

TRAUMA FROM TRAFFIC ACCIDENTS AFTER IMPLEMENTATION OF LAW Nº. 11.705 - "DRY LAW"
TRAUMA POR ACIDENTES DE TRÂNSITO APÓS IMPLANTAÇÃO DA LEI Nº 11.705 - "LEI SECA"
TRAUMA POR ACCIDENTES DE TRÂNSITO DESPUÉS DE LA IMPLEMENTACIÓN DE LA LEY Nº. 11.705 - "LEY SECA"

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Submitted on: 2017/02/23 Approved on: 2018/01/22

ABSTRACT

Objective: to characterize the occurrence of traffic accident trauma in a municipality in the state of Minas Gerais, a year before and after the implementation of Law 11,705 "Dry Law". **Method:** Retrospective cross-sectional study. The records of traffic accidents attended by the 8th Battalion of the Fire Department and the Mobile Emergency Response Service were used. The variables were: age and sex, type of accident, the day of the week, time, place, and deaths. **Results:** There were 5,904 accidents, 48.2% previous to the "Dry Law" and 51.8% later. A total of 6,581 victims were rescued, predominantly aged between 18 and 29 years old and male (86.8%). There was a significant reduction in the number of deaths (35.7%), the predominance of motorcycle accidents, in streets and avenues, on Saturdays, between 5:00 pm and 5:59 pm. **Conclusion:** Although there was a slight increase in the number of traffic accidents after the implementation of the "Dry Law", a significant reduction in the number of deaths was observed in this study, which allows us to infer that the law reduced the severity of accidents in the studied.

Keywords: Wounds and Injuries; Accidents, Traffic; External Causes; Emergency Medical Services.

RESUMO

Objetivo: caracterizar a ocorrência de trauma por acidente de trânsito em um município do estado de Minas Gerais, no período de um ano antes e após a implantação da Lei 11.705 "Lei Seca". **Método:** estudo transversal retrospectivo. Foram utilizados os registros de acidentes de trânsito atendidos pelo 8º Batalhão do Corpo de Bombeiros e o Serviço de Atendimento Móvel de Urgência. As variáveis foram: idade e sexo, tipo de acidente, dia da semana, horário, local e óbitos. **Resultados:** ocorreram 5.904 acidentes, sendo 48,2% anteriores à "Lei Seca" e 51,8% posteriores. Foram socorridas 6.581 vítimas com predominância de faixa etária entre 18 e 29 anos e sexo masculino (86,8%). Houve significativa redução do número de óbitos (35,7%), predomínio de acidentes motociclísticos, em ruas e avenidas, aos sábados, entre 17h e 19h59min. **Conclusão:** apesar de evidenciar-se pequena elevação no número de acidentes de trânsito após a implantação da "Lei Seca", constatou-se neste estudo importante redução do número de óbitos, o que permite inferir que a lei reduziu a gravidade dos acidentes no município estudado.

Palavras-chave: Ferimentos e Lesões; Acidentes de Trânsito; Causas Externas; Serviços Médicos de Emergência.

RESUMEN

Objetivo: caracterizar la incidencia de traumas por accidentes de tránsito en un municipio del estado de Minas Gerais, un año antes de la implementación de la Ley 11.705 "Ley Seca" y después de la misma. **Método:** estudio transversal retrospectivo. Se utilizaron los registros de accidentes de tránsito atendidos por el 8º Batallón del Cuerpo de Bomberos y el Servicio de Atención Móvil de Urgencias. Las variables eran: edad y sexo, tipo de accidente, día de la semana, horario, lugar y muertes. **Resultados:** Hubo 5.904 accidentes: 48,2% antes de la "Ley Seca" y 51,8% después. Fueron socorridas 6.581 víctimas, con predominio del grupo de edad entre 18 y 29 años y del sexo masculino (86,8%). Se observó una reducción significativa del número de muertes (35,7%), predominio de accidentes de motocicleta, en calles y avenidas, los sábados, entre las 17h y las 19h59min. **Conclusión:** a pesar de la pequeña elevación en el número de accidentes de tránsito después de la implementación de la "Ley Seca", en este estudio se constató una importante reducción del número de muertes, lo cual permite deducir que la ley redujo la gravedad de los accidentes en el municipio estudiado.

Palabras clave: Heridas y Lesiones; Accidentes de Tránsito; Causas Externas; Servicios Médicos de Urgencia.

