Factors associated with mortality from external causes in an Intensive Care Unit

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Abstract

The demographic and epidemiological profile of mortality in Brazil is marked by an increasing number of external causes, which generates a financial impact for the Unified Health System due to the increase in hospital admissions, especially in Intensive Care Units. This study aimed to analyze the factors associated with mortality from external causes in an intensive care unit. This is a cross-sectional survey, based on secondary data, carried out in an Intensive Care Unit in 2019. The data were analyzed using descriptive statistics, to verify the factors associated with hospital mortality, the Qui-squared and Pearson's tests were used. There were 267 (26.72%) admissions to the Intensive Care Unit, of which 49 (18.4%) died. There was an association of death with the variables: sex (p=0.003), age group (p<0.001), city of residence (p=0.041), nature of the injury (p=0.005), affected body region (p=0.023), length of stay in the ICU (p=0.024), time to ICU admission (p<0.001), Glasgow Coma Scale (GCS) (p<0.001), Richmond Agitation Sedation Scale (p=0.021), invasive mechanical ventilation (p<0.001), duration of invasive mechanical ventilation (p<0.001), vasoactive drugs (p<0.001), acute kidney failure (p = 0.002), indwelling urinary catheter (p<0.001), gastric tube (p<0.001), central venous catheter (p<0.001), and invasive blood pressure (p<0.001). It was identified that the factors associated with mortality from external causes in the ICU are related to the sociodemographic profile, and the characteristics referring to the event and the care provided.

Keywords: External causes. Hospital Assistance. Mortality. Intensive Care Units. Epidemiology.

INTRODUCTION

Brazil is characterized by a demographic and epidemiological transition , marked by the increasing number of occurrences of external causes[1]. From 1980 to the present day, these are characterized as a public health problem of a great magnitude, which has assumed a prominent position in the ranking of morbidity and mortality worldwide and nationally, causing a strong impact on society[1].

External causes are defined, according to the World Health Organization (WHO (2005)), as a set of health problems that may or may not be fatal depending on the severity of the injuries and the affected body location, and are classified as unintentional: related to traffic, work, falls, poisoning, drowning, burns, among others; and intentional: aggression and self-harm, such as suicide, homicide, deprivation, or neglect[2].

Among the external causes are accidents

and violence that, despite being largely preventable, continue to rise, causing numerous damages to the population and which together represent about 9% of global mortality[3]. Of these 9%, it is estimated that 24% result from traffic accidents, 16% from suicides, 14% from falls, and 10% from homicides, while the rest are attributed to other exogenous causes[3].

In Brazil in 2020, the overall mortality was 1,556,824 deaths and external causes were responsible for 146,038 deaths, affecting a greater proportion of males (81.05%) when compared to females (18.95%), in the age group between 20 and 39 years old (41.18%), with the highest prevalence occurring in the Southwest Region (34.97%) followed by the Northeast Region (33.27%)[4].

These health problems worry the Brazilian government due to the high costs in two different aspects. The first concerns the social cost of reaching an economically active part of society, where the functional and cognitive disabilities resulting from these diseases are responsible for generating socioeconomic problems due to the early loss of human capital[5-6]. The second is intrinsically related to the financial impact for the Unified Health System (UHS), due to the increase in hospital admissions, as non-fatal victims need emergency care, specialized assistance, in addition to physical and psychological rehabilitation. These injuries can generate sequelae that, depending on the severity and location of the damage, can be temporary and/or permanent, visible and/or invisible, when they do not lead to death[7-8].

The condition of severity due to accidents, violence, poisoning, and some other types of external causes is one of the most frequent reasons for hospitalization in intensive care units. Since most survivors have a complex clinical profile, hemodynamic instability, and a risk of worsening and death, these units are the most appropriate place to promote recovery, as they have a specialized multiprofessional team that provides full-time care, in addition to having technologies, equipment, and other essential resources for treatment[6,9-11].

Recognizing that reducing the magnitude of this problem is currently one of the biggest challenges for public health policies, due to the high socioeconomic costs, the strong financial impact on the SUS, and the potential loss of years of productive life, the present study aims to provide support in identifying factors related to mortality from external causes. The results herein further aim to subsidize the improvement of the quality of care provided to these individuals, as well as the need to implement effective interventions accordingly, both in the managerial scope like assistance of hospital units, in addition to being able to guide health surveillance actions.

