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IMPACT OF MOTORCYCLE ACCIDENTS IN THE MUNICIPALITY OF ANÁPOLIS

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ABSTRACT

Introduction: Motorcyclists, often involved in serious accidents, represent a significant economic and social burden, especially for low-income families and for social security in cases of death. **Objective:** to carry out a survey of accidents involving motorcycles in the city of Anápolis. **Methods:** This is a descriptive and ecological study that used data from DATASUS. **Results:** Through data collected in DATASUS, it was observed that the number of traumatized motorcyclists in the municipality varied significantly. The year 2021 was its peak, with 504 victims, showing an increase compared to 2020 (308 cases). After this increase, the numbers decreased in 2022 (393) and 2023 (391). The total number of days of hospitalization also followed this trend, reaching 2,107 days in 2021. The value of the Hospital Admission Authorization (AIH) varied, with the lowest value recorded in 2021 (R$1,186.41) and the highest in 2023 (R$1,543 ,33). The total cost of hospital services remained high, with the highest value in 2021 (R$1,186.41). **Conclusion:** Between 2020 and 2023, motorcycle accidents in Anápolis overwhelmed the SUS, hospitalizations and hospital costs totaled R$1,812,540. In the long term, investment in accident prevention can help reduce financial impacts and improve public health in the municipality.

Keywords: Traffic, Injuries, Motorcycles, Prevention.

INTRODUCTION

Traffic injuries represent a public health problem, ranking among the leading causes of death in low- and middle-income countries and as the sixth leading cause of years of life lost due to disability (DALY). In Brazil, in 2020, there were more than 190,000 hospitalizations related to traffic accidents in the Unified Health System (SUS), of which 61.6% involved motorcyclists. Mortality was especially high among young people, being the leading cause of death in the 5 to 14 age group and the second leading cause in the 15 to 39 age group, with 32,716 deaths, 36.7% of which were motorcyclists.[1]

Traffic accidents generate annual costs estimated at R$ 50 billion, primarily due to the loss of productivity of the victims, followed by hospital costs. Motorcyclists, often involved in serious

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accidents, represent a significant economic and social burden, especially for low-income families and for social security in cases of death.[1]

Data from the 2019 National Health Survey (PNS) reveal disparities in helmet use: while 82.6% of the population over 18 reported wearing a helmet, this rate varies regionally, being lower in the Northeast (68.6%) and higher in the South (95.7%). Helmet use is also lower among individuals with lower education levels and income. Additionally, 17% of adults reported driving after consuming alcohol, with a higher prevalence among men (20.5%).[1]

TABLE 1 - Risk Factors Related to Motorcycle Injuries

Users	Not wearing a helmet Driving under the influence of alcohol Speeding High acceleration Age/inexperience of users Braking errors Use of drugs (other than alcohol and related substances) Lane switching or zigzag driving Competition Aggressive driving Failure to make oneself visible
Road Environment	Mixed traffic (roads randomly occupied by cars, heavy vehicles such as buses and trucks, pedestrians, cyclists, and motorcyclists) Road infrastructure design Pavement conditions
Vehicles	The inherent lack of protection against trauma. This refers to the nature of the vehicle, which lacks a protective shell and other passive safety devices (side protection bars, airbags).
Structural Factors	Inadequate training (referring to the ease of obtaining a motorcycle license) Deficient legislation Weak enforcement Lenient enforcement policies Unsustainable mobility policies Lack of inclusive urban planning Limited public transport Infrastructure Commercial determinants of health Precarious working conditions

Source: Brasil - Ministério da Saúde.

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The use of motorcycles as a means of transportation for work, especially in delivery services, exacerbates the problem, with many accidents being classified as typical work-related accidents.

Motorcycle accidents often result in bone fractures due to the high force involved, which frequently exceeds the bones' capacity to withstand impact. The severity of the fracture depends on the intensity of the force applied and the areas of the body affected. The American Academy of Orthopedic Surgeons classifies fractures into five main types[2]:

Stable fracture: When the ends of the bone are aligned, with no significant displacement.

Open or compound fracture: The skin is broken, though the bone may not be visible in the wound.

Transverse fracture: The fracture occurs along a horizontal line.

Oblique fracture: The fracture follows an angled pattern.

Comminuted fracture: The bone is broken into three or more fragments.

The treatment and long-term prognosis depend on the severity of the fracture and the patient's overall health. Many fractures heal with proper and timely treatment, but some may require more intensive approaches, such as permanent rods or bone grafts[2].

The analysis of the impact of motorcycle accidents in the municipality of Anápolis is of utmost importance for understanding the socioeconomic and public health effects caused by these events. The growing number of motorcyclists in the city, combined with the increasing occurrence of accidents, poses challenges to both the local healthcare system and traffic infrastructure. With a high rate of severe injuries and deaths resulting from motorcycle accidents, it is essential to evaluate the consequences of these accidents for the population's health, hospital costs, and economic implications, such as loss of productivity and increased expenses for medical treatments.

