

# THE IMPACT OF MOTORCYCLE ACCIDENTS IN A REFERENCE HOSPITAL DURING THE COVID-19 PANDEMIC

## IMPACTO NOS ACIDENTES MOTOCICLÍSTICOS EM UM HOSPITAL REFERÊNCIA DURANTE A PANDEMIA DE COVID-19

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### ABSTRACT

**Objective:** This study aimed to analyze the relationship between the number of motorcycle accidents attended at a reference Hospital for trauma in Campinas, state of São Paulo, and the pandemic by COVID-19 during the year 2020. **Methods:** This is a cross-sectional, descriptive retrospective study carried out at Hospital PUC- Campinas, through the analysis of medical records of patients, victims of motorcycle trauma undergoing orthopedic surgical management in 2020. The phases of the pandemic and the isolation rates according to the São Paulo Plan were studied. Chi-Square tests, and the Least Squares method were applied for statistical calculations. **Results:** 155 medical records were analyzed, of which 91.61% of the patients were male. Of those admitted, 94.84% suffered fractures and 51.61%, polyfractures. There was a correlation between the average isolation rates and the number of accidents. In the 14-day period, as the average isolation rate increased by 10%, there was an increase of approximately 3 accidents in that period. In the 7-day analysis, 1.7 more traumas were observed for every 10% increase in the average isolation. **Conclusion:** The results suggest that by increasing the average isolation rate, the number of traumas per motorcycle treated at the institution increased. **Level of Evidence III, Comparative Retrospective Study.**

**Keywords:** Accidents, Traffic. COVID-19. Pandemics. Social Isolation.

### RESUMO

**Objetivos:** Analisar se houve relação do número de acidentes motociclísticos atendidos em um hospital referência para o tratamento de trauma em Campinas com a pandemia pela COVID-19 durante o ano de 2020. **Métodos:** Estudo transversal, retrospectivo descritivo, realizado no Hospital PUC-Campinas, por meio da análise de prontuários de vítimas de trauma por acidente de moto com conduta cirúrgica ortopédica em 2020. Foram estudadas as fases da pandemia e as taxas de isolamento de acordo com o Plano São Paulo (Plano SP). Utilizaram-se análises de p-valor usando testes qui-quadrado e o método de mínimos quadrados para cálculos estatísticos. **Resultados:** Foram analisados 155 prontuários de pacientes, dos quais 91,61% eram do sexo masculino. Dos internados, 94,84% sofreram fraturas e 51,61%, polifraturas. Houve correlação entre as taxas médias de isolamento com o número de acidentes. No período de 14 dias, à medida em que houve crescimento de 10% na média da taxa de isolamento, observou-se um aumento de aproximadamente três acidentes. Na análise de 7 dias, observou-se 1,7 traumas a mais a cada 10% do aumento da média de isolamento. **Conclusão:** Os resultados sugerem que, ao aumentar a taxa média de isolamento, houve um aumento do número de traumas por acidente de moto atendidos na instituição. **Nível de Evidência III, Estudo Retrospectivo Comparativo.**

**Descritores:** Acidentes de Trânsito. COVID-19. Pandemias. Isolamento Social.

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### INTRODUCTION

Traffic accidents constitute a public health problem of great importance with repercussions on the population's morbidity and mortality. The accident is understood as an unintentional event, causing physical and/or emotional injuries with great impact on the victim.<sup>1</sup> Statistics from the Mortality Information System (SIM)

show that between 2007 and 2011 there were 694,763 deaths from external causes in Brazil, and 28.7% (199,374) of these were due to traffic accidents.<sup>2</sup> Motorcycle accidents represent the largest proportion of deaths,<sup>3</sup> which justifies their importance in relation to public policies and awareness campaigns. The young adult is an important victim, a fact that shows not only a social damage,

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The study was conducted at Hospital PUC-Campinas.