Furthermore, the occurrence of external causes is one of the most frequent reasons for hospitalizations in ICUs, as these non-fatal victims require a set of highly specialized therapies and procedures and technological devices for their care and recovery. Therefore it is essential to analyze the association between mortality and the factors related to the characteristics of the disease, clinical conditions and the assistance offered, in order to identify, prevent, and control the factors that are intrinsically related to the care provided[12]. In view of the above, the following objective was created: to analyze the factors associated with mortality from external causes in an intensive care unit.

METHODS

This was an epidemiological, cross-sectional, and descriptive study, linked to the project "Factors associated with multimorbidity in individuals treated in an adult intensive care unit". Secondary data were collected through medical records of individuals hospitalized in intensive care units due to external causes, from January to December 2019.

The field of investigation was the three adult ICUs of the Hospital Geral Prado Valadares – HGPV. The first unit opened in 2006 with 10 inpatient beds, and in 2018 two more ICUs were built, expanding to 29 beds.

This hospital is considered large and is located in the municipality of Jequié, in the Southwest region of Bahia, and is defined as a Strategic Component of the Urgency and Emergency Care Network, as it is the only public trauma hospital for medium and high complexity care for this health micro-region, which is composed of 26 municipalities covering 516,876 thousand inhabitants[13]. As a statewide and mixed management hospital, it provides exclusive care through the Unified Health System and has 276 operational beds distributed in Medical, Surgical, Neurological, Pediatrics, Psychiatry, Intensive Care, in addition to urgency and emergency care[13].

The study population consisted of individuals of both sexes, admitted to the HGPV ICUs due to health problems resulting from external causes according to Chapter XX of the International Classification of Diseases (ICD – 10) (External causes of morbidity and mortality), in the categories V01 to Y98; and who were under the care of the team for more than twenty-four hours, between January and December 2019. The medical records of individuals who stayed in the ICU for less than 24 hours were adopted as an exclusion criterion, because the short period of stay makes it impossible to identify some variables related to the analysis of care.

Initially, the medical records were identified through the admissions book of the ICU sector of HGPV and then located in the Medical Archive and Statistics Service (MASS). After identifying the medical records, data was collected using an instrument developed by the researchers. For this study, the following variables were chosen:

1) Sociodemographic variables: sex (male and female); age group (< 60 years and ≥ 60 years); color/race (brown, yellow, indigenous black); marital status (with and without a partner); schooling (elementary school, high school, and no information); profession; and city of residence (Jequié and others);

2) Regarding the event and clinical outcome: type of external cause (other external causes of accidental trauma (W00-X59), transportation accident (V01-V99), assault (X85-Y09), intentional self-harm (X60-X84), medical care complications (Y40-Y84), undetermined causes (Y10-Y34), sequelae from external causes (Y85-Y89)); nature of the injury (fractures/polytrauma, burns, intoxications, medical care complications and other injuries); affected body region (head/neck, chest and abdomen, upper limbs (UL)/lower limbs (LL) and multiple segments); origin (surgical center, emergency room, surgical clinic, neurological clinic, and external transfer); length of stay in the ICU (≤6 days and >6 days); and clinical outcome (ICU discharge, hospital discharge, death, external transfer, and transfer to another ICU).

3) Regarding care and clinical status: waiting time for ICU admission (≤24h and > 4h); Glasgow Coma Scale (light Traumatic Brain Injury (TBI), moderate TBI, severe TBI, and not applicable); Richmond Agitation Sedation Scale (RASS) (+1 (restless), 0

(calm alert), -1 (drowsy), -2 (mild sedation), -3 (moderate sedation), -4 (deep sedation), -5 (does not wake up), does not apply, and not informed (NI)); imaging tests in the first 24 hours (yes and no); surgery (elective, emergency, both and not); invasive mechanical ventilation (IMV) (yes and no); IMV time (≤07 days and >07 days); use of vasoactive drugs (yes and no); acute kidney failure (AKF) (yes and no); kidney replacement therapy (KRT) (yes and no); antibiotic therapy (yes and no); infection (yes, no, and NI)); indwelling urinary catheter (IUC) (yes and no); gastric tube (yes and no); enteral tube (yes and no); central venous catheter (CVC) (yes and no); invasive blood pressure (ABP) (yes and no); drain (yes and no). Some adverse events that were described in the medical records were also considered, namely: pressure injury, lack of medication, drug allergy, canceled surgeries, suture dehiscence, accidental fall, and extubation, which were categorized and presented as the presence or absence of adverse events (yes and no). The variables that did not present information were also categorized and presented by the acronym NI.

