Artigo Original

Land transport accidents: motorcycles as a public health problem

Acidentes de transporte terrestre: as motocicletas como problema de saúde pública

Accidentes de transporte terrestre: las motocicletas como problema de salud pública

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Abstract: Objective: To describe the epidemiological profile of hospitalizations for Land Transport Accidents, involving motorbikes, between the years 2011 to 2020, in the state of Rio Grande do Sul. **Method:** This is a descriptive epidemiological study with data from the Hospital Information System. Descriptive methods of analysis were used, with rates expressed in absolute numbers, relative frequency and weighted by population. **Results:** The results indicate that young white males concentrate the highest rates of hospitalizations in the state. They also suggest an increase of cases between the months of October and March, besides presenting the highest hospital mortality rates in the southern macro-region of the state. **Conclusion:** The knowledge of the profile of hospitalizations involved in these accidents can help in the structuring of strategies appropriate to local realities, with the aim of reducing accidents, damage to health, suffering and treatment costs.

Keywords: Motorbikes, Morbidity, Accidents.

Resumo: Objetivo: Descrever o perfil epidemiológico das internações por Acidentes de Transporte Terrestre, envolvendo motocicletas, entre os anos de 2011 a 2020, no estado do Rio Grande do Sul. **Método:** Trata-se de um estudo epidemiológico descritivo com dados oriundos do Sistema de Informação Hospitalar. Utilizou-se métodos descritivos de análise, com taxas expressas em números absolutos, frequência relativa e ponderadas pela população. **Resultados:** Os resultados indicam que jovens brancos, do sexo masculino, concentram as maiores taxas de hospitalizações no estado. Sugerem, também, um aumento de casos entre os meses de outubro a março, além de apresentar as maiores taxas de mortalidade hospitalar na macrorregião do sul do estado. **Conclusão:** O conhecimento do perfil das hospitalizações envolvidas nestes acidentes pode auxiliar na estruturação de estratégias adequadas as realidades locais, com o objetivo de reduzir os acidentes, danos à saúde, sofrimentos e gastos de tratamento.

Palavras-chave: Motocicletas, Morbidade, Acidentes.

Resumen: Objetivo: Describir el perfil epidemiológico de las hospitalizaciones por Accidentes de Transporte Terrestre, con participación de motocicletas, entre los años 2011 a 2020, en el estado de Rio Grande do Sul. **Método:** Se trata de un estudio epidemiológico descriptivo con datos del Sistema de Información Hospitalaria. Se utilizaron métodos de análisis descriptivos, con tasas expresadas en números absolutos, frecuencia relativa y ponderadas por población. **Resultados:** Los resultados indican que los varones jóvenes de raza blanca concentran las mayores tasas de hospitalización del estado. También sugieren un aumento de casos entre los meses de octubre y marzo, además de presentar las mayores tasas de mortalidad hospitalaria en la macrorregión sur del estado. **Conclusión:** El conocimiento del perfil de las hospitalizaciones implicadas en estos accidentes puede ayudar a estructurar estrategias adecuadas a las realidades locales, con el objetivo de reducir los accidentes, los daños a la salud, el sufrimiento y los costes de tratamiento.

Palabras clave: Motos, Morbilidad, Accidentes.

INTRODUCTION

External Causes (EC) include injuries arising from accidental and intentional determinants (violence). In this context, EC are one of the leading causes of morbidity and mortality worldwide, especially among the young, economically active, and male population. The increase in population and life expectancy, combined with economic growth cause changes in the behavior of society. One of these changes concerns the way people move from one place to another, thus generating problems which directly interfere in their daily lives. Among them, it stands out the increase in the fleet of motor vehicles and its social repercussions that reverberate on the cases of Land Transport Accidents (LTA). The disorderly growth of the vehicle fleet, without planning to adapt the traffic and the lack of education, increases the number of accidents and, consequently, of deaths(1-2).

According to estimates by the World Health Organization (WHO), the mortality rate due to traffic accidents in 2013 corresponded, approximately, to 20 deaths per 100 inhabitants in low-income countries, 18.4 in middle-income countries (a group in which Brazil belongs) and 9.2 among high-income countries. In 2016, approximately 37,000 people died as a result of traffic accidents, of which 6,400 (17%) died after occurrences on Brazilian federal highways(3). The concern with traffic accidents has become increasingly greater worldwide, as this phenomenon has been highlighted as an important public health problem. Data from the WHO indicate that 1.2 million people die every year in the world as a result of traffic accidents. Of these, young people between 15 and 19 years of age are the biggest victims(1,3).

