Victims profile in function of motorcycle engine potency and assisted by the Fire Department of Uberlândia, Brazil

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Abstract

Introduction: *Traffic accidents are a global issue, especially in emerging countries, resulting in a high number of deaths and significant social and economic expenditures with victims. Motorcycle accidents stand out mainly by its greater vulnerability, and studies relating bike engine potency and accidents are still rare.* ***Objective:*** *To trace the profile of victims involved in motorcycle accidents as a function of motorcycle power that were assisted by the Fire Department in Uberlândia, Brazil.* ***Methodology:*** *A transversal, retrospective, analytic and quantitative study, based on a public database. Twelve thousand nine hundred Occurrence Reports were retrospectively analyzed between 2015 and 2018 in the Integrated System of Social Defense from the Military Fire Department of Minas Gerais state database. Variables that allowed accident characterization were collected (such as motorcycle conductor or passenger and from the accident itself) and were compared in function of the motorcycle power or engine potency (less than 250 CC as low and more than 250 CC as high).* ***Results:*** *There was a lack of information in reports about the accident and even greater lack about the injured person, ranging from 0% to 52%. The predominance of accidents was with motorcycles below 250 CC. The values of severity and clinical data scores were not different between engine potency categories, except for the heart frequency of the injured, with a median of 82 and 80 beats for high and low engine potency, respectively. A greater frequency of accidents involving men, single, with higher education conducting motorcycles over 250 CC, involved in falls, with occurrence between 18:01 and 24:00 hours was noted. However, accidents occurred mostly with small-sized vehicles and motorcycles and did not differ between days of the week. Accidents showed a spatial pattern where most accidents occurred downtown and, consequently, in more commercial regions, with no major differences in engine potency.* ***Conclusion:*** *Even though accident severity did not differ between engine potency categories, the profile of participants showed some differences. This information, along with more complete and broader data in the reports, can offer subsides for more assertive public policy implementation to mitigate traffic accidents.*

Keywords: Traffic accident, motorcycle, motor power, engine size, engine potency, pre-hospital care.

1. Introduction

Traffic accidents represent a global problem, and traffic deaths due to motorcycle accidents is a growing concern for public health services in many countries (Sadeghi-Bazargani et al., 2018). Thus, there is a need for effective intervention programs to reduce the burden of deaths caused by motorcycle accidents (Sadeghi-Bazargani et al., 2018). Mortality due to motorcycle accidents increased generally and in all age brackets in the last years; moreover, the number of motorcycle fatal accidents keeps rising, suggesting that the risk for the motorcyclist was not treated properly in the last two decades (Chaudhuri et al., 2019).

Motorcycle accidents involve predominantly small engine potency motorcycles, below 125-150 CC (Zabeu et al., 2013; Fernandes et al., 2019). Studies about victim profile differences among engine potency class are absent or rare, to our knowledge in Brazil, and, at least, the use of protection equipment does not seem to be related to engine potency (Santos et al., 2016). Motorcycle popularization and affordability has increased in the last years, and acquisition focus and use purposes of small or big engine potency differs

both in user profile and in marketing (Marim, 2010). It is believed and demonstrated that motorcycles with bigger engine potency can present differences in accident profile compared to small engine potency (Langley et al., 2000; Waseem et al., 2019; Hidalgo-Fuentes & Sospedra-Baeza, 2019; Méndez-Magaña et al., 2019), which can provide subsidies for specific health policies.

Therefore, a quality information system consists in a relevant element to be considered, since it will provide essential data to subsidize research and policies in health, in addition to facilitate the development of adequate public policies and prevention and promotion tools to health, besides promoting the development of adequate public policy and health prevention and promotion tools, as well as evaluation of implemented actions (Soares et al., 2015). In this respect, initial service reports, such as the ones collected by the Fire Department or those from Urgency and Emergency Service Providers, become essential in this process comprehension. Several studies have used this data attempting to characterize this phenomenon (Pereira et al., 2017; Barbosa et al., 2014). In many Brazilian cities, the Fire Department is still responsible for the first assistance to traffic accidents and to transport patients to health units; however, many towns do not count with emergency services with a complete health team (doctors and nurses).