Data tabulation was performed in Microsoft Excel 2013 and analysis was performed in the statistical program Statistical Package for the Social Sciences (SPSS) version 21.0, which were presented through descriptive statistics, through absolute and relative frequencies. Subsequently, we proceeded with the analysis of factors associated with mortality from external causes through bivariate analysis between the dependent variables (death: yes or no) and independent variables (other variables) through inferential statistics using the Chi-Square test. Fisher's exact test was considered in cases where the expected frequency of the contingency tables was ≤ 5. A confidence interval of 95% was adopted, with a significance level of $p < 0.05$.

The present study was submitted and approved by the Research Ethics Committee of the State University of Southwest Bahia, Jequié campus, according to protocol No. 3.092.575 and CAAE: 03324918.2.0000.0055, through Resolution No. 466/12 of the National Health Council and the Ministry of Health Health. As this is research with secondary data, the Informed Consent Form (ICF) was waived.

RESULTS

In 2019, of the 999 individuals admitted to the ICU, 267 (26.72%) were due to external causes, of which 49 (18.4%) died. Among these individuals, there was a prevalence of males (n=163; 61%), elderly (n=135; 50.6%), brown (n=207; 77.5%), without a partner (n=164; 61.4%), and residents of other cities in the state of Bahia (n=165; 61.8%) (table 1).

A sub-record was identified regarding the variables of education and profession (n=264; 98.9% and n=267; 100%, respectively).

As for the type of external causes according to the ICD-10, the other external causes of accidental trauma group prevailed (n=143; 53.6%), followed by transportation accidents (n=85; 31.8%).

As for the nature of the injury, fractures/polytraumas were more common (n=224; 83.9%), the most affected body regions were the upper and lower limbs (n=114; 42.7%), as well as multiple segments (n=91; 34%). Of the individuals admitted to the ICU, the majority came from the operating room (n=151; 56.6%) and from the emergency room (n=97; 36.3%), with a length of stay of up to 6 days in the ICU (n=158; 59.2%).

Table 1 – Sociodemographic characteristics of individuals hospitalized for external causes in an intensive care unit. Jequié, BA, Brazil, 2019.

Variable	N	%
Sex		
Male	163	61
Female	104	39
Age Group		
< 60 years	130	48.7
≥ 60 years	135	50.6
NI	02	0.7
Race/Color		
Brown	207	77.5
Yellow	01	0.4
Black	04	1.5
Indigenous	01	0.4
NI	54	20.2
Marital Status		
Has partner	48	18.0
No Partner	164	61.4
NI	55	20.6
Schooling		
Elementary School	02	0.7
High school	01	0.4
NI	264	98.9
Profission		
NI	267	100
City of Residence		
Jequié	102	38.2
Others	165	61.8

NI: Not Informed.

Of the subjects, 155 (58.7%) were admitted to the ICU within 24 hours of hospital admission, 142 (53.2%) had mild TBI, 89 (33.3%) were admitted using sedatives, 53 (19.9%) of these had a sedation level of -5 (no response to verbal or physical stimuli) according to the RASS scale, 234 (87.6%) underwent imaging within the first 24 hours after hospital admission, 131 (49.1%) underwent emergency surgery, 145 (54.3%) underwent IMV, among which 88 (60.7%) remained under ventilatory prosthesis for up to 7 days.

It was observed that 98 (36.7%) used vasoactive drugs, 234 (87.6%) did not develop acute kidney failure, 11 (4.1) required kidney replacement therapy, 219 (82%) used antibiotic therapy, and 199 (74.5%) had no record of infection.

Regarding the use of invasive devices, 177 (63.3%) used an indwelling urinary catheter (IUC), 49 (18.3%) used a gastric tube, 100 (38%) used an enteral tube, 128 (47.9%) used a central venous catheter (CVC), 61 (22.8%) had invasive blood pressure monitoring, and 138 (51.7%) used some type of drain. It is noteworthy that 127 (47.6%) of the individuals hospitalized for external causes suffered some type of adverse event.

Regarding the bivariate analysis between deaths from external causes in the ICU and sociodemographic aspects, an association was observed in relation to sex (p = 0.003), age group (p ≤ 0.001), and city of residence (p = 0.041). The proportion of deaths was higher in males (n=39; 79.6%), aged less than 60 years (n=33; 67.3%), and 25 (51%) resided in the city of Jequié, as shown in table 4.

