Suicide Attempts Assisted By Firefighters According to Traumatic Brain Injury

Tiago Regis Franco de Almeida¹ · Adriana Leandro de Araújo² · Diógenes Munhoz³ · Pedro Gomes Andrade⁴ · Gabriela Arantes Wagner⁵

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Abstract
Studies worldwide have reported increasing trends in suicides and attempts during the pandemic. The literature shows that improving surveillance and monitoring of suicide and attempts requires broad multisectoral prevention strategies. In Brazil, the São Paulo State Fire Department (CBPMESP) makes up the emergency response team for suicide and suicide attempted calls and public emergencies. Given this context, this paper sought to describe the characteristics of suicide attempts assisted by the CBPMESP according to traumatic brain injury (TBI), between 2018 and 2020, measured by the Glasgow Coma Scale (GCS). For this purpose, a descriptive study of 6,582 suicide attempts attended by CBPMESP was carried out. The factors associated with trauma brain injury according to the Glasgow Coma Scale (dependent variable) were analyzed by a multinomial regression model. Results show a significant increase of 8.0% (p=0.039) in the number of calls responded by CBPMESP between 2018 and 2020. Men presented a higher prevalence of more violent methods for suicide attempts, namely firearms and hanging, followed by severe TBI; in women, severe TBI occurred mostly by hanging. Despite the increase in fatal suicide attempts during the pandemic, time to attend to victim acted as a protective factor for preventing severe TBI in men and women.

Keywords Prevention · Trauma · Coma · Fire Department · COVID-19

Introduction
Studies show that the COVID-19 pandemic has affected the countries of the world differently according to the public health and sanitary measures adopted (Burnett et al., 2020). The effects of social distancing and quarantine on mental health during the COVID-19 pandemic are noticeably similar to those of traumatic events, resulting

Extended author information available on the last page of the article
in common observable disorders such as major depression, post-traumatic stress disorder, anxiety disorders, increased alcohol and drug use, and suicide attempts (Mari & Oquendo, 2020). Incidentally, decreased access to treatment for mental disorders, difficulty obtaining medication, increased alcohol consumption, economic hardship, unemployment, bankruptcy, grief, and general uncertainty regarding the future are all risk predictors for suicide (Mari & Oquendo, 2020). Low and middle-income countries, such as Brazil, also suffer from lack of infrastructure and loss of social rights due to political crisis (Zalsman et al., 2020), which establishes an important need for suicide prevention after the pandemic.

In the warnings issued about the need to study this topic, the World Health Organization (WHO) emphasized that suicide can be prevented by timely, evidence-based, and low-cost interventions. Any national suicide prevention strategy has to be multisectoral (education, labour, agriculture, business, justice, law, defence, politics, and the media), tailored to each country’s cultural and social context. According to WHO, when conceptualizing and implementing a national suicide prevention strategy, countries must specify clear objectives, targets, indicators, timelines, milestones, assigned responsibilities and budget allocations (World Health Organization, 2018). On the topic of suicide research, the International Academy of Suicide Research provided recommendations on conducting such studies during the COVID-19 pandemic (Holmes et al., 2020). In Brazil, the state strategic actions planned include (Ministry of Health, 2017) fostering and supporting research and intersectoral arrangements for the surveillance and qualification of information on suicide attempts in the country (Martins Júnior et al., 2016; World Health Organization 2019).

Several studies have reported trends in suicides and suicide attempts worldwide during the pandemic. One such research, a meta-analysis of 54 studies, found that during the COVID-19 pandemic, 2.37 out of 20 individuals in the general population experienced suicidal ideation. Suicidal behavior rates increased during the pandemic, especially among the youth and women from democratic countries, such as the United States, France, Australia, for example (Dubé et al., 2021). In Brazil, suicide mortality rates increased 43% between 2010 and 2019 nationwide, while the South and Midwest presented the highest suicide rates among the country’s regions. The data also showed a higher risk of death by suicide among Brazilian men in 2019 (3.8 times higher); however, when comparing the years 2010 and 2019, suicide rates for women and men showed a 29% and 26% increase, respectively (Brasil, 2021). Although suicide ideation by gender has already been described among high- and middle-income countries during the COVID19 pandemic (Schluter et al., 2022), this variable has not yet been evaluated in Brazil.

Studies show that improving surveillance and monitoring of suicide and suicide attempts requires broad multisectoral prevention strategies (Pan American Health Organization, 2018; Yip & Chau, 2020), but these require actors with reliable data on the occurrence of such events. Non-fatal and fatal suicide attempts, for example, have similar characteristics; thus, variables capable of predicting non-fatal suicide attempt behavior should be at the forefront of research to assess suicide risk groups (Gvion & Levi-Belz, 2018). This falls on the planning and operationalization of health and public safety policies, since these facts are closely related to the care provided by extra- and intra-hospital emergency teams.
In Brazil, the São Paulo State Fire Department (CBPMESP), with nearly 9,000 firefighter officers, makes up the emergency response teams for suicide and suicide attempted calls, as well as emergency management activities, fire prevention and fighting, victim searches, rescues, and public emergency response. CBPMESP faces, on a daily basis, many concrete cases of suicide attempt in São Paulo, often being the only institution available to perform emergency response to suicide and suicide attempts, responding on average to 2,000 calls of this nature per year (Munhoz, 2018). In these calls, besides collecting data and information about the cases, these professionals encounter a variety of suicide attempt crises, in various types of scenarios, which requires knowledge and technique to act in these situations.

