Impact of the COVID-19 Pandemic on Dog Bite Injuries in a Private Hospital in Brazil: A Comparative Epidemiological Study

Impacto da pandemia de COVID-19 em lesões por mordedura de cães em um hospital privado no Brasil: Um estudo epidemiológico comparativo

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Abstract

Introduction Dog bites are a significant public health problem, often requiring emergency department (ED) visits. Patterns of injury vary by age, with children typically injured on the head and neck and adults, on the extremities. The COVID-19 pandemic altered human-dog interactions, with some studies reporting an increase in dog bite injuries (DBI). This study evaluated trends in DBI at a private hospital in São Paulo, Brazil, during the pandemic and analyzed the demand for plastic surgery consultations.

Method A multicenter retrospective observational study analyzed cases coded W54 (ICD-10) across five emergency units of Hospital Israelita Albert Einstein from January 2019 to June 2021. Patients were categorized into pre-social isolation (Group 1) and post-social isolation (Group 2) periods. Variables included patient demographics, admission date, day of the week, visit time, and plastic surgery consultations. Statistical analyses were performed using R software.

Results Among 1129 cases, 558 occurred in Group 1 and 571 in Group 2. Despite a significant reduction in overall ED visits, the relative frequency of DBI increased during the pandemic ($p < 0.001$). Plastic surgery consultations showed a modest rise but were not statistically significant ($p = 0.0775$). No significant differences were observed in patient age, sex, or visit time.

Conclusions The pandemic influenced the relative frequency of DBI at this hospital, highlighting the need for preventive strategies and further research in diverse healthcare settings to better understand this issue.

Keywords
- bites and stings
- COVID-19
- dogs
- emergency room visits
- plastic
- surgery

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Resumo

Introdução Mordeduras de cães representam um relevante problema de saúde pública, frequentemente demandando atendimento em pronto-socorro (PS). As lesões variam conforme a idade: crianças geralmente apresentam ferimentos na cabeça e pescoço, enquanto adultos são mais atingidos nas extremidades. Durante a pandemia de COVID-19, alterações nas interações entre humanos e cães foram relatadas, com alguns estudos apontando aumento das lesões por mordedura de cães (LMC) em períodos de lockdown. Este estudo investigou as tendências de LMC em um hospital privado de São Paulo, Brasil, durante a pandemia, e avaliou a demanda por consultas em cirurgia plástica.

Método Estudo retrospectivo observacional multicêntrico que analisou casos com o código W54 da CID-10 em cinco unidades de emergência do Hospital Israelita Albert Einstein entre janeiro de 2019 e junho de 2021. Os pacientes foram divididos em períodos pré- (Grupo 1) e pós-isolamento social (Grupo 2). Dados avaliados incluíram características demográficas, data e horário das visitas, dia da semana e demanda por cirurgia plástica. As análises estatísticas foram realizadas no software R.

Resultados Entre 1129 casos, 558 ocorreram no Grupo 1 e 571 no Grupo 2. Apesar da redução nas visitas gerais ao PS, a frequência relativa de LMC aumentou durante a pandemia ($p < 0{,}001$). Consultas de cirurgia plástica cresceram discretamente, sem significância estatística ($p = 0{,}0775$). Não houve diferenças relevantes na idade, sexo ou horário das visitas.

Conclusões A pandemia influenciou a frequência relativa de LMC, destacando a importância de estratégias preventivas e investigações mais amplas para entender este problema.

Palavras-chave

- cães
- cirurgia plástica
- COVID-19
- mordeduras e picadas
- visitas ao pronto socorro

Introduction

Dog bites are a significant public health concern, frequently resulting in emergency department (ED) visits.[1] These injuries are particularly common in children, who often sustain bites to the head and neck with crush injuries and soft-tissue avulsions, but also in adults in whom bites more frequently occur on the extremities and hands, varying from a wide range of severity and complications.[2–4] Epidemiological analyses of dog bite injuries presenting to the emergency department of a private hospital in Brazil during the COVID-19 pandemic.

