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Analysis of Commuting Accidents Reported to the National Social Security Fund from 2000 to 2022 in Abidjan, Côte d'Ivoire

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Abstract

Due to their high frequency, high morbidity and mortality, occupational accidents represent a true "pandemic" in the workplace. They are composed of two variants, including commuting accidents. **Materials and Methods:** To study the epidemiological aspects of those reported to the Social Security Fund from 2000 to 2022, we conducted a descriptive study of cases collected from January 2000 to December 2022. Data were collected using a survey form and analyzed using SPSS software (version 22.0). **Results:** The study examined 362 commuting accident cases. Male victims represented 68.5% of the workforce, with an average age of 39.5 years, ranging from 20 to 60 years. Transport and telecommunications workers accounted for 49.7% of cases; 24.9% of victims come from the industry. Road traffic and assault accounted for 55.2% and 27.6% of the circumstances of occurrence, respectively. Employees traveling on foot accounted for 33.1% of victims. The injuries caused by these accidents were primarily wounds 47% and fractures 22.1% and in multiple locations in 40.6% of cases; 95.9% of commuting accident victims received sick leave. These stoppages resulted in an average of 27.7 days off work and a total of 10,280 lost workdays. Injuries progressed towards recovery in 66.3% of cases. **Conclusion:** Commuting accidents are risks as serious as workplace accidents themselves. Reducing the prevalence of these accidents will require improvements in staff transportation and collaboration with the Ministry of Transportation to raise awareness of road code compliance.

Keywords

Commuting Accidents, Risk Factors, Severity, Prevention, Abidjan

1. Introduction

Workplace accidents (WAs) are occupational risks inherent to human activity. Based on estimates by the International Labor Organization (ILO), a fatal workplace accident and a death from a work-related illness occur every 15 seconds worldwide, representing more than 2.3 million deaths per year [1]-[4].

Due to their high frequency, high morbidity and mortality, workplace accidents are a true "workplace pandemic". The cost of lost workdays was equivalent to nearly 4% of global gross domestic product (GDP) [5].

In France, in 2008, there were 703,976 WAs, of which 44,037 resulted in the payment of a permanent partial disability (PPD) pension [6]. These workplace accidents include both accidents themselves and their variants, particularly commuting accidents. A commuting accident is an accident that occurs to a worker while traveling from home to work and vice versa, regardless of the cause, provided that this journey has not been modified or interrupted for personal reasons [2].

The French National Health Insurance Fund for Salaried Workers (CNAMTS) recognized 87,855 commuting accidents in 2008 [6]. These are generally road traffic accidents (RTAs), as many workers travel to work by land [7].

In 2021, Belgium recorded 20,660 commuting accidents, a ratio of approximately 8 per 1000 workers, more than half of which were road traffic accidents [8].

RTAs related to commuting to and from work are one of the leading causes of death in the workplace [9]. The victims of these commuting accidents are generally pedestrians, users of two-wheeled motorized vehicles, and users of public transport vehicles [10].

The age of commuting accident victims varies from one country to another. Indeed, in Italy, a study of employees who were victims of commuting accidents reported that they were predominantly men aged 51 to 60. Among these workers, 32.1% were motorcyclists and 28.6% were car drivers who were victims of fatal accidents [9].

In Brazil, however, the victims were younger. From 2009 to 2016, a study reported that commuting accident victims were men aged 20 to 29 and suffered leg or ankle fractures [11].

In addition to road accidents, which account for the majority of commuting accidents, there are other mechanisms that can cause these accidents. These are accidents caused by falling on the same level or from stairs, assaults, illnesses, impacts against an object generally causing injuries such as contusions, wounds, fractures and sometimes death [10].

The sectors of activity identified as those whose employees constituted the majority of victims were human health and social work, commercial activities, and call centers [12].

In Africa, statistics are still poorly known, and these risks are certainly understated. Furthermore, most occupational health and safety systems in Africa do not

yet integrate the social economy sector, a sector particularly prone to accidents. However, in Burkina Faso, a study of workplace accident files from 2012 to 2016 indicated that commuting accidents accounted for 62% of claims [13].

In Côte d'Ivoire, numerous studies have focused on workplace accidents [14]-[16]. However, they have mainly focused on occupational accidents themselves, without including commuting accidents, which, according to written works, are just as frequent and serious [6] [9] [11] [13]. According to the National Social Security Fund (CNPS), the number of occupational accidents was estimated at 79,692 between 2000 and 2012, and the number of commuting accidents at 10,299 [17]. In 2022, the fund's data estimated the number of workplace accidents at 8000, with an annual average of 5400. Thus, based on the above figures, the number of workplace accidents can be estimated at 142,000 and the number of commuting accidents at 20,500 between 2000 and 2022.

