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Fatores associados ao óbito de motociclistas nas ocorrências de trânsito

Factors associated with the death of motorcyclists in traffic accidents*

FATORES ASSOCIADOS AO ÓBITO DE MOTOCICLISTAS
NAS OCORRÊNCIAS DE TRÂNSITO

FACTORES ASOCIADOS AL FALLECIMIENTO DE MOTOCICLISTA
EN ACCIDENTES DE TRÁNSITO

Nelson Luiz Batista de Oliveira[1], Regina Marcia Cardoso de Sousa[2]

ABSTRACT

In order to identify the factors associated with death among motorcyclists involved in traffic accidents in Maringá – PR, a retrospective study was performed, including motorcyclists involved in accidents in the year 2004. Data were collected from the Military Police records, the Integrated System for Emergency Trauma Care (Sistema Integrado de Atendimento ao Trauma em Emergência –SIATE) and the Institute of Legal Medicine. Bivariate analyses and binary logistical regression were performed. A total of 2,362 motorcyclists were identified in the Police Reports, 1,743 of whom also had records in the Emergency Responders reports. Victims who succumbed to their injuries differed from victims who survived in terms of age, place of residence, time elapsed since obtaining a driver's license, and their physiological condition at the scene of the accident. The following variables were maintained in the final model: Glasgow Coma Scale (GCS), Revised Trauma Score (RTS), pulse, and blood oxygen saturation. The physiological conditions of the victims at the scene of the accidents were highlighted in the final model, with GCS surpassing RTS in regards to association with death.

DESCRIPTORS
Accidents, traffic
Motorcycles
Mortality
External causes
Emergency nursing

RESUMO

Para identificar fatores associados ao óbito em motociclistas envolvidos em ocorrências de trânsito, em Maringá-PR, foi realizado estudo retrospectivo incluindo os motociclistas envolvidos em acidentes no ano de 2004. As fontes de dados foram os registros da Polícia Militar, do SIATE e do Instituto Médico Legal. Foram realizadas análises bivariadas e regressão logística binária. Identificaram-se 2.362 motociclistas nos Boletins de Ocorrência e, destes, 1.743 tinham registros nos Relatórios de Atendimento do Socorrista. As vítimas fatais diferiram das demais quanto à faixa etária, ao local de residência, ao tempo de habilitação e as suas condições fisiológicas na cena da ocorrência. No modelo final permaneceram as seguintes variáveis: Escala de Coma de Glasgow (ECGl), Revised Trauma Score (RTS), pulso e saturação de O2 no sangue. As condições fisiológicas das vítimas na cena do acidente se destacaram no modelo final e a ECGl superou o RTS na associação com óbito.

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DESCRITORES
Acidentes de trânsito
Motocicletas
Mortalidade
Causas externas
Enfermagem em emergência

RESUMEN

Para identificar factores asociados al fallecimiento de motociclistas involucrados en accidentes de tránsito, en Maringá-PR se realizó estudio retrospectivo incluyendo a los motociclistas involucrados en accidentes durante 2004. Datos recolectados de registros de Policía Militar, SIATE e Instituto Médico Legal. Se identificaron 2362 motociclistas en las Actas de Accidentes; de ellos, 1743 tenían registro en los Informes de Atención del Socorrista. Las víctimas fatales difirieron del resto en lo referente a faja etaria, lugar de residencia, tiempo de habilitación y condiciones fisiológicas en la escena del accidente. En el modelo final permanecen las variables: Escala de Coma de Glasgow (ECGl), Revised Trauma Score (RTS), pulso y saturación de O2 en sangre. Las condiciones fisiológicas de las víctimas en la escena del accidente se destacan en el modelo final, y la ECGl superó al RTS en la asociación con fallecimiento.

DESCRIPTORES
Accidentes de tránsito
Motocicletas
Mortalidad
Causas externas
Enfermería de urgencia

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INTRODUCTION

Having a huge economic and social impact, traffic accidents have proved a constant threat to all users of public roads, contributing significantly to high mortality and morbidity rates in young adults[1].