In the United States, dog bites account for ~0.3% of all ED encounters, translating to an average incidence of 135 per 100,000 population.[1] In the United Kingdom, the incidence of dog bite hospital admissions increased from 6.34 per 100,000 population in 1998 to 14.99 per 100,000 in 2018.[5] However, in Brazil, those numbers increase significantly: according to surveillance data from the national health information system (SINAN), an incidence of 255 bite-injuries per 100,000 people occur per year in the south american country.[6]

During the COVID-19 pandemic, there was a notable increase in dog attacks in emergency rooms, with a notable rise in pediatric dog bite injuries. Several studies have documented this phenomenon.[7–11] Habarth-Morales et al. reported a significant increase in the incidence of dog bite injuries among children during the pandemic, with a 44% increase in their institutional cohort and a 25% increase in a national cohort relative to 2019.[7] Similarly, Plana et al. found a substantial increase in pediatric dog bite injuries during the pandemic, with a notable spike in emergency department presentations. The study highlighted that most injuries occurred to the head and upper extremities, with a significant proportion requiring surgical intervention.[8]

This trend may be attributed to factors such as more time spent at home during social isolation, remote learning and increased stress levels, which may have altered supervision patterns and interactions between children and dogs.[7] Furthermore, there have been reports on behavioral changes in pets during lockdown, with more pronounced negative changes, suggesting altered social dynamics between owners and dogs.[12]

The Hospital Israelita Albert Einstein (HIAE) is a private tertiary hospital that operates four emergency care units in the metropolitan region of São Paulo, Brazil, each equipped with comprehensive medical resources, including on-call plastic surgery teams to address complex trauma cases. During the COVID-19 pandemic, members of these teams reported a perceived increase in cases involving dog bite injuries, raising concerns about potential shifts in public health patterns during this period.

This study aims to primarily evaluate whether the perceived local rise in dog bite cases was statistically significant and, secondarily, to assess whether there was a corresponding increase in the engagement of on-call plastic surgery

specialists in managing these cases. By addressing these aims, the study seeks to provide evidence-based insights for healthcare planning and injury prevention strategies in similar contexts.

Methodology

A multicentric retrospective observational study was conducted following approval from the Institutional Review Board of Hospital Israelita Albert Einstein (HIAE) under the identification number CAAE 55744822.0.0000.0071. The study aimed to analyze the incidence of cases classified under the primary diagnosis "Bitten or struck by dog" (ICD-10 code W54, version 2010) among patients presenting to the emergency departments of HIAE's units in Alphaville, Morumbi, Chácara Klabin, Ibirapuera, and Perdizes. HIAE is a private healthcare institution funded through internal resources and third-party payers. The study period extended from January 1, 2019, to June 30, 2021.

Data collected for cases of dog bite injuries included patient age, sex, date of admission, day of the week, time of visit, and whether a plastic surgery consultation was requested during the visit. Patient age was recorded as an absolute number and categorized into four groups: 0–4 years, 5–9 years, 10–11 years, and 12 years or older. Patient sex was classified as male or female. The days of the week were grouped into two categories: "weekdays" (Monday through Friday) and "weekends/holidays" (Saturday, Sunday, and public holidays). The time of visit was categorized as "daytime" (7:00 AM to 6:59 PM) or "nighttime" (7:00 PM to 6:59 AM).

Cases with incomplete data or a secondary ICD-10 W54 diagnosis recorded in the patient charts were excluded from the analysis. The remaining cases were categorized into two groups based on the date of the initial visit: Group 1 (pre-social isolation) included cases from January 1, 2019, to February 29, 2020, while Group 2 (post-social isolation) included cases from May 1, 2020, to June 30, 2021.

The total number of cases presenting to HIAE emergency departments and the number of cases requiring plastic surgery consultations for dog bite injuries (DBI) were analyzed for these periods. Total monthly case counts were recorded. Statistical analysis was performed using R software, version 3.6.2, with a significance level set at 0.05.

Quantitative variables included age (in years), the mean monthly number of DBI emergency visits, and the relative frequency of DBI visits compared with overall emergency visits. Qualitative variables comprised age group, sex, day of the week, time of visit, and the presence of a plastic surgery consultation request.