There was no association between death and type of external causes according to the ICD-10 (p=0.298); however, the nature of the injury (p=0.005) and the affected body region (p=0.023) showed an association with mortality, with a higher prevalence of polytrauma (n=18; 36.7%) and multiple segments (n=21; 42.9%), respectively. Regarding the characteristics related to care, it was found that the len-gth of stay (p=0.024) and the time to ICU admission (p<0.001) is associated with mortality.

According to the clinical evolution of the individuals in the ICU, an association was observed regarding the classification of TBI by severity according to ECG (p<0.001), use of analgosedation (p<0.021) and vasoactive drugs (p<0.001), as well as the development of acute kidney failure (p<0.001). Invasive ventilatory support (p<0.001), IMV time (p<0.001), and the outcome extubation or evolution to tracheostomy (p=0.001) was associated with mortality in the bivariate analysis, as well as the use of invasive devices, such as: indwelling urinary catheter (p<0.001), gastric tube (p<0.001), central venous catheter (p<0.001), and invasive blood pressure (p<0.001), as shown in table 5.

Table 2 – Characteristics of the event and clinical outcome of individuals hospitalized for external causes in the intensive care unit. Jequié, BA, Brazil, 2019.

Variable	n	%
Type of external cause		
Other external causes of accidental trauma	143	53.6
Transport Accident	85	31.8
Aggression	24	9.0
Intentional self-harm	06	2.2
Medical care complications	04	1.5
Undetermined causes	03	1.1
Sequelae from external causes	01	0.4
NI	01	0.4
Nature of injury		
Fractures/Polytraumatism	224	83.9
Bums	02	0.7
Intoxications	05	1.9
Medical care complications	04	1.5
Too many injuries	29	10.9
NI	03	1.1
Affected body region		
Head/neck	52	19.5
Thorax and abdomen	06	2.2
Upper limb	114	42.7
Multiple segments	91	34
NI	04	1.6

to be continued...

... continuation table 2

Variável	n	%
Origin		
Surgery Center	151	56.6
Emergency	97	36.3
Surgical Clinic	11	4.1
Neurological Clinic	01	0.4
External transfer	7	2.6
Length of stay in the ICU		
≤ 6 days	158	59.2
> 6 days	109	40.8
Clinical Outcome (n= 267)		
ICU discharge	202	75.7
Hospital discharge	07	2.6
Death	49	18.4
External Transfer	07	2.6
Transferred to another ICU	02	0.7

NI: Not Informed; UL/l.L: Upper limbs/lower limbs.

Table 3 – Characteristics regarding care and clinical status of individuals hospitalized for external causes in an intensive care unit. Jequié, Bahia, Brazil, 2019.

Variable	n	%
Time to ICU admission		
≤ 24h	109	41.3
> 24h	155	58.7
NI	03	1.1
GCS		
Light TBI	142	53.2
Moderate TBI	13	4.9
Severe TBI	18	6.7
Not applicable	89	33.3
NI	05	1.9
RASS		
+1 (restless)	01	0.4
0 (calm alert)	04	1.5
-1 (drowsy)	02	0.7
-2 (light sedation)	04	1.5
-3 (moderate sedation)	09	3.4
-4 (deep sedation)	16	6.0
-5 (does not wake up)	53	19.9
Not applicable	170	63.7
NI	8	3.0
Imaging tests in the first 24 hours		
Yes	234	87.6
No	19	7.2

to be continued...

Variable	n	%
NI	14	5.2
Surgery performed (n=267)		
Elective	93	34.8
Emergency	131	49.1
Both	09	3.4
No	34	12.7
VMI		
Yes	145	54.3
No	121	45.3
NI	01	0.4
Time of VMI (n=145)		
≤7 days	88	60.7
>7 days	57	39.3
Vasoactive drug use		
Yes	98	36.7
No	169	63.3
AKF		
Yes	24	9.0
No	234	87.6
NI	09	3.4
KRT		
Yes	11	4.1
No	256	95.9
Antibiotic therapy		
Yes	219	82.0
No	48	18.0
Infecction		
Yes	51	19.1
No	199	74.5
NI	17	6.4
IUC		
Yes	177	66.3
No	87	32.6
NI	03	1.1
Gastric tube		
Yes	49	18.3
No	213	79.8
Enteral tube		
Yes	100	37.5
No	163	61.0
NI	4	1.5
Central venous catheter		
Yes	128	47.9
No	137	51.4

... continuation table 3

Variable	n	%
NI	02	0.7
ABP		
Yes	61	22.8
No	203	76.1
NI	03	1.1
Drain		
Yes	138	51.7
No	129	48.3
Evento adverso		
Sim	127	47.6
Não	140	52,4

TBI: Traumatic Brain Injury; GCS: Glasgow Coma Scale; TQT: Tracheostomy; IMV: Invasive mechanical ventilation; AKF: Acute Kidney Failure; KRT: Kidney replacement therapy; IUC: Indwelling urinary catheter; CVC: Central venous catheter; ABP: Invasive blood pressure; NI: Not Informed.

