

## Lesion analysis of forensic autopsies of violent traffic deaths at HOGIP over a two-year period

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### Abstract

The violence of road accidents leads to frequent and particularly complex deaths requiring the intervention of forensic medicine.

The objective of this study is to determine, with the help of autopsies, the socio-demographic profile, the exact causes and modes of death of traffic accident victims.

**Materials and methods:** This is a retrospective study based on data collected from court requisitions, autopsy reports and registers of the General Hospital Idrissa Pouye of Grand Yoff in Dakar from January 1, 2020 to December 31, 2021.

**Results:** The gender distribution of the present study showed a higher proportion of males (74%) compared to females (26%).

The distribution of traffic fatalities shows 2 peaks, between the age groups of 15-30 years and 31-45 years. Our study shows that the majority of fatal road traffic accidents occur in rural areas.

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

In the present study, polytraumatic injuries were responsible for 35% of the deaths followed by head injuries at 25%, i.e. a total of 60% of deaths. Lesions with neurological complications (14%), infectious complications (11%), internal bleeding (11%) and external bleeding (4%) were responsible for the deaths.

**Conclusion:** Traffic accidents, with their exponential number of deaths, constitute a real public health problem. The knowledge of the modes of these accidental deaths and fatal injuries, especially in young people, is possible thanks to the contribution of the medicolegal autopsy.

**Keywords:** Autopsy; Traffic Accident; Violent Death; Injuries; Senegal

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## 1. Introduction

The number of deaths due to 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 [1]. Thus, the implementation of many prevention programs and increased safety measures in Senegal and around the world, the violence of road accidents lead to frequent and particularly complex deaths. These are often polytrauma, requiring the intervention of forensic medicine.

The main objective of our study is to determine, with the help of autopsies, the sociodemographic profile and the lesions attributable to the cause of death of traffic accident victims.

## 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.

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

### 2.1. Materials

This is a retrospective study based on data collected from court requisitions, autopsy reports, and registers of the facilities 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

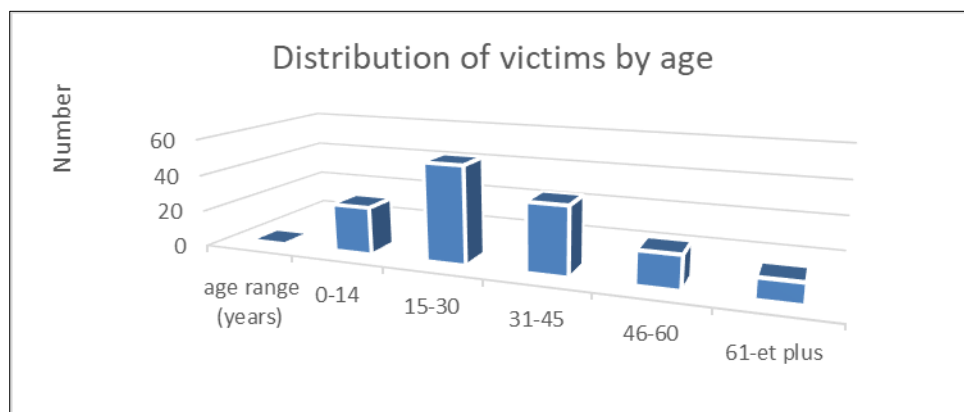
- Scientific autopsies
- Autopsies in which the bodies were found in an advanced state of putrefaction

### 2.2. 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, address, marital status, nationality, place of death), on the other hand the medico-legal aspects (circumstances of death, type of death, type of death).

## 3. Results

### 3.1. Age



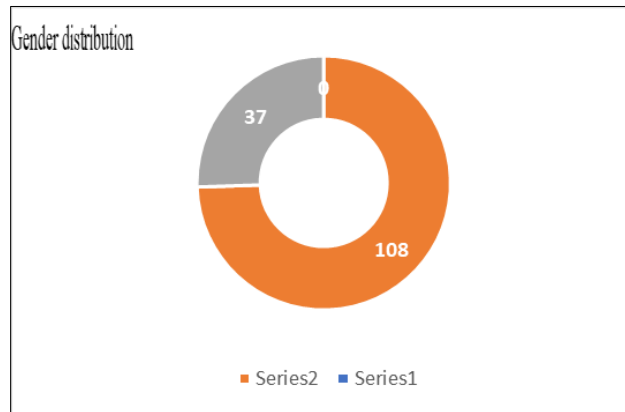
**Figure 1** Distribution of victims by age

The young adult age group, those between 15 and 30 years old, stands out from the others with the highest number of deaths. 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%.

### 3.2. Sex

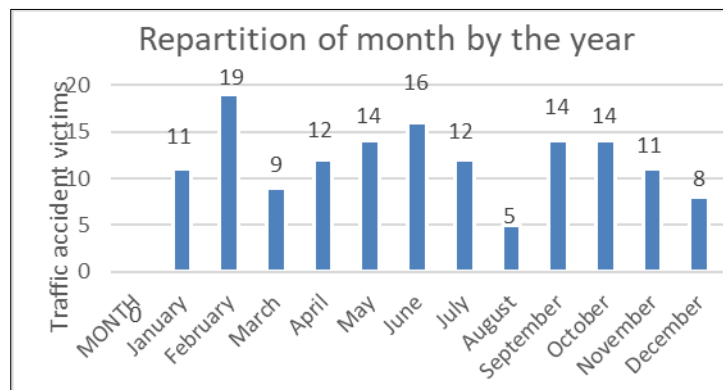
As for the distribution of the subjects according to sex, our results showed a clear predominance of the male sex predominance of males, with 108 cases, or 74% of all deaths.