What are the causes, severity, and impacts of commuting accidents reported to the Social Security Fund (IPS-CNPS) during the study period?

The aim of this study was to contribute to improve knowledge of commuting accidents and their prevention. The overall objective was to study commuting accidents reported to the IPS-CNPS from 2000 to 2022. The specific goals were to:

1) Determine the prevalence of commuting accidents reported to the IPS-CNPS from 2000 to 2022.

2) Describe the characteristics of commuting accidents reported to the IPS-CNPS from 2000 to 2022.

3) Analyze the medical and legal consequences of commuting accidents reported to the IPS-CNPS from 2000 to 2022.

2. Materials and Method

2.1. Materials

2.1.1. Type, Period, and Duration of the Study

We conducted a cross-sectional and descriptive study of commuting accidents reported to the IPS-CNPS in Abidjan from 2000 to 2022. Our study lasted three (3) months.

2.1.2. Study Location

The study took place at IPS-CNPS, in the claims management department. The IPS-CNPS is the institution responsible for managing the national statutory social protection system for salaried and similar workers in the private sector, as well as for self-employed workers. Its mission is to collect contributions from employers, recognize work-related accidents and illnesses, and pay social benefits.

2.1.3. Study Population

The study examined the files of commuting accident victims reported to the IPS-CNPS in Abidjan between 2000 and 2022.

2.1.4. Sample, Sampling

Sample Size

The sample size was calculated taking into account the prevalence p from the study by Lompo *et al.* [13]. The sample size was calculated using the Schwartz formula: $n = t^2 \cdot p\,(1 - p)/m^2$.

n: minimum sample size to obtain significant results for an event and a fixed risk level.

t: confidence level (the typical 95% confidence value will be 1.96).

p: estimated proportion of the population that presents the characteristic (p = 62%).

m: margin of error (set at 5%).

$n = [(1.96 \times 1.96) \times 0.62 \times (1 - 0.62)]/(0.05 \times 0.05) = 362$

Inclusion and Exclusion Criteria

The study included commuting accident reports for workers reported between January 1, 2000 and December 31, 2022, commuting accident reports for hired workers, correctly constituted declaration files with the exception (non-inclusion criterion) of files subject to foreclosure (declaration deadlines exceeding 2 years).

2.2. Method

2.2.1. Data Collection

After obtaining authorization to conduct the study, data collection was carried out in three stages:

We first went to the Information Systems Division (ISD) to obtain a list of commuting accident files reported to the IPS-CNPS. Then, equipped with the list of claim numbers and policy numbers of commuting accident victims, we consulted the electronic document management (EDM) file. EDM is a module that allows you to organize, store, consult, and process files from digital or electronic documents. It is also a tool that facilitates the search, consultation, and use of files regardless of the agency. Finally, we randomly selected 362 files that met the inclusion criteria and completed our questionnaire based on the declaration form and medical report. The questionnaire provided information on socio-professional data (age, gender, industry, professional category, job position, job seniority), accident data (time of occurrence, circumstances of occurrence, material agent, type of injury, location of injury, means of transport), and forensic medical care (accident severity, temporary disability (TD), progression, permanent partial impairment (PPI) rating, professional outcome, and compensation cost).

2.2.2. Data Processing and Analysis

Data entry was performed using Microsoft Word 2000 and Excel version 2016.

Microsoft Excel 2016 and SPSS version 22.0 were used to classify and organize the data. Statistical summaries in the form of means, proportions, tables, and graphs were used to summarize the quantitative and qualitative variables. The analysis consisted of a description of sociodemographic and professional variables, accident data, and forensic medical care.

2.2.3. Ethical Considerations

The study was conducted in compliance with the ethical clauses governing occu-

pational health and safety practice and in accordance with the rules of medical ethics. The results of this study will not be used for commercial purposes but solely for scientific research.

3. Results

3.1. Sample

We identified 142,000 work-related accident records and 20,500 commuting accidents over the period from 2000 to 2022. The inclusion criteria resulted in a sample of 362 commuting accident records.

3.2. Sociodemographic Data

The average age of the victims was 39.5 years, with a range of 20 to 66 years; 42% were between 30 and 39 years old. Men represented 68.5% of the victims, with a gender ratio of 1.17.

3.3. Professional Data

3.3.1. Sector of Activity

In our series, 49.7% of victims came from the transport and telecommunications sectors (Table 1).

Table 1. Distribution of reported commuting accidents from 2000 to 2022 according to the victims' sector of activity.

