

Surveillance of Road Accidents in Bouake, Ivory Coast, 2018: Hospital Prevalence and Seriousness Factors

Gnissan Henri Auguste Yao^{1,4,*}, Lepri Bernadin Nicaise Aka^{2,6}, Damus Paquin Kouassi^{1,4}, M'Begnan Coulibaly^{2,4}, Alfred Douba^{2,5}, Armelle Claverie Tanoa Koffi⁴, Opri Irika⁴, Arsene Deby Kouame⁴, Ismael Arnaud Ouattara⁴, Mouanta Stephanie Maryse Laurel Tanoh⁴, Sory Ibrahim Soumahoro^{1,4}, Jean Marie Ouaga⁵, Bangaman Christian Akani^{2,5}, Mahamadoun Sangho³

¹Public Health, Medical Science, Alassane Ouattara University, Bouake, Ivory Coast

²Public Health, Medical Science, Félix Houphouët Boigny University, Abidjan, Ivory Coast

³Public Health and Specialty, University of Sciences, Techniques and Technologies of Bamako, Bamako, Mali

⁴Regional Branch of the National Institute of Public Hygiene of Bouake, Bouake, Ivory Coast

⁵National Institute of Public Hygiene, Abidjan, Ivory Coast

⁶Expanded Immunization Program Coordination Department, Abidjan, Ivory Coast

Email address:

gnissanyao@yahoo.fr (G. H. A. Yao)

*Corresponding author

To cite this article:

Gnissan Henri Auguste Yao, Lepri Bernadin Nicaise Aka, Damus Paquin Kouassi, M'Begnan Coulibaly, Alfred Douba, Armelle Claverie Tanoa Koffi, Opri Irika, Arsene Deby Kouame, Ismael Arnaud Ouattara, Mouanta Stephanie Maryse Laurel Tanoh, Sory Ibrahim Soumahoro, Jean Marie Ouaga, Bangaman Christian Akani, Mahamadoun Sangho. Surveillance of Road Accidents in Bouake, Ivory Coast, 2018: Hospital Prevalence and Seriousness Factors. *World Journal of Public Health*. Vol. 7, No. 1, 2022, pp. 6-13. doi: 10.11648/j.wjph.20220701.12

Received: January 8, 2022; Accepted: January 26, 2022; Published: February 16, 2022

Abstract: Our study aims to determine the factors associated with the severity of road accidents in Bouake. We carried out a cross-sectional and analytical study, using road accident surveillance data, from January 1 to December 31, 2018. The prevalence of accidents was 44.38/10,000 inhabitants. The victims were between 15-34 years old (57.8%), male (77.3%), pupils and students (16.1%), pedestrians (20.57%). The motorbike was the main means of transport for the victims (69.21%). The accidents involved two motorcycles (25.8%), a motorcycle and a car (23.84%), a motorcycle and a pedestrian (18.55%). About half (48.92%) of the accidents occurred in 4 neighborhoods. The peaks of accidents were observed in April-May (16.54%) and December-January (20.78%); Thursdays (16.33%), Saturdays (16.89%) and Sundays (15.01%); and between 12 p.m.-12 a.m. The victims were machine operators (49.13%), passengers (29.40%), or pedestrians (20.57%). Emergency evacuations were done by ambulance (47.53%), and within the first 3 hours (96.21%). Fractures and head trauma were observed in 26.27% of the victims. The lesions were on the limbs (64.07%). Factors associated with the severity of the accidents during the accident (0.000); time of accident. There is a linear relationship between the time and the severity of the accident; the type of means of transport used: personal motorcycles (P=0.000), motorcycle taxis (P=0.000). Conclusion: Knowledge of the associated factors could contribute to reducing the prevalence of this new epidemic.

Keywords: Severity Factors, Monitoring, Road, Accident, Bouake, 2018

1. Introduction

Road accidents are a major, but neglected, public health problem which calls for concerted efforts to ensure effective prevention in the long term [1]. Modernism, which implies a

mechanization of all sectors of the economy and above all a more and more extensive development of road traffic, generates an exponential increase in the number of road traffic accidents, thus posing a major public health problem [2]. Of all the systems that people deal with on a daily basis, road

traffic systems are the most complex and the most dangerous [1]. Every year, more than 1.3 million people die in traffic accidents. Over 20 to 50 million injured people, many of whom will remain disabled as a result of their injuries [3]. Road traffic crashes cause huge economic losses for those affected, their families and countries as a whole [3].

These losses come from the cost of treatments and lost productivity for those who die or remain disabled as a result of their injuries, as well as for family members who have to take time off work or school to care for the injured.