Traffic accidents demand a specific level of knowledge by health professionals, therefore, there are instruments to help decision-making in urgencies and emergencies, such as evaluation scales for pre-hospital or in-hospital assistance. Some of these instruments are Glasgow Coma Scale (GCS) and Reviewed Trauma Score Scale (RTSS) (da Paixão Oliveira et al., 2014). Glasgow Coma Scale (GCS) must be used in the patient's first care, and it is based on three items: eye-opening, verbal response, and motor response (da Paixão Oliveira et al., 2014). Consciousness level oscillation is one of the most relevant parameters to establish deterioration in patients with traumatic brain injury (da Paixão Oliveira et al., 2014). Also, for victim clinical evaluation, a worldwide used instrument is Reviewed Trauma Score Scale (RTSS), which is based on vital parameters, such as GCS evaluation and respiratory rate, systolic arterial pressure, to classify victim's clinical condition in relation to severity and mortality risk (Alvarez et al., 2016; Lima et al., 2021). This score is classified as physiological for considering parameters of patients' vital functions (Alvarez et al., 2016).

In this context, this study traced the profile and clinical picture of victims (motorcycle driver and ride) involved in motorcycle accidents as a function of the motorcycle engine potency, and that were assisted by the Fire Department of Uberlândia, Brazil.

2. Methodology

This was a transversal, retrospective, descriptive, analytic, and quantitative study. All data were obtained from the Occurrence Report (OR) of each traffic accident filed by the firefighters of the 5th Fire Department Battalion from Minas Gerais, located in Uberlândia, Minas Gerais State, Brazil. Uberlândia is a medium-sized city located in the Southeast of the country, with 4,115 km^2 area, with 700 thousand inhabitants (estimated in 2020). It is the most populous city of Triângulo Mineiro region and the second of the State; it is among the most populous cities after the State capitals of Brazil. Moreover, it had a fleet of 90,849 and 101,971 motorcycles, and 18,980 and 20,706 scooters in 2015 and 2020, respectively (Ministério da Infraestrutura 2020). Those numbers corresponded to about 150 vehicles per 1,000

inhabitants in 2020.

The study evaluated traffic accidents Occurrence Reports (OR) involving motorcycles. It also evaluated the profile of the injured (that is, the driver or the ride). Data collection was indirect, consulting the "Social Defense Integrated System" electronic database, from the Military Fire Department from Minas Gerais (MFD-MG), where OR are filed. The Battalion sent an electronic spreadsheet with previously requested data. This study was not submitted to the Research Ethics Committee since the database used is from public domain. No physical or electronic OR was accessed by the authors; all data was requested to the MFD-MG, via official letter, and the corporation accessed the system, collected the requested data, and shared it in electronic spreadsheets, with no information that could identify those involved in the traffic accidents. Occurrence Reports were analyzed retrospectively, from 1st January 2015 to 30th September 2018, totalizing 12,900 OR. Since some of the qualitative variables with multiple levels presented only a few cases (that is, small representativity), those variables were recategorized, as described in this study.

All OR in the spreadsheet were included. The following variables were collected from all accidents: date, day of the week, if weekday or weekend, neighborhood, time of the accident (classified in the intervals: 00h00 to 05h59; 06h00 to 11h59; 12h00 to 17h59 and 18h00 to 23h59), and to which health service the victim was sent (classified as secondary assistance – IAU [Integrated Assistance Unit] or tertiary – General Clinics Hospital from Uberlândia [GCHU]), time until accident assistance, type of collision, and engine potency or motorcycle model specification. Subsequently, for all models, engine potency was obtained, followed by motor classification (that is, motorcycles with less than 250 CC [low potency] and 250 CC or more [high potency]). Some outcomes were compared in function of this variable.

The variables related to the accident victim were marital status (classified as single or married); schooling level (elementary school complete or incomplete, high school or bachelors' degree complete or incomplete); gender (feminine or masculine); age (years); injury level, Glasgow Coma Scale (GCS) and Reviewed Trauma Score Scale (RTSS) (Baxt et. al., 1989; Champion et al., 1989), arterial pulse, oxygen saturation, respiratory rate, arterial pressure. Also, it was investigated if the patient died in situ. The variable GCS was regrouped into the categories GCS from 3 to 8, GCS from 9 to 12, and GCS from 13 to 15, and RTSS was regrouped into two categories: RTSS from 0 to 6, and RTSS from 7 to 12. All 12,900 OR were confirmed for the presence of these clinical and variables.