Activity Sector	Number of Employees	Percentage (%)
Livestock	3	0.8
Industries	90	24.9
Construction & Public Works	50	13.8
Transport & Telecommunications	180	49.7
Commerce	39	10.8
Total	362	100

3.3.2. Professional Category

Employees and manual workers accounted for 82% and 3.6% of victims, respectively.

Employees include all agents, administrative staff and so on.

3.3.3. Workplace

According to our results, 30.1% of the victims were machinists and 21% were security guards (Table 2).

3.3.4. Seniority in the Position

In this series, 61.6% of victims had less than a 5-year job tenure.

Table 2. Distribution of reported commuting accidents by job function.

Professional Qualification	Number of Employees	Percentage (%)
Commercial Agent	5	1.4
Data Entry Clerk	4	1.1
Security Guard	76	21
Regulatory Agent	12	3.3
Administrative Staff	43	11.8
Health Agent	9	2.5
Technical Services Agent	58	16
Small Station Manager	11	3
Local Planning Team Member	3	0.8
Graphic Designer	3	0.8
IT Specialist	2	0.6
Machinist	109	30.1
Dog Handler	2	0.6
Production Operator	5	1.4
Manual Laborer	13	3.6
Monitoring & Regulation	7	2
Total	362	100

3.3.5. Accident Data

We note that 38.1% of accidents occurred between midnight and 6 a.m., leaving home for 56.9% of victims; 33.1% of victims were traveling on foot; 55.2% of accidents occurred during cardiopulmonary arrest (CPA). Bladed weapons and blunt objects were involved in 27.6% of accidents (**Table 3**).

Table 3. Characteristics of the commuting accident.

Accident Parameter	Number of Incidents	Percentage (%)
Time of Occurrence (Hours)		
00 h - 06 h	138	38.1
06 h - 12 h	49	13.5
12 h - 18 h	65	18
18 h - 00 h	110	30.4
Moment of Occurrence		
Leaving home	206	56.9
Returning from work	156	43.1
Means of Transportation for Victims		
On foot	120	33.1
Personal vehicle	20	5.5

Continued

Staff transport bus	26	7.2
Carpooling	90	24.9
Motorcycle	76	21
Bicycle	30	8.3
Causal Agent		
Road Traffic Accident (RTA)	200	55.2
Knife/Blunt object (Assault with)	100	27.6
Ground (Fall from own height)	25	6.9
Solid object (Struck by)	30	8.3
Dog bite	7	1.9

3.3.6. Location of Injuries

Multiple localized injuries affected 40.6% of victims. 23.7% of injuries were located in the lower limbs (Table 4).

Table 4. Distribution of commuting accidents by injury location.

Location of Injury		Number of Incidents	Percentage (%)
Head			**5.5**
Skull	20	5.5	3.3
Face	12	3.3	0.8
Eye	3	0.8	2.2
Shoulder	8	2.2	8.3
Arm	30	8.3	0.6
Upper Limb			**2.2**
Elbow	2	0.6	1.1
Forearm	8	2.2	7.7
Wrist	4	1.1	0.8
Hand	28	7.7	3.6
Hip	3	0.8	2.5
Hip and Thigh	13	3.6	4.1
Lower Limb			**3.9**
Knee	9	2.5	8.8
Leg	15	4.1	1.1
Ankle	14	3.9	2.8
Foot		32	8.8
Thorax		4	1.1
Spine		10	2.8
Multiple Locations		147	40.6
Total		362	100

3.3.7. Type of Injury

Injuries accounted for 47% of the lesions (Table 5).

Table 5. Distribution of reported commuting accidents by type of injury.

Type of Injury	Number of Incidents	Percentage (%)
Wounds	170	47
Fractures	80	22.1
Contusions	20	5.5
Sprains/Dislocations	16	4.4
Dermabrasions	10	2.8
Swelling	3	0.8
Multiple Injuries	63	17.4
Total	362	100

3.4. Other Medical-Legal and Professional Aspects

A stoppage of work certificate was issued to 95.9% of victims of commuting accidents; 41% benefited from 10 to 29 days off work and 66.3% of injuries progressed towards recovery (Table 6).

Table 6. Distribution of victims according to the consequences induced.

Items	Number of Incidents	Percentage (%)
Accident Severity		
Work accident with lost time	347	95.9
Work accident without lost time	15	4.1
Duration of Temporary Incapacity to Work (TIW)		
<10 days	77	22.2
[10 - 29 days]	143	41.2
[30 - 49 days]	50	14.4
[50 - 69 days]	20	5.8
[70 - 89 days]	32	9.2
≥90 days	25	7.2
Outcome		
Recovery	230	66.3
Undetermined	117	33.7

4. Discussion

Information biases related to the retrospective nature of the study and concerning data on after-effects, fatal commuting accidents, data on professional outcomes, and individual compensation costs should be noted. However, the scientific infor-

mation provided is usable.

