

## FACTORS INVOLVED IN THE DETERMINATION OF NEGATIVE PROGNOSIS IN COMPLEX CERVICAL TRAUMATOLOGY

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**Abstract:** Complex cervical trauma is an important component of the otorhinolaryngologic pathology, with a rising incidence. Cervical injuries, both the blunt and penetrating ones, are most frequently associated with violence, hetero- or self-inflicted nature. They also occur in road accidents and professional sports. Excessive alcohol consumption has a great impact on complex cervical trauma. Regarding complex cervical traumas produced by an autolytic, aggression or accidental mechanism in which a history psychiatric pathology is diagnosed or not, the psychological and psychiatric assessment plays an essential role in the recovery and social reintegration.

To assess the complexity and actual prevalence of the aero-digestive cervical trauma, multicenter studies are needed to optimize and standardize a national algorithm for the long-term diagnosis, treatment and management of patients, as well as a protocol with the forensic aspects of this pathology for the protection of both doctors and patients. This guide would facilitate and create a common framework for a multidisciplinary approach to diagnosis.

The present research study has been conceived as a comprehensive approach to a significant number of subjects differentiated according to several criteria: age, gender, background, cervical trauma type, the survivors / deceased, alcohol level. Since the main type of cervical trauma identified both in survivors and deceased was cervical trauma produced by an autolytic mechanism, it was assumed that to understand and correct this form of suicide and it is necessary first to investigate the generating factors, the modalities of action and the immediate and delayed consequences of their action.

**Keywords:** complex cervical trauma, negative prognosis, alcohol, psychiatric pathologies.

### INTRODUCTION

Complex cervical trauma is a common cause of morbidity and mortality worldwide, [1] but also a real problem of public health, in the context of increased aggressiveness, suicide attempts and road accidents [2-4]. A significant risk factor with a great impact on the complex cervical trauma mortality is alcohol, considered a significant cause of death among these subjects [5, 6], being toxic with the most social and medical effects [5-9]. Through its mutual action on personality and behavior, it contributes to intentional or unintentional injuries that occur both to consumers and others [10]. These injuries include violence among people, suicide, homicide and alcohol-related accidents. Frequency of alcohol consumption and the amount of alcohol consumption increase the risk of trauma, the risk of suicide and lead to

an exacerbation of psychiatric pathologies [11].

The present research study has been conceived as extensive work to a significant number of subjects differentiated according to several criteria: age, gender, background, cervical trauma, survivors/deceased, alcohol level. Since the primary type of cervical trauma identified both in survivors and deceased was cervical trauma produced by an autolytic mechanism, it was assumed that to understand and correct this form of suicide, it is necessary first to investigate the generating factors, the modalities of action and the immediate and delayed consequences of their action. The study aims to identify the risk factors that have entered into the determinism of unfavorable prognosis in patients with suicide attempts or aggression. In this regard, the investigations carried out on this study group aim to analyze the phenomenon in the following aspects:

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trauma reality and scale, victim typology, intricate factors in determining these behaviors, immediate and late consequences. The analysis is intended to be a diagnostic, descriptive study of the individual involved in a traumatic cervical condition based on qualitative values.

**MATERIAL AND METHOD**

The study group consisted of 395 patients from all Moldavian counties, with complex cervical traumatological pathology, produced by different mechanisms such as car accidents, domestic accidents, aggression, ballistic trauma, autolysis, hanging or strangulation attempts. It was divided into two groups depending on the department where the patients were investigated, as follows: group 1 - 106 patients admitted to the ENT department, "Sf. Spiridon" Emergency Hospital in the period 2012 – 2016, and group 2 - 289 patients from the Institute of Forensic Medicine, deceased by complex cervical pathology during 2012 and 2016. The information selected from the observation sheets and the necropsy reports were from the following categories: demographic and epidemiological characteristics, lesion appearance and mechanism, associated or recurrent pathologies.

General exclusion criteria: under 18 years

old, patient refusal to participate, presence of cervical trauma in history, but without pathological lesions or superficial injuries without symptoms.

The data was uploaded and processed using statistical features in SPSS 18.0.

Significance tests used: t-Student test, ANOVA test,  $\chi^2$  test, Kruskal-Wallis correlation, Pearson correlation coefficient (r) and linear trend.

**RESULTS**

In the studied cases both the group of patients with poor prognosis and the group of survivors predominant male patients (86.6% vs. 89.1%;  $p = 0.506$ ). Gender was not a positive prognostic factor to cause a higher risk of death (RR = 0.94, IC95%: 0.80-1.11) (Fig. 1).