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but also the increased demand for health services and losses in the economically active population.<sup>4</sup>

In addition to the problems about motorcycle accidents, in Brazil, the first case of COVID-19 was confirmed on February 26, 2020. On March 11 of the same year, the World Health Organization upgraded the disease caused by the new coronavirus to a pandemic status.<sup>5</sup> This fact characterized an atypical year in the face of a rapidly spreading virus, affecting the social, economic and public health spheres. Faced with the collapse of the health system, interventions were necessary in an attempt to contain the spread of the virus, such as social isolation.<sup>6</sup> The Government of the state of São Paulo, through the so-called São Paulo Plan, established criteria for cities to regulate the operation of certain sectors. These criteria were grouped and classified into five phases: Phase 1 (red), Phase 2 (orange), Phase 3 (yellow), Phase 4 (green) and Phase 5 (blue), respectively from the highest to the lowest level of restrictions.<sup>7</sup>

Among the social and economic repercussions, the pandemic scenario caused companies – which worked during some periods with the doors closed – to seek new alternatives, such as the implementation or intensification of delivery services through digital platforms, since the possibility of shopping without leaving home became imperative for the entire population.<sup>8</sup>

In addition, many workers who lost their jobs before or during the health crisis, as a complement or as a main source of income, sought on these platforms the possibility of working as motorcycle or bicycle delivery.<sup>9</sup> For this portion of the population, motorcycle accidents mean interruptions in productive activities, temporarily or permanently.<sup>10</sup> For the health system, accidents represent the consumption of infrastructure and economic resources, which are extremely compromised during the pandemic crisis.

Considering the relevance of the morbidity and mortality of motorcycle accidents and the atypical year of 2020 characterized by the coronavirus pandemic, as well as its repercussions, the objective of this study was to analyze the profile of the patient victim of a motorcycle accident, as well as the relationships between the number of accident patients treated at the PUC-Campinas Hospital – which became a reference for trauma in the city during the pandemic – with the phases of the São Paulo Plan classification and the average isolation rates in Campinas.

## METHODS

This is a cross-sectional, retrospective and descriptive study, carried out at the Hospital of PUC-Campinas, filed by the Research Ethics Committee with registration in the Plataforma Brasil under number 88812818.3.0000.5481. An analysis of the medical records of 155 patients seen during the year 2020 from January to December was carried out through records in the Orthopedics and Traumatology service. All participants signed the informed consent form (ICF). Campinas is the city in which the institution where the research was conducted is located. The fleet of motor vehicles in the city in 2020 was 922,266, with a motorization index of 76 vehicles for every 100 inhabitants.<sup>11</sup>

The study population consisted of all patients who suffered motorcycle accidents (driver or rump) who underwent orthopedic surgical management. In the analyses, motorcycle accident patients who did not undergo orthopedic surgeries and roadkill victims were excluded. Age, sex, occupation, period of the day, day of the week, associated injuries and deaths were evaluated.

The data related to the Classification Phases, which are a parameter for the city of Campinas, were taken from the São Paulo Plan (<https://www.saopaulo.sp.gov.br/planosp/>). In the case of the weekly, biweekly or monthly analysis, the largest number of days framed in the phase (Phase 1, Phase 2, Phase 3, Phase 4 and

Phase 5) in which the selected period was located. The Phases are a classification system that takes into account the criteria of Health System Capacity and Pandemic Evolution. The indicators that help in these criteria are: occupancy rate of ICU COVID beds, ICU COVID beds per 100,000 inhabitants, variation of new cases, variation of hospitalizations and variation of deaths.<sup>7</sup>

Isolation rate data were collected from the São Paulo Plan website and these are estimated by SIMI-SP (São Paulo Intelligent Monitoring System) through an agreement with telephone operators, ABR (Brazilian Association of Telecommunications Resources) and IPT (Institute of Technological Research), so that the State can consult anonymously collected information on displacements in the mapped municipalities.<sup>7</sup>

Epidemiological data were statistically analyzed with the aid of the Chi-square test used to estimate the p-value. Small p-values were considered in order to consolidate statistically significant observations. The average of the isolation rates of each selected period was calculated, in order to seek correlation between this variable and the number of accidents when measured at intervals of 7 and 14 days, investigated using linear adjustments through the Least Squares Method. This method uses the inverse of the uncertainties of the means as the weight of the data in determining the correlation.

