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SCHOLAR JOURNALS



(RESEARCH ARTICLE)



## Evaluation of head injuries in forensic autopsies of violent traffic deaths from 2020-2021 at HOGGY

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International Journal of Scientific Research Updates, 2022, 04(02), 240–246

Publication history: Received on 27 October 2022; revised on 10 December 2022; accepted on 12 December 2022

Article DOI: <https://doi.org/10.53430/ijrsru.2022.4.2.0186>

### Abstract

**Introduction:** Deaths from head injuries secondary to road traffic accidents are considered a major health problem. The main objective of our study is to determine, with the help of autopsies, the socio-demographic profile and the nature of the cranial injuries observed in fatal road traffic accidents.

**Materials and methods:** In this study, we were interested in the cases of fatal traffic accidents, based on autopsy data, This is a retrospective study based from January 1, 2020 to December 31, 2021.

**Results:** The age group of young adults, those between 15 and 30 years old, stands out from the others with the others with the number of subjects that it gathers, constituting 36.6 % of the of the total number of deaths.

As for the distribution of the subjects according to sex, our results showed a clear predominance of the predominance of the male sex, counting 108 cases, i.e. 74% of all deaths. We will explore the various injuries caused by fatal accidents. When we look at the anatomical site of fatal injuries, polytrauma and head trauma stand out, accounting for 50 cases (35% of the total). Representing 50 cases (35%) and 36 cases (25%) respectively.

**Conclusion:** Head injury patients following a head traffic accident constitute a major health problem in Senegal. These head injuries are one of the main causes of morbidity and mortality among young people. Better implementation of traffic prevention policies and respect for traffic rules and good roads would help reduce this threatening problem in our country.

**Keywords:** Head injuries; Road traffic; Accidents; Skull fracture; Cranial hemorrhages; Autopsy

### 1 Introduction

Deaths from head injuries secondary to road traffic accidents are considered a major health problem and are a frequent cause of morbidity and mortality [1].

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The number of deaths due to road traffic accidents continues to increase, reaching 1.35 million in 2016, while death rates relative to the size of the world population have stabilized in recent years [2]. Thus, despite the implementation of many prevention programs and increased safety measures in Senegal and around the world, road traffic accident violence results in frequent and particularly complex deaths.

The main objective of our study is to determine, with the help of autopsies, the socio-demographic profile and the nature of the cranial injuries observed in fatal road traffic accidents.

## 2 Material and methods

In this study, we were interested in the cases of fatal traffic accidents, based on autopsy data, which we supplemented with data from the Police or Gendarmerie. Thus, we used several variables such as rate, sex, age, month of the accident and distribution of fatal injuries on the body of the victim.

### 2.1 Framework of the study

Our study was conducted in the hospital structure of the General Hospital Idrissa Pouye of Grand Yoff in Dakar.

### 2.2 Materials

This is a retrospective study based on data collected from court requisitions, autopsy reports and registers of the structures involved in this study from January 1, 2020 to December 31, 2021.

It will include all cases of death that have received a forensic autopsy following a judicial requisition.

We have excluded from this study: Scientific autopsies

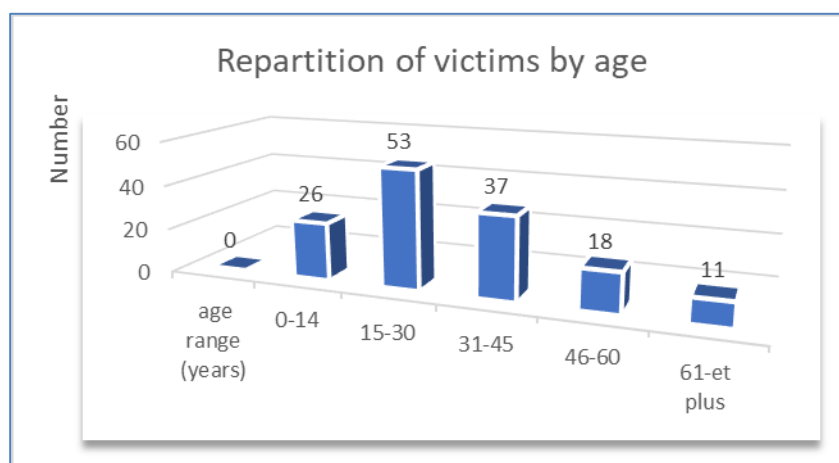
### 2.3 Methodology

The collection of elements was carried out for each autopsy, on the basis of a file including on the one hand the epidemiological data (age and sex, place of death, period), on the other hand the forensic aspects (circumstances of death, type of death, type of death).