Road accidents cost most countries 3% of their gross domestic product [3]. This is more than what they receive in development aid [4]. More than 90% of road deaths occur in low- and middle-income countries, which have less than half of the world's registered vehicle fleet. Road accidents are the eighth leading cause of death in the world, one of the three leading causes of death among people aged 5 to 44, and the leading cause of death among young people aged 15 to 29 [5, 6]. It is estimated that road accidents are expected to cause 2.4 million deaths per year by 2030 and become the fifth leading cause of death worldwide if no effective preventive measures are taken [7]. According to projections, between 2000-2020, traffic fatalities are expected to decrease by around 30% in high-income countries but increase exponentially in low- and middle-income countries [8]. This is because the rapid increase in motorization in these countries has not gone hand in hand with sufficient improvement in road safety strategies and urban planning. Reducing the number of road injuries and deaths will prevent suffering, unleash growth and provide resources that can be used for more productive purposes. Activities carried out under the Decade of Action for Road Safety will contribute to efforts to improve sustainable development systems.

Middle-income and low-income countries like African countries continue to pay a heavy price for this social scourge. Yet the tragedy behind these figures attracts less media attention than other less frequent types of drama. [9] The fight against this scourge is hampered by the quality of data on road accidents collected and reported by developing countries [10]. Surveillance is another major challenge for all African countries as well as for Côte d'Ivoire, where there is to date no comprehensive epidemiological surveillance system for traffic accidents, both in terms of triggering or enabling factors. than in terms of support. Faced with the increase in road accidents in Côte d'Ivoire [11], and particularly in Bouake, we decided to conduct this study in order to determine the factors associated with road accidents in Bouake, in order to reduce the prevalence of this new epidemic, which has today become a real public health problem in this city.

2. Material and Method

2.1. Study Setting and Place of Study

Our study took place at the epidemiological surveillance service of the regional branch of the National Institute of Public Hygiene of Bouake (AR-INHP-Bouake). It focused on

the data collected in the surgical emergencies of the Bouake CHU from January 1, 2018 to December 31, 2018, as part of the monitoring of road accidents. It aimed to determine the prevalence of road accidents, the individual characteristics of the victims and the factors associated with road accidents. Bouake is a town in the center of the Ivory Coast located about 350 km from Abidjan. It is the capital of the GBEKE department [12]. It is the second largest city on the Ivory Coast. It has an area of 2700 hectares comprising more than fifteen neighborhoods and an estimated population of 608,138 inhabitants [13]. Its road of more than 100 km presents significant deterioration; The town of Bouake and its infrastructure were deeply affected by the war that broke out on September 19, 2002 in the Ivory Coast, leaving them in an "advanced state of disrepair" which is gradually being rehabilitated. This city is crossed by an important road axis of international scope, going to the north of the country. There is a University Hospital Center (CHU). The Bouake CHU is the reference center par excellence for health structures in all regions of the center and north of the country. The relief of the city of Bouake is flat covered with a wooded savannah. We distinguish four seasons:

1. Hot, dry and non-rainy season (November to February).
2. Hot, humid and rainy season (March to June).
3. Cool, humid and little rainy season (July to August).
4. Cool, humid and rainy season (September and October).

The AR-INHP-Bouake is one of the branches of the INHP (National Institute of Public Hygiene) was created by decree number 91-656 of October 9, 1991. It is a public administrative establishment, responsible for the application of the national health policy in terms of general hygiene; prophylaxis and control of transmissible and parasitic endemics; carrying out or participating in the development of health programs.

2.2. Type of Study

We conducted a cross-sectional and analytical study, which focused on road accident surveillance data in the city of Bouake from January 1 to December 31, 2018, initiated by the regional branch of the Bouake hygiene institute.

2.3. Population and Sampling

Our study focused on road accident victims of all ages, occurring in the city of Bouake and admitted to the surgical emergency department of Bouake University Hospital. A notification form for road accident victims had been drawn up and made available to emergency surgery doctors in order to notify all road accident victims admitted to this service, and allowing them to have information on the socio-demographic and clinical characteristics of the victims, the associated factors and the factors of gravity of these road accidents. All the information contained in the traffic accident notification form was entered into a computer from a mask designed for this purpose. This data management process resulted in the constitution of the road accident monitoring database in Bouake available at the regional branch of the Bouake hygiene institute.

2.4. Technique and Method of Data Collection

The data were collected from the road accident surveillance database developed by the epidemiological surveillance service of the regional public hygiene office of Bouake, with the aim of better assessing the importance of road accidents. the road in this locality, according to the individual characteristics of the victims, the associated factors and the factors of gravity. Confidentiality of information was ensured by respecting anonymity at all stages. Road accident victims in the town of Bouake were described taking into account the independent variables: socio-demographic characteristics, associated factors. In order to determine the seriousness factors of road accidents in the city of Bouake, we have grouped the accident victims into two categories. Thus, a serious accident is an accident which resulted in the death of the victim or caused a fracture or a head trauma in the victim. And a non-serious accident is an accident that has resulted in lesions that are not life-threatening to the victim and in which the lesions observed, if any, are wounds, contusions, dislocations or sprains. For the site of the lesions, we took into account the sites of the most important lesion per victim.

Has the epidemiological surveillance of road accidents carried out from the emergency department made it possible to notify all cases of road accidents in the town of Bouake? This question could constitute a limit to our study.

