Undeclared civil war? Urban violence in major city in Brazil

Guerra civil não-declarada? Um recorte do status da violência urbana em uma capital no Brasil

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A B S T R A C T

Purpose: Civil violence is responsible for 2.5% of deaths worldwide; it killed more people in the 21st century than the sum of all wars. This study describes violence victims treated at a trauma reference hospital in Salvador, Brazil and analyzes the impact of different types of interpersonal violence. **Methods:** Interpersonal violence victims admitted between July 2015 and July 2017 were included. The 1,296 patients (mean age: 30.3 years; 90% male) were divided into three groups according to the mechanism of interpersonal violence: 1) beating, 2) firearm injury and 3) stab wound (STW) injury. The groups were compared for the following variables: age, gender, trauma mechanism, Revised Trauma Score (RTS) at admission, need for intensive care unit (ICU) attention, length of hospital stay, need for transfusion of blood products and death. **Results:** Gunshot wounds (GSW) were the primary mechanism of injury (59%), followed by beating (24%) and STW (17%). Gunshot wound victims had a lower mean RTS upon admission, increased need for blood products and more Intensive Care Unit (ICU) admissions. Beating victims had the longest mean hospital stay (11.6 ± 19.6 days). The GSW group accounted for 77.4% of all deaths. The in-hospital mortality rate was significantly higher in the GSW group (12.7%) than in the beating group (5.4%) and in the STW group (4.9%). **Conclusions:** Gunshot wound victims are more critical: they require longer ICU stays, more transfusions of blood products and exhibit increased mortality compared with STW and beating victims.

Headings: Violence. Traumatology. Wounds and Injuries. Armed Conflicts.

INTRODUCTION

Approximately 1.3 million people die each year as a result of civil violence[1], which accounts for 2.5% of mortality worldwide and killed more people in the 21st century than the sum of all wars during this period[1]. Homicide and violent assaults are especially concentrated in Latin America[2], and Brazil is the 8th most violent country in the world[3].

Acts of a physical nature-for example, beatings and firearm injuries-are examples of interpersonal violence[2]. Such violence is increasing in Brazil[3]. Between 1996 and 2016, more than 1 million homicides were recorded in Brazil. In 2016, 62,517 people were killed; approximately 70% of these peopled died from gunshot wounds[3]. These numbers are even more stark when compared with countries that are engaged in war. In Iraq, roughly 400,000 war-related deaths occurred between 2003 and 2011 (equivalent to 45,000 deaths/year)[4]. In Syria, roughly 200,000 deaths occurred between 2011 and 2018 (approximately 25,000 deaths/year)[5].

Bahia is the 7th most violent state in Brazil. Trauma represents the second cause of death in Bahia, after cardiovascular diseases[3]. In 2016, this state reported approximately 7,000 violent deaths, including more than 5,000 homicides caused by gunshot wounds[3, 6].

Violence is preventable, and knowledge about its triggers, victim profiles and environment are fundamental for the creation of public policies[7]. Hence, this study was designed to compare the outcomes of different types of interpersonal violence victims. The investigation also described the profiles of those victims treated at a trauma reference hospital in Salvador, a major city of Bahia, state of Brazil.

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METHODS

A retrospective cohort study was carried out by analyzing the medical records of patients admitted to the Trauma Care Line at a trauma referral hospital in Salvador, Bahia. Interpersonal violence victims admitted between July 2015 and July 2017 were included. The patients were divided into three groups according to the type of violence they had suffered from: 1) beating, 2) gunshot wound (GSW) injury and 3) stab wound (STW) injury. The groups were compared for the following variables: age, gender, trauma mechanism, Revised Trauma Score (RTS) at admission, need for Intensive Care Unit (ICU) admission, length of hospital stay, need for transfusion of blood products and mortality.

The sample distribution was evaluated using curtosis and skewness calculations. Continuous variables with parametric distribution were expressed as means and standard deviations, and univariate analysis between the groups was conducting using the ANOVA test, followed by the Bonferroni post-test. Continuous variables with a non-parametric distribution were expressed as medians and interquartile ranges. We used the Kruskall-Wallis test, followed by the Dunn post-test, for the univariate analyses. Categorical variables were expressed as frequencies and percentages, and comparisons among the three groups were performed using the chi-squared test. The results were considered statistically significant when $p<0.05$.