In the group of deceased patients, 56.2% were over 45 years of age, while in survivors, the weight was 43.6% ( $p = 0.029$ ). The risk of death at older ages was 1.45 times higher (RR = 1.45; IC95%: 1.04-2.04) (Fig. 2).

The study population predominated in patients from rural areas: 73.9% of deceased patients and 56.4% of survivors ( $p = 0.001$ ). The estimated risk of death in rural patients was 1.74 times higher (RR = 1.74, IC95%: 1.25-2.42) (Fig. 3).

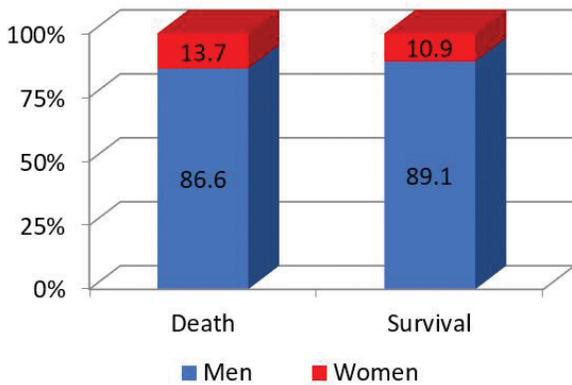


Figure 1. Distribution of lethality by gender.

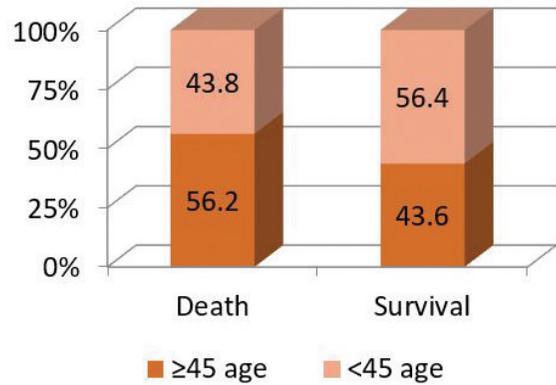


Figure 2. Distribution of lethality by age groups.

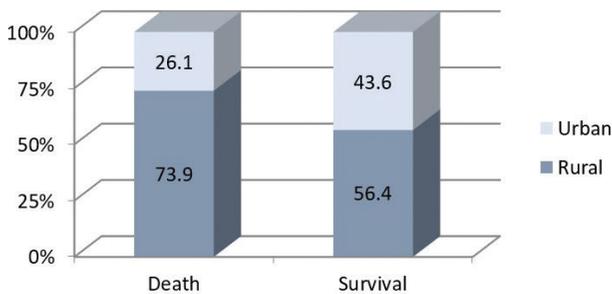


Figure 3. Distribution of lethality by place of origin.

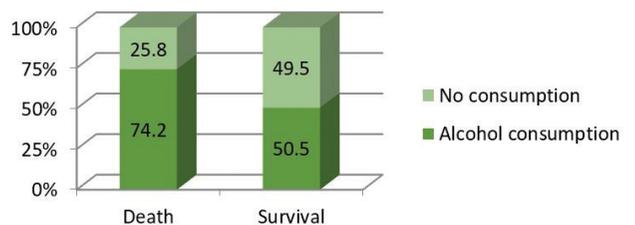


Figure 4. Distribution of lethality based on alcohol consumption.

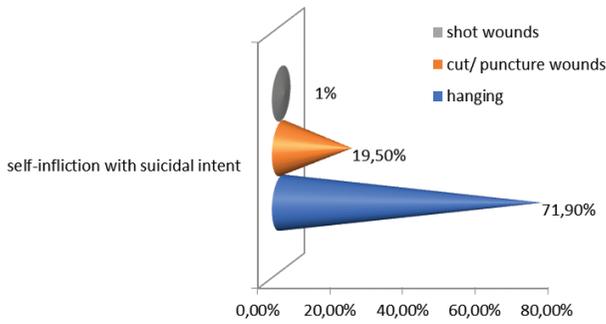


Figure 5. Share of cases in the total study group with the autolytic mechanism.