2.5. Data Analysis Technique

The data were collected from the database of the epidemiological surveillance service of the AR-INHP in Bouake. Data were analyzed using SPSS 22 software. Quantitative variables are expressed as mean with standard deviation and extreme values. Qualitative variables are expressed as a proportion. Measures of frequency and mean were calculated with a 95% confidence interval (CI). The univariate analysis consisted of determining the measure of association between the severity of the accident and the explanatory variables. It resulted in the determination of the Odds Ratio (OR) with their 95% confidence intervals (CI) and probabilities (p). The threshold of significance of the probabilities (P) was a value less than 0.05. Multivariate analysis consisted of multiple logistic regression from the results obtained during univariate analysis.

2.6. Ethical Considerations

The initial notification of road accident victims could only be done after obtaining an authorization from the Medical and Scientific Director (DMS) of the Bouake CHU. In addition, confidentiality of information was ensured by respecting anonymity at all stages.

3. Results

3.1. Socio-demographic Characteristics of Accident Victims in the City of Bouake

3.1.1. Age

The victims of road accidents were in 57.8% of cases

between 15-34 years old.

The average age of road accident victims was 28.17 years with extremes of 1 month and 85 years.

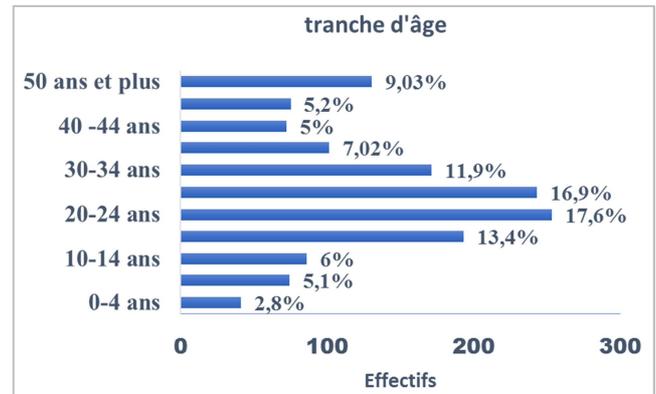


Figure 1. Distribution of victims by age category.

3.1.2. Sex

Among the victims of road accidents 327 (22.7%) were female and 1112 (77.3%) were male with a sex ratio of 3.4.

3.1.3. Profession

Pupils and students (16.1%), represented the main victims of road accidents in Bouake among the professions identified.

3.2. Proportion of Road Accident Victims

The surgical emergency department registered 5,396 patients during the study period.

The proportion of traffic accident victims among those admitted to emergency surgery was 56%.

Accidents in the city of Bouaké accounted for 47.6% of road accident victims admitted to surgical emergencies at Bouaké CHU.

The proportion of road accident victims in Bouaké in 2018 was 44.38/10,000 inhabitants.

3.3. Circumstance of Occurrence of Accidents

3.3.1. Position/Role of Victims

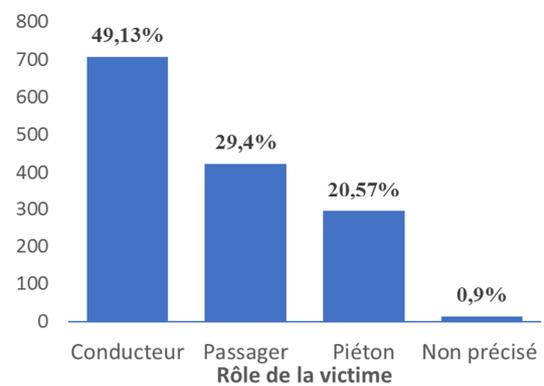


Figure 2. Breakdown of victims according to the role of victim.

Pedestrians accounted for 20.57% victims of road accidents.

3.3.2. Means of Transport Used

Table 1. Breakdown of victims according to the means of transport used.

Type of victim's means of transport	n	%
Personal motorcycles	627	43,57
Motorcycle taxis	389	25,64
On foot without gear	290	21,54
Public transport cars	85	5,91
Personal cars	21	1,46
Bicycles	20	1,39
Tricycles	5	0,35
Trucks	2	0,14
Total	1439	100,00

The motorbike was the main means of transport for victims of road accidents (69.21%) of which 43.57% are personal motorbikes and 25.64% are motorbike taxis.

3.3.3. Mechanism of the Accident

The accidents involved two motorcycles in 25.8% of the cases, a motorcycle and a car in 23.84% and a motorcycle and a pedestrian in 18.55% of the cases.

3.3.4. Location of Accidents by Neighborhood

About half (48.92%) of road accidents had occurred in 4 of the 18 main districts of the city with respectively 16.54% in Dar Es Salam, 11.81% in Air France, 11.22% in commerce and 9.31% in Ahougnansou.

3.3.5. Chronology of Accidents

(i). Depending on the Month



Figure 3. Monthly evolution of road accident victims in Bouake.

3.4. Factors Associated with the Severity of Traffic Accidents

Table 2. Factors associated with the severity of road accidents in the city of Bouake.