How to cite this article:

Geiger LSC, Chavaglia SRR, Ohl RIB, Barbosa MH, Tavares JL, Oliveira ACD. Trauma from traffic accidents after implementation of Law nº. 11.705 - "Dry Law". REME – Rev Min Enferm. 2018[cited _____];22:e-1072. Available from: _____ DOI: 10.5935/1415-2762.20180002

INTRODUCTION

Traffic accidents are defined by the World Health Organization (WHO) as any non-premeditated event involving at the time of the accident a vehicle intended or primarily used for the transportation of people, animals or goods from one place to another, where at least one of the parties is in motion on the roads or areas open to the public.¹

Traffic accidents are included in the International Classification of Diseases - ICD, 10th edition, in the chapter entitled "External causes of morbidity and mortality" in the category of transportation accidents. In this category, there is a detail on how they can vary according to the circumstances of the event, specifying them as to the type of victim, the vehicle involved in an accident, being this classification of extreme importance for the collection of statistics of morbidity and mortality in the development of epidemiological studies on this subject.¹

WHO data shows that by 2013 the number of deaths from traffic accidents - 1.25 million - has been relatively constant since 2007, despite the increase in population, global motorization and the number of deaths predicted. This suggests that the interventions implemented in recent years to improve road safety worldwide have saved lives.²

According to this report, low-income countries have twice as many fatality rates as those in high-income countries, with deaths that are disproportionate to the level of motorization in these countries: 90% of injury deaths occur in low-income and medium income countries, which hold only 54% of vehicles worldwide.²

The highest mortality rates due to traffic injuries occur in the African region, being more than twice as high as the lowest in the European region, especially in high-income countries. Nearly half of road deaths (46%) in the world are "vulnerable users": pedestrians, cyclists, and motorcyclists. Besides the pain and suffering they cause, road traffic accidents result in significant economic losses for victims, their families, and nations as a whole, costing most countries 1-3 percent of their gross national product.³

World estimates show that these numbers could rise to 1.9 million in 2020 and 2.4 million in 2030 if preventative measures are not taken because of the increase in the number of vehicles associated with economic growth. Traffic accidents represent the third cause of death in the range of 30-44 years old; the second in the range of 5-14; and the first in the range of 15-29 years old, reaching young adults in the full productive phase of life, which represents a serious public health problem.⁴

Data show that developing countries have a large proportion of accidents involving fatalities, around 90%. Among these countries, there is Brazil, where the country's annual traffic accident rate by 2008 was over 1.5 million, involving approximately 7.5 million people, with 400 thousand injuries and 35 thousand deaths each year.⁵

Land transportation accidents in Brazil affect victims with different levels of impairment according to the type of accident (motor vehicle, motorcycle and other types of motor vehicle accidents) and sociodemographic characteristics of the population, resulting in approximately 43 thousand deaths per year, representing one of the main causes of death in the country. When the main cause of the accident is analyzed, they are attributed to human factors such as recklessness, lack of attention, speed abuse, and alcohol consumption.^{6,7}

In 2010, the Unified Health System (SUS) had more than 145 thousand hospitalizations of traffic accident victims costing approximately R\$ 187 million. In recent years, the vehicle fleet in Brazil has doubled, especially for motorcycles, whose licensing grew by more than 75%, caused by several factors, such as its low purchase value compared to automobiles, ease of access to consortiums and multiple lines of financing.⁷⁻⁹

The increase in traffic accidents represents a significant impact on the world economy, not only because of the high costs of care and hospitalization of the victims, but also because it is responsible for the death of a significant portion of the economically active population, since the profile of the fatal victims has been predominantly of males and of productive adult age.¹⁰

It is also worth noting that the occurrence of victims due to these accidents - dead, injured or disabled - also affects family and friends, since many families have their income diminished by the loss of the financier, having to bear costs and care.¹¹

The relationship between alcohol and traffic accidents has been associated with significant rates of deaths and victims of traumas treated with positive blood alcohol levels.⁸⁻¹⁰

Several studies indicate that alcohol use is one of the main causes of traffic accidents since in 25 to 50% of deaths the victims had evidence of alcohol consumption before the accident. Data indicate that the probability of an individual being fatal in an accident when drinking alcohol increases seven times over a sober person.^{5,7,10-12}

The effect of alcohol on the human body is a proven fact, although it is a function of many variables such as gender, age, body weight, individual metabolism and amount of ingestion. Alcohol intake is one of the main risk factors for admissions and deaths in traffic. The scientific literature evidence that between 30 and 50% of the victims of traffic accidents in the capitals of the country consumed alcohol before the accident.¹³⁻¹⁵