## 3 Results

### 3.1 Age

The age group of young adults, those between 15 and 30 years old, stands out from the others with the others with the number of subjects that it gathers, constituting 36.6 % of the of the total number of deaths. In second place comes the group of adults aged 31 to 45 years of age, representing 25.6% of cases, followed by those aged 1 to 14 years, which representing 18%. Autopsies in which the bodies were found in an advanced state of putrefaction



**Figure 1** Repartition of victims by age

### 3.2 Sex

As for the distribution of the subjects according to sex, our results showed a clear predominance of the predominance of the male sex, counting 108 cases, i.e. 74% of all deaths.

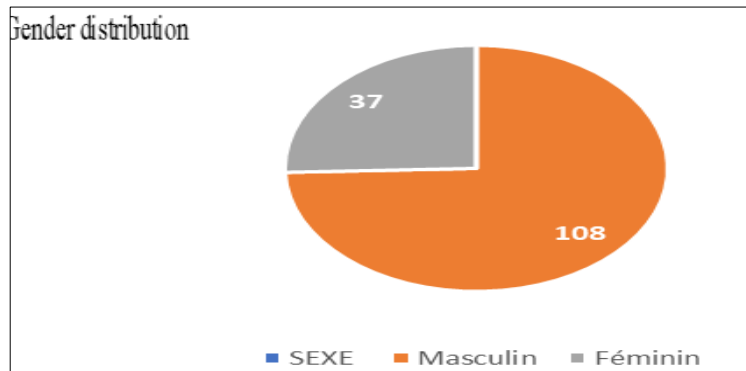


Figure 2 Gender distribution

### 3.3 Distribution according to the month of the year

We noticed a peak in the month of February with 19 cases (13%), then in June with 16 cases (11%) and then the months of May, September and October with 14 cases (10%) each.