Data collected were reorganized in an electronic spreadsheet (Microsoft Office Excel for Windows®) and exported to IBM Statistical Package for the Social Sciences (SPSS) software version 20.0, for Windows®, to data analysis. Initially, the percentage or relative frequency of OR with lack of information was calculated for all variables studied. For all analyses, engine potency group was considered as treatment and each accident as a repetition, and significance level of 0.05 was adopted. For statistical treatment, all continuous data, separated by group, were analyzed by Kolmogorov Smirnov Lilliefors' normality test. No variable followed a normal distribution ($p < 0.001$). Qualitative data were compared using the Chi-Square independence test. Mann-Whitney test was applied to non-paired quantitative data for comparisons.

Whenever the neighborhood of accident was informed, the relative frequency of accidents was calculated, and this parameter was used to evaluate the spatial distribution of accidents in Uberlândia urban area. In this analysis, data were not separated by engine potency since they showed the same distribution pattern in the previous analyses. The package geoR was used for geostatistics analysis (Ribeiro & Diggle,

2001). Adjustment of the semi-variance model was obtained by an exponential model with a robust estimator ("modulus") and the minimum distance of 15,000 was adopted and executed in R package (R Core Team, 2020).

3. Results

It is important to highlight that there is a lack of important information in the Occurrence Report (Table 1). This lack of information is concentrated in the variables regarding the immediate assistance to the victim. Important information such as consciousness level, severity state of victim and health unit destination are not informed in several OR. Lack of information in decreasing order was motorcycle engine potency (55.02% of cases), systolic and diastolic arterial pressure (41.1%), respiratory rate and oxygen saturation (39.16% and 34.1%, respectively). Records of GCS and RTSS scores were absent in 25.9% and 25.91% respectively. There is also an absence of information regarding conductor age (0.68%). The only variable present in 100% of OR is the injury level. Engine potency was the variable with most absence information (55.02%), which could jeopardize profile evaluation and characterization in function of engine potency. Most motorcycles are less than 250 CC (prevailing those bellow 150 CC) (Figure 1). The low representativity of some engine potencies in the total sample did not allow stratification of victim profile in accidents involving motorcycles above 250 CC. Analysis of these subgroups showed practically the same profile among categories 250 to 300 CC and over 300 CC (results not shown). Based on previous analyses, the groups were stablished as described in Methods (Tables 1 and 2).

Some variables were distinct between the two engine potency groups (low: less than 250 and high: 250 CC or more) (Tables 2 and 3). Majority of men use high engine potency (82.13% versus 73.40%), most are single in low engine potency (58.98% versus 52.94%), have complete bachelor's degree or are studying (23% versus 14.28%), accidents prevalence was between 18:01 and 24:00 hours (34.44% versus 28.13%), and the nature of the accident with greater prevalence of falls and smaller prevalence of small vehicles (Table 2). Regarding the victims' variables, only the median pulse was different between the two engine potency groups (82 bpm versus 80 bpm, high and low, respectively) (Table 3). Most of the victims are men, with high school educational level, involved in a small vehicle collision throughout the day (Table 3). It is important to highlight that in database there were records elevated and non-physiological values, such as a respiratory rate of 171 breaths per minute, even though we were not able to validate such values. These errors can implicate in biased analysis and decision making, even though they occurred in a small frequency.

Results show small severity differences between accidents in function of engine potency categories (Tables 2, 3 and 4). Comparisons between engine potency categories and GCE, showed no dependency between them ($X^2 = 0.80$, $p = 0.671$), as well as for RTSS ($X^2 = 0.23$, $p = 0.629$) and for injury level ($X^2 = 1.08$, $p = 0.781$). It was difficult to evaluate injury level and death in the accident local, since information was contradictory in some OR, mostly in the fatal item, which can include death in situ, on the way to a health unit or in the health unit itself. Thus, it was not possible to detail this item.

Accident frequency, in percentage, as a function of time and engine potency emphasizes their frequency in rush time, especially at 19:00. It is also evident that accident frequency in relation to the engine potency dichotomy is proportional; accidents with high potency motorcycles are greater than low

potency ones only in the beginning of the night (from 19:00 to 24:00 hours). Therefore, there is no divergency between the time of occurrence with the two size groups. This observation demonstrates that motorcycles are used to go to work and, in this occasion, tend to get involved in accidents (Figure 2).