Stratified survival curves were analyzed for the three groups using the Kaplan-Meier model. Overall and paired comparisons between groups were conducted by the Log-Rank test (Mantel-Cox).

We used the Cox proportional regression model to evaluate the association between the three mechanisms of interpersonal violence and survival time, adjusting for the covariables age, sex and RTS at admission. The Enter method was used to include the variables in the model. The data were tabulated and analyzed using the Statistical Package for Social Sciences (SPSS) version 14, IBM Corporation, Chicago, USA. (Company, Location).

RESULTS

A total of 1,296 victims of interpersonal violence were included. The cohort had a mean age of 30.3 years and was 90% male. We found that GSW were the primary mechanism of injury (59%), followed by beating (24%) and STW (17%). Table 1 lists the general characteristics of the patients.

Table 2 lists a comparison of the variables between the different mechanisms of interpersonal violence. The GSW victims had a lower mean age than the beating victims (6.8 ± 0.7 years younger, 95% CI 5.1–8.6 years, $p<0.05$) and STW (5.3 ± 0,8 years younger, 95% CI 3.4–7.3 years, $p<0.05$). There was no statistically significant age difference between the beating victims and the STW victims (p=0.321). The GSW group included more men (94.8%) compared with the aggression (84.9%) and STW (82.6%) groups (x^2 (2) = 43.234; $p<0.05$).

The RTS at admission was lower in GSW victims compared with STW victims (-0.28 ± 0.08, 95% CI -0.47 to -0.98, $p<0.05$). However, there was no significant difference in RTS among the other groups. Use of blood products was significantly higher in the GSW group (25.2%), followed by victims of STW (16.0%) and beating (6.1%) (x^2 (2) = 54.276; $p<0.05$).

Table 1. *Demographic and clinical data of victims of interpersonal violence.*

Variable	N (Total = 1,296)	%
Mean age (± SD*) (years)	30.3 (11.2)	-
Age group		
Up to 19 years	170	13.1
20–39 years	895	69.1
40–59 years	198	15.3
60 years and over	33	2.5
Gender		
Male	1.171	90.4
Female	125	9.6
Mechanism of injury		
Penetrating	983	75.8
Blunt	313	24.2
Mechanism of interpersonal violence		
GSW	758	58.5
Beating	313	24.1
STW	225	17.4
Mean RTS at admission (± SD)	7.44 (1.03)	-
ICU hospitalization		
Yes	212	16.4
No	1084	83.6
Use of blood products		
Yes	246	19.0
No	1050	81.0
Mean length of hospital stay (± SD) (days)	9.1 (13.6)	-
Deaths during hospital stay	124	9.6

*SD = Standard deviation.

Table 2. *Comparison of stratified variables according to the type of interpersonal violence.*

Variable	GSW (n = 758 / 59%)	Beating (n = 313 / 24%)	STW (n = 225 / 17%)	p value
Mean age (± SD) (years)	27.7 (10.1)	34.6 (12.2)	33.0 (10.8)	< 0.01**
Age group, n %				< 0.001***
Up to 19 years	130 (17.2)	28 (8.9)	12 (5.3)	-
20–39 years	536 (70.7)	195 (62.3)	164 (72.9)	-
40–59 years	78 (10.3)	78 (24.9)	42 (18.7)	-
60 years and over	14 (1.8)	12 (3.8)	7 (3.1)	-
Gender, n (%)				< 0.001***
Male	719 (94.8)	266 (84.9)	186 (82.6)	-
Female	39 (5.2)	47 (15.0)	39 (17.3)	-
Mean RTS at admission (± SD)	7.36 (1.16)	7.48 (0.92)	7.64 (0.58)	0.01**
ICU hospitalization, n (%)	153 (20.2)	38 (12.1)	21 (9.3)	< 0.001***
Use of blood products, n (%)	191 (25.2)	19 (6.1)	36 (16.0)	<0.001***
Length of hospital stay (days) (± SD *)	9.4 (13.1)	11.6 (19.6)	5.3 (6.0)	<0.001**
Intra-hospital death, n (%)	96 (12.7)	17 (5.4)	11 (4.9)	<0.001***

*SD = Standard deviation. ** ANOVA. *** Chi-squared.