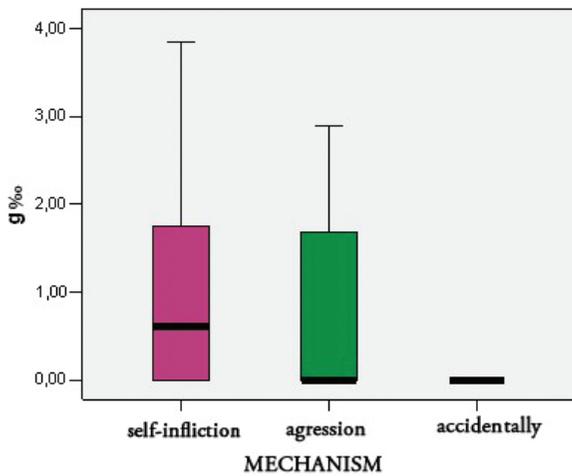


Figure 6. The average level of alcohol depending on the mechanism of trauma.

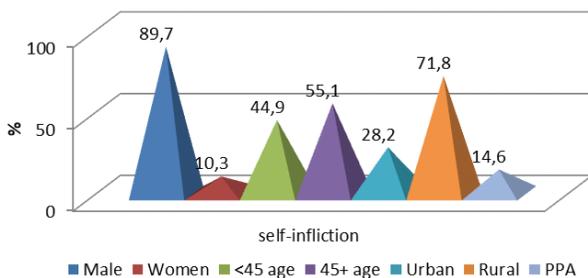


Figure 7. Structure of the patient group with the autolytic mechanism.

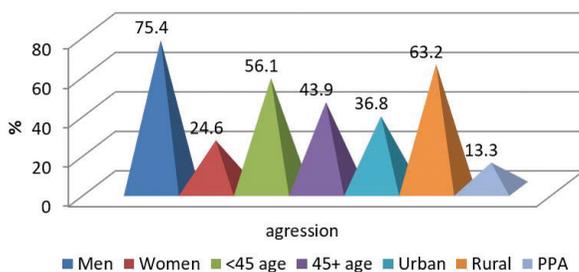


Figure 8. Structure of the group of patients with an aggressive mechanism.

Study patients predominated in alcohol users: 74.2% of deceased patients and 50.5% of survivors ( $p = 0.001$ ). The estimated risk of death in alcohol users was 1.47 times higher ( $RR = 1.47$ ;  $IC95\%: 1.20-1.80$ ) (Fig. 4).

Of the total of patients selected for the study, the mechanism for producing autolytic trauma, it has been noted the predominance of autolytic hanging mechanism (71.9%), followed by cut wounds in 19.5% of cases and only 1% product by ballistic trauma. This reduced percentage of ballistic trauma is mainly caused to the extremely low access to firearms in our country due to the legislation on arms and ammunition in force (Fig. 5).

In subjects with cervical trauma autolytic products, the average level of alcohol was about  $1.02 \text{ go} / 100 \pm 0.94$ , while the abused subjects, the average was  $0.84 \text{ alcohol go} / 100 \pm 0.28$ , significantly higher mean values compared to subjects with accidental trauma at which the alcohol level was  $0 \text{ go} / 100$  ( $p = 0.05$ ) (Fig. 6). These alcohol values correspond to the clinical state of incoordination and confusion, illustrating the spontaneity of the suicidal gesture and of making aggression in various forms.

Of all patients in this study, we have identified three groups depending on the mechanism characteristic of the production. Group of patients with injuries caused by autolytic mechanism presented the following points: 89.7% of patients are male, older than 45 years old, other pathologies history in 55.1% of cases and 71.8% cases in rural areas (Fig. 7).

The study group of patients subjected to physical aggression is characterized by the following characteristics: in the majority, i.e. 75.4% are men, with an average age of less than 45 years old in 56.1% of cases, with rural origin in 63.2% compared to 36.8% in the urban area and only 13.3% have other medical conditions at the time of the trauma (Fig. 8). Although complex cervical trauma occurred in small numbers by accident mechanism, after data analyzed patient group outlined the following characteristics: patients are men in 84.6% of cases, with an average age less than 45 years in 53.8% of cases, with 53.8% of rural area, no associated pathologies at the time of trauma (Fig. 9).

In synthesis, the profile of the self-murderer with unfavorable prognosis has been outlined (Table I):

- age over 45 years;
- rural area;
- alcohol
- automated hanging mechanism.