For victims of traffic accidents, the consequences are death, severe injury, the need for specialized pre-hospital and intra-hospital care, a prolonged recovery period, chronic complications stemming from the original injury, and emotional and financial hardship. The social losses related to these events are related to potential years of lost life, inability to work and decreased productivity due to physical and psychological limitations, and costs related to diagnosis, treatment and rehabilitation[2].

Among traffic events, it has been noted in recent decades that there has been a steady increase in the number of victims involved in motorcycle accidents. Motorcycles have been gaining in acceptance and approval due to the fact that they are fast, economical and easy to maintain[3]. It is important to highlight that, in our environment, motorcycles have acquired a very specific use as a way to deliver objects, documents and food quickly[4].

In some cities, like Maringá - PR, the use of motorcycles has further expanded to include the transportation of passengers, similar to a taxi service performed by automobiles. The number of motorcyclists who work in heavy traffic is growing and shows the magnitude of the tasks they perform in meeting contemporary social needs. The risk of a being involved in a motorcycle accident is inherent in the daily work of these individuals and enhanced by personal, social and economic interests in relation to demands for speed and urgency[4].

A study performed with motoboys in the cities of Londrina and Maringá showed through questionnaire responses that these individuals toil in poor working conditions, and that there is a high exposure to risks, including a high accident rate among these professional motorcyclists. Demand for productivity, long working hours, driving while tired, alternating work shifts and driving at high speeds on the streets were common working conditions and risk situations reported[4].

The mortality rate from motorcycle accidents is a public health problem resulting not only from the frequency of its use, but also from the vulnerability of both the driver and passenger(5-6). The performance of the nurse in the pre-hospital setting is of fundamental importance in caring for the victims of traffic accidents, assuming responsibility together with the healthcare team for the care rendered to these patients and for the immediate decision-making process based on knowledge and quick assessment.

> ...the knowledge of the characteristics of the victims related to mortality facilitates an understanding of the reality of these events and contributes to improving planning and decision-making toward preventing traffic occurrences and deaths stemming from them.

In Brazil, there are few studies that examine the factors associated with mortality exclusively related to motorcyclists. Global research[7-8] analyzes victims of motor vehicle accidents but does not focus on victims of motorcycle accidents; however, some authors acknowledge this limitation and state that motorcycle accident victims, due to the influence of specific factors such as mechanism of injury and risk of serious injuries, must be studied separately[7-8].

Regarding traffic accident events, only the intersectoral actions that address prevention, implemented in a coordinated manner, can reduce casualties and deaths caused by them[9]. Therefore, the knowledge of the characteristics of the victims related to mortality facilitates an understanding of the reality of these events and contributes to improving planning and decision-making toward preventing traffic occurrences and deaths stemming from them.

Given this perspective, the objectives of this study were to compare motorcyclists fatally injured with the ones who survived according to their general characteristics and physiological conditions at the scene of the accident and identify factors associated with death.

METHOD

This is an epidemiological, descriptive, analytical and retrospective study[10]. The sample consisted of motorcyclists involved in traffic accidents in the city of Maringá – Paraná, in the period from January 1st to December 31st, 2004. All drivers identified on the Traffic Accident Events Reports (*Boletins de Ocorrência de Acidente de Trânsito*-BOAT) of the Rescue Care Emergency Reports (*Relatórios de Atendimento do Socorrista* - RAS) from the Integrated System of Emergency and Trauma Care (*Sistema Integrado de Atendimento ao Trauma e Emergência*-SIATE) were analyzed. For more complete information about the deceased victims, records from the Legal Medical Institute (IML) were obtained and used.

To collect data for each victim, we created a separate instrument that included all variables of interest to the study. During data collection, all records of traffic accidents occurring in 2004 and filed with the 4th Military Police Battalion (BOAT), the 5th Fireman Group - SIATE (RAS) and IML were consulted and reviewed. A review of IML's records was extended until June 2005, 180 days after the last records on BOAT and RAS were obtained. This approach was adopted in order to identify all deaths resulting from motorcycle accidents in 2004, even when death was a late consequence of the event.

The records for the year 2004 were consulted every month. When the record indicated that a motorcycle ac-

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cident had occurred, the information included therein was then transferred to the specific data collection instrument.