A literature review showed that specific training for these calls can have a positive effect on the response to individuals having a crisis (Chidgey et al., 2019). To this end, a Technical Approach to Suicide Attempts was developed in Brazil, the goal of which is to have the fire professional use a standard protocol focused on the individual, using psychological techniques, body language, and firefighter operating procedures (Munhoz, 2018). Other countries have also developed this type of approach. In the United Kingdom, for example, patients undergo a recovery-oriented program that builds on strengths of the person in distress and their natural circle of support (Kar Ray et al., 2020). Besides providing operational assistance, CBPMESP has a training group that works permanently to give lectures on suicide prevention and action in case of a suicide crisis, aimed at emergency and health professionals, universities, and congresses, with the main mission of standardizing emergency care for suicide attempts throughout Brazil.

Studies have found evidence of changes in patient admission rates at trauma centers worldwide during the pandemic, such as Iraq (Riyadh & Abdulrazaq, 2021), Canada (Ball, 2021), Vienna (Nia et al., 2021; Carlin et al., 2021), Italy (Chevallard et al., 2021), Puerto Rico (Ruiz-Medina et al., 2021), and London (Hay et al., 2021). Moreover, the impact of COVID-19 on suicide attempts can be observed in emergency dispatches, hotlines, and emergency departments. In Japan, the percentage of emergency dispatches related to suicide attempts increased significantly in 2020 compared with the previous 2 years (Habu et al., 2021). In China, a study of the calls made to the largest suicide hotline suggests that COVID-19-related distress led to an increase in calls among individuals who are generally at lower risk of suicide attempt than those who normally call (Tong et al., 2021). A cross-sectional study of nearly 190 million emergency department visits carried out in the United States found that visit rates for suicide attempt were higher from mid-March through October 2020, during the COVID-19 pandemic, compared with the same period in 2019 (Holland et al., 2021). Among the youth, emergency department visits for suspected suicide attempts increased among adolescent girls aged 12–17 years during the summer of 2020 and remained stable among adolescent boys (Yard et al., 2021). In Brazil, however, only one cross-sectional study reported an increased risk of suicide in a psychosocial public health center during the COVID-19 pandemic (de Moura et al., 2021). Consequently, this article seeks to describe the characteristics of suicide attempts assisted by the Fire Department between 2018 and 2020, according to traumatic brain injury (TBI) measured by the Glasgow Coma Scale (ECG), between sexes, to verify possible TBI differences attributed to gender.
Method

Study Design and Population

This descriptive study included all data from the 6,582 suicide attempt calls answered by CBPMESP between January 2018 and December 2020. Data on suicide attempt calls were collected from the Operational Data System (SDO) of CBPMESP’s Operational Coordination. SDO provides anonymous data on incident and therefore we had no access to personal data, addresses and/or any information that would allow identification of these subjects. Filling out the call response information is considered the closure of services. The firefighter does this as part of the emergency response service in the same shift as the occurrence, and it cannot exceed three days from the initial registration. The Secretary of Public Safety analyzes all data on the technical and operational services provided by CBPMESP.

Emergency Calls to CBPMESP

Assistance to suicide attempt victims by CBPMESP is requested via Emergency Calls (193). After the call, firefighters are dispatched for on-site assistance. Upon arrival, professionals may encounter non-fatal or fatal suicide attempts. In the latter case (death verified by a doctor or when the victim shows evident signs of death that can be verified by the firefighter), the victim is referred for identification and forensic investigation, within the scope of Public Safety. In the case of a non-fatal suicide attempt, the firefighter acts to rescue the individual. Once rescued, the victims are immediately referred to health services in their area of coverage, thus bringing the victim within the scope of the Health Department (Fig. 1—Supplementary File).

Data Linearization

Due to the time elapsed before the fire department arrived and other factors related to the context of suicide attempt calls, many entries in the database consist of more than one emergency call. Thus, the database used here had more than one entry for each attempted suicide call.

To analyze the data, we conducted a linearization process sorting by victim “id” and time variables (year, month, day of the week, and call start time). Following the sorting, we aggregated rows of data by “id” and measured the new variables dependent on this aggregation, especially the “time to attend to victim”, which was measured by the difference, in minutes, between the response time of the first committed police vehicle and the final maximum time to attend to victim. The other variables were related to the first line by “id.” This mainly influenced the period of the assistance (early morning, morning, afternoon and evening), which refers to when the assistance started.

To analyze the outcome of brain injury severity according to the Glasgow Coma Scale (GCS), we excluded events classified as “refusals” and “deaths,” since the level of consciousness of the victims was not measured. Records with inconsistent
data, such as undetermined gender, age less than 7 years, or unlisted age, were also excluded (Fig. 2).

**Outcome – Trauma Severity**

Trauma severity was assessed using the Glasgow Coma Scale (GCS) (Jennett & Bond, 1975). The firefighter in charge performed the assessment and completion of the scale during care. GSC is a tool used to assess and calculate a patient’s level of consciousness that uses a triple criteria scoring system: best eye opening (maximum
4 points), best verbal response (maximum 5 points), and best motor response (maximum 6 points). These scores are summed to provide a total score between 3 and 15, characterizing the traumatic brain injury (TBI) severity. Our analyses used the categories: severe TBI (≤8), moderate TBI (9 to 12), and mild TBI (13 to 15).