We processed 362 commuting accident files. The victims were workers whose predominant age range was 30 - 49, with an average age of 39.5 years, ranging from 20 to 66. The majority of victims were male (68.5%), with a gender ratio of 2.1. For Malte *et al.* [18], in a study conducted in Brazil, the age groups of 18 to 29 and 30 to 39 were found to have a male predominance, reasonably because in both situations, the most active and productive populations come from this age group.

Workers who were victims of commuting accidents were distributed across various sectors and fields of activity, particularly in transport and telecommunications (49.7% of victims) and in industry (24.9%). These results are comparable to those of Lacerda *et al.* in Salvador-BA, where most victims worked in commerce, construction, real estate, hospitality, food, and transport [19]. Employees represented 82% of workers who were victims of commuting accidents. This category of workers represents the most vulnerable and the most exposed to the risk of aggression during the commute to and from work. Indeed, due to low incomes and the high cost of traditional transportation, these workers are forced to use unsuitable means of transportation such as motorcycle taxis or walking, with a potentially high risk of commuting accidents in our environment.

Analysis of accident data reveals that 33.1% of victims were pedestrians and 29.3% used motorcycles or bicycles to get to work. These commuting accidents occurred at varying times, but had peak periods. Thus, we observe that 38.1% of these risks occurred during peak hours, which are between midnight and 7 a.m., and 30.4% occurred between 6 p.m. and 11 p.m. Road traffic accidents accounted for 55.2% of the victims, and assaults (with knives and blunt objects) accounted for 27.6%. His results are proportional to those of Da Silva *et al.* in France who found 26% of vehicles and 47% of pedestrians involved in the occurrence of reported commuting accidents [20]. We can therefore affirm that these results could be explained by the fact that workers leave early in the morning from their homes to the workplace and are sometimes exposed to physical attacks or are hit by vehicles. Whatever the causative agent, the accident caused various injuries to the body. The most frequent were wounds (47%) and fractures (22.1%); multiple locations were predominant on different parts of the human body (40.6%) contrary to the results of Gounongbé *et al.* in Benin dominated by fractures (22.9%) followed by wounds (21.1%), a difference probably linked to a larger population of motorcycle taxis providing the bulk of public transport in this country and the incivility of drivers [21] [22]. In the series of Rahmani *et al.* in 2013 [23] and Lompo *et al.* In 2019 in Ouagadougou, fractures also topped the list with higher proportions of 25.21% and 48.88% respectively [13]. The reasons mentioned above could also explain this discrepancy between the results. Wounds could be of varying severity, superficial or deep. However, the most common in these commuting accidents were cuts, contusions, and abrasions. Fractures most often affected the lower limbs (legs, ankles, feet) and upper limbs (arms, wrists, hands). These preferential locations concern the limbs, the most exposed body segments.

The severity of the fractures varied considerably depending on the nature and type of injuries, ranging from simple wrist fractures to complex fractures of the long bones. They resulted in temporary work interruptions in 95.9% of cases. The related non-working days ranged from 10 to 29 days, with an average of 28 days. They totaled 10,280 lost workdays.

The progression of injuries was toward recovery for 66.3% of victims; it was unknown for 33.7% of employees. The evolution of injuries resulted in recovery for 66.3% of victims, while it was unknown or not specified in the file for 33.7% of employees, likely due to administrative issues or loss to follow-up. This situation could lead to an underestimation of the true burden of long-term disabilities or fatal outcomes. No commuting accidents or fatal outcomes were documented. Unlike the 2013 study by Kouassi *et al.* on workplace accidents, which revealed that the outcomes of injuries were recovery (93%), consolidation (5%), and death (2%) [14], these outcomes may be the result of good medical care. However, we do not know the potential progression to death or sequelae, as well as the related proportions of victims whose outcomes could not be documented.

5. Conclusion

We observed a relatively high prevalence of commuting accidents. The victims, mostly men, were assaulted or victimized by vehicles, generally on the way to and from work, at extreme hours. They suffered multiple injuries requiring a relatively long period of incapacity. The progression was often towards recovery and in some cases the evolution was unknown. This observation encourages the conduct of other epidemiological studies, particularly prospective ones, in order to seek data on the after-effects, the individual cost of compensation and the professional future. It would be relevant to include commuting accidents of agricultural workers who use motorcycles on village tracks of uncertain quality. The assessment of severity should also combine the economic cost, in particular the cost of absenteeism and the opportunity cost. The prevention of these commuting accidents should involve collaboration with the Ministry of Transport. This collaboration should focus on improving public transportation for early and late shifts, and strengthening road safety infrastructure in high-risk areas.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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