Spatial distribution of accidents in Uberlândia revealed more accidents in central areas (hot spots), while suburbs have lower prevalence (cold spots). Since there is a greater concentration of business downtown, such as stores, banks, public agencies etc., and people are usually hired to use their motorcycle for delivery, there is also more traffic, eventually, people get involved in traffic accidents. The spatial distribution of accidents was similar between the two engine potency categories, so it was chosen to show only the overall distribution, regardless of specific engine potency (Figure 3). The model adjusted to semi-variance was the exponential model with the following parameters: nugget effect equal zero, range equal to 1078.9985, practical range of 3232.391, and constant of 1.0205.

Table 1. Lack of information (relative frequency [%]) from motorcycle accident Occurrence Report assisted by the Fire Department of Uberlândia, Brazil (number of Occurrence Report = 12,900). Variables ordered by frequency.

	Absences	
Variable	N	%
If has spouse	0	0.00
Schooling level	0	0.00
Injury level	0	0.00
Accident's nature	0	0.00
Time	0	0.00
Date	0	0.00
Weekday	0	0.00
Gender	6	0.05
Age	88	0.68
Neighborhood	2,863	22.19
Glasgow Coma Scale	3,341	25.90
Reviewed Trauma Score Scale	3,343	25.91
Health unit destiny	3,394	26.31
Arterial pulse	4,338	33.63
Oxygen saturation	4,399	34.10
Respiratory rate	5,052	39.16
Arterial pressure	5,313	41.19
Systolic pressure	5,313	41.19
Diastolic pressure	5,313	41.19
Engine potency (CC) or model	7,098	55.02

Source: the authors.

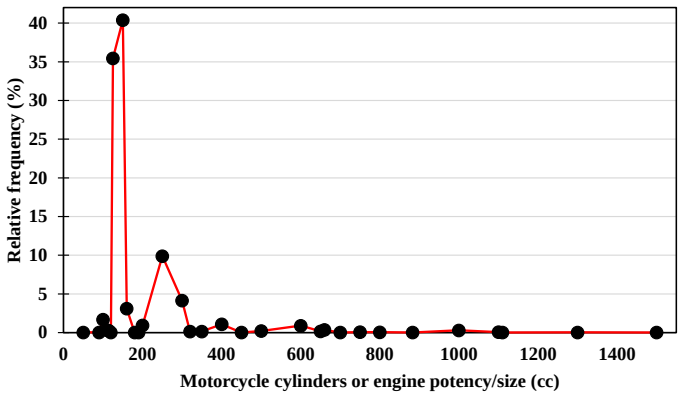
Table 2. Sociodemographic data from the victims and the accidents, collected from the Occurrence Report from motorcycles accidents, as a function of engine potency, and that were assisted by the Fire Department of Uberlândia, Minas Gerais, Brazil.

Variable	Level	Engine Potency (CC) (% (n))		X^2 (p)
		< 250	≥ 250	
Gender	Feminine	26.60 (1,270)	17.87 (183)	34.23 (<0.001)
	Masculine	73.40 (3,504)	82.13 (841)	
With spouse	No	52.94 (2,159)	56.98 (502)	4.75 (0.029)
	Yes	47.06 (1,919)	43.02 (379)	
Schooling level (complete or not)	Elementary	25.43 (1,412)	27.35 (239)	48.42 (<0.001)
	High School	50.29 (2,004)	49.66 (434)	
	Superior	14.28 (569)	23.00 (201)	
Nature	Animal	0.33 (16)	0.39 (4)	15.15 (0.034)
	Hit	3.58 (171)	3.90 (40)	
	Large vehicle	3.64 (174)	2.83 (29)	
	Small vehicle	63.72 (3,044)	60.00 (615)	
	Bicycle	1.57 (75)	2.63 (27)	
	Motorcycle	16.58 (792)	16.98 (174)	
	Fall	10.55 (504)	13.27 (136)	
	Kite lines	0.02 (1)	0.00 (0)	
Time	00:00 as 06:00	5.32 (254)	4.68 (48)	16.26 (0.001)
	06:01 as 12:00	29.96 (1,431)	27.51 (282)	
	12:01 as 18:00	36.59 (1,748)	33.37 (342)	
	18:01 as 24:00	28.13 (1,344)	34.44 (1,025)	

Source: the authors.