In this sense, the volume of motorbikes in circulation has been growing at a fast pace all over the country, accounting for 29,094,771 two-wheeled motor vehicles for the year 2020, with a growth rate of 3.25% in relation to the previous year. In this scenario, the southern region of Brazil ranks third in number of vehicles with these characteristics, totaling a fleet of 4,115,665 vehicles. The Southeast and Northeast regions occupy first and second places, respectively. Within the

southern region, the state of Rio Grande do Sul (RS) is in second place with a fleet of 1,336,297 units of these vehicles(4-5). According to statistics from the Rio Grande do Sul State Traffic Department (DETRAN - RS) for the year 2021, there were 1,451 deaths up to the month of November, with motorbikes and scooters being involved in 20.6% of fatal accidents. In this same perspective, 26.1% of the deaths are related to motorcyclists(6).

Thus, the issue of LTA is configured as a serious public health and social security problem. The suffering of victims and relatives, the costs of treatment and rehabilitation are examples of the social difficulties encountered in dealing with the issue in everyday life. In this sense, this study investigates some of the main characteristics of hospital morbidity due to accidents involving motorbikes in RS. It is asked what is the profile of morbidity and mortality of these events in RS? Thus, the objective of this study is configured in the description of the epidemiological profile of hospitalizations by traffic accidents involving motorbikes in RS, for the years 2011 to 2020.

METHODOLOGY

This is a descriptive epidemiological study of hospital morbidity by LTA involving motorbikes in RS for the period from 2011 to 2020. The data come from the Hospital Information System (SIH), in its entirety, for the period 2011 to 2020, according to categories V20 to V29 (motorcyclist traumatized in a transport accident) contained in the International Classification of Diseases (ICD-10), chapter XX. It is noteworthy that the database mentioned is contained in the Department of Informatics of the SUS (DATASUS) of free and universal access. The variables from the SIH are: character of care, care regimen, age group, gender, race/race, year and month of care and hospital mortality rate. The data were submitted to descriptive methods of univariate analysis, with rates expressed in absolute numbers and relative frequency, besides being weighted by the population (in the elaboration of the cartography). A spreadsheet and the TabWin4.15 program were used for data organization and analysis(7).

In order to explore the occurrence of possible socio-environmental phenomena related to the occurrences of LTA in young adults, this study chose to add the technique of cartographic analysis. It is understood that the use of the representation of geographic space and its cuts in social research contexts have been increased, mainly due to the availability of epidemiological data in large databases, which enable the use of cartographic tools(8-9).

For population studies, the unit of analysis is a population, or a group of people subjected to a characteristic event that generally belong to a defined geographical space. The groups under analysis may be contained in geographical units such as neighborhoods, cities, regions or macro-regions and the analyses are guided by comparing rates and indicators of the phenomenon under study related to these units(8).

Thus, this study used for cartographic analysis, data aggregated by health macro-region of RS. In addition to increasing the explanatory potential, this analysis technique enables the identification of population groups, risk areas and the guidance of more comprehensive interventions to address social phenomena with repercussions in the field of health(8).

RESULTS

The following data refer to the 15,734 hospitalizations involving motorcyclists in the period from 2011 to 2020, in the state of RS. Table 1 presents the categories of these hospitalizations, according to chapter XX of ICD-10, in the study period.

Table 1.
Category of hospitalizations involving motorbikes in RS, according to ICD-10, in the period from 2011 to 2020.

Category (ICD-10)	N (15.734)	% (100)
V29 Motorcyclist injured in other transport accidents and in non-specific transport accidents	13.684	87.0
V23 Motorcyclist traumatized in collision with an automobile (car), or pick-up truck	933	5.9
V28 Motorcyclist traumatized in a non-collision transport accident	414	2.6
V22 Motorcyclist injured in collision with a two- or three-wheeled motor vehicle	200	1.3
V27 Motorcyclist traumatized in collision with a fixed or stationary object	159	1.0
V24 Motorcyclist traumatized in collision with a heavy transport vehicle or a bus	126	0.8
V20 Motorcyclist traumatized in collision with a pedestrian or an animal	117	0.7
V21 Motorcyclist traumatized in collision with a pedal vehicle	56	0.4
V26 Motorcyclist traumatized in collision with another non-motorized vehicle	38	0.2
V25 Motorcyclist traumatized in collision with a train or a railway vehicle	7	0.0

Source: Ministry of Health – SIH SUS

It is possible to observe in table 1 that the highest number of hospitalizations is related to motorcyclists traumatized in other transport accidents and in unspecified transport accidents (V29) with 87% of the records. In the same table, in second place, are accidents involving motorcyclists traumatized in collision with an automobile (car), "pick-up" or pick-up truck (V23) with 5.9% of the cases.