Quantitative variables were analyzed using measures of central tendency and dispersion. The variable "age," which exhibited a non-normal distribution, was described using the median and interquartile range and analyzed with the Mann-Whitney U test. The relative frequency of DBI emergency visits as a percentage of overall visits and the mean monthly DBI emergency visits demonstrated normal distributions; these variables were described using the mean and standard deviation and compared using the student's *t*-test.

Qualitative variables were summarized using absolute and relative frequencies. For variables where any category was expected to have a frequency less than five (e.g., hospital and diagnosis), Fisher's exact test was applied. For all other qualitative variables, Pearson's chi-squared test was used to assess associations.

Results

A total of 1,129 cases of dog bite injuries were identified across the two study periods, with 558 cases in Group 1 (pre-social isolation) and 571 cases in Group 2 (post-social isolation) (►**Table 1**). The study excluded the months of March and April 2020 to create a 2-month interval between the groups, accounting for the potential period of gradual implementation and adaptation to social isolation measures, thereby enhancing the study's validity.

The distribution of patients by sex was similar between the groups, with females accounting for 53% of cases (295 in Group 1 and 300 in Group 2) and males comprising 47% (263 in Group 1 and 271 in Group 2), yielding a p-value of 0.9121. The median age of patients was also comparable between groups: 38 years (interquartile range [IQR]: 17, 38, 52, 90) in Group 1 and 38 years (IQR: 16, 38, 51, 89) in Group 2.

Non-statistically significant differences were observed for several variables. Regarding age groups, there was an increase in the "0–4 years" category from 22 (4%) in Group 1 to 29 (5%) in Group 2, and in the "5–9 years" category from 56 (10%) to 62 (11%), while the "10–12 years" category decreased slightly from 40 (7%) to 37 (6%), and the "12+ years" category remained stable, decreasing marginally from 440 (79%) to 443 (78%) (p-value = 0.7426). The distribution of cases by day of the week was also consistent, with "weekdays" increasing slightly from 345 (62%) to 357 (63%), and "weekends/holidays" remaining steady at 213 (38%) to 214 (37%) (p-value = 0.81). Similarly, time of visit showed minimal variation, with "daytime" visits increasing from 344 (62%) to 363 (64%), and "nighttime" visits decreasing from 214 (38%) to 208 (36%) (p-value = 0.5041). Plastic surgery consultations also showed a modest increase, rising from 41 (7%) in Group 1 to 59 (10%) in Group 2, while cases without consultations decreased from 517 (93%) to 512 (90%) (p-value = 0.0775). The mean monthly number of DBI visits rose slightly, from 39.1 ± 5.98 in Group 1 to 40.8 ± 6.51 in Group 2 (p-value = 0.5000).

In contrast, the relative frequency of DBI visits compared with total emergency visits demonstrated a statistically significant increase between the two periods, rising from 0.1338 ± 0.0195 in Group 1 to 0.2941 ± 0.0650 in Group 2 (p-value < 0.001). During the study period, the total number of emergency visits across the five HIAE units decreased substantially, from 399,115 in Group 1 to 187,641 in Group 2. ►**Table 1**

Discussion

Dog bites are a significant cause of emergency room visits due to their frequency and the potential severity of injuries

Table 1 Profile of dog bite injury cases at HIAE before and during COVID-19 pandemic

Variables	Group 1 N = 558 (49%)	Group 2 N = 571 (51%)	*p*-value
Sex			0.9121
Female	295 (53%)	300 (53%)	
Male	263 (47%)	271 (47%)	
Age (in years)*	38 (17; 38; 52; 90)	38 (16; 38; 51; 89)	0.302
Age group			0.7426
0 to 4 years old	22 (4%)	29 (5%)	
5 to 9 years old	56 (10%)	62 (11%)	
10 to 12 years old	40 (7%)	37 (6%)	
> 12 years old	440 (79%)	443 (78%)	
Day of the week			0.8100
Weekdays	345 (62%)	357 (63%)	
Weekends/holidays	213 (38%)	214 (37%)	
Time of visit			0.5041
Daytime	344 (62%)	363 (64%)	
Nighttime	214 (38%)	208 (36%)	
Plastic surgery consultations			0.0775
Yes	41 (7%)	59 (10%)	
No	517 (93%)	512 (90%)	
Monthly bites in ED**	39.04 ± 5.98	40.75 ± 6.51	0.5000
DBI relative frequency**	0.1338 ± 0.0195	0.2941 ± 0.0650	< 0.001