Therefore, the objective of this study is to conduct a survey on motorcycle accidents in the municipality of Anápolis.

METHODS

This is a descriptive and ecological study that used data from the electronic portal of the Department of Informatics of the Unified Health System (DATASUS – http://tabnet.datasus.gov.br).

In Brazil, traffic accident reporting is primarily carried out through the Mortality Information System (SIM) and the Traffic Accident Notification System (SISTAT). These systems are used to register, monitor, and collect data on traffic accidents across the country.

Mortality Information System (SIM): The SIM is maintained by the Ministry of Health and is used to record deaths, including those resulting from traffic accidents. It provides important data on the causes of death, allowing for the analysis of fatal accidents.

Traffic Accident Notification System (SISTAT): SISTAT is a system developed by the National Department of Traffic (DENATRAN) in partnership with the Ministry of Health. Its aim is to register and monitor traffic accidents occurring in the country, including those with victims. The system allows for the collection of detailed information about the circumstances of the accident, the type of injury, and the severity of the victims, in addition to enabling the integration of data from different agencies and levels of government.

These reports are generated through the statistical tabulation application Tabnet, developed

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by the Ministry of Health. The data were extracted in November 2014.

Regarding research ethics, the guidelines of the National Health Council Resolution No. 674, dated May 6, 2022, were followed. Since this involves the evaluation of publicly available data, it was not necessary to obtain approval from Plataforma Brasil.

RESULTS

The data were collected from DATASUS in November 2024, covering the years 2020 to

Table 1 - Hospital Morbidity in SUS for External Causes - by place of residence - Goiás, Municipality: 520110 ANÁPOLIS, V20-V29 Motorcyclist Trauma, 2020-2023, number of injured individuals.

	2020	2021	2022	2023	Total
ANÁPOLIS	308	504	393	391	1596
Total	308	504	393	391	1596

Table 2 - Hospital Morbidity in SUS for External Causes - by place of residence - Goiás, Municipality: 520110 ANÁPOLIS, V20-V29 Motorcyclist Trauma, 2020-2023, length of stay by Municipality and Year of processing.

	2020	2021	2022	2023	Total
ANÁPOLIS	1720	2107	1605	1584	7016
Total	1720	2107	1605	1584	7016

Table 3 - Hospital Morbidity in SUS for External Causes - by place of residence - Goiás, Municipality: 520110 ANÁPOLIS, V20-V29 Motorcyclist Trauma, 2020-2023, average AIH value by Municipality and Year of processing.

	2020	2021	2022	2023	Total
ANÁPOLIS	1837,51	1186,41	1236,07	1543,33	1411,73
Total	1837,51	1186,41	1236,07	1543,33	1411,73

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Table 4 - Hospital Morbidity in SUS for External Causes - by place of residence - Goiás, Municipality: 520110 ANÁPOLIS, V20-V29 Motorcyclist Trauma, 2020-2023, values of hospital services by Municipality and Year of processing.

	2020	2021	2022	2023	Total
ANAPOLIS	463159,3	478210	393041,2	478129,1	1812540
Total	463159,3	478210	393041,2	478129,1	1812540

2023, as they are already consolidated data.

DISCUSSION

The number of motorcyclists injured in the municipality showed significant variations between 2020 and 2023. In 2021, there was a peak with 504 injured individuals, representing a substantial increase compared to 2020, which had 308 cases. This increase may be related to several factors, such as the growth of the motorcycle fleet or changes in traffic behavior. However, after this peak, the number of injured individuals slightly decreased in 2022 (393) and 2023 (391), although it remains considerably high compared to 2020.

The number of hospital stay days followed the trend of the number of injured individuals, with 2,107 days of hospitalization in 2021, the year with the highest number of victims. The total number of stay days for the period from 2020 to 2023 was 7,016 days, with 2023 showing a slightly lower value (1,584 days) compared to the previous year, 2022 (1,605 days). This indicates that, although the number of injured individuals decreased, the severity of the injuries may have led to longer hospitalizations.

The average value of the Hospital Admission Authorization (AIH) showed significant variations over the years, with the lowest value recorded in 2021 (R$1,186.41) and the highest in 2023 (R$1,543.33). The decrease from 2020 to 2021 may indicate the adoption of cost containment measures or changes in the types of hospitalizations, while the increase in 2023 reflects a possible rise in the cost of hospital services, perhaps due to greater case complexity or inflation in hospital costs.

The total amount spent on hospital services in the municipality increased from 2020 to 2021, from R$463,159.30 to R$478,210, indicating a higher demand for hospital services during that period. This amount remained relatively stable in the following years, with variations in 2022 and 2023 (R$393,041.20 and R$478,129.10, respectively), suggesting that, despite fluctuations in the number of injured individuals, the overall financial impact on the healthcare system remained high.