Legend: X^2: Chi-Square value based on Chi-Square test for Independence., p: probability.

Figure 1 – Relative frequency distribution of motorcycle engine potency (CC) involved in accidents in Uberlândia, Brazil. (n = 5,802 motorcycles)



Source: the authors.

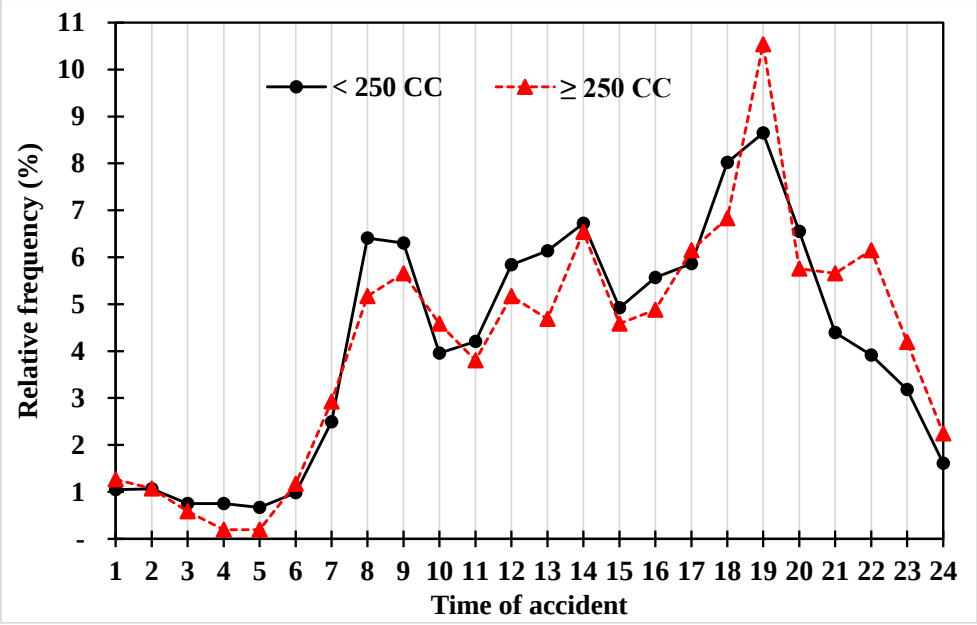
Table 3. Profile of engine potency (CC) and victims of motorcycle accidents, as a function of engine potency classification, assisted by the Fire Department of Uberlândia, Minas Gerais, Brazil.

Variable	Engine potency	Average	SE	N	Minimum	Median	Maximum	*p*
Engine Potency	< 250	138.84	0.23	4,777	50	150	200	<0.001
	≥ 250	330.08	5.1	1,025	250	250	1,500	
	All	172.62	1.33	5,802	50	150	1,500	
GCS	All	14.64	0.02	5,075	3	15	15	0.938
Age	All	32.64	0.17	5,778	2	29	88	0.627
RTSS	All	11.85	0.02	5,074	0	12	12	0.959
Pulse	< 250	83.22	0.21	3,754	10	80	153	0.021
	≥ 250	84.45	0.46	768	13	82	150	
	All	83.43	0.19	4,522	10	80	153	
SO_2	All	97.11	0.05	4,489	4	98	99	0.987
SAP	All	124.27	0.15	3,999	11	120	200	0.831
DAP	All	80.71	0.13	3,999	36	80	130	0.150
RR	All	18.34	0.11	4,109	4	18	171	0.949

Source: the authors

Legend: *p*: probability based in the Mann-Whitney test; SE: standard error, GCS: Glasgow Coma Scale; RTSS: Reviewed Trauma Score Scale; SO_2: oxygen saturation; SAP: systolic arterial pressure; DAP: diastolic arterial pressure; RR: respiratory rate.

Figure 2. Relative frequency (%) of motorcycle accidents assisted by the Fire Department as function of engine potency (CC) and time of accident in Uberlândia, Brazil.



Source: the authors.