RISK FACTORS	Serious accident		Less serious accident		OR	IC	P		
	n	%	n	%					
Age groups	<15 years	45	10,5	156	14,7	1,000	0,676	1,481	0,997
	15-25 years	113	26,4	392	36,9				
	26-35 years	166	38,8	323	30,5	1,782	1,346	2,360	0,000
	36-45 years	62	14,5	114	10,7	1,886	1,298	2,740	0,000
Sex	≥ 46 years	42	9,8	76	7,2	1,917	1,245	2,950	0,002
	Feminine	53	14	274	25,8	0,468	0,339	0,645	0,000
Professions	Male	325	86	787	74,2				
	Vehicle driver	19	9,5	49	7,8	1,695	0,907	3,166	0,095
	Motorcycle driver	3	1,5	22	3,5	0,596	0,170	2,082	0,413
	Official	34	17,1	85	13,5	1,748	1,042	2,934	0,033

(ii). Depending on the Day

Accidents were observed every day of the week, but even more on Thursdays (16.33%), Saturdays (16.89%) and Sundays (15.01%).

(iii). Depending on the Time

Road accidents occurred between 12 noon and midnight among 1173/1439 victims, or 81.51%. With respectively 19.46% between 6 a.m.-12 p.m., 28.14% between 12 p.m.-6 p.m. and 33.91% between 6 p.m.-12 a.m.

3.3.6. Use of Protective Measures

The precision of wearing the seat belt was found in 1 victim.

The precision of wearing a helmet was found in 9 people among the victims.

3.3.7. Other Associated Factors

The victims were machine operators (49.13%), passenger (29.40%), or pedestrian (20.57%).

The mechanism of occurrence of road accidents was percussion (47.8%), collision (16.5%).

The circumstances of this occurrence were overtaking, disobeying signs and speeding when specified.

Only 26 (1.8%) of the victims admitted their responsibility for the occurrence of the accident.

The fire brigade ambulance was used as a means of transport for the admission of the victims to the surgical emergency in 47.53% of the cases, in 19.67% of the cases the transport of the victims of the accidents had been made by other means including municipal taxis (19.46%), personal cars (0.14%) motorcycles/tricycles (0.07%).

3.3.8. Admission Deadline

When the admission deadline was specified, it was before the 3rd hour (509/529), or 96.21% of cases.

3.3.9. Type of Lesions Observed

Fractures and head trauma accounted for 26.27% of injuries with 18.97% and 7.30% respectively.

3.3.10. Site of Lesions

The majority of lesions were located in the Lower Limb (41.97) Upper Limb (22.10) and the Face (19.25%).

RISK FACTORS	Serious accident		Less serious accident		OR	IC	P			
	n	%	n	%						
Position of the victim during the accident	Pupil/student	43	21,6	188	29,9					
	Household	3	1,5	31	4,9	0,423	0,123	1,448	0,159	
	Unemployed	4	2	10	1,6	1,748	0,523	5,841	0,358	
	Artisan	60	30,2	125	19,8	2,098	1,335	3,298	0,001	
	Trader	33	16,6	120	19	1,202	0,723	1,998	0,476	
	Driver	227	60,1	493	46,5					
	Passenger	63	16,7	360	33,9	0,380	0,278	0,518	0,000	
	Pedestrian	88	23,3	208	19,6	0,918	0,684	1,233	0,573	
	Time of accident	00H-06H	20	6,3	55	5,9	0,980	0,566	1,698	0,944
		06H-12H	71	22,3	209	22,5	0,916	0,655	1,281	0,608
12-18H		96	30,1	309	33,2	0,837	0,618	1,135	0,253	
18H-00H		132	41,4	356	38,3					
Type of transportation used by the victim	None (Pedestrian)	85	22,5	205	19,4	1,505	1,061	2,135	0,021	
	Truck	0	,0	2	,2	-	-	-	-	
	Personal motorcycle	183	48,4	444	41,8	1,496	1,112	2,013	0,007	
	Motorcycle taxi	84	22,2	305	28,7					
	Tricycle	2	0,5	3	0,3	2,420	0,398	14,724	0,322	
	Bike	4	1,1	16	1,5	0,907	0,295	2,787	0,865	
	Public transport	15	4	70	6,6	0,778	0,423	1,408	0,417	
	Personal car	5	1,3	16	1,5	1,134	0,403	3,187	0,810	
None (Pedestrian)	85	22,5	205	19,4	1,505	1,061	2,135	0,021		

The factors associated with the severity of road accidents in the city of Bouake were: male sex ($p=0.000$), age, with ages > 15 years ($P=0.000$), between 26 and 35 years ($P=0.000$) and between 36-45 years ($P=0.000$) and > 46 years ($P=0.002$). The profession with pupils/students, craftsmen ($P=0.001$); the position of the victim during the accident including drivers, passengers (0.000); the time of the accident; the different confidence intervals show that there is a linear relationship between the time and the severity of the accident; the type of means of transport used by the victim, including personal motorcycles ($P=0.0007$), motorcycle taxis.