Abbreviations: DBI, dog bite injuries; ED, Emergency Department; HIAE, Hospital Israelita Albert Einstein.
*Variable described by the median (25th percentile; 75th percentile; 100th percentile) with p-value calculated using the non-parametric Mann-Whitney test.
**Variables described by the mean ± standard deviation with p-value calculated using Student's *t*-test.

they can cause. The common injuries from dog attacks include crush injuries and soft-tissue avulsions, particularly in children, who are more likely to be bitten on the head and neck. In adults, bites more frequently occur on the extremities and hands.[2]

Epidemiological data on dog attacks in emergency rooms in Brazil reveal significant insights into the incidence and characteristics of these injuries. National health information system (SINAN) surveillance data recorded an average of 506,148 dog bite patients annually between 2008 and 2017, translating to an incidence rate of 255 bite-injuries per 100,000 people per year.[6] The majority of those incidents occur in urban settings, accounting for 71% of the cases, and only about half of the patients received the correct post-exposure prophylaxis (PEP) following a bite by a suspect rabid animal, as per the Ministry of Health guidelines.[13] These findings highlight the critical need for improved surveillance, public education, enhanced training for health workers and the implementation of integrated bite case management approaches.[6]

By the end of 2019, the world faced an unprecedented global health crisis caused by the novel coronavirus SARS-CoV-2, which rapidly evolved into a worldwide pandemic in 2020. In response, widespread lockdowns and social distancing measures were implemented to curb the virus's transmission.[14]

Numerous studies globally have documented a significant increase in pediatric DBI cases during the pandemic,[7–11] whereas our study found no statistically significant changes in the total number of DBI cases in the same period, either in the adult or pediatric populations.

A possible explanation is that variations in public health measures, cultural practices, or dog ownership trends might influence outcomes. For instance, our study analyzed data from a private tertiary healthcare institution in Brazil and did not include information from a nationwide and public base, which could have altered the results. Furthermore, dog training rates in Brazil - however unexplored by contemporary studies on dog behavior - may also contribute to our sample's results. It is known by Brazil's pet industry that families have shifted toward smaller dog breeds due to urban living trends, and accordingly to several veterinarian studies, they are less likely to cause serious injuries that would implicate in ED visits.[15,16] Notwithstanding, these hypotheses carry significant public health implications, underscoring the need for further investigation to develop and implement preventive strategies aimed at reducing the associated morbidity and burden of DBI on the healthcare system.

It was hypothesized that the profile of dog bite incidents would demonstrate variations in time of visit, day of the

week, and age group during the study period. However, the findings revealed no significant changes in these variables. This anticipated variation was considered to be potentially influenced by multifactorial dynamics.

First, extended periods at home due to remote working and schooling likely increased the frequency of interactions and, thus, proximity between children and dogs - not necessarily with the right supervision.[7,8] Second, the pandemic saw a rise in dog adoptions, often referred to as "pandemic puppies," which introduced many inexperienced dog owners to the challenges of cohabiting and managing dog behavior. New dogs in households, combined with the stress and anxiety experienced by both humans and animals during the pandemic, may have led to more unpredictable dog behavior.[7,12] Additionally, changes in routine and environment, such as stressful circumstances experienced by their owners, changes in daily activities and reduced opportunities for socialization and exercise for dogs, may have led to increased anxiety and aggression in some animals, further contributing to the rise in bite incidents.[12] All of which have been documented in american and polish studies, for example, but not in brazilian ones so far.