For entry into the logistic model the independent variables analyzed were: a) related to the general characteristics of the motorcyclists: sex, age range, position on the vehicle (driver or passenger), the age of vehicle involved, the residence of those involved (Maringá or other cities), how long since the drivers had obtained their driver's license; and b) related to the physiological conditions of the victims at the site of the traffic occurrence: Revised Trauma Score (RTS), respiratory rate, systolic blood pressure, total score on the Glasgow Coma Scale (GCS, which includes eye opening, best verbal response, best motor response), pulse and O_2 saturation.

In this research, and in all analyses, we took into account the total number of fatalities (n= 29).

Upon completion of data collection the data were stored in a computerized database, which was built in Excel®. When any inconsistency between data sources, RAS and BOAT came up, the data from BOAT was adopted as reference because this represented the official source of registration of fatal and non-fatal traffic accidents due to their legal nature, and also because it presented detailed information as to the circumstances of the occurrence of the accident, including any witnesses.

To compare groups of individuals who were killed with those who survived we used bivariate analysis and the Chi-square test. Fisher's Exact test was used in cases where more than 20% of the expected frequency of contingency tables were less than or equal to five.

To identify factors associated with death, we used multivariate analysis (binary logistic regression). At this stage, the logistic regression model was adjusted for each of the independent variables, and these variables were analyzed before the occurrence of death. We selected for entry into the logistic model those variables that achieved a value of $p \leq 0.20$ in the bivariate analysis.

In constructing the model, the RTS was tested according to two different classifications. The victims with an RTS =12 were tested before those that presented an RTS < 12; we also analyzed victims with an RTS >10 before those with an RTS $\leq$ 10. GCS was analyzed according to three different classifications: GCS = 15 before GCS < 15; GCS > 8 before $\leq$ 8 and GCS > 12 before GCS $\leq$ 12. These classifications were based on the indications in the literature in relation to the use of these indexes[11-12].

Variables that destabilized the model and/or variables for which the Chi-square Test was not significant (i.e. were not associated with the response variable) were removed from the model. The selected variables are presented as a table with the respective odds ratios and a confidence interval of 95%. The model's adequacy was assessed by the Hosmer-Lemeshow Test.

For the analysis and interpretation of results we used Statistical Program 7.1 ® and the Statistical Analysis System (SAS - 9.1)®. In all analyses, we established a significance level of 5%.

To use data sources, we first obtained the authorization of the 4th Military Police Battalion, SIATE, and IML. Once all permissions were granted by the respective institutions, the study proposal was submitted to the Standing Committee on Ethics in Research Involving Human Subjects of the State University of Maringá (COPEP - EMU) and was subsequently approved under Opinion Nº. 354/2005.

RESULTS

During the study period we identified, through the BOAT records, a total of 1951 accidents, which involved 2362 motorcyclists. Of the total number of motorcyclists, 1863 (78.88%) suffered injuries according to BOAT and 1743 (93.56%) of the wounded had records on RAS.

The proportion of men relative to women was 4.2:1. As for age, it was observed that 71.76% of the motorcyclists were between 20 and 39 years of age. The mean age was 27.94 years, with a standard deviation of 9.76. The residence of 81.46% of the motorcyclists was listed as the city of Maringá.

The drivers were 6.62 times more numerous than passenger motorcyclists. Of the total number of females involved in motorcycle accidents, more than half (56.24%) were motorcycle drivers. Of the 2052 drivers, 88.75% had a license to drive the vehicle. The average time they were qualified as drivers was 6.78 years, with a standard deviation of 7.36, and only 5.46% had been licensed for less than one year.

BOAT records indicated that 84.58% of the motorcyclists were wearing a helmet at the time of the accident; 0.55% did not wear this protective equipment. However, in 14.87% cases there was no record of this information and, as a result, this variable was not included in the association analyses.

Most of the motorcycles involved in these incidents had five years of use (56.65%), but the average age of the motorcycles was approximately six years, with a standard deviation of 5.96 years.