## RESULTS

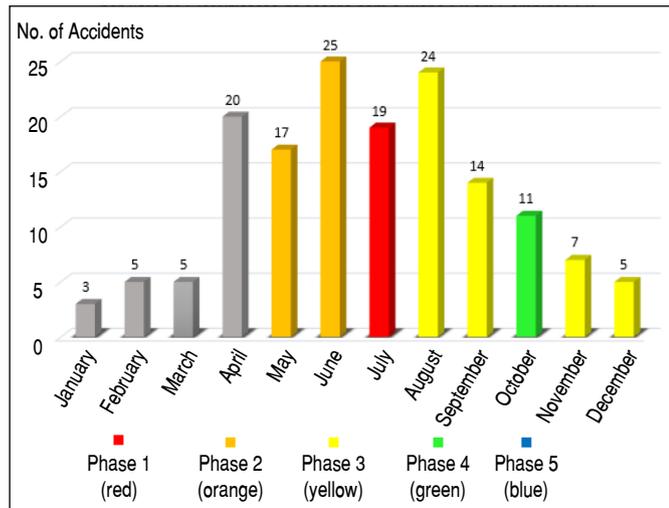
Among the 155 patients analyzed, 142 were male (91.61%) and 13 were female (8.39%). The most significant age group was 18 to 29 years (54%), with a mean age of 31.21 years (16 to 67 years). In 51.61% of the hospitalized patients, the patients suffered polyfractures and in 37.42% of the general cases they were exposed fractures. The lower limbs were the most affected site, representing 75.48% of the fractures. The injuries occurred mainly in the bones of the tibia, fibula and femur, respectively, representing 28.6%, 19.7% and 13.4% of the total fractures. The period with the highest number of cases was the night (36%), followed by the afternoon (28%), the morning (23%) and the morning (13%), with  $p < 0.001$ . There was no death among hospitalized patients (Table 1).

In this study, there was a trend in the occurrence of accidents on weekends, since the days with the most significant numbers were Sunday (23.23%), Saturday (17.42%) and Friday (16.13%), with  $p < 0.001$  (Table 1).

**Table 1.** Profile of patients victims of motorcycle accidents treated at Hospital PUC-Campinas in 2020.

	2020	p-value
<b>Total accidents</b>	155	
<b>Sex</b>		< 0.001
Male	91.61%	
Female	8.39%	
<b>Age</b>		< 0.001
Average age	31.21	
Most prevalent age group	18 to 29 years (54%)	
Age Range	16 to 67 years	
<b>Fractures</b>		
Occurrence of fracture	94.84%	> 0.05
Occurrence of polyfracture	51.61%	< 0.001
Occurrence of exposed fracture	37.42%	< 0.001
Most affected place	Lower limbs (75.48%)	$p = 0.05$
Days of highest occurrence	Sunday (23.23%), Saturday (17.42%) and Friday (16.13%)	< 0.001
Period of highest occurrence	Night (36.13%)	< 0.001
Fatalities	0%	< 0.05

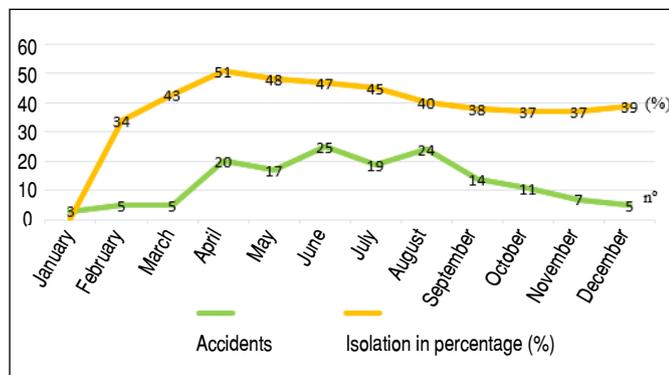
Data on the victims' profession were collected, and in 76 of the cases, they were not informed. The most reported profession was that of motorcyclist in 19 patients (12%), followed by the autonomous profession in 5 of the patients (3%). Data were collected from fifteen General Balance Sheets of the São Paulo Plan, as of May 2020. With these data, a comparison was made with the Phase in which Campinas passed mostly during the month with the number of accidents attended by the institution (Figure 1).