4. Discussion

Our study aimed to identify the factors associated with road accidents in Bouake, thus making it possible to identify priority interventions to remedy this scourge, a real public health problem in this locality.

4.1. Prevalence

In our study, accidents in the city of Bouake caused 47.6% of surgical emergency admissions.

The hospital prevalence of road accident victims in the town of Bouake was 4.97/1000 inhabitants, or 497/100,000 inhabitants.

This prevalence was higher than that observed in the study by Benie in 2016, covering all traffic accidents in Côte d'Ivoire with significant differences in motorization depending on the locality [14] and Moshiri in Tanzania (5.98 per 100,000), which dealt with injury trauma of all types both domestic and urban [15]. However, it was lower than those observed by Labinjo in Nigeria (41 per 1,000) [16] and by Kobusingye in Uganda (38.9 per 1,000) [17], where motorization and road traffic remained higher despite the increase in the vehicle fleet in the city of Bouake dominated by two-wheeled vehicles circulating with great recklessness

and ignorance of road safety rules.

4.2. Sociodemographic Characteristics

4.2.1. Age

The victims of road accidents were between 15-34 years old (57.8%). This could be explained by the youth of our population, 77.3% of whom were under 35, generally having two-wheeled vehicles, and driving at risk. Our results corroborate those of Kandolo in Lubumbashi with a frequency of 60% of accidents in the age group between 18 and 37 years, linked to the inexperience, lack of control and recklessness of drivers at this age. [18, 19]. As with that of KONAN K. et al. [11] which found 53.3% of victims among 16-35 year olds.

4.2.2. Sex

The victims of road accidents were male in 77.3% of cases. This male predominance of road accident victims was also observed by Benie in Abidjan with 98.4%, [14] by Coulibaly in Mali and Wu in China with respectively 75 and 76.6% [20, 21, 14] as well as by Privat and Rougier in France with 83.3% and 88% respectively [22, 23]. BAH ML et al, in 2013 found 80% of male subjects among victims of AVP; when Krah and Coll in 2012 in the surgical emergency of the CHU de Bouake identified among the victims of AVP 79% of male subjects [24]. According to the WHO, 73% of road fatalities are men [3]. This could be explained by the great risk-taking of men when they are behind the wheel of machines always wanting to test others. Also close to half of the drivers in our study (49.13%) were male.

4.2.3. Profession

Among the professions identified, pupils and students were the main victims of road accidents in Bouake (16.1%). This could be explained by the youth of this population in a city where young pupils and students generally travel on foot or by motorcycle taxi, testifying to the absence of spaces designed for pedestrians and two-wheeled vehicles and of the absence

of a vehicle suitable for public transport [25]. Our results are superimposable on those of Sango in Mali in 2014 in the district of Bamako with 31.3% of the bodily victims of the road which were pupils and students [10].

4.3. Factors Associated with Road Accidents in Bouake

4.3.1. Position/Role of Victims

Pedestrians accounted for 20.57% (296/1439) of road accident victims. Our results are lower than those of Bénié in Ivory Coast from 2002-2011 which reports that pedestrians represented 59.3% of road accident victims [14]. This difference could be explained by the large motorization of this city since the politico-military crisis of 2002 which was based on the city of Bouake [25], the motorcycle having become the main means of transport in a city where the roads have an advanced level of degradation. However, our results are superimposable on those of Sango in Bamako in 2014 where pedestrians represented 19% of the victims [10].

4.3.2. Vehicles Involved in Traffic Accidents

Motorcycles were the main means of transport for road accident victims (69.21%), of which 43.57% were personal motorcycles and 25.64% were motorcycle taxis. The accidents involved two motorcycles in 25.8% of the cases, a motorcycle and a car in 23.84% and a motorcycle and a pedestrian in 18.55% of the cases.

This spread of motorcycles was born out of the politico-military crisis of 2002 [25] which made the city of Bouake the epicenter of the crisis with degradation of roads and absence of vehicles suitable for public transport [25]; motorcycle taxis have therefore appeared to overcome transport problems. Our results corroborate with those of Bamako in Mali where 81.4% of the vehicles involved were motorcycles and motorbikes. In Lubumbashi in 2008, Kandogo in a study noted that 38% of two-wheeled vehicles were involved in road accidents [18].

4.3.3. Location of Accidents by Neighborhood

About half (48.92%) of road accidents had occurred in 4 of the 18 main districts of the city with respectively 16.54% in Dar Es Salam, 11.81% in Air France, 11.22% in commerce and 9.31% in Ahougansou. This could be explained by the high population density in these neighborhoods and by the significant deterioration of the roads in these neighborhoods [25].

4.3.4. Chronology of Accidents

Road accidents in Bouake occurred every month of the year, with spikes in April (9.10%), May (8.90%), December (10.15%) and January (10.63%).