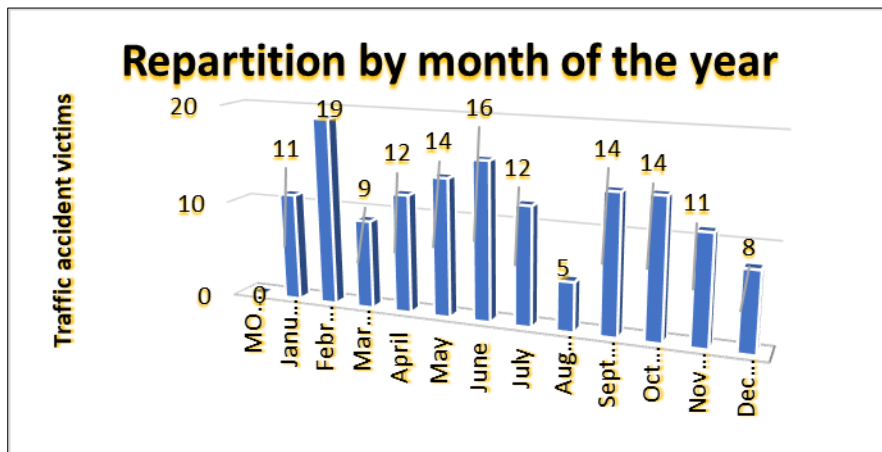


Figure 3 Distribution by month of the year

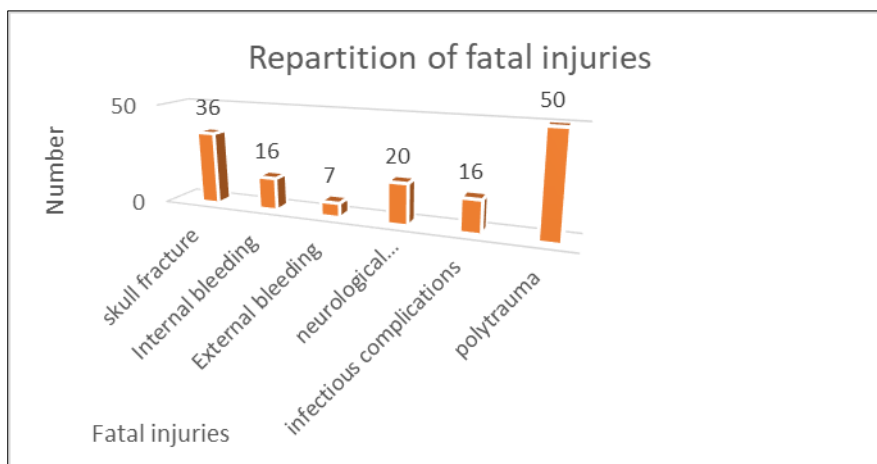
### 3.4 Location of the accident

The rural perimeter represents the majority of fatal road traffic accidents, i.e. 103 cases out of 145 cases (71%), while the urban perimeter recorded 42 cases (29%).

### 3.5 Fatal injuries

In this section, we will explore the various injuries caused by fatal accidents. When we look at the anatomical site of fatal injuries, polytrauma and head trauma stand out, accounting for 50 cases (35% of the total). Representing 50 cases (35%) and 36 cases (25%) respectively.

Lesions with neurological complications (14%), infectious complications (11%), internal bleeding (11%), and external bleeding (4%) were responsible for the deaths.



**Figure 4** Distribution by injury

The anatomical lesions in the head trauma patients presented different types of fractures and various intracerebral hemorrhages. Thus, we found:

### 3.5.1 Skull fractures

In our study of 36 cases of head trauma, a lesion of the scalp was noted in 30 (83%) cases. We observed skull fractures in 32 (88%) cases, the frontotemporal bones represented 81%, followed by the -parietal bones 12.5%, and the occipital bones 6.5%.

Fractures of the base of the skull were noted in 20 cases. Thus, we find the majority of fractures in the middle cranial fossa with 75%, the posterior cranial fossa is observed in 15% and a fracture of the anterior cranial fossa noted in 10%.

### 3.5.2 Cranial hemorrhages

Subdural hemorrhages were present in 62%, followed by subarachnoid hemorrhage 25%, extradural hemorrhage 10%, and intracerebral hemorrhage 3%.

## 4 Discussion

In the present study, polytrauma was responsible for 35% of deaths followed by head trauma at 25%, for a total of 60% of deaths.

A similar distribution of fatal injuries has been found in other studies [3,4].

However, other studies [5,6] show a predominance of head injuries followed by polytrauma.

Skull trauma was found to be the most common fracture site, reinforcing this finding. These results are consistent with studies from India, Iran and Brazil [7,8,9]. Indeed, the cephalic extremity being the most sensitive part of our body protecting in addition the neurological structure, does not withstand violent trauma and results in death in the majority of traffic accidents.

Traffic accidents can cause serious polytrauma in addition to head trauma that can seriously influence the initial vital prognosis and the functional prognosis later. Thus we can find several fractures of the limbs, a thoracic trauma with cardiac and pulmonary lesions, an abdominal trauma with lesions of the spleen, the liver and or a hemorrhagic shock, a section of an artery or vein with a state of shock.

We note that the extremities, i.e. the skull and limbs, are the most frequently affected sites. This could be explained by their location at the extremities of the body, making them the first targets.

Head injuries due to traffic accidents are the most frequent cause of morbidity and mortality in most developed and developing countries.

The gender distribution of the present study showed a higher proportion of males (74%) compared with females (26%). A three-year retrospective study from India determined the pattern of forensic autopsies and observed a higher percentage of males (71.46%) than females (28.53%) [10].

A similar trend has also been demonstrated in studies conducted by other authors [11,12,13,14]. The above studies are consistent with the approximate results of our study. This is due to the fact that men travel more than women because of their socioeconomic status and their responsibilities within the family.