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A significantly higher proportion of patients required ICU admission in the GSW group (20.2%) than in the beating (12.1%) or STW (9.3%) groups (χ^2 (2) = 20.296; p < 0.05).

Beating victims exhibited the longest mean hospital stay (11.6 ± 19.6 days).

According to the Bonferroni post-test, there was no significant difference (p=0.299) between the hospital stay durations of aggression victims and GSW victims (9.4 ± 13.1 days). Compared with the STW group, the GSW group presented significantly longer hospitalization durations (difference: 4.1 ± 1.2 days, 95% CI 1.07–7.12, p=0.004). The GSW group also presented significantly longer hospitalization durations than beating victims (difference: 6.2 ± 1.6 days, 95% CI 2.34–10.15, p < 0.05).

The GSW group accounted for 77.4% of all deaths. The in-hospital mortality rate was significantly higher in the GSW group (12.7%) than in the aggression group (5.4%) or the STW group (4.9%) (χ^2 (2) = 20.286, p < 0.05).

Figure 1 shows the cumulative survival curves according to the Kaplan-Meier model stratified by type of interpersonal violence. The log-rank test revealed that the survival distributions of the three types of interpersonal violence were significantly different (Log-rank: χ^2 (2) = 7.343, p=0.025). In the paired comparison, the survival curve of the GSW group was significantly different than that of the beating group (Log-rank: χ^2 (1) = 4.657, p=0.031).
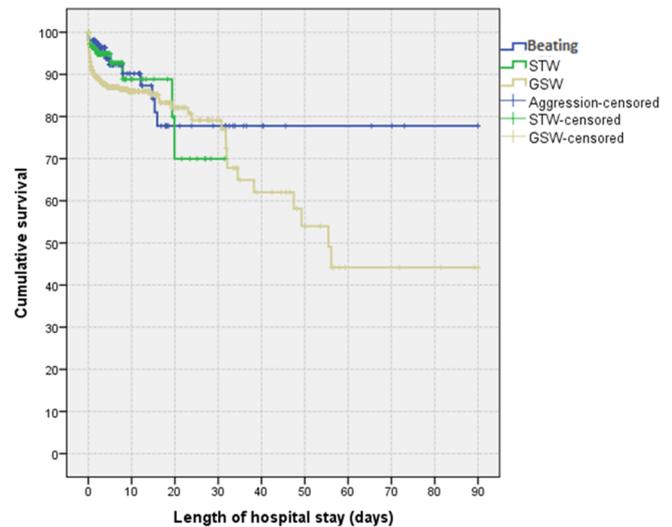

Figure 1. Kaplan-Meier survival curves stratified by type of interpersonal violence.

However, there was no significant difference between the GSW and STW groups (Log-rank: χ^2 (1) = 3.799; p = 0.051), or between the STW and beating groups (Log-rank: χ^2 (1) = 0.020; p=0.889).

We found that the GSW group exhibited a shorter survival time compared with the beating group according to multivariate analysis with the Cox regression model after adjusting for age, sex and RTS (Table 3 and Figure 2). Compared with the STW group, GSW victims exhibited shorter survival times. However, we note that this difference was not statistically significant (adjusted hazards ratio 1.457, 95% CI 0.760–2.790, p=0.256).

Table 3. Adjusted Hazards Ratios of the Variables Included in the Cox Regression Model.