This could be explained by the start of the rainy season in April and May, associated with the deterioration of the roadway and the recklessness of the drivers. Also to the great mobility of populations during the major holiday periods in December and January, generally associating consumption with excitement, and speed at the wheel.

In the study of Almeimoune A et al in Mali, the months of May and June were the most accident-prone with respectively

9.50% and 9.45% of motorcycle accidents [26].

In our study, accidents were observed every day of the week, but even more on Thursdays (16.33%), Saturdays (16.89%) and Sundays (15.01%). These days are known to be wedding days, during which the two-wheelers indulged in high-risk driving demonstrations. Our results corroborate those of Ekra and Col in Côte d'Ivoire which had shown that the majority of accidents occurred on weekends with 14.8% respectively, Thursdays, 15.7% Saturdays and 16.4% Sundays; all as in several other studies [11, 24].

The traffic accidents occurred in the second half of the day between 12 noon to midnight (81.51%). With respectively 19.46% between 6 am-12 am, 28.14% between 12 pm-6 pm and 33.91% between 6 pm-12 am. This could be explained by the density of traffic at these times of the day, where the entire population goes about these activities, usually on foot or on motorbikes. This is also the case in Bamako in Mali where Sango had noted that 71% of road accidents took place between 10 a.m. and 10 p.m. [10], as well as in the study of Almeimoune A et al, or 74.30% of accidents took place between 7:30 a.m. and 4 p.m. [26]. In the study of Benie in Ivory Coast from 2002 to 2011, 42.4% of road accidents took place between 4 p.m. and 10 p.m. [14].

4.3.5. Use of Protective Measures

The accuracy of wearing a seat belt was found in one victim, and the accuracy of wearing a helmet was found in 9 of the victims. This low use of individual protection measures could be explained by the lack of knowledge of safety measures and the authorities' lack of rigor in monitoring and compliance with these measures, despite their importance in reducing the consequences of accidents.

4.3.6. Position of the Victim During the Accident

In our study, the victims were machine operators (49.13%), passenger (29.40%), or pedestrian (20.57%). Our results are lower than those of Sango in Bamako in Mali who found at the level of health establishments, 71.7% of victim drivers, 26.9% of passengers and 1.4% of pedestrians. This difference could be explained by the fact that in the city of Bouake, motorcycle taxis are used as public transport without a passageway for pedestrians and two-wheelers.

4.3.7. Mechanism and Circumstances of Occurrence

In our study, the mechanism of road accidents was percussion (47.8%), collision (16.5%); with the circumstances of overtaking, disregarding signs and speeding. In Lubumbashi, the major causes of road accidents were speeding; drunk driving and recklessness, respectively 34%, 20.3% and 12.1% [18]. All of these circumstances could be explained by the lack of vehicles suitable for public transport [25] and by the very young age of our drivers.

Among the victims, only 26 (1.8%) admitted their responsibility for the accident.

The victims were evacuated to the surgical emergency room by the military fire brigade ambulance in 47.53% of cases. Some had benefited from other means including municipal taxis (19.46%), personal cars (0.14%), motorcycles/tricycles

(0.07%). Our results are different from those of Sango in Mali where 66, 4% of the victims had been evacuated by the ambulance of the military firefighters, and 16.7% by personal vehicles [10]. This poor evacuation of victims by the ambulance of the civil protection and security forces, which are the military firefighters, could be explained by the populations' ignorance of emergency numbers and by the often long waiting time observed. before the arrival of the ambulance, thus favoring other means of evacuation.

4.3.8. Admission Deadline

The majority of road accident victims (96.21%) were admitted to emergency surgery within the first 3 hours after the accident. This rapidity of admission could be explained by the geographical location of the Bouake CHU in the city center and easy to access; also, by the diversity of the means of transport used for admissions to the surgical emergency departments of the Bouake CHU after accidents. Our results corroborate those of Traore Baba in Mali in whom 90.5% of patients had been admitted to the Reference Health Center (CS Ref) within the first 6 hours of their accident [27].

4.3.9. Type of Lesion

Serious injuries (fractures and head trauma) represented 26.27% of injuries with 18.97% and 7.30% respectively. Our results are different from those of Sango in Bamako where only 12.4% of road accident victims were seriously injured with respectively 8.3 seriously injured against 4.1% of people killed [10]. This high proportion of serious injuries could reflect the failure to wear a helmet in a city where the majority of road accidents involved motorcycles generally running at high speed.

4.3.10. Site of Lesions

The majority of lesions were located in the lower limbs and upper limbs, with respectively 41.97% and 22.10%. Our results are superior to those of Traoré B in Niono in Mali, TRAORE SD in Kolokani in Mali and of DIARRA I in Niono in Mali who observed a predominance of lesions in the lower limbs and upper limbs with respectively 26.5%, 21.8% [27] 25.3% and 19.9%. [28] and 38.3% and 19.2% [29]. This predominance of lesions in the lower limbs and upper limbs could be explained by the exposure of the limbs to direct and indirect shocks [27].