Table 4 – Sociodemographic characteristics of individuals hospitalized for external causes in the intensive care unit associated with death. Jequié, BA, Brazil, 2019.

Independent variables	Death		P-value *
	Yes	No	
	n (%)	n (%)	
Sex			
Male	39 (79.6)	124 (56.9)	0.003
Female	10 (20.4)	94 (43.1)	
Age range (in years)			
< 60	33 (67.3)	97 (44.5)	<0.001
≥ 60	14 (28.6)	121 (55.5)	
NI	2 (4.1)	0 (0.0)	
Marital status			
With Partner	9 (18.4)	39 (17.9)	0.308
No Partner	26 (53.0)	138 (63.3)	
NI	14 (28.6)	41 (18.8)	
Ethnicity			
Brown	43 (87.8)	164 (75.2)	0.400
Yellow	0 (0.0)	1 (0.5)	
Black	0 (0.0)	4 (1.8)	
Indigenous	0 (0.0)	1 (0.5)	
NI	6 (12.2)	48 (22.0)	
City of residence			
Jequié	25 (51.0)	77 (35.3)	**0.041**
Outras	24 (49.0)	141 (64.7)	
Education			
Elementary School	0 (0.0)	2 (0.9)	0.711
High school	0 (0.0)	1 (0.5)	
NI	49 (100)	215 (98.6)	

NI: Not Informed.

Table 5 – Characteristics referring to the event and the assistance of individuals hospitalized for external causes in the intensive care unit associated with death. Jequié, BA, Brazil, 2019.

Independe Variables	Death		P-value*
	Yes	No	
	n (%)	n (%)	
Types of external causes			
Other external causes	18 (36.7)	125 (57.3)	0.298
Transportation accidents	22 (44.9)	63 (28.9)	
Aggression	5 (10.2)	19 (8.7)	
Self-inflicted injuries	0 (0.0)	1 (0.5)	
Complications medical care	2 (4.1)	4 (1.8)	
Undetermined causes	1 (2.0)	3 (1.4)	
Sequelae of external causes	1 (2.0)	2 (0.9)	
NI	0 (0.0)	1 (0.5)	
Nature of injury			
Fracture/Polytraumatism	41 (83.7)	183 (83.9)	**0.021**
Burns	3 (6.1)	2 (0.9)	
Intoxication	0 (0.0)	2 (0.9)	
Medical care complications	1 (2.0)	3 (1.4)	
Too many injuries	2 (4.1)	27 (12.4)	
Not specified	2 (4.1)	1 (0.5)	
Affected body region			
Head/Neck	15 (30.6)	37 (17.0)	**0.023**
Chest/Abdomen	0 (0.0)	6 (2.8)	
UL/LL	12 (24.5)	102 (46.8)	
Multiple Segments	21 (42.9)	70 (32.1)	
Not specified	1 (2.0)	3 (1.4)	
Origin			
Surgery Center	22 (44.9)	129 (59.2)	0.147
Emergency	25 (51.0)	72 (33.0)	
Surgical Clinic	2 (4.1)	9 (4.1)	
Neurological clinic	0 (0.0)	1 (0.5)	
External regulation	0 (0.0)	7 (3.2)	
Time in ICU			
≤ 6 days	22 (44.9)	136 (62.4)	0.024
> 6 days	27 (55.1)	82 (37.6)	
Tempo para admissão na UTI			
<24h	25 (51.0)	55 (25.2)	0.001
>24h	24 (49.0)	160 (73.4)	
NI	0 (0.0)	3 (1.4)	
GCS at admission to ICU			
Light TBI (13 to 15 points)	10 (20.4)	132 (60.6)	<0.001
Moderate TBI (9 to 12 points)	5 (10.2)	8 (3.7)	
Severe TBI (3 to 8 points)	6 (12.2)	12 (5.5)	
Not Applicable	26 (53.1)	63 (28.8)	
NI	2 (4.1)	3 (1.4)	

to be continued...