Independent Variables

Independent variables consisted of gender (“male” and “female”), age group (“8 to 14,” “15 to 29,” “30 to 59,” and “60+”), details of the attempt (“hanging,” “jumping,” “poisoning,” “cold weapon,” “firearm,” and “jumping in front of a car”); time to attend to victim (“up to 51.8,” “51.9 to 82.8,” “82.9 to 131,” and “131.1 or more”); Time of day (“early morning” (0–5), “evening” (18–23), “afternoon” (12–15), and “morning” (6–11)), month of the year (January to December), and day of the week (Monday through Sunday) were also included.

Statistical Analysis

We performed a descriptive analysis of the sample characteristics and trauma severity according to GCS and gender, using the Pearson’s chi-square ($\chi^2$) test for comparisons. Statistical analyses were performed using Stata17® program and R version 4.0.3 (2020-10-10). All p-values $<0.050$ were considered statistically significant. Polynomial regression was used to analyze factors associated with trauma severity according to GCS as the dependent variable, by gender. Reference category for this analysis was mild TBI, contrasted with severe TBI and moderate TBI. Baseline variables with p-value $<0.200$ in the univariate analysis were selected for the multiple
polynomial model, fitted using the stepwise method. The magnitude of associations was estimated using odds ratios and respective 95% confidence intervals (95%CI). Non-significant variables were excluded if there was no greater than 10% change in other estimated parameters. All analyses were performed for the years 2018, 2019, and 2020.

Ethical Considerations

Study approved by the Research Ethics Committee of the Universidade Federal de São Paulo (protocol 2466300120, March 5°, 2020).

Results

Results showed a significant increase of 8.0% ($p=0.039$) in the number of calls answered by CBPMESP between 2018 and 2020. As for deaths, prevalence increased from 31.3% to 2018, to 31.9% in 2019, and 36.8% in 2020. Regarding the responses with rescue of victims, prevalence increased 28.0%, 35.6%, and 36.4% in 2018, 2019, and 2020, respectively (Data no shown).

Table 1 describes the characteristics of the calls. All the years surveyed presented a higher prevalence of suicide attempts calls among men aged 30 to 59 years old. Regarding the outcome, mild TBI had a higher prevalence, followed by death, severe TBI, and moderate TBI. As for the type of call, jumping and hanging were the most frequent, especially in the afternoons and evenings. The months from September to December and the weekends presented the highest prevalence of calls in all years.

Table 2 shows the distribution of baseline characteristics according to trauma severity, as classified by the GCS, by year and gender. Men presented a higher prevalence of mild TBI, followed by severe TBI and moderate TBI in all years. They also showed a higher prevalence of more violent methods for suicide attempts followed by severe TBI, mainly hanging and firearms. We found a higher prevalence of calls followed by severe TBI in the morning and with a time to attend to victim of 82.9 to 131.0 min in 2019. In 2020, men presented a higher prevalence of severe TBI in the afternoon. We verified an inversely proportional relationship between time to attend to victim and severe TBI and directly proportional between this variable and mild TBI among men.

For women, the picture was different regarding methods of attempted suicide. Although severe TBI occurred predominantly by hanging, as among men, between 2019 and 2020, poisoning was the second most prevalent form among women. In 2018, 66.7% of women observed with severe TBI used firearms. This method was not used in the subsequent years. Finally, in 2020, women presented the same inversely proportional relationship between time to attend to victim and prevalence of severe TBI, as well as directly proportional relationship regarding the occurrence of mild TBI (Table 2).

The multiple polynomial analysis showed that the occurrence of moderate TBI was negatively associated with longer time to attend to victim for men between 2019 and 2020. After adjustment, time to attend to victim of 131.1 or more proved to
Table 1  Characteristics of suicide attempt calls (%) responded by the CBPMESP between 2018–2020. São Paulo, Brazil (N = 6,582)