4.4. Factors Associated with the Severity of Traffic Accidents

Factors associated with the severity of road accidents were male sex ($p=0.000$), age, with ages < 15 years ($P=0.000$), between 15-25 years ($P=0.012$) and between 30 -59 years ($P=0.001$). The profession with pupils/students ($P=0.023$), housewives ($P=0.034$) and craftsmen ($P=0.002$); the position of the victim during the accident including drivers (0.000), passengers (0.000); the time of the accident, the type of transportation used by the victim, including personal motorcycles ($P=0.000$), motorcycle taxis ($P=0.000$). Our results are superimposable on several studies including that of Sango in Mali which found in addition to the factors of seriousness of road accidents found in our study: lack of

control of the driver ($p=0.03$), Recklessness of the pedestrian ($p=0.002$), inattention ($p=0.002$), excessive speed ($p<0.0009$), dangerous maneuvering on the roadway ($p<0.0002$). This could be explained by the fact that in the Sango study, the data came from several sources [10]. This is also the case for the study by Benié in Côte d'Ivoire which found as risk factors for road accidents: Excess speed ($p=0.000$), non-compliance with the highway code, dangerous overtaking and parking ($p=0.000$), and mechanical failure ($OR=3.9$; $p=0.000$) as well as the environment [14].

5. Conclusion

This study on the factors associated with road accidents in Bouake made it possible, while highlighting the risk factors associated with road accidents, to determine the factors of seriousness of road accidents in this locality. Urgent measures are needed in view of the growing scale of the phenomenon, in order to put an end to this new epidemic, which is a real public health problem in this once bustling city, tarnished by the motorcycle taxi phenomenon.

References

- [1] OMS. Rapport mondial sur la prévention des traumatismes dus aux accidents de la circulation. [World report on road traffic injury prevention]. Résumé; 2004. ISBN 9242591319.
- [2] Yao GHA, Douba A, Bamba L, Aka LBN, Dagnan NS. Problématique des accidents de la route dans le monde: causes, ampleur et prévention. Abidjan. [Problems of road accidents in the world: causes, extent and prevention. Abidjan]: Afrique Biomédicale. 2013; 18 (1): 90-100.
- [3] OMS. Accidents de la route. Les principaux faits. 2021 [Road accidents. The main facts. 2021]. [Internet] [cité le 20 Juillet 2021]. Disponible sur: <https://www.who.int/fr/news-room/fact-sheets/detail/road-traffic-injuries>.
- [4] Jacobs G, Aeron-Thomas A, Astrop A. Estimating Global Road Fatalities. Transport Research Laboratory. 2000; 445.
- [5] OMS. Plan mondial pour la Décennie d'action pour la sécurité routière 2011-2020. [Global Plan for the Decade of Action for Road Safety 2011-2020].
- [6] OMS. Rapport de situation sur la sécurité routière dans le monde. Genève 2013. [Global status report on road safety. Geneva 2013].
- [7] La sécurité routière dans le monde [Road safety around the world]. [Internet] [cité le 20 Juillet 2021]. Disponible sur: <https://www.un.org/fr/roadsafety/background.shtml>.
- [8] Nantula MR., VM and Reich, Equity dimensions of roads traffic injuries in low- and middle-income country. Injury Control and Safety Promotion. 2003.
- [9] Peden M. et al. Rapport mondial sur la prévention des traumatismes dus aux accidents de la circulation. Genève, Organisation mondiale de la Santé, 2004. [World report on road traffic injury prevention. Geneva, World Health Organization, 2004].