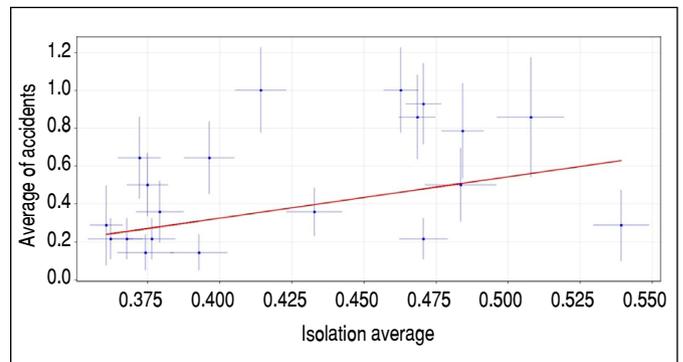
**Figure 1.** Number of accidents attended by the PUC-Campinas Hospital by Classification Phase according to the São Paulo Plan in Campinas-SP.

The relationship with the yellow phase of August and September was tested with the yellow phase of November and December and they are incompatible ( $p < 0.001$ ), that is, these phases are different in terms of the behavior of the number of accidents. Moreover, there is a difference in the behavior of the initial months of the SP Plan from May to September compared to October to December regarding the number of victims, with  $p < 0.005$ .

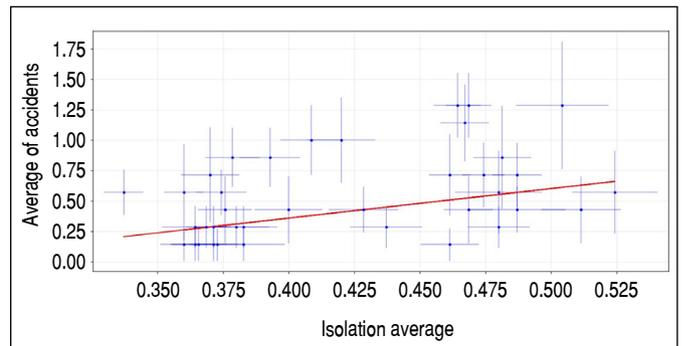
Regarding the isolation rates, Figure 2 shows the two variables (average of the monthly isolation rate and the number of accidents). However, to investigate the correlation between these data, Figure 3 and Figure 4 were constructed using linear adjustments from the Least Squares method, which uses the inverse of the uncertainties of the data to estimate the weight of each data for the adjustment. Each blue point represents sets of 14 or 7 days and the uncertainties are represented by the perpendicular lines that cross the points.



**Figure 2.** Comparison between the number of motorcycle accidents attended by the PUC-Campinas Hospital and the average percentage of isolation in Campinas-SP.



**Figure 3.** Relationship between average isolation and motorcycle accidents every 14 days.



**Figure 4.** Relationship between average isolation and motorcycle accidents every 7 days.

For the 14-day graph (Figure 3), the correlation was 2.2 with uncertainty of 0.7 (that is, it is statistically significant), which translates that as an increase of 0.1 (10%) in the average isolation rate is observed, the expectation of the average of motorcycle accidents increases by 0.22, which implies a result of approximately 3 more accidents in this period.

Similarly, in Figure 4, every 7 days a ratio of 2.4 (7) was observed, which is also statistically significant, pointing to an increase in the expectation of 0.24 accidents per 10%, which suggests 1.7 more accidents in a period of 7 days.

## DISCUSSION

The current situation of the impact of motorcycle accidents has been widely discussed, as it entails social, psychological, economic, social security and environmental consequences, in addition to the demand for health resources.<sup>12</sup> This problem gains greater significance when inserted in the context of the pandemic, in view of the overload of the health system and consequent scarcity of resources, from the attention of institutions in raising awareness of sanitary measures, to infra-structural and economic resources.

The profile of the victim of motorcycle accidents in the present study is in agreement with the medical literature. The victim is predominantly male with a more prevalent age range of 18 to 29 years.<sup>13</sup> In our study, there was a predominance of lesions in the lower limbs, especially in the bones of the tibia, fibula and femur, the results of which are consistent with the profile found in the literature.<sup>13</sup> Lower limb injuries are one of the major causes of prolonged hospital stay, according to a study by Craig, Sleet and Wood.<sup>14</sup>

The number of patients victims of motorcycle accident trauma attended by the PUC-Campinas Hospital during 2020 was 155. This number increased ( $p < 0.05$ ), compared to other studies

carried out in 2010 and 2017 at the same institution, in which 114 and 105, respectively, were the numbers of patients treated who suffered traffic accidents due to motorcycles.<sup>15</sup>