Of the wounded who had records both at BOAT of the Military Police and at the RAS of SIATE, the vast majority (94.78%) had an RTS =12, with only 2.46% having a score of $\leq$10. The average RTS at the scene of the occurrence was 11.83, with a standard deviation = 1.07. The GCS parameter is part of the RTS and presented the highest change in frequency; even so, 93.05% of the motorcyclists obtained a maximum GCS scores of 15, while a small number (2.43%) presented scores $\leq$8. The average GCS score at the site of the occurrence was 14.65, with a standard deviation = 1.76. Using this scale, the verbal response

parameter presented the highest change in frequency (6.59% of the cases).

Of all physiological parameters analyzed in this study, the highest frequency of alteration was observed in relation to pulse and oxygen saturation of the blood (23% and 12.16%, respectively).

Data in Table 1 show the results related to the time interval between the occurrence of the accident and death of the victim. From the data, one can conclude that the majority of deaths (68.96%) occurred during the first 24 hours of the event.

Table 1 - Distribution of fatalities according to the time interval between the occurrence and death - Maringá, 2004

Interval	Nº	%
At the site	11	37.93
< 24 hours	9	31.03
1 to 7 days	5	17.24
8 to 29 days	3	10.35
1 to 5 months	1	3.45
Total	29	100.00

Source: Records from the Forensic Medical Institute Note: (n= 29)

Table 2 - Distribution of motorcyclists involved in traffic accidents, number of deaths and survivor p values according to sex, age and position on the motorcycle - Maringá, 2004

Variables	Categories	Motorcyclists				p
		Deaths		Survivals		
		Nº	%	Nº	%	
Sex (n=2302)*	Male	26	89.65	1835	80.73	0.3401
	Female	3	10.35	438	19.27	
Age group (n=2302)*	2 to 9 years	-	-	13	0.57	
	10 to 19 years	6	20.68	300	13.19	
	20 to 29 years	10	34.48	1206	53.05	
	30 to 39 years	5	17.25	474	20.86	**0.0031**
	40 to 49 years	3	10.35	183	8.06	
	50 to 59 years	3	10.35	79	3.48	
	60 to 69 years	2	6.89	18	0.79	
Position on motorcycle(n=2362)	Driver	25	86.21	2027	86.88	0.7862
	Passenger	4	13.79	306	13.12	

Source: BOAT of the Military Police * The difference between the total number and the number observed represents non-informed data. Note: (n= 2362)

The results presented in Table 2 show that there was a statistically significant relationship with respect to age range. In the death group, there was a higher percentage of individuals aged between ten and nineteen years and older than 40 years, compared with survivors. Of those aged between ten and nineteen years, 217 (70.92%) were motorcycle drivers and 89 (29.08%) were passengers. The variables sex and position on the motorcycle were not related to the occurrence of death.

Table 3 - Distribution of motorcyclists involved in traffic accidents, deaths and survivors and p values, according to length of time licensed, age of the motorcycle and residence of victims - Maringá, 2004

Variations	Categories	Motorcyclists				p
		Dead		Survivors		
		Nº	%	Nº	%	
Length of Time Having a Driver's License (n=1883)*	Not licensed	-	-	68	3.65	
	License expired	2	10.53	-	-	
	Less than 1 year	2	10.53	110	5.91	**0.0000**
	Between 1 and 10 years	8	42.10	1314	70.49	
	More than 10 years	7	36.84	372	19.95	
Age of motorcycle (n=2251) *	up to 5 years old	14	60.87	1324	59.42	
	up to 10 years old	5	21.74	533	23.93	1.0000
	More than 10 years old	4	17.39	371	16.65	
Residence of victims involved (n=2296) *	Maringá	17	58.63	1907	84.11	**0.0010**
	Other cities	12	41.37	360	15.89	

Source: BOAT of the Military Police. * The difference between the total number and the observed number represents non- informed data. Regarding the variable length of time having a driver's license, 310 passengers were excluded   NOTE: (n=2362)

In Table 3 it can be seen that there was a statistically significant association between the motorcyclists killed and the variables of interest, including length of time having a driver's license and place of residence of those involved. A higher number of deaths were observed among those who were not licensed or had let their license expire, as well as among those who had had a license for less than one year or more than ten years. Residents of other counties represented more than 40% of the dead and less than 16% of the living.