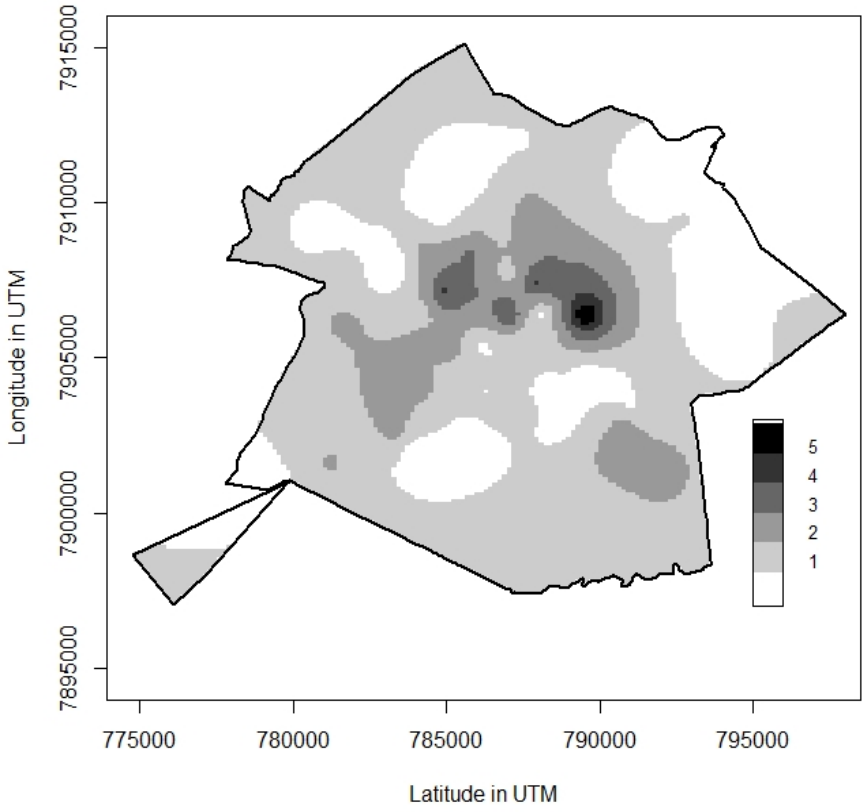
Table 4. Profile of the victims and motorcycle accidents, regardless of engine potency (CC), assisted by the Fire Department from Uberlândia, Minas Gerais, Brazil.

Variable	Level	% (n)	Statistics (p)
Weekday	Sunday	11.63 (675)	$X^2 = 6.64$ (0.355)
	Monday	13.86 (804)	
	Tuesday	14.39 (835)	
	Wednesday	15.37 (892)	
	Thursday	15.05 (873)	
	Friday	15.86 (920)	
	Saturday	13.84 (803)	
Weekday	Weekday	74.50 (4,324)	$X^2 = 1.20$ (0.272)
	Weekend	25.47 (1,478)	
Health assistance destination	IAU	84.34 (4,259)	$X^2 = 0.71$ (0.400)
	Hospital	15.66 (791)	
Death in situ	No	99.74 (5,787)	$X^2 = 0.84$ (0.360)
	Yes	0.26 (15)	
GCS	3 to 8 points	2.09 (106)	$X^2 = 0.80$ (0.671)
	9 to 12 points	1.67 (85)	
	13 to 15 points	96.24 (4,884)	
RTSS	0 to 6 points	1.56 (79)	$X^2 = 0.23$ (0.629)
	7 to 12 points	98.44 (4,995)	
Injury level	With no apparent injury	4.03 (234)	$X^2 = 1.08$ (0.781)
	Light injury	82.71 (4,799)	
	Grave or unconscious	12.75 (740)	
	Fatal	0.50 (29)	

Source: the authors

Legend: X^2: Chi-Square values based on Chi-Square test for independence; p: probability; IAU: Integrated Assistance Unit; GCS: Glasgow Coma Scale; RTSS: Reviewed Trauma Score Scale.

Figure 3. Spatial distribution of relative frequency (%) of motorcycle accidents assisted by the Fire Department of Uberlândia, Minas Gerais State, Brazil.



Source: the authors.