This evidence has led several countries to adopt lower limits on alcohol consumption and alcohol tolerance, especially in young or inexperienced drivers. However, it is recognized that other important measures need to be taken, such as the certainty and speed of punishment. Countries with a permitted level of alcohol content for drivers of 0 to 0.02 g/dL can reduce the rate of traffic accidents for young drivers from 4 to 24%.^{2,12,16}

In Brazil, on June 19, 2008, Law 11,705, known as the "Dry Law" (Lei Seca), was modified, basically altering Articles 165, 276 and 277 of the Brazilian Traffic Code, establishing imposition of more severe penalties for driving under the influence of alcohol.¹⁷

Law 12,760, enacted on December 20, 2012, is currently in force in Brazil, which makes the Dry Law more rigid based on three important changes: imposing zero tolerance on the driver who consumed alcohol; increase in the value of the fine and admission of video use, testimonial evidence or other evidence of intoxication. This new regulation lowered the limits of alcohol tolerance in the breathalyzer test to 0.34 milligrams or more of alcohol per liter of expired alveolar air (0.34 mg/L) and a blood test that shows a result of six deciphers of alcohol per liter of blood (6 dg/L).^{17,18}

Therefore, it is necessary to investigate the impact of the "Dry Law" on the reduction of morbidity and mortality resulting from traffic accidents. It is also important to characterize the occurrence of traffic accident trauma to increase the knowledge of the epidemiological reality of some aspects related to injuries and deaths in traffic and the circumstances of its occurrence, becoming an important tool for policies to promote health and prevention of these diseases, reducing their morbidity and mortality.

This study aims to contribute to the knowledge of the traffic accident trauma in a municipality in the state of Minas Gerais-MG attended by the pre-hospital care teams of the 8th Battalion of the Minas Gerais Fire Brigade (8th BBM) and the Mobile Emergency Response Service (SAMU), and the possible influence of Law 11,705 on municipal statistics.

Thus, this study aims to characterize traffic accident trauma in a municipality in the state of Minas Gerais, a year before and after the implementation of Law 11,705 ("Dry Law").

MATERIAL AND METHODS

It is a descriptive, cross-sectional, retrospective study, having the records of the traffic accident attendances carried out by the 8th Battalion of the Fire Brigade (8th BBM) and the Mobile Emergency Care Service (SAMU) of a municipality of MG as a data source. According to data from the National Transit Department – DENATRAN of July 2015, the municipality under investigation had a fleet of 209,165 vehicles for an estimated population of 322,126 people, with a vehicle for every 1.5 people.^{19,20}

The data collection investigated the universe of the records of traffic accident cases in the year before the dry law, from June 20, 2007, to June 19, 2008, and in the subsequent year, from June 20, 2008, to June 19 of 2009. There were 20 SAMU records excluded due to incomplete data. This study included both passengers and drivers in all age groups, due to the impos-

sibility of distinguishing drivers among those rescued, since in the service there is no record of this specific data.

The study variables are age group and gender of the victim, type of accident, the day of the week of the accident; prevailing schedules; road and neighborhoods of the attendance; fatalities on the place of the accident or during transportation.

The variable called "study period" was classified into two items:

- the period before the Dry Law – understood as the period of one year before the Law 11,705 of June 20, 2008, considered from June 20, 2007, to June 19, 2008.
- the period after the Dry Law – understood as the period of one year following the Law 11,705 of June 20, 2008, considered from Jun 20, 2008, to June 19, 2009.

The age was collected according to the classification of the age groups already used by the Fire Department, with the following stratification: zero to four years old; five to nine years old; 10 to 17 years old; 18 to 29 years old; 30 to 50 years old; and over 50 years old.

The type of accident was classified according to the characteristics of those involved, according to the following items: by automotive vehicle (vehicles with two axles or more, in this category car, truck, bus, etc.); motorcycle and bicycle; and run over.

For the variable called "time of occurrence," the recorded time of the telephone communication with the Fireman and SAMU was considered.

The data were obtained by consulting the computerized records of the Fire Department and SAMU, according to the study variables, inserted into a Microsoft Excel worksheet and transported to the Statistical Package Social Science (SPSS) version 18 for processing and analysis. Quantitative variables were subjected to descriptive statistical analysis, central tendency (mean, median and fashion) and variability (standard deviation and amplitude) and qualitative variables were expressed by absolute and percentage frequency.