|                  | 2018% (N) | 2019% (N) | 2020% (N) |
|------------------|-----------|-----------|-----------|
| **TOTAL**        | 28.5 (1,874) | 35.0 (2,304) | 36.5 (2,398) |
| **Sex**          |           |           |           |
| Male             | 62.9 (1,178) | 59.9 (1,380) | 60.8 (1,458) |
| Female           | 37.1 (696) | 40.1 (924) | 39.2 (940) |
| **Age group (years)** |     |           |           |
| 8–14             | 1.3 (23) | 2.1 (48) | 2.0 (47) |
| 15–29            | 37.1 (646) | 39.2 (899) | 41.1 (980) |
| 30–59            | 55.5 (967) | 54.3 (1,247) | 51.4 (1,226) |
| 60+              | 6.1 (106) | 4.4 (102) | 5.6 (133) |
| **Outcome**      |           |           |           |
| Death            | 16.6 (303) | 13.6 (310) | 15.3 (361) |
| Mild TBI         | 71.7 (1,308) | 74.2 (1,688) | 73.7 (1,740) |
| Moderate TBI     | 4.4 (81) | 4.8 (110) | 4.5 (106) |
| Severe TBI       | 7.2 (131) | 7.3 (167) | 6.5 (154) |
| **Detail**       |           |           |           |
| Hanging          | 21.6 (406) | 21.1 (485) | 21.2 (508) |
| Jumping          | 41.5 (778) | 43.1 (993) | 43.0 (1,032) |
| Poisoning        | 12.5 (234) | 14.8 (342) | 14.8 (354) |
| White gun        | 16.2 (303) | 13.5 (310) | 14.5 (348) |
| Firearm          | 1.7 (32) | 1.5 (34) | 1.4 (33) |
| Jumping in front of a car | 6.5 (121) | 6.1 (140) | 5.1 (123) |
| **Time of day**  |           |           |           |
| Early morning    | 11.5 (216) | 13.2 (304) | 12.3 (294) |
| Night            | 33.0 (618) | 32.8 (755) | 32.4 (777) |
| Afternoon        | 32.6 (610) | 32.3 (744) | 32.3 (774) |
| Morning          | 22.9 (430) | 21.7 (501) | 23.0 (553) |
| **Month**        |           |           |           |
| January          | 7.8 (146) | 7.7 (178) | 9.3 (224) |
| February         | 7.9 (148) | 6.6 (152) | 8.3 (198) |
| March            | 8.6 (161) | 8.0 (185) | 8.7 (209) |
| April            | 7.8 (146) | 7.9 (181) | 6.3 (152) |
| May              | 7.3 (137) | 8.6 (197) | 7.8 (188) |
| June             | 7.6 (142) | 6.9 (159) | 8.2 (196) |
| July             | 7.8 (146) | 6.9 (159) | 6.5 (156) |
| August           | 8.4 (158) | 7.1 (163) | 7.7 (184) |
| September        | 8.8 (164) | 10.8 (248) | 10.3 (247) |
| October          | 10.5 (196) | 10.2 (235) | 9.3 (222) |
| November         | 9.3 (175) | 9.1 (210) | 9.1 (218) |
| December         | 8.3 (155) | 10.3 (237) | 8.5 (204) |
| **Day of the week** |       |           |           |
| Monday           | 14.9 (279) | 14.9 (343) | 14.0 (336) |
| Tuesday          | 15.7 (294) | 14.2 (328) | 13.7 (329) |
| Wednesday        | 12.3 (230) | 13.9 (321) | 13.5 (323) |
| Thursday         | 12.3 (231) | 12.9 (297) | 13.3 (319) |
| Friday           | 13.2 (247) | 11.9 (274) | 13.3 (319) |
| Saturday         | 15.9 (297) | 14.8 (342) | 15.4 (368) |
be a protective factor in 23% of moderate TBI occurrences in men. This protection increased to about 32% in 2020 when compared with time to attend to victim up to 51.8 min. For severe TBI, attendance by CBPMESP acted as a protective factor for 50% of cases in 2020. As for women, time to attend to victim of 131.1 or more acted as a protective factor in 25% of severe TBI cases when compared with time to attend to victim up to 51.8 min (Table 3).

Discussion

Our study showed a significant increase of about 8.0% (p = 0.039) in the number of calls responded to by CBPMESP between 2018 and 2020. We found a higher prevalence of suicide attempts calls among men aged 30 to 59 years old with mild TBI. Suicide attempts by jumping and hanging were the most attended by firefighters. The methods used for suicide attempts differed by gender in all years. Men presented a higher prevalence of more violent suicide methods, mainly hanging and firearms, followed by severe TBI; among women, severe TBI occurred predominantly by hanging. Finally, time to attend to victim was a protective factor for severe TBI in men and women in 2020. Similar to studies on the severity of mental health impacts during the COVID-19 pandemic, we found an increased number of suicide attempt calls responded to by CBPMESP in 2020, with a significant increase in the prevalence of fatal suicide attempts (36.8% in 2020).

The São Paulo Megacity Mental Health Survey found that adults living in the São Paulo megacity had a higher prevalence of mental disorders than their counterparts in other parts of the world, especially anxiety disorders (19.9%), followed by mood disorders (11%), impulse control (4.3%), and substance use disorders (3.6%) (Andrade et al., 2012). Add to this the long period of social distancing and imposed by the pandemic, São Paulo showed a positive gradient for COVID mortality rates in regions with higher indicators of social inequality (less education, more household crowding, lower a higher concentration of subnormal areas), exposing structural inequities in Brazilian society that were not addressed by the governmental response to pandemic (Ribeiro et al., 2021).

Our findings are paramount to the need for well-trained emergency response teams, as they are the first responders in an attempted suicide call. They are tasked with making initial contact with the victim, who is in acute crisis, establishing the bond.

Table 1 (continued)

| Time to attend to victim (min) | 2018% (N) | 2019% (N) | 2020% (N) |
|-------------------------------|-----------|-----------|-----------|
| Sunday                        | 15.8 (296) | 17.3 (399) | 16.9 (404) |
| Up to 51.8                    | 26.2 (491) | 27.2 (584) | 27.8 (682) |
| 51.9 to 82.8                  | 26.3 (493) | 24.9 (584) | 26.5 (650) |
| 82.9 to 131.0                 | 25.7 (483) | 23.4 (548) | 23.0 (564) |
| 131.1 or more                 | 21.7 (407) | 24.5 (576) | 22.7 (556) |