Variable	Hazards Ratio adjusted (HRA)	Confidence interval 95% to HRA	p value
Age (for every 1 year increase)	1.014	0.998–1.030	0.086
Male	1.218	0.613–2.424	0.573
RTS at admission (for each reduction of 1 unit)	1.763	1.613–1.927	< 0.001
Beating	1.0 (Reference)	-	0.026
STW	1.431	0.655–3.127	0.369
GSW	2.085	1.198–3.627	0.009

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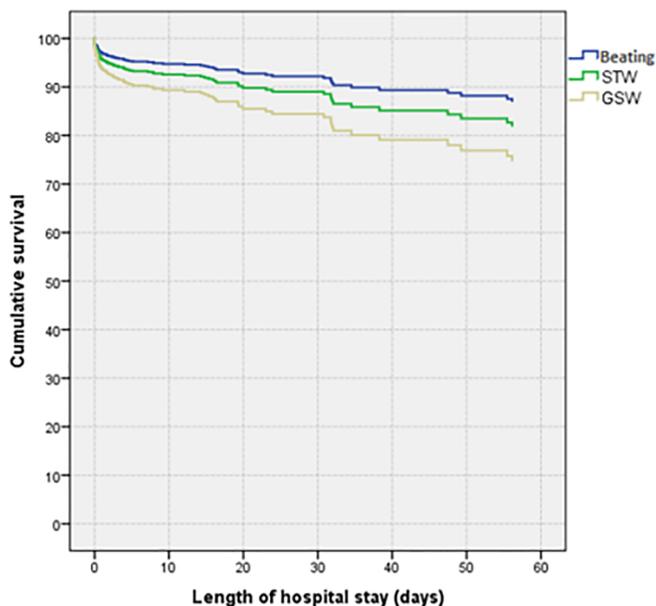*Undeclared civil war? Urban violence in major city in Brazil*

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Figure 2. *Survival curves of the Cox regression model stratified by the type of interpersonal violence adjusted for age, sex and RTS.*

DISCUSSION

Penetrating trauma (GSW and STW) accounted for 76% of all cases. The GSW victims accounted for nearly 60% of all patients. A Danish study reported that only 3.7% of interpersonal violence injuries were caused by stab or gunshot STW or GSW[8]. In a study conducted in Denver, GSW victims accounted for 27.9% of the sample, STW victims accounted for 30.3% of the sample and beating victims accounted for 41.8% of the sample[9]. At two Level I Trauma Centers in Los Angeles, the proportion of GSW victims reached 35.2%[10]. The use of firearms as an instrument of interpersonal violence in Brazil is comparable to that of refugee victims of violence during the civil war in Syria, where the proportion of GSW varied from 83.7–96.8%[11-13].

In this study, the victims of interpersonal violence were predominantly male (90.4%) and of an economically active age (mean age: 30.3 years). The GSW victims had the lowest mean age among the groups (27.7 years). Such findings are consistent with the results of other studies[14-18].

Beating occurred more frequently among women than men (37.6% versus 22.7%). Several studies have indicated that patterns of interpersonal violence differ with gender, especially in terms of the use of sharp instruments[19-23]. Women are victims of hanging, strangulation and suffocation practiced mainly by their partners, parents or close relatives[19-23]. Those wounds occur mainly in the craniofacial region, causing hematomas, lacerations and fractures delivered by punches, kicks and occasionally blunt objects[8,17,24,26].

The wounds of GSW victims are typically more critical than two other groups[27]. In this study, the mean value of RTS at admission of the GSW group (7.36) was lower than that of the STW group (7.64). Compared with studies conducted in Curitiba, Brazil (RTS = 7.29) and Ankara, Turkey (RTS = 6.64), the GSW victims in our sample presented less-serious wounds upon admission[28,29].

There was also more pronounced consumption of blood products in the GSW group (25%) compared with the STW (16%) and beating (6%) groups. Recently, the Johns Hopkins Medical Institute reported a proportion that 20.1% of GSW victims needed blood products. That investigation revealed that GSW victims were five times more likely to need blood products compared with other trauma patients[7]. The number of transfused components needed by GSW victims was 10 times higher than that of patients injured by other mechanisms[7].