This project was approved by the Committee of Ethics in Research with Human Beings, Federal University of Triângulo Mineiro - UFTM, with Protocol no1498.

RESULTS

In the periods studied, there were 5,904 traffic accidents that demanded care for people with trauma by the 8th BBM and the SAMU of the municipality. It is verified that, in both study periods, the 8th BBM was the service that provided the most care for injuries to victims of trauma. Of the 2,843 occurrences in the period before Law 11,705, 1,511 (53.1%) were attended by the 8th BBM and 1,332 (46.9%) by the SAMU, with a 5.9% increase in attendance by the 8th BBM and a decrease proportional by SAMU in the year after that Law (Table 1).

Table 1 - Distribution of traffic accidents with victims of trauma attended by the 8th BBM and SAMU, according to the study periods (2007-2009) and the care institutions. Minas Gerais, 2016

Care Institutions	The period before the Dry Law (2007/2008)		The period after the Dry Law (2008/2009)		Total	
	N	%	N	%	N	%
Fire Department	1511	53,1	1807	59	3318	56,2
SAMU	1332	46,9	1254	41	2586	43,8
Total	2843	100	3061	100	5904	100

Considering the two study periods, there is an increase in the number of traffic accidents in the period after the "Dry Law" - 218 (7.8%) visits – than in the period before the law.

Regarding the characterization of victims of traffic accidents, it was observed that most of the victims were males, 86.8 and 75.6%, respectively, in both periods. However, it was observed the increase of the women of 11.2% in the period after the law. In the 5,094 occurrences, 6,581 victims were assisted, most of them in the age group of 18 to 29 years old, with 42.9 and 42.4% in the periods studied, respectively.

In decreasing percentages, it is observed the age group of 30 to 50 years old and over 50 years, in both periods (Table 2).

Table 2 - Distribution of the number and percentage of victims of traffic accidents attended by the 8th BBM and SAMU, according to study periods and age group. Minas Gerais, 2016

Age group	The period before the Dry Law		The period after the Dry Law		Total	
	N	%	N	%	N	%
0-40	30	0,9	50	1,5	80	1,2
5-9	90	2,8	101	3,0	191	2,9
10-17	271	8,4	300	8,9	571	8,6
18-29	1388	42,9	1419	42,4	2807	42,7
30-50	965	29,9	1047	31,3	2012	30,7
> 51	487	15,1	433	12,9	920	13,9
Total	3231	100	3350	100	6581	100

Regarding the types of accident and study period, it was observed that 53.4% were motorcycle accidents, indicating an increase of 5.0% between the two study periods. The second highest frequency was the bicycle accidents, in both periods. However, there was a reduction of 3.9% in the number of events in the subsequent year (Table 3).

Accidents caused by running over-represented the smallest percentage part and showed a small variation between one period and another, decreasing 0.4% in the subsequent period. While it is considered that the repercussions of Law 11705 relate in particular to automotive vehicle accidents, it can be inferred that running over are often the result of poor driver behavior.

Table 3 - Distribution of services performed by the 8th BBM and SAMU according to the study periods (2007-2009) and the type of accident. Minas Gerais, 2016

Type of accident	The period before the Dry Law (2007/2008)		The period after the Dry Law (2008/2009)		Total	
	N	%	N	%	N	%
Running over	398	13,9	415	13,5	813	13,7
Bicycle	586	20,6	512	16,7	1098	18,6
Motocycle	1444	50,7	1706	55,7	3150	53,4
Automotive Vehicle	415	14,5	428	13,9	843	14,3
Total	2843	100	3061	100	5904	100

Regarding the days of the week, it was observed that the highest frequency was on Saturday (18.0 and 16.3%), followed by Friday (15.0 and 15.3%) and Sunday (14.7% 14.1%) (Table 4).

Table 4 - Distribution of traffic accidents attended by the 8th BBM and SAMU, according to the study periods (2007-2009) and the day of the week. Minas Gerais, 2016

Day of the week	The period before the Dry Law		The period after the Dry Law	
	N	%	N	%
Monday	374	13,2	454	14,8
Tuesday	363	12,7	385	12,7
Wednesday	379	13,3	427	13,9
Thursday	371	13,0	383	12,5
Friday	426	15,0	469	15,3
Saturday	513	18,0	511	16,7
Sunday	417	14,7	432	14,1
Total	2843,0	100,0	3061,0	100,0

The hours of highest victim assistance were from 7 am to 8:59 p.m.; from 11 am to 1.75 p.m. and from 5 p.m. to 7.75 p.m.