Patients with complex cervical traumatology pathology, hospitalized at the Otolaryngology Clinic,

“Sf. Spiridon” Iasi, have a survival duration of 3.80 years for men (IC95%: 3.63-4.37) and 3.46 years for women (IC95%: 3.47-4.53). The likelihood of survival for two years after the injury is about 80% in both women and men but decreases to about 30% in men and about 10% in women four years after the event (Fig. 10).

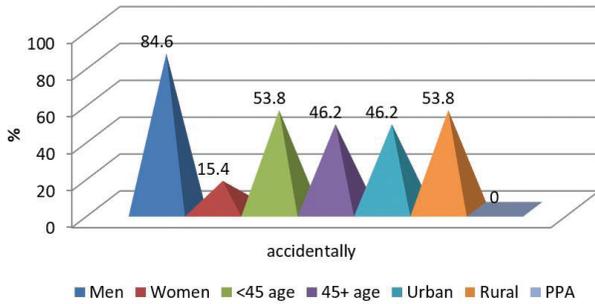


Figure 9. Structure of patient group with an accidental mechanism.

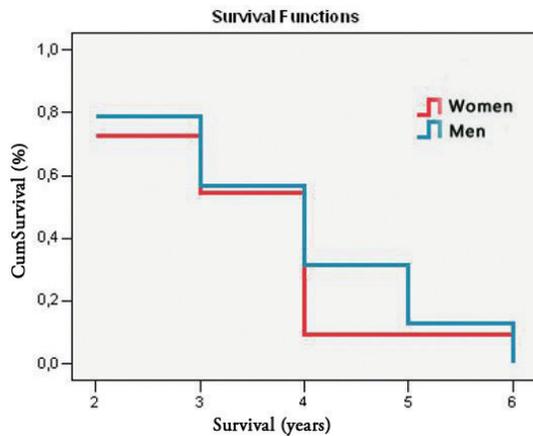


Figure 10. The probability of survival of patients in the ENT Clinic by gender.

Based on age groups, the expected survival time was 3.78 years (IC95%: 3.61-4.39) in patients who were less than 45 years and 3.75 years (IC95%: 3.48-4.52) in those over 45 years old, at four years post-traumatism, the probability of survival drops below 30% (Fig. 11).

Based on backgrounds, the expected survival time was 3.67 years (IC95%: 2.40-3.60) in urban patients and 3.83 years (IC95%: 3.63-4, 37) in rural patients, four years post-traumatic, the likelihood of survival dropping below 30% (Fig. 12).

## DISCUSSION

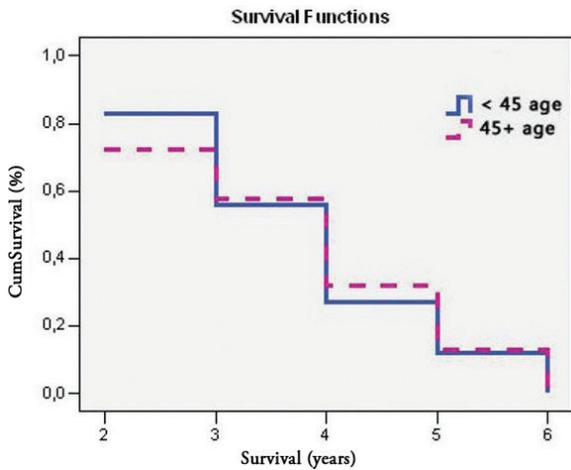
The resulting statistical aspects tended to highlight the complex cervical traumatology in its magnitude. In this analysis, we have started from the existing reality, namely that the studies carried out so far are generic and the official data reflects only to a small extent the magnitude of the phenomenon. According to recent WHO estimates, more than 5 million people worldwide die from a traumatic injury every year and it is estimated that for each death, 10 to 20 patients are hospitalized and 50 to 100 patients receive emergency care, indicating the enormous burden on the country's resources [12].

The comparative analysis of the medical studies addressed to traumatic patients by interpersonal aggression at the national level reveals that the aggression represents a weight of 10% of the total health services performed for the population [13-22].