4. Discussion

This study described the profile and clinical characteristics of victims involved in motorcycle accidents, as a function of motorcycle engine potency, and that were assisted by the Fire Department of Uberlândia, Brazil. Incomplete filling of OR resulted in an elevated lack of information which impaired proper tracing of clinical history of the victims and the accident per se. Thus, a public record of traumas with detailed and reliable information is extremely necessary to comprehend what is associated with motorcycle accidents and provide information to plan better prevention actions (Alghnam et al., 2019). It was also noticed the need for orientation and capacitation for the professionals involved in filling the OR, in order to provide subsides for the elaboration of prevention measures and better legal support in cases of litigation. Lack of information in patient's hospital record is also an issue (Antunes et al., 2108; de Souza et al., 2019), and capacitation actions were effective also in this manner (de Souza et al., 2019).

Most victims were male, had incomplete or complete high school; most accidents occurred between 18h00min and 23h59min. These results are in accordance with Damasceno et al. (2018) and Choi et al. (2020), who also found greater proportion of male patients, in addition to a greater proportion of people who consumed alcohol and were not wearing helmet in the moment of accident. In this context, elements with more social permissibility, aggressive behavior, excessive speed, risky maneuvers and possibly alcohol consumption among men has contributed to a greater incidence of motorcycle accidents among

men (Andrade et al., 2009). Nevertheless, gender issues need a more specific approach and research for better comprehension.

The most frequent causes of motorcycle accidents in this study are collision with small vehicles and other motorcycles. To be hit or injured by other vehicle, including other motorcycles, cars, trucks is a frequent injury mechanism (Alghnam et al., 2019). Moreover, drivers and riders more prone to injuries because the motorcycle proportions are smaller in comparison to other vehicles and there is no adequate protection for motorcycle drivers. The most frequent safety equipment worn, and perhaps the only one, is the helmet, and it is important to highlight that oftentimes it is worn only due to legal aspects, avoiding the risk of being fined.

The time bracket with more assistance corresponded to 8:00 until 20:00 (Mascarenhas et al., 2016). Accidents that occur near lunch or dinner time could be explained by a greater frequency of moto-boys working in this time of the day by apps, who, oftentimes, rush to deliver the orders, breaking the laws (like speeding) to increase their productivity (Moraes, 2008); also, in these time of the day, there is usually greater traffic due to workers going home for their mid-day meal or after the day's work. These last reasons need further and specific analyses.

In the present study, average age was 32.6, in contrast with that observed by Barbosa et al. (2014), where most victims were between 21 and 30 years old. In contrast, Damasceno et al. (2018) also found similar average age bracket (between 30 and 40 years old) and gender prevalence (masculine) to the present study. Youth mortality, because of injuries caused by motorcycles, is increasing in 12 Brazilian capitals, which represents a serious public health problem, demanding the implementation of more effective public policies (Souza et al., 2020).

Vital data showed a small variation in heart rate (bpm) between the two motorcycle engine potency groups and no differences between the other severity scores. Thus, considering OR with motorcycles, GCS average of 14.6 points (light degree) was found, and it was similar to that observed by Barbosa et al. (2014). The average RTSS of 11.8 points found in the present study agrees with Pereira et al. (2017), who conducted a study in Uberlandia and found an RTSS between 11 and 12 points in 97% cases.

Motorcycle accidents do not depend on the weekday to happen, but numerically they occur more often on weekdays than on weekends. It is suggested that the greater frequency of accidents during workdays is related to work activities that require daily transportation, which increases vehicle fleet, making the environment more prone to accident occurrence. Conversely, in another city of Minas Gerais state, there was a greater frequency of accidents on weekends (Silva et al., 2018), perhaps because that study considered only the cases that required hospitalization. The reason for riding the motorcycle in the moment of accident could collaborate in this aspect comprehension; however, that information is absent in all OR.

Despite the elevated number of accidents involving motorcycles, independently of the engine potency, there is a smaller number of deaths in situ (0.2%) compared to what Barbosa et al. (2014) observed (2.1%). That might be because the Fire Department of Uberlândia does not have the autonomy to determine death in situ, except in specific and restricted situations, since there are no doctor (physician) in their team. In contrast, assistance provided by the Emergency Mobile Assistance (known as SAMU), reported by Barbosa et al. (2014), the service, and the professionals have this autonomy since they have doctors in their team. The percentages of "death in situ" and "fatal injury" are 0.26% and 0.50%, respectively, confirming the

impossibility of having or not the autonomy to determine death in situ in some situations unless the victim had thoracic or head crushing. In all other cases, victims are transported to a hospital where a doctor will confirm death, even if there is a fatal injury statement or absence of vital signs, as observed in many OR. Also, sometimes the victim is transported to a hospital unit still in life, but does not survive, that information is not always reported back to the Fire Department, and the system is not updated to "fatal injury". Unfortunately, that jeopardizes an adequate evaluation of death risk as function of engine potency, since hospitals do not record that kind of information.