Font: Operational Data System (SDO) of the São Paulo State Fire Department. aTraumatic Brain Injury (TBI) according Glasgow Coma Scale: Severe (≤ 8), moderate (9 to 12), and mild (13 to 15).
|         | 2018 (%) | 2019 (%) | 2020 (%) |
|---------|----------|----------|----------|
|         | Mild 1  | Moderate 2 | Severe 3 | p-value | Mild | Moderate | Severe | p-value | Mild | Moderate | Severe | p-value |
| Total   | 85.0    | 4.6      | 10.4     | 0.246   | 84.2  | 4.6      | 11.2    | 0.133   | 85.5  | 5.1      | 9.4    | 0.575   |
| Age group (years) |          |          |          |         |       |          |         |         |       |          |         |         |
| 8–14    | 80.0    | 10.0     | 10.0     | 0.246   | 85.1  | 4.2      | 12.6    | 0.22    | 85.1  | 4.5      | 10.4   | 0.002   |
| 15–29   | 85.4    | 3.4      | 11.2     | 0.246   | 85.0  | 5.1      | 9.9     | 0.246   | 85.3  | 5.4      | 9.3    | 0.002   |
| 30–59   | 85.8    | 4.5      | 9.7      | 0.246   | 89.3  | 3.6      | 7.1     | 0.246   | 85.3  | 8.0      | 6.7    | 0.002   |
| 60+     | 81.5    | 10.8     | 7.7      | 0.246   | 89.3  | 3.6      | 7.1     | 0.246   | 85.3  | 8.0      | 6.7    | 0.002   |
| Detail  |         |          |          | <0.001  |       |          |         | <0.001  |       |          | <0.001 |         |
| Hanging | 58.8    | 4.1      | 37.1     | <0.001  | 55.0  | 9.0      | 36.0    | <0.001  | 60.1  | 7.1      | 32.8   | <0.001  |
| Jumping | 91.4    | 3.2      | 5.4      | <0.001  | 92.9  | 2.5      | 4.6     | <0.001  | 92.9  | 2.9      | 4.3    | <0.001  |
| Poisoning | 87.2  | 10.6     | 2.1      | <0.001  | 83.3  | 5.3      | 11.4    | <0.001  | 76.5  | 13.7     | 9.8    | <0.001  |
| Cold weapon | 90.0  | 6.7      | 3.3      | <0.001  | 89.2  | 7.0      | 3.8     | <0.001  | 938   | 2.8      | 3.4    | <0.001  |
| Firearm | 54.6    | 0.0      | 45.4     | <0.001  | 73.3  | 0.0      | 26.7    | <0.001  | 62.5  | 6.3      | 31.3   | <0.001  |
| Jumping in front of a car | 89.3 | 1.8      | 8.9      | <0.001  | 91.6  | 2.8      | 5.6     | <0.001  | 94.1  | 4.4      | 1.5    | <0.001  |
| Time of day |       |          |          | 0.781   |       |          |         | 0.011   |       |          | 0.026  |         |
| Early morning | 87.1 | 5.7      | 7.3      | 0.781   | 87.1  | 2.4      | 8.3     | 0.011   | 83.0  | 9.4      | 7.6    | 0.026   |
| Night   | 84.0    | 5.3      | 10.7     | 0.781   | 86.6  | 5.6      | 7.8     | 0.011   | 88.4  | 4.6      | 7.0    | 0.026   |
| Afternoon | 86.0 | 3.4      | 10.6     | 0.781   | 81.7  | 5.4      | 12.9    | 0.011   | 83.4  | 4.2      | 12.4   | 0.026   |
| Morning | 83.8    | 4.6      | 11.6     | 0.781   | 80.4  | 3.4      | 16.2    | 0.011   | 85.7  | 4.3      | 10.0   | 0.026   |
| Month   |         |          |          | 0.778   |       |          |         | 0.841   |       |          | 0.980  |         |
| January | 84.6    | 3.9      | 11.5     | 0.778   | 77.5  | 6.7      | 15.7    | 0.841   | 88.4  | 3.3      | 8.3    | 0.980   |
| February | 91.7 | 2.8      | 5.6      | 0.778   | 81.7  | 2.4      | 15.9    | 0.841   | 86.0  | 5.4      | 8.6    | 0.980   |
| March   | 81.7    | 7.3      | 11.0     | 0.778   | 82.6  | 5.8      | 11.6    | 0.841   | 87.4  | 3.2      | 9.5    | 0.980   |
| April   | 87.1    | 2.9      | 10.0     | 0.778   | 85.5  | 4.8      | 9.6     | 0.841   | 82.1  | 6.4      | 11.5   | 0.980   |
| May     | 85.3    | 4.9      | 9.8      | 0.778   | 83.7  | 6.1      | 10.2    | 0.841   | 83.7  | 5.8      | 10.5   | 0.980   |
| June    | 84.3    | 3.6      | 12.1     | 0.778   | 85.9  | 3.5      | 10.6    | 0.841   | 92.6  | 3.2      | 4.2    | 0.980   |
| July    | 91.9    | 5.4      | 2.7      | 0.778   | 84.2  | 4.0      | 11.8    | 0.841   | 83.3  | 4.2      | 12.5   | 0.980   |