- [10] Sango HA. Epidémiologie et surveillance des accidents corporels de la route dans un pays en développement: cas du Mali (Bamako). [Epidemiology and monitoring of road injury accidents in a developing country: case of Mali (Bamako)]. Thèse 2014 [Internet]. sur: <https://tel.archives-ouvertes.fr/tel-01508527>.
- [11] Konan KJ, Assouhoun KT, Kouassi F, Ehua SF. Profil épidémiologique des traumatisés de la voie publique aux urgences du CHU de Yopougon. [Epidemiological profile of road trauma victims in the emergency department of Yopougon University Hospital] *Rev Int Sc. Med.* 2006; 8 (3): 44-8.
- [12] Direction générale de la décentralisation et du développement locale. Monographie Gbéké. [General Directorate of Decentralization and Local Development. Monograph Gbéké] [Internet]. [Cité le 24/10/2021]. Disponible sur: http://www.dgddl.interieur.gouv.ci/index.php?page=mono_det ail&title=regions&id=10.
- [13] RGPH-2014 Résultats globaux. [RGPH-2014 Overall results.] [Internet]. [Cité le 24/10/2021] disponible sur: <https://www.ins.ci/documents/rgph/ivoirien18plus.pdf>.
- [14] Joseph Benie Bi Vroh., Issaka Tiembre, Kouadio Daniel Ekra, Marie-Noëlle Ano Ama, Orlando Missiemoun Ka, N'cho Simplicie Dagnan, et al. Déterminants des accidents mortels de la circulation routière en Côte d'Ivoire de 2002 à 2011. [Determinants of fatal road traffic accidents in Ivory Coast from 2002 to 2011] *Santé Publique.* 2016; 5 (28): 647-53.
- [15] Moshiro C, Heuch I, Astrom AN, et al. Injury morbidity in an urban and a rural area in Tanzania: an epidemiological survey. *BMC Public Health.* 2005; 5: 11 doi: 10.1186/1471-2458-5-11.
- [16] Labinjo M, Juillard C, Kobusingye OC, Hyder AA. The burden of road traffic injuries in Nigeria: results of a population-based survey. *Injury Prevention.* 2009; 15: 157-62.
- [17] Kobusingye O, Guwatudde D, Lett R. Injury patterns in rural and urban Uganda. *Inj Prev* 2001; 7: 46-5.
- [18] Kandolo SI, Matungulu CM, Mukanya PK et al. Facteurs associés aux accidents de la route dans la ville de Lubumbashi. [Factors associated with road accidents in the city of Lubumbashi] *Santé publique.* 2014; 25: 889-97.
- [19] Tiwari RR, Ganveer. A study on human risk factors in non-fatal road traffic accidents at Nagpur. *Indian J Public Health.* 2008; 52 (4): 197-9.
- [20] Coulibaly Y, MP E, Diallo A et al. Le Traumatisme crânien à L'hôpital du Point G: À propos de 80 cas. [Head trauma at the Point G hospital: About 80 cases.] *Mali Méd.* 2004; 19: 3-4.
- [21] Wu X, Hu J, Zhuo L et al. Epidemiology of traumatic brain injury in eastern China, 2004: a prospective large case study. *J Trauma.* 2008; 64 (5): 1313-9.
- [22] Privat JM, Marty Double C Privat JM, Double CM, Frerebeau P, Aiguesvives. Etude anatomo-clinique du syndrome du traumatisme crânien grave. [Anatomo-clinical study of severe head trauma syndrome]. *Rev Electroenceph Neurophysiol Clin.* 1979; 9: 109-15.
- [23] Rougier A, Bonnaud E, Castel JP, Richer E, Vital C, Cohadon F. Contrôle anatomique de 30 cas de comas traumatiques graves d'embée. [Anatomical control of 30 cases of severe traumatic comas from the outset] *Rev Electroencephalogr Neurophysiol Clin* 1979; 9: 101-8.
- [24] Krah KL., Yao LB., Sery BJLN., M'bra KI., Benié AC., Kouassi KJE. et coll. Données épidémiologiques des accidents de moto aux Urgences chirurgicales du CHU de Bouaké. [Epidemiological data of motorcycle accidents in the Surgical Emergencies of the Bouaké University Hospital] *Rev Int Sc. Méd.* 2013; 15 (3): 161-2.
- [25] Kassi-Djodjo I. Les taxis-motos: un transport de crise dans la ville de Bouaké (Côte d'Ivoire). [Motorcycle taxis: crisis transport in the city of Bouaké (Ivory Coast).] *Géotransports, Transport et développement des territoires.* 2013; (1-2): 105-14.
- [26] Almeimoune A, Mangane M.I., Diop T., Beye S., Dembele A., Koita S. Aspects épidémiologiques, cliniques des traumatismes liés aux accidents de la circulation routière (ACR) impliquant les motos à Bamako. [Epidemiological and clinical aspects of trauma related to road traffic accidents (ACR) involving motorcycles in Bamako] *Ramur.* 2017; 22 (1): 64-7.
- [27] Traore Baba. Etude épidémiologique-clinique des traumatismes liés aux accidents de la circulation routière pris en charge dans le CS Réf de Niono. [Epidemiological-clinical study of trauma related to road traffic accidents treated in the CS Ref of Niono] [Internet] [Thèse de médecine]. [Bamako]: FMOS; 2019 [cité 05 Novembre 2021]. Disponible sur: <https://www.bibliosante.ml/bitstream/handle/123456789/3714/19M385.pdf?sequence=1&isAllowed=y>.
- [28] Traore S. Etude épidémiologique-clinique des traumatismes des accidents de la circulation routière dans le centre de santé de référence de Kolokani à propos de 146 cas. [Epidemiological-clinical study of road traffic accident trauma in the Kolokani reference health center about 146 cases] [Internet] [Thèse de médecine]. [Bamako]: FMOS; 2010 [cité 06 Novembre 2021]. Disponible sur: <http://www.kenya.net/fmpos/theses/2008/med/pdf/10M207.pdf>.
- [29] Diarra I. Etude épidémiologique-clinique des traumatismes liés aux accidents de la circulation routière dans le centre de santé de référence de Niono. [Epidemiological-clinical study of trauma related to road traffic accidents in the reference health center of Niono.] [internet] [Thèse de médecine]. [Bamako]: FMOS; 2010 [cité 06 Novembre 2021]. Disponible sur: <http://www.kenya.net/fmpos/theses/2012/med/pdf/12M42.pdf>.