**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

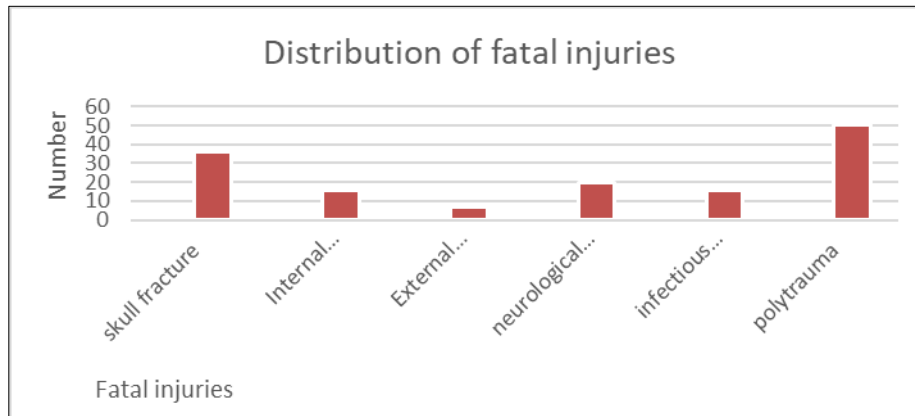
The rural perimeter represents the majority of fatal road traffic accidents, i.e. 103 cases out of 145 (71%), while the urban perimeter recorded 42 cases (29%).

### 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.

The most frequent anatomical lesions observed in neurological complications represented 75% for cervical spine fractures, 15% for dorsal spine fractures and 10% for lumbar spine.



**Figure 4** Distribution by injury

#### 4. Discussion

According to the World Health Organization (WHO), approximately 1.35 million people die each year as a result of road crashes, and 93% of road crash deaths worldwide occur in high-income countries, even though they have only 60% of the total vehicles in the world [1].

The death rate from road traffic crashes in Senegal remains alarming, despite efforts by the authorities. In Senegal, nearly 27,000 people are killed in road accidents each year, 11,000 of whom are recorded in Dakar. This trend mirrors that of the African Region. Although it accounts for only 3% of the total number of registered vehicles, the Region accounts for 20% of road accident deaths in the world, with nearly 272,000 deaths. In addition, it has a high road death rate with 26.6 per 100,000 inhabitants. Between 2015 and 2019, road accidents caused an average of 644 deaths each year [2].

However, forensic autopsies have been instrumental in the epidemiological assessment of traffic accident cases. Studies conducted in Manipal [3] and Bangalore [4] (India), Iran [5, 6], Bangui [7], Australia [8], Mthatha and Transkei (South Africa) [9], have used forensic autopsies to assess fatal victims of traffic accidents. Forensic autopsies can determine the exact cause and manner of death, the time elapsed since death, and the circumstances of death.

The main causes of these accidents are related to human behavior (speeding, telephone driving, effects of drugs and alcohol). In addition, the age of the vehicle fleet and the condition of the roads are also a factor. Beyond the human cost, these accidents constitute a significant burden for the country's economy.

Analysis of these factors would help identify shortcomings in the implementation of preventive measures to reduce road traffic deaths.

##### 4.1. Gender

The gender distribution of the present study showed a higher proportion of males (74%) compared to females (26%). A three-year retrospective study in 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 study results 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.

#### **4.2. 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, 20], show on different epidemiological determinants of traffic fatalities that most victims were young.

The increased vulnerability of these age groups (15-30 and 31-45 years) to fatal accidents is due to the fact that these age groups are the most mobile and dynamic among 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.

#### **4.3. Location**

Our study shows that the majority of fatal road traffic accidents occur in rural perimeters. Similar results were found by other authors [21], and [22], who recorded 88 and 74% of fatal road traffic accidents in rural areas respectively. In addition, some authors [23, 24, 25] 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 signaling, 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.

#### **4.4. Time of the 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.

#### **4.5. Anatomical injuries**

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

A similar distribution of fatal injuries has been found in other studies [26, 27].

However, other studies [28, 29] show a predominance of head injuries followed by polytrauma.

Trauma to the skull was found to be the most common fracture site, reinforcing this finding. These results are consistent with studies from India, Iran and Brazil [30, 31, 16, 32].

Polytrauma and head injuries following traffic accidents are the most common cause of morbidity and mortality in most developed and developing countries.

The cephalic extremity, being the most sensitive part of our body and protecting the neurological structure, does not tolerate violent trauma and leads to death in the majority of traffic accidents. Cranial injuries are dominated by subdural hematomas, intracranial hemorrhages, fractures of the skull, fractures of the temporal bone and even crushing of the entire skull. Traffic accidents can cause serious polytrauma in addition to a cranial trauma that can seriously influence the vital prognosis initially 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.

The frequency of polytrauma could be related to the violence of the accident, thus generating an attack with several points of impact.

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## 5. Conclusion

Traffic accidents, with their exponential number of deaths, constitute a real public health problem. The mortality rate related to road traffic accidents remains worrying in Senegal despite the efforts made by the authorities. Accidents are related to environmental and human factors.

The knowledge of the modes of these accidental deaths and fatal injuries is possible thanks to the contribution of forensic autopsy. Analysis of these factors would help identify gaps in the implementation of preventive measures to reduce fatalities. Beyond the human cost, these accidents are a major handicap for the country's economy.

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## Compliance with ethical standards

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### *Disclosure of conflict of interest*

The authors declare no conflict of interest.

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