**Table 2** Characteristics of the suicide attempt (%) assisted by the CBPMESP by traumatic brain injury (TBI) according to Glasgow Coma Scale between 2018 and 2020, per sex. São Paulo, Brazil (N=6,582)
|                | 2018(%) | 2019(%) | 2020(%) | p-value | 2018(%) | 2019(%) | 2020(%) | p-value | 2018(%) | 2019(%) | 2020(%) | p-value |
|----------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| **MEN**        |         |         |         |         |         |         |         |         |         |         |         |         |
| Total          | 85.0    | 4.6     | 10.4    |         | 84.2    | 4.6     | 11.2    |         | 85.5    | 5.1     | 9.4     |         |
| August         | 85.7    | 6.5     | 7.8     |         | 84.7    | 4.2     | 11.1    |         | 84.5    | 6.2     | 9.3     |         |
| September      | 78.1    | 6.9     | 15.1    |         | 90.2    | 3.3     | 6.6     |         | 83.2    | 6.7     | 10.1    |         |
| October        | 85.1    | 2.1     | 12.8    |         | 86.8    | 2.6     | 10.5    |         | 87.1    | 5.7     | 7.3     |         |
| November       | 81.2    | 4.7     | 14.1    |         | 80.8    | 4.8     | 15.2    |         | 82.2    | 6.5     | 11.2    |         |
| December       | 84.7    | 4.7     | 10.6    | 0.127   | 85.2    | 7.0     | 7.8     | <0.001  | 83.5    | 4.9     | 11.7    | 0.018   |
| Time to attend to victim |         |         |         | 0.127   |         |         |         |         |         |         |         |         |
| Up to 51.8     | 80.1    | 4.0     | 15.9    | 80.0    | 9.4     | 10.6    |         | 80.6    | 7.4     | 12.0    |         |         |
| 51.9 to 82.8   | 87.2    | 5.1     | 7.7     | 82.8    | 4.6     | 12.6    |         | 82.9    | 5.6     | 11.5    |         |         |
| 82.9 to 131.0  | 86.5    | 5.2     | 8.4     | 82.8    | 2.9     | 15.2    |         | 87.4    | 4.8     | 7.8     |         |         |
| 131.1 or more  | 85.4    | 4.0     | 10.5    | 90.3    | 2.4     | 7.3     |         | 90.7    | 2.7     | 6.6     |         |         |
| **WOMEN**      |         |         |         |         |         |         |         |         |         |         |         |         |
| Total          | 87.1    | 6.6     | 6.2     | 0.082   | 88.0    | 7.0     | 5.0     |         | 88.9    | 5.7     | 5.4     |         |
| Age group (years) |         |         |         |         |         |         |         |         |         |         |         |         |
| 8–14           | 66.7    | 0.0     | 33.3    |         | 95.2    | 0.0     | 4.8     |         | 94.1    | 5.9     | 0.0     |         |
| 15–29          | 88.6    | 5.7     | 5.7     |         | 85.7    | 9.0     | 5.3     |         | 87.8    | 5.5     | 6.7     |         |
| 30–59          | 85.9    | 7.8     | 6.3     |         | 88.9    | 6.2     | 4.9     |         | 89.2    | 6.3     | 4.5     |         |
| 60+            | 90.6    | 0.0     | 9.4     |         | 89.5    | 5.3     | 5.3     |         | 90.5    | 2.4     | 7.1     |         |
| Detail         | <0.001  |         |         | <0.001  | <0.001  |         | <0.001  |         |         |         | <0.001  |         |
| Hanging        | 61.1    | 9.3     | 29.6    |         | 63.3    | 11.7    | 25.0    |         | 76.2    | 1.6     | 22.2    |         |
| Jumping        | 94.5    | 2.9     | 2.6     |         | 95.2    | 2.5     | 2.3     |         | 94.5    | 3.4     | 2.1     |         |
| Poisoning      | 74.6    | 16.2    | 9.2     |         | 75.0    | 16.5    | 8.5     |         | 74.3    | 14.4    | 11.2    |         |
| Cold weapon    | 94.1    | 4.2     | 1.7     |         | 92.7    | 6.0     | 1.3     |         | 94.1    | 4.1     | 1.8     |         |
| Firearm        | 33.3    | 0.0     | 66.7    |         | 100.0   | 0.0     | 0.0     |         | 100.0   | 0.0     | 0.0     |         |
| Jumping in front of a car | 93.2    | 5.1     | 1.7     |         | 95.3    | 3.1     | 1.6     |         | 98.0    | 2.0     | 0.0     |         |
| Time of day    | 0.416   |         |         | 0.917   |         |         |         |         | 0.537   |         |         |         |
Table 2 (continued)

| Time to attend to victim | 2018(%) | 2019(%) | 2020(%) |
|--------------------------|---------|---------|---------|
|                          | Mild\(^1\) | Moderate\(^2\) | Severe\(^3\) | p-value | Mild | Moderate | Severe | p-value | Mild | Moderate | Severe | p-value |
| Total                    | 85.0 | 4.6 | 10.4 | 84.2 | 4.6 | 11.2 | 85.5 | 5.1 | 9.4 | 0.966 | 0.446 | 0.021 |
| Early morning            | 88.7 | 7.0 | 4.2 | 90.7 | 5.6 | 3.7 | 90.5 | 3.2 | 6.3 |
| Night                    | 89.8 | 5.3 | 4.9 | 87.7 | 7.3 | 5.0 | 89.7 | 6.0 | 4.3 |
| Afternoon                | 87.6 | 6.2 | 6.2 | 86.3 | 7.9 | 5.8 | 88.2 | 5.1 | 6.8 |
| Morning                  | 81.3 | 9.0 | 9.7 | 89.6 | 5.8 | 4.6 | 87.7 | 8.0 | 4.3 |
| Month                    |        | 0.079 | 0.951 | 0.598 |
| January                  | 92.7 | 7.3 | 0.0 | 85.5 | 10.1 | 4.4 | 94.3 | 5.7 | 0.0 |
| February                 | 88.7 | 7.6 | 3.8 | 84.9 | 9.4 | 5.7 | 89.9 | 5.8 | 4.4 |
| March                    | 91.1 | 1.8 | 7.1 | 91.6 | 5.6 | 2.8 | 87.7 | 6.2 | 6.2 |
| April                    | 72.0 | 10.0 | 18.0 | 88.8 | 6.3 | 5.0 | 96.4 | 0.0 | 3.6 |
| May                      | 87.3 | 5.5 | 7.3 | 93.2 | 2.7 | 4.1 | 87.1 | 7.1 | 5.7 |
| June                     | 90.5 | 2.4 | 7.1 | 83.9 | 7.1 | 8.9 | 84.8 | 5.1 | 10.1 |
| July                     | 81.0 | 9.5 | 9.5 | 83.6 | 10.9 | 5.5 | 91.8 | 4.9 | 3.3 |
| August                   | 87.7 | 5.3 | 7.0 | 86.7 | 10.0 | 3.3 | 86.2 | 4.6 | 9.2 |
| September                | 89.8 | 8.5 | 1.7 | 86.8 | 8.8 | 4.4 | 84.4 | 10.0 | 5.6 |
| October                  | 86.1 | 9.7 | 4.2 | 88.8 | 4.1 | 7.1 | 91.2 | 5.9 | 2.9 |
| November                 | 86.4 | 4.6 | 9.1 | 89.6 | 6.5 | 3.9 | 90.2 | 3.7 | 6.1 |
| December                 | 93.2 | 6.8 | 0.0 | 88.8 | 5.6 | 5.6 | 85.9 | 7.8 | 6.3 |
| Time to attend to victim |        | 0.966 | 0.446 | 0.021 |
| Up to 51.8               | 85.4 | 7.9 | 6.7 | 86.1 | 9.0 | 4.9 | 84.4 | 8.6 | 7.0 |
| 51.9 to 82.8             | 87.4 | 6.6 | 6.0 | 86.8 | 6.4 | 6.9 | 86.7 | 5.7 | 7.6 |
| 82.9 to 131.0            | 87.1 | 6.4 | 6.4 | 90.2 | 6.8 | 2.9 | 90.9 | 4.6 | 4.6 |
| 131.1 or more            | 89.3 | 5.0 | 5.8 | 89.2 | 5.4 | 5.4 | 94.6 | 3.5 | 2.0 |