... continuation table 5

Independent variables	Death Yes n (%)	Death No n (%)	P-value*
RASS at ICU admission			
+1 (restless)	0 (0.0)	1 (0.5)	**0.021**
0 (alert and calm)	1 (2.0)	3 (1.4)	
-1 (drowsy)	0 (0.0)	2 (0.9)	
-2 (light sedation)	1 (2.0)	3 (1.4)	
-3 (moderate sedation)	1 (2.0)	8 (3.7)	
-4 (deep sedation)	3 (6.1)	13 (6.0)	
-5 (not awake)	19 (38.8)	34 (15.6)	
Not aplicable	21 (42.9)	149 (68.3)	
NI	3 (6.1)	5 (2.3)	
Imaging exams in 24 hours			
Yes	44 (89.8)	190 (87.2)	0.825
No	3 (6.1)	16 (7.3)	
NI	2 (4.1)	12 (5.5)	
Surgery			
Elective	10 (20.4)	83 (38.1)	0.113
Emergency	28 (51.7)	103 (47.2)	
Both types	2 (4.1)	7 (3.2)	
No	9 (18.4)	25 (11.5)	
VMI			
Sim	44 (89.8)	101 (46.3)	**<0.001**
Não	5 (10,2)	116 (53.2)	
SI	0 (0,0)	1 (0,5)	
Time of IMV			
≤ 7 days	26 (53.1)	62 (28.4)	**<0.001**
>7 days	18 (36.7)	39 (17.9)	
NI	5 (10.2)	117 (53.7)	
Vasoactive drugs			
Yes	38 (77.6)	60 (25.7)	**<0.001**
No	11 (22.4)	158 (72.5)	
AKF			
Sim	11 (22.4)	13 (6.0)	**0.002**
Não	36 (73,5)	198 (90,8)	
SI	2 (4,1)	7 (3,2)	
KRT			
Yes	4 (8.2)	7 (3.2)	0.115
No	45 (91.8)	211 (96.8)	
Antibiotic use			
Yes	39 (79.6)	180 (82.6)	0.624
No	10 (20.4)	38 (17.4)	
Infection			
Yes	13 (26.5)	38 (17,4)	**0.040**
No	30 (61.2)	169 (77.5)	

to be continued...

Independe Variables	Death		P-value*
	Yes	No	
	n (%)	n (%)	
NI	6 (12.2)	11 (5.0)	
IUC			
Yes	44 (89.8)	133 (61.0)	<0.001
No	5 (10.2)	82 (37.6)	
NI	0 (0.0)	3 (1.4)	
Sonda gástrica			
Sim	20 (40.8)	29 (13.3)	<0.001
Não	28 (57.1)	185 (84.9)	
SI	1 (2.0)	4 (1.8)	
Gastric tube			
Yes	22 (44.9)	78 (35.8)	0.341
No	26 (53.1)	137 (62.8)	
NI	1 (2.0)	3 (1.4)	
CVC			
Yes	43 (87.8)	85 (39.0)	<0.001
No	6 (12.2)	131 (60.1)	
NI	0 (0.0)	2 (0.9)	
ABP			
Yes	24 (49.0)	37 (17.0)	<0.001
No	25 (51.0)	178 (81.6)	
NI	0 (0.0)	3 (1.4)	
Drain			
Yes	22 (44.9)	116 (53.2)	0.293
No	27 (55.1)	102 (46.8)	
Adverse Event			
Yes	17 (34.7)	79 (36.2)	0.811
No	25 (51.0)	115 (52.8)	
NI	7 (14.3)	24 (11.0)	

TBI: Traumatic Brain Injury; GCS: Glasgow Coma Scale; TQT: Tracheostomy; IMV: Invasive mechanical ventilation; AKF: Acute Kidney Failure; KRT: Kidney replacement therapy; IUC: Indwelling urinary catheter; CVC: Central venous catheter; ABP: Invasive blood pressure; NI: Not Informed.

DISCUSSION

In Brazil, the recognition of external causes as a public health problem is justified by their relationship with increasing trends of ICU mortality and hospitalization rates, and are considered the fourth cause among the others health problems[12].

In the present study, a mortality rate of 18.4% was identified. A retrospective epidemiological study was carried out in an ICU in 2011, in the city of Florianópolis, which identified a mortality rate of 16.9% from external causes[11]. Another study carried out in Tocantins through the Mortality Information System (MIS) database between 2010 and 2015, identified an overall mortality rate of 18.5%[14].