Moreover, our study showed that the percentage of emergency department (ER) visits for dog bite-related injuries (BSD) increased by 2.2-fold during the COVID-19 pandemic compared with the pre-pandemic period. However interesting from a statistical analysis, this result does not infer new findings to our research. The elevated relative rate is likely attributable to the unique characteristics of DBI, which often compel patients to seek immediate medical care despite social isolation measures.

The severity of dog bite injuries can vary widely, ranging from minor puncture wounds to severe lacerations and avulsions, often requiring complex surgical intervention, particularly when facial structures are involved. Injuries to the cheeks and lips are notably common in such cases.[3,17,18] Also, infections are a frequent complication, necessitating antibiotic prophylaxis, especially for high-risk wounds. Consequently, the urgency of emergency treatment is driven by the potential for significant tissue damage, infection risk, and the requirement for surgical repair in more severe cases. Moreover, the assessment and administration of tetanus and rabies prophylaxis are essential components of managing dog bite injuries, underscoring the need for timely medical expertise, irrespective of social isolation measures.[2]

A notable finding in this study indicates that the number of plastic surgery consultations for DBI remained statistically stable, showing neither an increase nor a decrease. As previously established, surgical repair is often necessary in more severe DBI cases, particularly those involving facial structures. While evidence from other studies suggests a rise in dog bite presentations during the COVID-19 pandemic, the severity of injuries and the subsequent need for surgical intervention, especially among pediatric cases, may have varied.

The study by Taylor et al. suggests that during the COVID-19 pandemic, there was a decrease in the severity of pediatric dog bite injuries to the face, as evidenced by fewer surgical consultations and cases involving multiple sites in the head and neck region. This indicates that, at least in this cohort, the severity of injuries requiring plastic surgery consultations may have decreased during the pandemic.[19]

Conversely, the study by Plana et al. reports a substantial increase in dog bite presentations during the pandemic, with the head being the most common site of injury, followed by the upper extremities, which could imply a higher demand for surgical interventions.[8]

Additionally, the study by Cordova et al. notes an increase in head and neck injuries, mostly due to animal bites, during the COVID-19 lockdown period. This suggests that while the overall number of emergency cases decreased, the relative proportion of certain types of injuries, including those requiring plastic surgery, may have increased.[20]

This research is subject to limitations. First, the data derived from a private tertiary hospital in São Paulo may not be representative of the broader Brazilian population, particularly with respect to socioeconomic status and access to healthcare. Hence incorporating data from public hospitals or national databases would provide a more comprehensive understanding of DBI across diverse populations. Additionally, variations in dog ownership trends were not explored in depth, potentially limiting the scope of the findings. Finally, this study lacks longitudinal follow-up on the long-term outcomes, such as complications, scarring and potential psychological impact on victims.

Conclusion

Dog bites are largely preventable injuries, yet they continue to place a substantial burden on emergency healthcare services. To mitigate this issue, a comprehensive and multidisciplinary approach is necessary, which includes targeted educational initiatives focusing on prevention, improved surveillance of at-risk populations such as children, and enhanced training for healthcare professionals. Additionally, public education campaigns that emphasize responsible dog ownership, proper dog behavior, and safe interaction between humans and dogs are critical for reducing the incidence and severity of these injuries. Such strategies are essential for effective injury prevention and the reduction of healthcare costs associated with dog bite injuries.

Contribuição do Autor

TSO: data analysis and/or interpretation, statistical analysis, data collection, conceptualization, study conception and design, project management, investigation, methodology, writing-original draft preparation, writing-review and editing, supervision, validation, visualization; DCG: conceptualization, study conception and design, project management, writing-review and editing, supervision; GCF: statistical analysis, data collection, research, methodology, writing - original draft preparation, software, validation; JRP: conceptualization, study conception and design, supervision; JA: data analysis and/or interpretation, final approval of the manuscript, conceptualization, study conception and design, project management, investigation, methodology, writing - review and editing, supervision, visualization.

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Clinical Trial
None.

Conflict of Interest
The authors have no conflict of interest to declare.

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