**Source:** Operational Data System (SDO) of the São Paulo State Fire Department. \(^1\)Traumatic Brain Injury (TBI) according Glasgow Coma Scale: Severe (≤8), moderate (9 to 12), and mild (13 to 15)

P-value: chi-square
of trust, and once safe, transporting them to the health care system, since the police alone cannot ensure effective responses or prevention to these incidents. England and Wales have important guidelines designed to clarify the role played the police service in responding to mental health incidents, and the extent of their care activities during violent incidents (Haidrani, 2017; College of Policing, 2017; National Police Chiefs’

Table 3 Association between time to attend to victim and traumatic brain injury (TBI) according to Glasgow Coma Scale, by year in Sao Paulo, Brazil, 2018–2020 (N=6,582)

|          | 2018         | 2019         | 2020         |
|----------|--------------|--------------|--------------|
|          | UnOR¹        | AdOR²        | UnOR¹        | AdOR²        | UnOR¹        | AdOR²        |
| MODERATE |              |              |              |              |              |              |
| Time to attend to victim (min) |            |              |            |              |            |              |
| 51.9 to 82.8 | 1.18(0.47–2.96) | 1.21(0.48–3.03) | 0.47(0.22–0.96) | 0.50(0.24–1.04) | 0.73(0.37–1.42) | 0.71(0.36–1.39) |
| 82.9 to 131.0 | 1.20(0.48–2.97) | 1.24(0.50–3.08) | 0.30(0.13–0.38) | 0.30(0.13–0.68) | 0.59(0.29–1.19) | 0.59(0.29–1.19) |
| 131.1 or more | 0.94(0.36–2.45) | 0.97(0.37–2.52) | 0.23(0.10–0.52) | 0.23(0.10–0.73) | 0.32(0.15–0.78) | 0.32(0.14–0.75) |
| SEVERE    | UnOR         | AdOR         | UnOR         | AdOR         | UnOR         | AdOR         |
| Time to attend to victim (min) |            |              |            |              |            |              |
| 51.9 to 82.8 | 0.44(0.24–0.81) | 0.43(0.23–0.81) | 1.14(0.66–1.97) | 1.11(0.63–1.96) | 0.93(0.56–1.54) | 0.83(0.49–1.40) |
| 82.9 to 131.0 | 0.48(0.27–0.87) | 0.50(0.27–0.92) | 1.41(0.84–2.37) | 1.33(0.77–2.05) | 0.60(0.34–1.05) | 0.62(0.35–1.11) |
| 131.1 or more | 0.61(0.35–1.07) | 0.62(0.35–1.10) | 0.61(0.34–1.09) | 0.62(0.34–1.12) | 0.48(0.27–0.86) | 0.47(0.26–0.85) |
| WOMEN     |              |              |              |              |              |              |
| MODERATE  | UnOR         | AdOR         | UnOR         | AdOR         | UnOR         | AdOR         |
| Time to attend to victim (min) |            |              |            |              |            |              |
| 51.9 to 82.8 | 0.81(0.35–1.86) | 0.77(0.34–1.77) | 0.70(0.35–1.42) | 0.69(0.34–1.41) | 0.64(0.30–1.34) | 0.65(0.31–1.36) |
| 82.9 to 131.0 | 0.80(0.35–1.82) | 0.78(0.34–1.78) | 0.72(0.36–1.45) | 0.69(0.34–1.42) | 0.49(0.22–1.10) | 0.48(0.21–1.10) |
| 131.1 or more | 0.60(0.22–1.61) | 0.60(0.23–1.63) | 0.58(0.27–1.23) | 0.59(0.27–1.27) | 0.35(0.15–0.86) | 0.35(0.14–0.85) |
| SEVERE    | UnOR         | AdOR         | UnOR         | AdOR         | UnOR         | AdOR         |
| Time to attend to victim (min) |            |              |            |              |            |              |
| 51.9 to 82.8 | 0.86(0.36–2.06) | 0.72(0.29–1.78) | 1.38(0.63–3.04) | 1.25(0.56–2.80) | 1.05(0.52–2.15) | 1.05(0.51–2.17) |
| 82.9 to 131.0 | 0.93(0.40–2.18) | 0.84(0.35–2.03) | 0.57(0.21–1.54) | 0.50(0.18–1.40) | 0.60(0.26–1.41) | 0.58(0.25–1.34) |
| 131.1 or more | 0.82(0.31–2.15) | 0.76(0.28–2.04) | 1.06(0.46–2.47) | 0.93(0.39–2.19) | 0.25(0.09–0.76) | 0.24(0.08–0.73) |