Regarding the distribution of care to victims according to the months of the year, it was found that the percentage of occurrences showed a greater variation in the previous year than the Dry Law – from 5.8 to 10.5% –, with the highest frequencies in the months of December and May. In the year following the law, this variation was from 6.8 to 9.1% and the highest frequency in October. During this period, the lowest percentages of attendance occurred in January (7.9%), February (6.8%) and July (8.1%).

Between the places of the accidents, the avenues and streets were the most frequent, with 5,197 (88.0%) cases and 559 (9.5%) on highways near the city.

As for the fatal cases at the accident place or during the transport of the victims, it was observed that there was a 35.7% reduction in deaths when comparing the number of fatal victims before the implementation of the Dry Law (28) with those that occurred in the study period after the implementation of the law (18). (Figure 1)

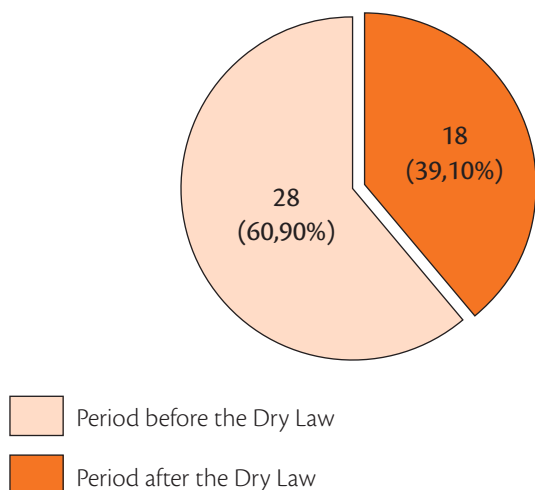


Figure 1 - Distribution of fatalities at the scene of the accident or during transportation, attended by the 8th CBM and SAMU. Minas Gerais, 2016.

DISCUSSION

The data presented in this research allow inferring that the Dry Law can become an important factor for changing statistical data regarding traffic accidents with fatal victims in the municipality.

There was an increase of 7.8% in the number of traffic accidents after the implementation of the "Dry Law". A study carried out in a regional hospital in the city of Rio de Janeiro confirms the findings of this study, which showed an increase of 7.7% in traffic accidents after the implementation of the law.¹⁰

However, research carried out with young trauma victims in a municipality in the state of Paraná showed a significant relationship between severe trauma and alcoholic beverage intake, also showing an increase in the chances of clinical manifestations with more severity by 50 times.²¹

An increase of 5.0% in motorcycle accidents was observed, which can be attributed to the low acquisition and maintenance cost of this type of vehicle. In the period from 2010 to 2015, there was a 26.4% increase in motorcycles and motor scooters in the municipal district of this study, which increased from 41,824 to 52,882 units.¹⁹

The recklessness and/or malpractice of these drivers and the vulnerability they are exposed can be important factors in the determination of high percentages of trauma victims involving motorcycles.^{8,22}

These considerations also apply to accidents involving bicycles, with 18.6% of total attendances in both periods. It is important to note that this percentage, together with 53.4% of all motorcycle accidents, represents most accidents (72.0%) with trauma victims when considering both periods of study.

It should be noted that these vehicles are an important means of transportation for the worker. The probable increase

in cyclists, given the recommendations for physical activity as a condition for a healthy life, demonstrates the need to include public policies aimed at reducing morbidity and mortality due to traffic accidents with these types of vehicles.

Regarding the running over, there was a decrease of 0.4%. A study carried out in Rio de Janeiro-RJ reported a 4.4% reduction in the number of road accidents after the implementation of the "Dry Law".¹⁰

Car accidents dropped by 1.0% in the period after the Law was implemented, but they were the third highest percentage, accounting for 14.3% of the total accidents - 14.5% and 13.9%, according to the periods of study, respectively - leading only to run over. This fact can be corroborated by the regional study carried out in Rio de Janeiro, which observed a reduction of 1.3% in automobile accidents.¹⁰

As for the time of the accidents, it is interesting to note that they occur increasingly in the course of the day, varying from one period to another from 4.4 to 4.3% in the morning and from 8.7 to 9.5% at the end of the afternoon, a fact that coincides with research carried out in other regions of the country.^{8,22}

Relating the attendances to the days of the week, it was verified that the percentages of traffic accidents have a maximum frequency in the weekends, especially on Saturday. In terms of healthcare services, it is important to highlight that hospitals work on a duty scale, which can lead to work overload due to the increase in the number of accidents on weekends.