This study also observed that motorcycles above 250 CC are more common among men, single, and with more schooling education; however, accident severity was similar between both engine potency categories. In a study conducted in Pakistan (Waseem et al., 2019), motorcycles of some specific brands are more likely to be involved in accidents with small injuries and less prone to serious or fatal accidents in comparison to similar brands of distinct origin; also, there is a small proportion (8%) of local brands. Prices of foreign motorcycle brands vary from 68% to 98% more than local brands with the same nominal engine potency. This price difference can occur due to manufacture quality or simply marketing differences. Thus, even with the same nominal engine potency, there might be difficulties operating motorcycles of distinct quality (Waseem et al., 2019). Consequently, small severity of injuries of motorcycle brands of lower quality could be attributed to lower effective potency, resulting from lower manufacture quality (Waseem et al., 2019).

Glasgow Coma Scale, RTSS, and injury degree in this study were similar to those found by Pereira et al. (2017), who studied the same city, and the same emergency mobile assistance service. There was a decrease in the number of victims with severe Glasgow (from 2.50% to 2.09%) and a corresponding increase of moderate Glasgow (from 1.25 to 1.56%). RTSS scores were similar in both studies, with most of them moderate to light (7 to 12 points), coinciding with Pereira et al. (2017), as well as injuries with a predominance of light ones over severe ones (or those that cause unconsciousness).

Accidents peaked at 19:00, during evening rush hour, either returning home or going to night school (Silva et al., 2018). This is an indirect indication that motorcycles are a transportation means to go to work in capitals and large cities, and not so much in smaller towns (Ganem & Fernandes et al., 2020).

Accident distribution in the urban perimeter of Uberlândia demonstrates that motorcycle accidents occur mostly downtown, suggesting that this region has greater concentration of enterprises, stores, banks, public agencies etc. Also, it is a region where people are employed for delivery services, using motorcycles; that, added to more intense traffic, make the scenario more prone for traffic accidents. This pattern of accident incidence in central and commercial regions has been observed in several studies (Ferreira, 2016; Santos & Júnior, 2006; Melo & Mendonça, 2021).

A study that analyzed 28,356 deaths in traffic caused by motorcycles and registered by the Legal Medicine Organization from Iran showed a greater frequency of fatal accidents in the suburbs than downtown, which were due to the greater velocity achieved in the outskirts of the city (Barzegar et al., 2020). In another study, the characteristics of associated risk and severe injuries were "improper functioning of the motorcycle before the accident", "traffic infraction by drivers". In contrast, the characteristic that reduces the risk is "the motorcycle brand" (Méndez-Magaña et al., 2019). Due to constraints of the Emergency Service Provider, death rate and its spatial distribution could not be analyzed.

There were some limitations to the present investigations. The first one is that some accidents do not demand the Fire Department assistance, or the victim refuses to be assisted, so there is no record of such cases in any Occurrence Report. The second limitation is that some variables are difficult to be determined, such as the velocity of the vehicle at the moment of the accident. The main limitation is the impossibility of validation of OR, especially those that were atypical, and to link them to the hospital assistance data. That would also demand the identification of the victims in data collection. However, that would increase the possibility of making other analyses and constructing more precise relations.

5. Conclusions

There is fragility in completely filling the Occurrence Reports, even though its objective is to detail the scene and the assistance conducted. As an advantage of filling it correctly, the victim and the service itself would be legally secure, it would be easier to analyze assistance and its quality, and it would also improve the assistance and the construction of health public policies.

Also, the reports showed that motorcycles with more than 250 CC are more common among men, single, with higher schooling level, and severity of accidents was similar between both engine potency categories. Accidents were dispersed, with greater frequency downtown. Motorcycle accidents in Uberlândia, Brazil, occur due to a fragile safety traffic culture, thus, increasing the number of victims assisted by the Fire Department, emergency services, and hospitals.

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7. References

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