Thus, men are more susceptible to road traffic accidents due to higher standards and a higher level of outdoor activities. Young men are also prone to engage in risky behaviors, such as speeding and riding their motorcycles on one wheel. These findings are of great concern because people in this age group are major contributors to the country's economy and are typically breadwinners. Therefore, the death of these economically productive individuals may prove to be a critical loss.

#### **4.1 Age range**

The distribution of traffic fatalities shows 2 peaks, between the age groups of 15 to 30 years and 31 to 45 years.

Other studies [15,16,17,18,19] on different epidemiological determinants of traffic fatalities show that most victims were young.

The increased vulnerability of these age groups (15-30 and 31-45) to fatal accidents is due to the fact that these age groups are the most mobile and dynamic of all other age groups for reasons of education, employment and other economic responsibilities. This young population generally has two-wheeled vehicles. Their reckless driving, irresponsible behavior and lack of helmet use predispose them to fatal accidents.

#### **4.2 Location**

Our study shows that the majority of fatal road traffic accidents occur in rural perimeters. Similar results were found by other authors [20,21], who recorded 88 and 74% of fatal road traffic accidents in rural areas respectively. In addition, some authors [22,23,24] noted that severe injuries were more frequent in rural areas .

In rural areas, we are confronted with defective or impassable roads, lack of visibility, defective signalling, houses along the road, sidewalks invaded by merchants, heterogeneous road traffic where carts, rickshaws, motorcycles and tricycles are mixed together, and other aggravating factors: the indiscipline of some drivers, the absence of police officers in traffic, a very dilapidated fleet of cars, failure to wear seat belts, the lack of use of child seats, overloading in public transport. Thus, this situation favors and accentuates the risk of fatal accidents.

#### **4.3 Period of accident**

In our study, we found various monthly peaks with practically the same rates in the months of February, May, June, September and October.

In our context, religious events with a monthly variation leading to a massive displacement of people, vacation activities, and the rainy season are often the source of road traffic accidents. The months of September and October correspond to the Magal of Touba and the Maouloud. These two religious events attract many pilgrims from several countries.

During the month of June, the change in weather conditions with the rainy season and its numerous floods, in addition to unfavorable roads, lead to many cases of accidents.

#### **4.4 Anatomical injuries**

##### *4.4.1 Fractures of the base of the skull*

In our study, we observed skull fractures in 32 (88%) cases, the frontotemporal bones accounted for 81%. Similar results have been observed in studies conducted by other authors [25,26,27].

We find a correlation with the data provided by Anil Aggrawal [28] who, taking into account the predominant location of skull fractures, concluded that frontal and temporal fractures were much more frequent than parietal and occipital fractures. Indeed, the mechanism of most motor vehicle accidents puts the frontotemporal region at greater risk of trauma than the parieto-occipital region.

#### 4.4.2 Intracranial hemorrhages

In the majority of cases of fatal head trauma, there was an association of skull vault fracture, with fracture of the base of the skull and intracranial hemorrhage. Skull base and intracranial hemorrhage. This can be explained by the fact that the fracture starts in the area of maximum impact and then propagates downwards to the base of the skull.

Subdural hemorrhage was the most frequent in our study in 62%, followed by subarachnoid hemorrhage in 25%. However, other previous studies [29, 1,30] show that subarachnoid hemorrhage was the most frequent.

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## 5 Conclusion

Head injury patients following a head traffic accident constitute a major health problem in the world and particularly in Senegal. Of all traumatic deaths, one-third to one-half are due to a head injury

These head injuries are one of the main causes of morbidity and mortality among young people. Better implementation of traffic prevention policies and respect for traffic rules and good roads would help reduce this threatening problem in our country.

Furthermore, it is important to carry out a study on the psychological factors that involve the risk taking of certain drivers in order to limit traffic accidents.

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## Compliance with ethical standards

### *Acknowledgments*

The authors thank the anatomopathology department of the Hospital General Idrissa Pouye of Grand Yoff and its staff.

### *Disclosure of conflict of interest*

The authors declare no conflict of interest.

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