In the same municipality, a survey carried out in 2008 indicated a significant increase in the number of accidents on weekends, with Saturday and Sunday having the highest frequencies than other days, with 34.0% of accidents coinciding with data obtained in this study.²³ It can be inferred that in these days the vehicles circulate with more speed in the roads, since there is a smaller fleet in the streets and avenues and, in many situations, the use of the alcohol can be associated.

Regarding the distribution of care to victims according to the months of the year, more variation was observed in the year before the law, highlighting the higher frequencies in the months of December and May. After the law, the highest frequency was in October.

Research data from a Rio de Janeiro-RJ emergency unit indicated a higher number of visits before the Dry Law in December and after the law in January, corroborating the results found in this investigation.¹⁰

The greater frequency of traffic accidents in May and December may be related to the fact that they are months with commemorative dates like Mother's Day and Christmas, which move the trade and, consequently, the traffic.

As for the months of January, February and July, which presented the smallest percentages in this study, they may be related to the vacation period, which would reduce traffic flow

and, consequently, accidents, or because there is no need for locomotion of people to work or school, because there is relative emptying of the city as a result of travel or because people are reluctant to leave home on colder days.

It was found that most victims in both periods were male. These data are in agreement with the literature, which shows that deaths due to traffic accidents reach young adults aged 15-44 years old who are in the full productive phase of life.^{2,3,17,24,25}

However, there is also an increase in the number (11.2%) of female victims after the implementation of the law. It is questioned whether this fact would be due to the increase in the number of women using automotive vehicles, both in the driver and passenger condition. A study carried out in Londrina-PR showed that the change in the lifestyle resulting from the transformation of the role of women in society determines the increase in the number of female drivers and the female mortality due to traffic accidents.²⁴

It can also be inferred that women are exposed to traumatic situations, associated or not with the use of alcoholic beverages, because they are accompanied by male individuals who use alcohol and put their own safety and their companions at risk.²⁴

Regarding the occurrence of fatal cases at the accident place or during transportation, there was a significant reduction after the implementation of the Dry Law. A geographic study carried out in micro-regions of the state of São Paulo showed a fall in the number of deaths due to traffic accidents of 1.35 percentage points, equivalent to 2.67% after the law was implemented. According to the authors, it represents a positive value, however, very low, considering that the expectation after the implementation of this law was a massive reduction in the number of accidents.²⁵

As to the streets and avenues are the most frequent accident places, this data can be related to the considerable increase of the contingent of automobiles in the public roads and by increasingly the use of these means of transport so much for the displacement for the work, as the displacement for bars, parties and other places of access to alcoholic beverages.

CONCLUSION

This investigation allowed the characterization of the occurrences due to traffic accidents with victims attended by SAMU and by the Fire Department of the 8th BBM from June 20, 2007, to June 20, 2009. Most of them were victims of motorcycle accidents, followed by bicycles, automobiles and, to a lesser extent, running over. Most accidents happened at the end of the week, predominantly on Saturday and from 5:00 p.m. to 7:59 p.m. However, it was found that the number of deaths suffered a considerable reduction, 35.7%, in relation to the previous year, which allows inferring that the mentioned law reached its purpose in reducing the severity of the accidents.

These findings confirm that after the introduction of the "Dry Law" there was a small increase in the number of occurrences of traffic accidents in the municipality, which emphasizes the need for more supervision and development of more effective educational actions among drivers regarding the use of alcohol. Investments from the municipal, state and federal spheres will certainly contribute to educational measures of greater impact in this municipality.

As a limitation of this study, it may be considered the fact that its design was carried out as a cross-sectional study, which does not allow the establishment of cause and effect relationships between the study variables. Another limitation refers to the fact that the data obtained reflects the reality of a municipality, which, although important, it does not allow the generalization of its results to other regions of the state of Minas Gerais. We believe that the data obtained are relevant and may lead to the development of new studies that overcome these limitations by focusing on the same theme.

Although initiatives to curb motor vehicle alcohol consumption are valid, they are insufficient to reduce morbidity and mortality resulting from traffic accidents and should form part of a broad, vigorous and incisive approach to the problem, education for citizenship.

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