Source: Operational Data System (SDO) of the São Paulo State Fire Department. ¹Multiple polynomial analysis, with Mild TBI as reference. ²Models adjusted by age, type of attempt, and time of day. Traumatic Brain Injury (TBI) according Glasgow Coma Scale: Severe (≤8), moderate (9 to 12), and mild (13 to 15)

of trust, and once safe, transporting them to the health care system, since the police alone cannot ensure effective responses or prevention to these incidents. England and Wales have important guidelines designed to clarify the role played the police service in responding to mental health incidents, and the extent of their care activities during violent incidents (Haidrani, 2017; College of Policing, 2017; National Police Chiefs’
Council, 2020). This includes, for example, emergency crews are dispatched to talk to the victim, understand their needs for as long as it takes to keep them safe (Kar Ray et al., 2020).

In Brazil, all CBPMESP officers received specific training for responding to suicide attempt calls during the annual update and improvement offered by the Fire Department (Professional Improvement Internship) in 2020 (Almeida, Wagner, Munhoz, & Santos, 2020). The program trained firefighters in the humanized approach technique (Munhoz, 2018), allowing them to become familiar with mental health concepts and provide standardized responses to events involving people with mental disorders. This training was critical during the COVID-19 pandemic, especially regarding the approach to people in mental distress.

The time to attend to victim, in an innovative manner, proved to be a key protective factor in the attention to suicide attempt victims during a call. In prevention, rather than direct emergency intervention, a study conducted by the Centro de Valorização da Vida (Brazilian Suicide Prevention Hotline – CVV) showed a trend to decrease the average of time to attend to victim between July 2020 and June 2021. According to the authors, however, it is impossible to know, by the duration of the call, whether it was more or less effective, whether the individual felt more or less embraced, since CVV has no access to the destination of the person who called the service (Brazilian Suicide Prevention Hotline, 2021).

Our work has limitations. As a study using secondary data collected during the service provided by firefighters at the scene, it lacked socioeconomic and health data to verify social vulnerabilities, mental disorders, and other information relevant to understanding the biopsychosocial conditions of the victims, since they are not featured on the call reports. Moreover, after victims are handed over to the health services near the scene, CBPMESP has no further updates on the victims, who are then within the health services’ scope. This may underestimate our data on the occurrence of fatal suicide attempts in victims with severe TBI.

Our results present relevant evidence for improving suicide prevention policies in the post-pandemic era. First, we showed that during the COVID-19 pandemic, the prevalence of fatal suicide attempts using more violent methods increased significantly, especially among men. This finding is extremely relevant regarding the need for public awareness and restriction of lethal methods, such as firearms, as shown by previous studies (Rorthman & Sher, 2021). Second, the length of time to attend to victim dispensed to suicide attempt victims acted as a protective factor in preventing severe TBI for both genders in non-fatal suicide attempts, demonstrating the need for improved emergency services. An emergency police and firefighter teams well trained in mental health, starting with the establishment of the bond of trust between the firefighter and the victim, can be a key tool for reducing fatal suicide attempts in emergency care. Finally, this study contributes to the call for the need of evidence when designing strategies to tackle suicide.

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Declarations  The authors have no competing interests to declare that are relevant to the content of this article.

Ethical Approval  The Research Ethics Committee of the Universidade Federal de São Paulo (protocol 2,466,300,120, March 5th, 2020) approved this study.

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### Authors and Affiliations

**Tiago Regis Franco de Almeida**¹ · **Adriana Leandro de Araújo**² · **Diógenes Munhoz**³ · **Pedro Gomes Andrade**⁴ · **Gabriela Arantes Wagner**⁵

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¹ Gabriela Arantes Wagner
gabriela.wagner@unifesp.br

² Tiago Regis Franco de Almeida
tiago.regis@unifesp.br

³ Adriana Leandro de Araújo
adriana@policiamilitar.sp.gov.br

⁴ Diógenes Munhoz
diogenessmm@bol.com.br

⁵ Pedro Gomes Andrade
pedro.andrade@ipea.gov.br

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¹ Departamento de Medicina Preventiva, Universidade Federal de São Paulo, Rua Botucatu 740, 4º andar, 04023-062 São Paulo, SP, Brasil

² Seção de Geostatística do Departamento Operacional do Corpo de Bombeiros da Polícia Militar do Estado de, São Paulo, SP, Brasil

³ Escola Superior de Bombeiros, Rod. Pref. Luiz Salomão Chamma, 4701, Franco da Rocha, SP, Brasil

⁴ Diretoria de Estudos e Políticas do Estado, das Instituições e da Democracia, Instituto de
Pesquisa Econômicas Aplicadas, São Paulo, SP, Brasil

Departamento de Medicina Preventiva, Universidade Federal de São Paulo, Rua Botucatu 740, 4º andar, 04023-062 São Paulo, SP, Brasil