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Table 4 - Distribution of motorcyclists involved in traffic accidents, deaths, survivors, and *p* values, according to physiological variables at the scene of occurrences - Maringá, 2004

Variations	Categories	Motorcyclists				p
		Dead		Survivors		
		N°	%	N°	%	
GCS (n=1743)	> 8	6	20.69	1695	98.89	**< 0.0001**
	≤ 8	23	79.31	19	1.11	
Eye opening (n=1743)	Unchanged	4	13.79	1675	97.72	**< 0.0001**
	Changed	25	86.21	39	2.28	
Verbal response (n=1743)	Unchanged	1	3.45	1627	94.92	**< 0.0001**
	Changed	28	96.55	87	5.08	
Motor response (n=1743)	Unchanged	2	6.90	1686	98.36	**< 0.0001**
	Changed	27	93.10	28	1.64	
RTS (n=1743)	= 12	4	13.79	1648	96.15	**< 0.0001**
	< 12	25	86.21	66	3.85	
Respiratory frequency (n=1743)	0 = ausente	11	37.93	-	-	**< 0.0001**
	1 = 1 to 5 mrm	-	-	-	-	
	2 = 6 to 9 mrm	-	-	-	-	
	3 = >29 mrm	3	10.35	37	2.15	
	4 = 10 to 29 mrm	15	51.72	1677	97.85	
Systolic blood pressure (n=1743)	0 = ausente	11	37.93	-	-	**< 0.0001**
	1 = 1 to 49 mmHg	-	-	-	-	
	2 = 50 to 75 mmHg	-	-	2	0.12	
	3 = 76 to 89 mmHg	-	-	3	0.18	
	4 = >89 mmHg	18	62.07	1709	99.70	
GCS (n=1743)	0 = 3	18	62.06	11	0.65	**< 0.0001**
	1 = 4 to 5	4	13.79	1	0.05	
	2 = 6 to 8	1	3.45	7	0.40	
	3 = 9 to 12	3	10.35	11	0.65	
	4 = 13 to 15	3	10.35	1684	98.25	
Pulse (n=1743)	Unchanged	11	37,93	1331	77.66	**< 0.0001**
	Changed	18	62,07	383	22.34	
Oxygen saturation (n=1741)*	Unchanged	11	37,93	1518	88.66	**< 0.0001**
	Changed	18	62,07	194	11.34	

Source: RAS - SIATE *The difference between the total number and the number observed represents non-informed data. GCS= Glasgow's Coma Scale; RTS= Revised Trauma Score Note: (n=1743)

The results presented in Table 4 show a statistically significant association between death and the physiological variables analyzed.

A higher proportion of low scores or altered parameters were observed in the group who succumbed to their injuries, compared to the scores of survivors.

Table 5 - Logistic regression multivariate of risk factors for death resulting from trauma suffered by motorcyclists involved in traffic accidents - Maringá - PR, 2004

Variable	Category	OR$_{adjusted}$	IC 95% OR$_{adjusted}$	p
GCS	≤ 8	21.52	[4.33 – 106.93]	**0.0002**
	> 8	1.00	-	
RTS	< 12	14.73	[2.58 – 84.03]	**0.0025**
	= 12	1.00	-	
Pulse	Changed	4.31	[1.47 – 12.60]	**0.0076**
	Unchanged	1.00	-	
Oxygen saturation	< 95%	3.37	[1.13 – 10.01]	**0.0287**
	≥ 95%	1.00	-	

Hosmer-Lemeshow's Test for adequacy of the model: p= 0.5773   GCS= Glasgow's Coma Scale; RTS= Revised Trauma Score; OR= Odds ratio; IC= Confidence Interval Note: (n=1743)

Table 5 shows the results of the multivariate analysis model, in relation to the dependent variable death. All motorcycle victims recorded in the BOAT and RAS data sources were part of this analysis.

The final model included the variables GCS, RTS, pulse and oxygen saturation as factors associated with death in motorcyclists involved in traffic accidents.