Overall, we found an in-hospital mortality rate of 9.6%. Victims of GSW (60%) accounted for almost 80% of all deaths (96 out of 124). The magnitude of tissue damage is directly related to the energy intensity transferred between the impacting object and the human body-a higher-speed firearm projectile increases the chance of the impator reaching vital organs and being lethal[27].

The GSW victims exhibited the highest in-hospital mortality rate in our study (12.7%). Reported mortality rates of GSW victims vary with location: 11% in Los Angeles; 12.6% in Bursa, Turkey; 16.9% in Ankara, Turkey; 22.9% in Denver; 24.4% at the Johns Hopkins Medical Institute[7,9,10,12,28,30]. Such variability is possibly explained by differences in the severity profiles of the treated patients and variability in the institutional protocols of care for victims of trauma. In addition, GSW mortality is associated with multiple factors such as local circumstances (public versus domestic), aggressor profile (unknown versus known)[28], the caliber of the firearm used[31], and the number and anatomical locations of the lesions[28].

Analysis of the cumulative survival curves with the Kaplan-Meier model (Figure 1) revealed a lower survival rate of GSW victims compared with patients in the beating group. However, the difference between GSW victims and the STW group was not statistically significant (p=0.051). According to the Cox proportional regression model, the GSW variable itself was associated with a lower survival rate compared with the beating group, even after adjusting for age, sex and RTS at admission.

Our findings are associated with several limitations. Our investigation was a unicentric study that did not evaluate socioeconomic level, ethnicity, number and anatomical location of lesions; it furthermore did not evaluate factors related to the motivation behind the aggression. These characteristics may be important for establishing a more complete and detailed picture of violence in Brazil.

This work reveals the relevance of having a registry system linked to trauma care to record the alarming prevalence of violence in Brazil. Such a system would be an important contributor to a national registry of violence. Clinical research and community interventions are necessary to identify high-risk individuals, determine the most effective interventions and stimulate changes in public policy to seek solutions to reduce rates of violence.

CONCLUSION

We found that GSW victims experienced severe medical needs and required hospital resources such as ICU admission and the use of blood products. In addition, the mortality rate of this group of patients was higher than that of victims of STW or beating. The survival rate in the GSW group was also lower than that of the beating group, even after adjusting for age, sex and RTS at admission. The use of firearms as an instrument of interpersonal violence is a public health problem in Brazil that has reached alarming proportions that rival those seen in war-torn regions.

R E S U M O

Objetivo: *a violência civil é responsável por 2,5% da mortalidade mundial, matou mais pessoas no século XXI do que o somatório de todas as guerras deste período. Este estudo descreve as vítimas de violência admitidas em um hospital de referência em trauma em Salvador - Bahia, Brasil e analisa o impacto dos diferentes tipos de violência interpessoal.* ***Métodos:*** *foram incluídos vítimas de violência interpessoal admitidas entre julho de 2015 e julho de 2017. 1296 pacientes (média de idade foi 30,3 anos, 90% do sexo masculino) foram divididos em três grupos de acordo com o mecanismo de violência interpessoal: espancamento, ferimentos por projétil de arma de fogo (FPAF), ferimentos por arma branca (FAB). Os grupos foram comparados de acordo com as seguintes variáveis: idade, sexo, mecanismo de trauma, Revised Trauma Score (RTS) na admissão, necessidade de internamento em unidade de tratamento intensivo (UTI), tempo de internamento, necessidade de transfusão de hemocomponentes e morte.* ***Resultados:*** *FPAF foram o principal mecanismo de injúria (59%), seguido por agressão (24%) e FAB (17%). As vítimas de FPAF apresentaram a menor média de RTS na admissão, maior necessidade de uso de hemocomponentes e de internamento em UTI. Vítimas de espancamento tiveram a maior média de duração de internação hospitalar (11,6±19,6 dias). Os FPAF causaram 77,4% das mortes.* ***Conclusão:*** *vítimas de FPAF são mais críticas, requerendo maior tempo de tratamento em UTI, mais hemocomponentes e maior mortalidade comparativamente às vítimas de FAB e espancamento.*

Descritores: *Violência. Traumatismos. Ferimentos e Lesões. Conflitos Armados.*

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