Table 2 presents hospitalizations involving motorbikes in RS considering the variables sex, age group and race/color.

Table 2.
Sex, age group and color/race of the records of hospitalizations involving motorbikes in RS, in the period from 2011 to 2020.

Variable	N (15.734)	% (100)
Sex		
Male	13.326	84.7
Female	2.408	15.3
Age Group		
Less than 1 year	8	0.1
1 to 4 years	28	0.2
5 to 9 years	57	0.4
10 to 14 years	187	1.2
15 to 19 years	1.992	12.7
20 to 29 years	5.779	36.7
30 to 39 years	3.697	23.5
40 to 49 years	2.255	14.3
50 to 59 years	1.246	7.9
60 to 69 years	362	2.3
70 to 79 years	98	0.6
80 years and	25	0.2

Source: Ministry of Health - SIH SUS

Table 2 shows that men are the most involved in motorbike accidents, with 84.7%, that is, men have 5.5 times higher hospitalization rates when compared to women.

Regarding the age bracket, individuals between 20 and 29 years of age had the highest hospitalization rate with 36.7% of the records. Considering, in the same table, the age bracket from 20 to 39 years, the hospitalization rates correspond to 60.2% of the cases.

The comparative analysis of hospitalization rates between ages indicates decreasing rates as the individual's age advances, decreasing hospitalizations and, consequently, the severity of accidents. From age 50 onwards, hospitalization rates decrease significantly, indicating more experienced, prudent drivers, taking fewer risks, valuing, and preserving life.

Figure 1 shows the distribution of hospitalizations involving motorcyclists in RS according to the months of the year.

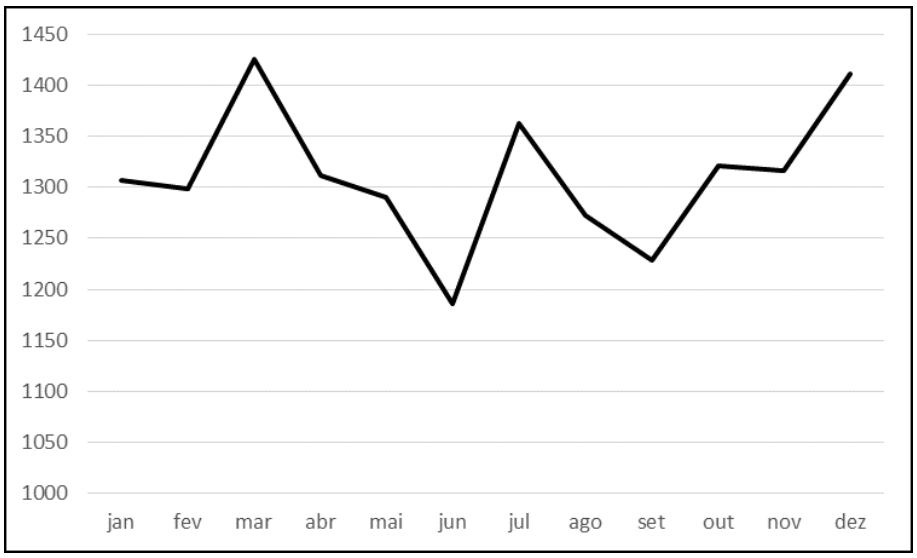

Figure 1.
Monthly distribution of hospitalizations involving motorbikes in RS, from 2011 to 2020.
Source: Ministry of Health - SIH SUS

The distribution of cases in relation to the months of the year (Figure 1) does not present a pattern of behavior of the hospitalizations in the period studied. However, the distribution of the data suggests a tendency in the increase of the number of accidents between October and March, with the exception of the month of July.

Figure 2 presents the mortality rate involving motorbikes by health macro-region in RS.