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This analysis showed that the risk factors for death were scores ≤ 8 points in GCS and < 12 in RTS, changes in pulse and blood oxygen saturation $<95\%$. Victims who had scores ≤ 8 points in GCS at the scene of occurrence were 21.52 times more likely to die than those whose scores were >8. Those that presented an RTS <12 were 14.73 times more likely to die, compared with those with a maximum physiological score (RTS = 12). The victims with alterations in pulse were 4.31 times more likely to die in comparison with those whose pulses were normal, and those with an oxygen saturation $< 95\%$ were 3.37 times more likely to die when compared with victims with a saturation $\geq 95\%$.

In this model, the analysis of RTS with values >10 and ≤ 10 showed no statistical significance. Regarding the GCS there was loss in the adjustment in the model when tested values were < 15 and $= 15$, as well as in the categorization ≤ 12 and >12.

The Hosmer-Lemeshow Test for model adequacy indicated a statistically significant association.

DISCUSSION

Traffic accidents involving motorcyclists increase proportionally with increasing age of these vehicles. With the growing number of motorcycles in Brazil, the drivers of motorcycles have been assuming first place among the victims of traffic accidents involving motor vehicles[13].

Currently, the motorcycle is a profitable option for the worker and is becoming less of a recreational vehicle. It has become a working tool for commuting in the cities due to its agility, reduced cost of maintenance, ease of parking and ability to move easily in congested traffic[14].

In Maringá, as well as in other Brazilian cities, the widespread use of motorcycles as a means of work and transportation has been observed. The flat topography and predominantly sunny days with temperatures above 20º Celsius contribute to the increase in use of this type of vehicle. In 2004, in the city of Maringá, there was a ratio of 916.9 motorcycles per 10,000 inhabitants[15]. At the present time, the number of motorcycles in the city is 54,650 vehicles[14].

The morbidity and mortality from traffic accidents are extremely high worldwide, but the proportion of deaths and injuries from motorcycle accidents is particularly high, often as a result of the greater exposure of its users, disregard for traffic laws, adoption of risky behaviors and the lack of skills and ability to perceive danger and resolve problems, in addition to the attraction of motorcyclists to risk and their excessive self-confidence[16].

The act of breaking the law, taking risks and overcoming challenges in a constant effort to live dangerously is worshiped as a heroic act, so that the scars from accidents become signs that support these values. Motorcyclists show the scars of accidents with visible satisfaction and vanity. There is a strong symbolic relationship between the motorcycle and frequent traffic violations. For these individuals, the motorcycle is synonymous with freedom, excitement, adventure and challenge[17].

In this study, among the 29 motorcyclists who died as a result of traffic accidents, 11 were pronounced dead at the scene of the accident; 18 died in the hospital. Most deaths (68.96%) occurred within the first 24 hours after the accident. Other authors[18] identified that 85% of trauma deaths occurred at the scene of the accident or within the first hours after the event.

In the analyses of the associations performed, age was associated with death. Individuals aged between ten and nineteen years and older than 40 years were proportionately more frequent among the dead when compared with survivors (20.86% versus 13.19% in the age group 10-19; 10.35% and 6.89% versus 8.06%, 3.48% and 0.79%, respectively, in individuals aged 40 years and older).

Researchers have linked youth populations with severe consequences of traffic accidents. They indicate the use of alcohol and drugs, speeding, risky behavior and disobeying traffic laws as acts more common in young people in general[12].

However, the results of the current study also show that motorcyclists over 40 years of age are proportionally more frequent among the dead than among the living, suggesting new questions in terms of motorcycle trauma victims.

As for the licensing of motorcycle drivers, length of time since becoming licensed was analyzed and revealed a statistically significant association between this variable and the likelihood of death. Among the deaths, a higher proportion of newly qualified individuals and individuals whose licenses had expired despite being qualified for more than ten years were also more likely to die. It is important to point out that, according to the National Traffic Code, individuals with expired driver's licenses for more than thirty days are considered non-eligible.

Despite the prevalence of residents of Maringá (81.46%) among the victims of motorcycle accidents, about 40% of the dead lived in other counties. A statistically significant association was observed between the place of residence and death.

In Singapore, authors[19] identified that accidents involving more severe injuries are linked to the nationality of the motorcyclists. Most victims are foreigners, leading to an increased likelihood of serious injuries and deaths in motorcycle accidents.