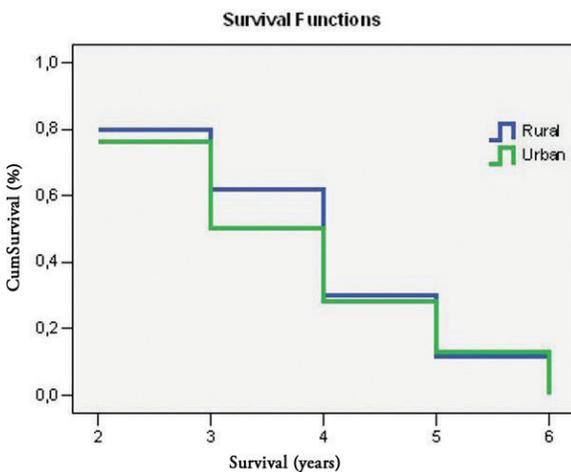
In this study, all patients who survived or died from complex cervical traumatic lesions were included for five years. In both groups of investigated patients,

Table 1. Profile of the suicide with unfavorable prognosis

	Death (n=283)		Survival (n=101)		chi2	p	RR	IC95%
	n	%	n	%				
<b>EPIDEMIOLOGICAL CHARACTERISTICS</b>								
Men	245	86.6	90	89.1	0.44	0.506	0.94	0.80-1.11
Age ≥ 45 years	159	56.2	44	43.6	4.76	<b>0.029</b>	1.45	1.04-2.04
Rural	209	73.9	57	56.4	10.23	<b>0.001</b>	1.74	1.25-2.42
Alcoholic	210	74.2	51	50.5	18.15	<b>0.001</b>	1.47	1.20-1.80
<b>LESIONAL MECHANISM</b>								
Autolytic	265	93.6	36	35.6	144.4	<b>0.001</b>	2.62	2.02-3.42
Aggression	15	5.3	42	41.6	94.68	<b>0.001</b>	0.13	0.07-0.22
Accidental	3	1.1	23	22.8	52.20	<b>0.001</b>	0.05	0.01-0.15
<b>TYPE OF LESION</b>								
Hanging	256	90.5	20	19.8	180.4	<b>0.001</b>	4.57	3.08-6.78
Strangulation	9	3.2	7	6.9	1.77	0.183	0.46	0.18-1.20
Stabbing	12	4.2	63	62.4	156.4	<b>0.001</b>	0.07	0.03-0.12
Road/ train accident	4	1.4	0	0.0	0.40	0.529	-	-
Hits	1	0.4	6	5.9	10.05	<b>0.002</b>	0.06	0.01-0.49
Ballistic trauma	0	0.0	4	4.0	7.81	<b>0.005</b>	-	-



**Figure 11.** The probability of survival of patients in the ENT Clinic by age groups.



**Figure 12.** Probability of survival of patients in the ENT Clinic depending on the area of origin.

male gender predominates in the 7: 1 ratio. In the study by Rautela *et al.*, in 2016, the identified weight was 9: 1 [23].

Compared with our study, the study by Dura *et al.* [22] reveals that men are involved in double proportion to women in acts of aggression. This fact is due to the more frequent implication of men in violent conflicts, certifying that the male gender is an epidemiological risk factor, causing an increased relative risk of death [24]. In our study, both in the group of patients with poor prognosis and the group of survivors, male patients prevail.

Compared to our study, studies in literature reveal that men are involved in double proportion to women in acts of aggression. Data from the literature suggests that rural residents have higher rates of aggression (interpersonal and self-aggression), but also socio-medical repercussions of increased gravity [24-26].

The data from this study shows that rural patients are the majority of survivors as well as those of the deceased, confirming that rural origin is a negative prognostic factor in the evolution of patients with complex cervical trauma produced by different mechanisms, increasing the relative death rate by 1.74%. Contrary to this study, the research conducted by Dura *S et al.*, in the period 2003-2012 identifies a slightly higher distribution of recourse to lesion pathology for urban patients who may be explained in the context in which access to health services is easier for those from urban areas. In contrast, in rural areas, greater leniency toward violent acts without significant medical consequences is present [22].

The total patient population was divided into three study groups according to the mechanisms of traumatic lesions: autolytic, aggression and accidental, then identifying the negative prognostic factors, which increase the relative risk of death.

According to studies, the average age of 45 indicates that they are more susceptible to neck injuries, perhaps due to their indulgence in homicide and suicide due to their poor psychological and financial standing [27].

The group of patients with autolytic cervical trauma presents the following: 89.7% of the patients are male, 45 years old in 55.1% of cases, 71.8% of cases from rural areas and an average alcohol level of about 1.02 go/oo ± 0.94. These aspects are the elements of the epidemiological profile of the self-murderer with a negative prognosis. Men accept the harsh methods of production in the case of autolytic attempts, so hanging is the most common way of producing the attempt. Chronic alcohol consumption and alcoholism promote suicide. The age of 45, outlined by the profile of the self-murderer, reveals the age at which they face social, economic, and health-related problems.

