the problem of road traffic injuries, just like those existing in low income countries to tackle the problems of malaria or HIV/AIDS. It is believed that traffic-related injury policy interventions and strategies developed and largely applied in developed countries where they have shown their efficacy are potentially transferable to low income countries [51, 52]. Time for Africans to copy the right thing!

Such programs need to be structured and coordinated at the central level. They should ideally include a coalition of all stakeholders likely to positively influence the overall action.

Any such programme begins with the supply of appropriate and comprehensive data on epidemiology and management of road traffic related injuries. It is in our opinion certain that more than 1496 people have been involved in traffic injuries and more than 79 people have died in Ngaoundéré as consequence of traffic injuries over the study period. The definition of guidelines at the national level for systematic capture of all cases of traffic injuries is a good starting point. While we acknowledge the difficulty of organizing community based studies in these settings, systematic institution of a trauma registration in all health institutions of Ngaoundéré could supply decision makers with valuable information. This is possible and has already been implemented in similar areas.

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