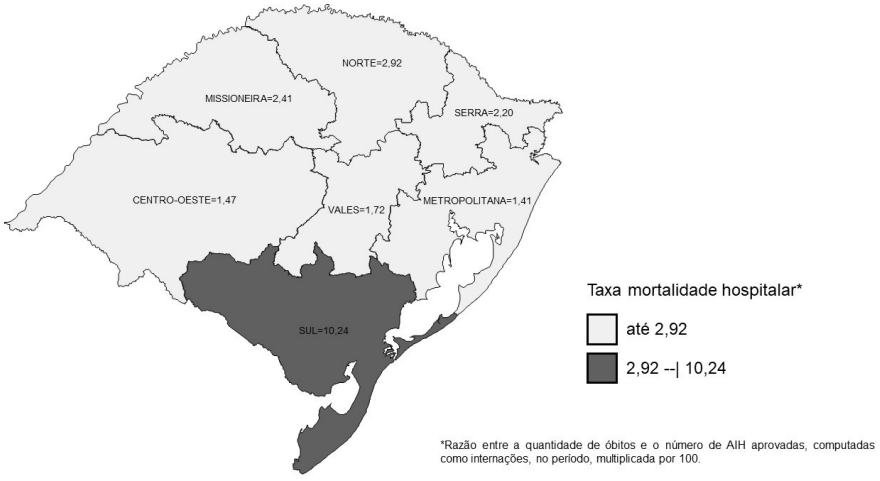

Figure 2.
Hospital mortality rate involving motorbikes, in the period from 2011 to 2020, according to the health macro-regions of RS.
Source: Ministry of Health - SIH SUS, mapping: BUENO, A.L.M.

Figure 2 shows that among all the macro-regions, the southern region has the highest hospital mortality rate in the state, being approximately 7.3 times higher than the rates registered in the state's metropolitan region.

DISCUSSION

The data presented in table 1 indicate that the motorbike is a dangerous and unsafe transportation, offering the driver greater impacts in cases of accident. Associated with this situation, one must consider the behavioral factor in safe riding(10). Traffic accidents are not the result of one or another factor, but rather, of a grouping of factors. The lower cost for acquiring motorbikes, when compared to other vehicles, and their insertion in the Brazilian informal labor market are factors that may help in the understanding of these events(11).

The high numbers of traumas and deaths also occur due to the lack of clear norms and safety for motorbike movement, as well as imprudence and dangerous driving, which generate risky driving in traffic(3). In studies on the profile of drivers who get involved in traffic accidents with motorbikes, it has been found that these are directly linked to the low level of education of motorcyclists, which often interferes with their ability to interpret information on existing risks, as well as to the competent advertising that idealizes the motorbike as synonymous with freedom and the silence of the industry regarding the safety problems of these vehicles(3).

The motorcyclist may be more prone to accidents at night, with greater severity related to reduced visibility, long working hours, generating fatigue, decreased reflexes and ability to concentrate. The greatest lethality of accidents is evidenced in serious injuries and physical sequels with no possibility of recovery, burdening all systems involved in the care of these victims and often preventing the return to the labor market(12).

In relation to Table 2, the predominance of males finds support in the literature when describing the greater exposure to accidents of men under social and cultural influence, to take greater risks when driving vehicles. It is understood that men are more vulnerable to this type of injury, given their historically more competitive, more aggressive, invulnerable, self-sufficient psychological profile at the wheel, immune to any fault, causing speeding, often associated with alcohol and the use of electronic devices(10).

The predominance of accidents in male individuals may be justified by sociocultural, educational and continental issues, since these individuals represent the majority of drivers of this type of vehicle, resulting in a vulnerable behavior profile in traffic(13). In this sense, studies point to behavioral issues as directly influencing morbidity and mortality rates, since men are more exposed to risks while driving, being more aggressive and practicing riskier maneuvers, while women are more prudent and expose themselves less(14).

The increased hospitalization rates among youngsters found in this study are in synergy with studies conducted in other regions of the country. In this sense, it is understood that, in addition to behavioral factors, the ease of moving in traffic, lower cost of acquisition and maintenance, access to the informal job market with the motorbike and low education explain part of these numbers in this age group(15-17).

It is believed that the greater involvement of young people in these problems is related to the feeling of freedom, generating a need to experiment and test new limits, which sometimes culminates in the association of drinking and driving, speeding, dangerous maneuvers, and inexperience in facing stressful situations

in traffic(10). The high number of accidents among young people on their motorbikes can also be justified by the use of drugs and irresponsibility when participating in illegal actions, such as street racing and the incorrect use of helmets(18). Another factor to be considered in this scenario, indicates that motorbikes used as a work vehicle, make up part of these statistics in many situations, moments of fatigue, tiredness, decreased reflexes and concentration are individual factors of vulnerability to accidents(13).