According to these results, drivers who are not familiar with the routes and the traffic in the city they travel in can contribute to a larger number of serious accidents.

In this study, all physiological variables analyzed presented an association with mortality and in multivariate regression analysis, the RTS, GCS, pulse changes and de-

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creased oxygen saturation in the blood outperformed the other variables related to the death of motorcyclists, thus allowing for a better adjustment of the model.

RTS is a physiological score, which is highly sensitive and is a strong predictor of survival probability. It is an important tool for making decisions for trauma victims requiring referral to specialized treatment (trauma) centers[20-21].

However, the main predictor in the final model for risk factors affecting motorcyclists' death was GCS. It was observed in this study that of the 29 victims who died, 23 (79.31%) had GCS scores $\leq$ 8, and only 6 (20.69%) had GCS scores $\geq$ 8. The risk of death for victims with GCS $\leq$ 8 was 21.52 times higher than for victims with higher scores.

The GCS was introduced as a clinical scale to assess the level of consciousness in 1974. Since then, this scale has been used in full in other systems calculating trauma scores such as the RTS and the Trauma Injury Severity Score (TRISS). It is one of the most common tools used in trauma treatment centers[11].

A study conducted in Canada from 1995 to 2003 evaluated 20,494 trauma victims. Total mortality was 6.9%; mortality was 3.0% among patients with GCS scores between 9 and 15 and 40.0% among patients with scores between 3 and 8. According to the authors, the results suggest that GCS efficiently and accurately predicts mortality[11].

The GCS scores observed at the scene of motorcycle accidents in the current study can be highlighted, as they surpassed the RTS in the ability to predict the occurrence of death. In the literature two aspects are in opposition to this result: the GCS is valued as a tool for establishing prognosis for victims of traumatic brain injury (TBI) and specifically, when the utility of this scale is to estimate the probability of survival of victims with that type of injury, its application should occur after pulmonary resuscitation and hemodynamics[22].

In this regard it is noteworthy that in this study, data from autopsies of 24 fatalities (82.75%) indicated TBI as the cause of death. Other specifics regarding the deaths of these motorcyclists in traffic accidents may also have contributed to the greater prediction value of the GCS compared to the RTS. This evidence may trigger greater appreciation of the GCS in the screening of victims of motorcycle accidents in pre-hospital care; however, additional research focusing on this outcome should be performed.

To finish the review of the results, two limitations of this study deserve mention: the frequency of missing data was high, as was incorrect/insufficient completion of some important information such as: helmet use by motorcyclists at the time the accident occurred, use of mandatory equipment in Maringá, vehicle speed and alcohol consumption by the driver. This lack of information regarding variables highlighted in the literature[1,5,12,16] associated with the occurrence of traffic accidents and severity of injuries prevented the analyses of these data, and may have excluded from the final model important determinants regarding deaths in the occurrences of motorcycle accidents. Also, in the final model the confidence intervals were quite large, probably due to the small number of events observed in the sample. However, in none of the variables did the confidence interval cross the line of no effect, i.e. the odds ratio (OR) did not include the value 1.0.

CONCLUSION

In organizing the results presented, there was always a concern with showing the characteristics of victims of motorcycle accidents, thus collaborating in the development of measures for the prevention of mortality from these events, as well as offering evidence for prehospital care of these victims.

In this sense it can be concluded that individuals living in other places, unlicensed, very young (10 to 19 years), or older than 40 years of age and licensed for more than 10 years (although older victims presented less frequently in relation to the other victims of motorcycle traffic occurrences) had proportionally larger numbers in the group of fatal victims in comparison with victims who survived.

The physiological condition of the victim at the scene of the accident is highlighted in relation to other characteristics of the victims in terms of mortality. In this analysis some aspects deserve to be highlighted at the conclusion of this study: the importance of the RTS was confirmed as an indicator of the seriousness of injuries at the scene; however, the GCS stood out in isolation in relation to mortality. In addition to this parameter special attention must be given to the presence of changes in pulse and the saturation of oxygen in the initial evaluation of the victims of motorcycle traffic accidents.

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