The percentage of ICU hospitalization due to external causes was 26.72%. This fin-

ding varies between regions and can be attributed to the number of local beds, given that occupation is carried out according to the availability of beds and due to high demand and hospitalization profiles, victims of external causes, despite sometimes needing intensive support, may not be admitted to these units due to the lack of beds[15].

With regards to sociodemographic characteristics, male individuals, aged less than 60 years old, and residents of Jequié composed the highest mortality rates in the ICU. This disparity is similar to findings in other studies and may be associated with risk factors, such as differences in behavior between men and women. For example, given that younger men tend not to reflect on the consequences of their actions, this leads them to a greater exposure, such as the consumption of alcoholic beverages associated with driving, as well as working with automobile and motorcycle transportation, such as truck drivers and motorcycle taxi drivers. There are also the sociocultural factors that lead men to greater exposure to external causes and, consequently, a greater propensity to traffic accidents and work accidents, in addition to violence[16-17].

It is also noteworthy that the Jequié is cut by two federal highways, BR-116 and BR-330, which may increase the number of occurrences due to external causes, as well as death. In the Bahia stretch of BR-116 alone, in 2021, there were 725 accidents with victims and 152 deaths[18]. Thus, it is necessary that greater investments be made in safety and in the prevention of traffic accidents in municipalities close to these highways.

In this study, regarding the characteristics of the injury, the nature of the injury and the affected body region, there was a statistically significant association with mortality, with a higher prevalence of fractures/polytrauma and multiple segments, respectively. Thus, it is inferred that the main diagnoses that may have contributed to death in patients with external causes admitted to the ICU were shock and TBI, given the severity of the injuries that cause circulatory complications and hemodynamic instability, in addition to compromising structural functions of the brain, which can lead to fatality[19].

Another important factor that showed a statistically significant association concerns the length of stay in the ICU. In this study, most individuals whose outcome was death remained in the ICU for a period longer than six days. This data may be related to the characteristics of the event and the clinical complexity of the individual[20], as well as the experience of the multiprofessional team in providing adequate care and interventions for these patients.

According to the Hospital Quality Commitment Program (HQC) and the Associação de Medicina Intensiva Brasileira (AMIB), the average length of stay in the adult ICU is 4.5 to 5.3 days, taking into account that the prolonged hospitalization in the intensive care unit is a concerning factor, as it increases the possibility of complications and increases hospital costs, in addition to reducing bed turnover rates[21].

The time between hospital admission and ICU admission showed a significant association with mortality. According to an American survey, it is recommended that admission be performed within six hours, as a prolonged waiting time for an intensive care bed can lead to late interventions, worsening of the clinical profile, and a 3% increase in the chance of mortality in comparison with patients transferred earlier[22].

Some clinical factors also increased in-hospital mortality in the ICU, including the GCS score that predicts the level of consciousness of individuals and the use of analgosedation assessed using the RASS scale. The worst prognoses and mortality rates are for critically ill patients who have severe TBI with a score between 3 and 8 points, which was not demonstrated in this study[23].

However, despite sedoanalgesia, a similar study showed a mortality rate of 51.1% for patients in deep sedation (RASS -3 to -5), which may be justified by the adverse results of sedatives and analgesics, including longer duration of mechanical ventilation, episodes of delirium, increased length of stay in the ICU, and increased rates of ventilator-associated pneumonia (VAP)[24]. In this context, in order to avoid such complications, it is necessary to emphasize the importance of care protocols to control the levels of sedation, avoid excessive administration and evaluate the possibility of daily interruptions for neurological awakening according to clinical evolution[25].

Despite the clinical heterogeneity of patients who are victims of external causes, a large proportion needed ventilatory support, due to acute respiratory failure (ARF) or for airway protection or prevention of secondary brain injury, among other conditions[26]. In this regard, it was found that invasive mechanical ventilation (IMV) is associated with death, with a prevalence in patients with less than seven days of use. In the present study, the severity of the patient from external causes is highlighted since they died faster due to complications and clinical condition.

Furthermore, a similar study identified an average of five days of use of the mechanical ventilator. Although it varies according to the clinical status of each individual, studies show that prolonged use, in addition to being a risk factor for mortality, also contributes to a higher incidence of pneumonia, airway injuries, immobility problems, and a consequent increase in the time of hospitalization and higher hospital costs[25,27].