In relation to Figure 1, the period between the months of October and March indicated a tendency in the increase of hospitalizations. It is suggested that the distribution of accidents in these months may be related to the period of climate change, where the temperature rises due to the summer season, generating a higher concentration of vehicles in traffic, especially because it coincides with the school holiday period, holidays, leisure, and rest trips. In this highlighted period, besides the holidays, there are the end of the year festivities that move the sales commerce causing an agglomeration of people and vehicles, especially the circulation of motorbikes, with their agility in the process of deliveries. Analyzing the decline in hospitalizations in July, although this is also a period of educational holidays, it is believed that the RS winter keeps people more reclusive, especially regarding the recreational use of the motorbike(19).

Brazil is experiencing the consequences of the rapid motorization of the population and the motorbike is popularly presented in the market as a means of transport and work-income(20). This change in profile is related to the increase in the motorbike fleet, the precarious conservation of public roads and, in this sense, the greater number of inexperienced drivers, besides the increase in traffic imprudence(3,21).

Data regarding the distribution of hospitalizations according to the years of the study corroborate similar studies on the subject. The number of hospitalizations increases at the beginning of the decade, suggesting a synergistic behavior with the increase in the motorbike fleet. In the year 2019 there is a drop in hospitalizations, probably reflecting the effects of social isolation associated with the COVID-19 pandemic, which decreased the circulation of vehicles and, consequently, the number of accidents and hospitalizations(22).

Figure 2 shows that the high hospital mortality rates in the southern macro-region may be related to the severity of the problems and the lack of qualified health services, delays in care and established assistance protocols(8). It is worth noting that the north of RS is a region of greater socioeconomic development, based on industrialization and service supply. On the contrary, the southern half of the state is focused on agribusiness and livestock, having, in this sense, extensive rural areas(8).

According to the literature, it is believed that the greater the distance between the municipalities and the capital, the worse the health services are. Researchers have identified in their studies that this phenomenon is justified by the difficulty encountered by these municipalities in hiring and maintaining health professionals, the low resolution in primary care, the absence of clinical protocols and regulation and the lack of qualified staff to act in the management of services(23).

It is understood that the greater development of the northern half offers a greater and more qualified technological apparatus, when compared to the

southern half of the state, making hospital services more effective and qualified. According to the Socioeconomic Atlas of RS, the hospital establishments are more concentrated in the most populous municipalities and with higher socioeconomic development, making it difficult to provide emergency care and larger interventions in smaller municipalities(23-24).

The incorporation of the space-territory category in epidemiological studies can subsidize a more comprehensive and punctual reflection and intervention, of the processes of health hand illness, in the case of this research, on accidents and hospitalizations of motorcyclists, based on the behavior and dynamics of life in this study region. It may be considered that this high rate of hospital mortality is there, marked by the characteristic geographic space of the region, with great movement, uncontrolled agitation and large concentration and agglomeration of vehicles, cargo transport, touring, tourism and especially motorbikes that circulate in favor of regional development, better income per capita and improved quality of life(9).

CONCLUSION

Data analysis suggests that the high rates of hospital admissions for accidents involving motorbikes are predominant among young people, white males. This demographic profile finds support in the literature that advances in the description of these victims by identifying that they have income tied to informal work, low education, and vulnerable behaviors. Accidents involving motorbikes are a serious, multifactorial public health problem with a broad socioeconomic impact on the cost of treatment and social security.

The highest incidence of hospital mortality was established in the hottest months of the year, holiday period and end-of-year festivities that move the commerce and tourism, increasing the flow of vehicles. Regarding hospitalizations, it is believed that the increase in cases has synergy with the growth of the motor vehicle fleet, risky driving, imprudence, and dangerous driving. The highest hospital mortality rate in the state was concentrated in the Southern Region, which, if compared to the northern half of the state, presents vulnerabilities in relation to work, income, and health services, suggesting difficulties in the equalization between the offer of beds and the treatment capacity for severe cases.

In this sense, it is noteworthy that studies with this research design have limitations for the knowledge of cause and effect. It is suggested, as an analytical advance, studies that address the behavioral patterns capable of making these individuals less or more vulnerable to these types of accidents. Finally, the importance of the analysis of the epidemiological profile of hospitalizations resulting from accidents involving motorbikes is highlighted. It is believed that research with this characteristic may contribute to the formulation of public policies for prevention and health promotion, guide and reorganize demands in health services, besides offering visibility to the theme.

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