Among the relevant factors that may contribute to the increase in this number, we highlight the relocation, from April 2020, of the municipality's health system by the Sectorial Coordination of Access Regulation of the Department of Audit and Regulation of the Unified Health System, in view of the need for reorganization due to the pandemic, in which the Hospital of PUC-Campinas was chosen as the reference institution for the care of traumas and other non-COVID pathologies in the city of Campinas.<sup>16</sup>

The growth in the number of motorcycle fleets was from 100,324 motorcycles in 2010 to 136,714 units in 2020.<sup>11</sup> However, the growth in the number of motor vehicles in 2020 considering all categories was only 0.6% compared to the previous year. This growth is the lowest in the last 10 years, with an average fleet growth rate of 2.9%.<sup>11</sup> In addition, it is worth mentioning that during 2020, in view of the community spread of COVID-19, intervention measures to contain the transmission of the virus were widely disseminated in the countries.<sup>17</sup> Faced with this, the government of the state of São Paulo initiated the introduction of social isolation measures on March 16. In the same month, there was another decree with stricter measures, allowing only essential services to operate. As of May 31, the state government implemented a five-phase plan to gradually relax distancing policies.<sup>7</sup>

The need for social isolation is directly linked to the delivery services of establishments considered essential.<sup>8</sup> The crisis caused an increase in the delivery of food, medicines and other products. One of the main delivery service platforms said 100,000 new restaurants were registered during the pandemic, an increase from 30 million orders in 2019 to 48 million orders in 2020.<sup>18</sup>

Given this scenario, the present study sought a relationship between the number of accidents attended by the institution and the Average Isolation Rates during the coronavirus pandemic.

It was observed that there was a relationship between the increase in the average isolation rate index and the number of motorcycle traumas treated at the institution, presenting an increase in the expectation of the number of accidents of approximately 3 more traumas in the period of 14 days, every 10% of the increase in the isolation rate. And for the 7-day period, the 10% increase in the isolation rate represented approximately 1.7 more accidents. This correlation may be linked to the increase in orders for essential

items via delivery, since these deliveries are mostly made by motorcycles or bicycles.

The occurrences of motorcycle accidents were mainly on weekends, Sundays and Saturdays, with 20.8% and 23.23% respectively, followed by Friday (16.13%). There was also a centralization of cases in the night (36.13%) and afternoon (28.39%). This pattern corroborates the results of a search made for a delivery app, which shows the concentration of orders on Friday, Saturday and Sunday and, mainly, during dinner (6 pm to midnight) and lunch (11 am to 2 pm).<sup>19</sup>

The increase in demand caused a 32% growth in motorcycle and bicycle deliveries in the city of Campinas during 2020, whose number went from 5,000 to 6,600, according to the Associação de Motoboys de Aplicativos de Campinas.<sup>20</sup> In the data collection of the present study, the profession that most appeared was that of motorcyclist in 19 patients (12%) even though in 76 of them, no profession was described in the medical record.

During this scenario, the impositions brought greater visibility to these workers, especially those who deliver via app or outsourced delivery. This is because the individual insertion of the worker in the labor market has become an emergency income opportunity in a scenario where many people are unemployed or have lost their jobs.<sup>9</sup> It is important to discuss that motorcyclists are the ones who die the most in work-related accidents, according to a survey by the Brazilian Ministry of Health and the Information Systems for Aggravation and Notifications (Sinan). The results showed that there were 15,511 fatal work accidents recorded between 2011 and 2020, and motorcyclists represent the largest portion of occurrences (21.2%).<sup>21</sup>

The present study has limitations regarding the methodology, as it is an analysis of data and medical files in which it was not possible to confirm the information filled and not filled in the patients' medical records.

## CONCLUSION

This study showed results that suggest that there is a relationship between the pandemic and the number of motorcycle accidents, pointing out that by increasing the average isolation rate, the number of traumas per motorcycle attended at the institution increased. These findings can be a source for the development of new studies and even the implementation of public policies on the health of motorcyclists, considering the reduction of traffic accidents and minimization of the burden of the health system and negative outcomes.

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