As for the outcome of MV, among the 44 individuals who required invasive ventilatory support and died, there was a high percentage of evolution to tracheostomy (68.4%) when compared to extubation (31.6%). Some studies have demonstrated the benefits of early TQT as a result of improved cli-

nical results, and suggest performing such a procedure in patients who are expected to use MV for a period longer than 21 days[28].

Another contributing factor to the mortality of victims of external causes is hemodynamic instability due to circulatory compromise and in these cases, adequate tissue perfusion must be ensured through the administration of crystalloids and blood transfusion according to clinical judgment. However, vasoactive drugs can be used when there is a need for inotropic support to limit the hypoperfusion of vital organs and prevent multiple organ failures[29].

In this study, the use of vasopressors remained independently associated with death. Moreover, other studies have also shown that mortality increases proportionally to the use of vasoactive agents, but scientific evidence is unable to provide a cause and effect relationship, and it is not clear whether the use of vasoactive drugs increases mortality or if its need is a poor prognostic marker[30-31].

Additionally, due to the vasoconstriction mechanism, vasoactive drugs constitute one of the possible causes of acute kidney failure (AKF), and they are one of the most frequently encountered complications in ICU patients[32]. Mortality from AKF in ICUs varies between 50% and 90% and is associated with prolonged hospitalization, use of therapies with advanced technologies, presence of comorbidities, multiple traumas, hypovolemia, need for invasive mechanical ventilation, and underdiagnosis or late diagnosis[33].

Regarding invasive procedures, it is understood that these are frequent in critical patients and are essential for monitoring and treatment. However, they are commonly related to the risk of clinical complications, with infections related to care being the main one. In this regard, a study developed in the ICU analyzing this relationship showed that all patients who died underwent at least one invasive procedure, of which all used IUC and 93.3% used CVC. Corroborating with

other studies that also found that the use of CVC, ABP, IUC, and gastric tubes have a statistically significant relationship with death[34].

Despite the relevant data presented, limitations should be highlighted. The under-reporting of information evidenced in the medical records analyzed with regards to sociodemographic variables, especially in relation to profession, prevents inferences from being made regarding mortality from exter-

nal causes, given that many traffic accidents happen to individuals who use motorcycles as means of transportation for the exercise of the profession, such as motoboys, mototaxi drivers, among others. Also it is noteworthy that underreporting of indices to estimate the severity of patients admitted to the ICU, such as the APACHE II, makes it difficult to associate mortality and prognosis of patients admitted to the ICU.

CONCLUSION

This study identified a mortality rate from external causes in the ICU of 18.4% and risk factors that make up the clinical profile of these victims. In addition, it was possible to determine the factors associated with mortality that are intrinsically related to the sociodemographic profile (gender, age group, and city of residence) and the characteristics related to the event and assistance provided (nature of the injury, affected body region, length of stay and time of ICU admission, vasoactive drugs, gastric tube, IUC, CVC and ABP).

These results provide subsidies for improving the quality of care provided to these individuals and consequently reducing the mortality rate associated with preventable

complications and late interventions. The importance of instituting evaluation indicators to analyze the quality of the care provided, the implementation of practices aimed at patient safety, as well as the reorganization of the hospital flow by managers with a view to reducing the waiting time for an ICU hospital bed is highlighted.

Furthermore, this study demonstrates the need for measures that will minimize the occurrence of deaths from external causes, through intersectoral actions, which involve the elaboration and implementation of resolute public policies, improvements in safety and inspection, as well as health education actions.

Author Statement CREdiT

Conceptualization: Araújo, DR; Oliveira, J.S. Methodology: Araújo, DR; Oliveira, J.S. Validation: Araújo, DR; Oliveira, JS; Jesus, C.S. Statistical analysis: Araújo, DR; Oliveira, J.S. Formal analysis: Araújo, DR; Oliveira, J.S. Research: Araújo, DR; Oliveira, J.S. Resources: Araújo, DR; Oliveira, J.S. Elaboration of original writing: Araújo, DR; Oliveira, J.S. Writing-revision and editing: Araújo, DR; Oliveira, JS; Jesus, CS; Vieira, SNS; Ribeiro, VP. Visualization: Araújo, DR; Oliveira, JS; Jesus, CS; Vieira, SNS; Ribeiro, VP. Supervision: Araújo, DR; Oliveira, JS; Jesus, CS; Vieira, SNS; Ribeiro, VP. Project management: Araújo, DR; Oliveira, J.S.

All authors read and agreed with the published version of the manuscript.

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