A study conducted at a government teaching hospital in the municipality of São Paulo analyzed the pattern of injuries in motorcycle accident victims treated at a reference emergency service. The data confirm the predominance of young male victims, with most being discharged

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from the hospital. The most frequent injuries were fractures of the limbs and pelvis, superficial wounds, cranioencephalic trauma, and dislocations, with the majority being of mild intensity (ISS between 1 and 9). Among fatal cases, a higher frequency of severe injuries was observed, such as fractures associated with cranioencephalic trauma and damage to abdominal organs.[3]

A study conducted at the Hospital Otávio de Freitas in Recife evaluated traumatic-orthopedic complications in motorcycle accident victims. The research identified that most of the victims were young (18-30 years old), male (95%), with low educational levels (45% had completed elementary school), and the most frequent collisions involved larger vehicles. The reported complications included persistent pain (95%), functional disability (94%), and infections (78%), which often resulted in severe cases such as osteomyelitis and prolonged hospitalizations.[4]

The study conducted at the Evangelical University Hospital of Curitiba (HUEC), Curitiba, PR, Brazil, analyzed the epidemiological profile of limb fractures in motorcycle accident victims treated at the emergency department between 2007 and 2013. This is a retrospective, descriptive, and observational study, analyzing 3,528 victims, of which 88.29% were men and 11.71% were women, with an average age of 29.7 years. A total of 4,365 fractures were identified, with a predominance in the lower limbs (59.66%) compared to the upper limbs (40.34%). The most common fractures were of the leg (18.14%), followed by the hand (11.57%) and wrist (10.65%).[5]

Another study conducted at the General Hospital of the State of Bahia between 2000 and 2010 analyzed the incidence of spinal cord injuries associated with motorcycle accidents, correlating them with the increase in motorcycle sales during the period and the anatomical distribution of the injuries. A total of 110 patient records with traumatic spinal injuries were evaluated, with an average age of 30 years, predominantly young individuals. A nearly fivefold increase in the incidence of injuries was observed, following the growth in motorcycle use in Brazil. The injuries were most frequent in the cervical spine (51.4%), followed by the thoracic spine (37.2%) and lumbar spine (11.4%). Only 34.3% of patients had no neurological deficit upon admission, with more severe and frequent spinal cord injuries associated with thoracic fractures.[6]

When analyzing motorcycle accidents as one of the leading causes of death and disability among the young population in Mexico, a descriptive and cross-sectional study included 98 patients who required orthopedic surgical treatment, with a predominance of men (94%) and an average age of 29.7 years. The results revealed that the most frequent accidents involved male motorcyclists with motorcycles under 150 cm^3, occurring mainly in rural areas and without helmet use (75.5%), usually involving a collision with a moving object. The most common fractures were of the tibia and fibula (28.9%), open fractures (52.3%), femur (25%), and forearm (10.5%). According to the AO classification, the most common fractures were AO 42 B 3.3, AO 32A3.2, and AO 23B1.2, which correspond to

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cases with a worse prognosis.[7]

The financial impact of motorcycle injuries in traffic is significant, placing increasing pressure on the resources of the Unified Health System (SUS) and affiliated hospitals. Although the number of deaths remained stable between 2011 (11,485 deaths) and 2021 (11,115 deaths), the hospitalization rate increased considerably, with a 55% growth over the period. In 2011, the hospitalization rate for motorcyclists was 3.9 per 10,000 inhabitants, rising to 6.1 in 2021, resulting in a cost of R$ 167 million in that year alone. This increase is directly related to the high frequency of severe injuries that require prolonged and complex treatments, overloading the healthcare system and generating high financial costs. In 2020, Brazil recorded more than 190,000 hospitalizations due to traffic injuries, of which over 61% involved motorcyclists, making it a public health issue with substantial financial implications. These injuries are responsible for a large portion of hospital costs and lost workdays, as well as directly impacting the country's economy.[1]

CONCLUSIONS

This analysis demonstrated the impact of motorcycle accidents in the municipality of Anápolis, particularly regarding the increase in hospitalizations and the consequent overload of the Unified Health System (SUS). Between 2020 and 2023, a considerable variation in the number of traumatized motorcyclists was observed, with a peak in 2021 that required a high amount of hospital resources. Although the number of injured individuals decreased in 2022 and 2023, the severity of the injuries resulted in prolonged hospitalizations, which increased the costs of hospital treatments.

The financial data indicate that the impact of injuries related to motorcycle accidents is substantial, with a significant increase in hospital expenses, reaching a total of R$1,812,540.00 between 2020 and 2023. The average value of the Hospital Admission Authorization (AIH) varied over the years, reflecting both changes in hospital costs and the complexity of hospitalizations. The severity of the injuries, combined with the increase in the motorcycle fleet and the lack of preventive measures, results in high costs for both the municipal and state healthcare systems.

This scenario highlights the need for public policies focused on preventing motorcycle accidents, such as awareness campaigns about the use of protective equipment, as well as improvements in road infrastructure. These actions would not only contribute to reducing the number of victims but also decrease the significant financial impact that motorcycle accidents impose on the healthcare system, alleviating the pressure on hospitals and public resources. In the long term, investing in accident prevention could result in considerable savings and contribute to the improvement of public health in the municipality of Anápolis.

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