In the study group with complex cervical aerodigestive traumatic lesions produced by aggressive mechanism, the majority of 75.4% were men, with the average age under 45, and the literature reports that more than half of the traumatic examinations for aggression were performed among 20- to 59-year-olds, confirming the severe social impact of the phenomenon, highlighting the failure of policies to prevent violence at the level of society and their consequences at the level of active social categories, as stated by the statistical data globally [28].

The study group with complex cervical traumatic injuries produced by accidental mechanism was small in size but was characterized by the following

profile: male, under 45 years of age and with the rural origin. Accidents have had the following etiologies: road accidents, accidental falls on sharp objects, accidents at work and accidents resulting from handling agricultural machinery. Similar results were also obtained by Rautela *et al.* in 2016 on a study conducted in northeastern India [23].

In the entire study group, alcohol users prevailed: 74.2% of deceased patients and 50.5% of survivors ( $p = 0.001$ ); instead, according to the lesion mechanism, the mean value of alcohol level was approximately  $1.02 \text{ g o/oo} \pm 0.94$  in those with autolytic traumas, while in the aggressive subjects the mean alcohol level was  $0.84 \text{ g o/oo} \pm 0.28$ , mean values significantly higher compared to the subjects with accidental trauma at which the alcohol level was  $0 \text{ g o/oo}$  ( $p = 0.05$ ).

Alcohol and substance abuse are generally risk factors for suicide, but little is known about the immediate effect of the suicide method. Based on information from 18,894 forensic death investigations, including toxicological findings and death, Lundholm *et al.* investigated the immediate influence of alcohol and the use of a violent manner of suicide [9, 29].

Researches in the last recent years have shown the link between alcohol consumption and the increased incidence of traumatic lesions at high risk among physical violence, sports and car accidents [9, 30, 31]. Studies related to the sociological impact of alcohol consumption show that 50% of the deaths caused by trauma occur in the pre-hospital stage due to the increased risk of severe traumatic injuries and the resuscitation protocol [9, 32]. Different laboratory studies have supported the idea that alcohol has potential and negative consequences, increasing the predisposition for greater severity of the trauma, even at low doses.

Alcohol consumption is, on the one hand, a contributing factor to trauma and, on the other hand, one of the aggravating factors of the subsequent evolution of the patient by altering the pathophysiological response to trauma. The predisposing factors of alcohol consumption are: entourage pressure (group of friends), socialization process, positive drinking patterns, psychological dependence and dysfunctional family of the alcoholic. Emphasis is placed on the role of social norms on alcohol consumption, the cost and availability of alcohol, the nature of the environment in which alcohol is consumed. Consistent with these models, legislation and social policy are the primary agents of intervention on excessive alcohol consumption; from the public health point of view, the main intervention

agents are the epidemiologists which must focus on primary and secondary prevention by identifying early consumption trends before they cause irreversible health problems [33, 34].

The effects of excessive alcohol consumption involve the production of serious social problems that affect the lives of many people, such as car accidents, suicide or murder, trauma or serious injuries [33]. Alcohol dependence leads to the deterioration of social and family ties, job loss and psychological deterioration [35]. However, many social and medical studies recognize that the relationship between alcohol and aggression (auto and interpersonal) is not causal, and alcohol was having a favored role [36].

**In conclusion**, for the entire study period, the number of male examinations was predominant, confirming that the male gender is a demographic risk factor in the determinism of the negative prognosis of complex cervical trauma. Patients from the rural area have a relatively slightly higher risk for traumatological events than residents in urban areas. Two-thirds of the mechanical traumatic casualty belong to the age range of over 45 years, which highlights the severe social impact of alcohol consumption, autolytic attempts and interpersonal violence at the level of active social groups.

Our results showed that the profile of the patient with a negative prognosis implies: a high blood alcohol concentration associated with higher mortality in complex cervical trauma produced by the autolytic mechanism in a male patient with an average age of 45 years and a rural area. As this study suggests, there are significant implications for demographic and favorable factors on the trauma mechanism. These findings can probably cause changes in our public health policies, and therefore the decrease in alcohol-related deaths on cervical trauma. Improving legislation on alcohol consumption as well as socio-economic conditions, can prevent interpersonal violence, suicide attempts and accidental injuries, thus preventing both morbidity and mortality of these cases.

#### Conflict of interest

The authors declare that they have no conflict of interest.

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