

## PRESENCE OF ALCOHOL IN ADOLESCENT HOMICIDE VICTIMS IN BELO HORIZONTE 2005-2009

### PRESENÇA DE ÁLCOOL EM ADOLESCENTES VÍTIMAS DE HOMICÍDIOS EM BELO HORIZONTE 2005-2009

### LA PRESENCIA DE ALCOHOL EN ADOLESCENTES VÍCTIMAS DE HOMICIDIO EN BELO HORIZONTE 2005-2009

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Submitted on: 07/12/2013

Approved on: 05/22/2014

#### ABSTRACT

The aim of the study was to evaluate the prevalence of positive toxicology screen (TS+) conducted *post mortem* and characteristics of victims of homicidal violence, aged 10-19 years in the city of Belo Horizonte, Minas Gerais, in the period 2005-2009. We conducted a population-based descriptive study using data obtained from the Mortality Information System (SIM, in Portuguese). Among the 4,159 homicide victims of all ages, 1008 (24.2%) were aged 13-19 years. Victims in this age group were male (95.0%), single (98.8), blacks (81.2%), with up to 8 years of education (68.8%), killed by firearms (87.5%) on the streets and highways (68.8%). TS was positive in 80 cases (7.9%). TS+ and blood alcohol concentration increased with age up to age 18. TS+ adolescent victims share similar characteristics with the remaining cases, however. Furthermore, the time elapsed between assault, death, and autopsy should also be taken into consideration. Given the increase in mortality from assault among Brazilian adolescents, the results of the study suggest that use of alcohol should be considered as a factor in public policies aimed at reducing violence and in the culture of peace.

**Keywords:** Homicide; Adolescent; Disorders Related to Alcohol; Alcohol Consumption.

#### RESUMO

O objetivo do estudo foi avaliar a prevalência de exame toxicológico positivo (ET+) realizado *post mortem* e as características das vítimas de violência homicida, com idade de 10 a 19 anos, na cidade de Belo Horizonte, Minas Gerais, no período de 2005 a 2009. Realizou-se estudo descritivo de base populacional a partir de dados obtidos no Sistema de Informações sobre Mortalidade (SIM). Entre as 4.159 vítimas de homicídios de todas as idades, 1.008 (24,2%) tinham 13 a 19 anos. Nesse grupo etário predominaram os homens (95%), solteiros (98,8), negros (81,2%), com até oito anos de estudo (68,8%) e mortos por arma de fogo (87,5%) em via pública (68,8%). Evidenciou-se ET+ em 80 casos (7,9%). A positividade do ET e o nível de alcoolemia aumentaram com o aumento da idade, com alcoolemia máxima aos 18 anos. Destaca-se a similaridade entre as características das vítimas adolescentes com ET+ e as das demais idades. Ressalte-se que não foi possível determinar o tempo decorrido entre a agressão, a morte e a realização da necropsia. Diante do crescimento da mortalidade por agressão entre os adolescentes brasileiros, os resultados do estudo revelam o uso do álcool como fator a ser incluído entre as políticas públicas visando à redução da violência e à cultura da paz.

**Palavras-chave:** Homicídio; Adolescente; Transtornos Relacionados ao Uso de Álcool; Consumo de Bebidas Alcoólicas.

#### RESUMEN

El objetivo del estudio fue evaluar la prevalencia de la prueba de drogas positiva (ET +) realizado *post mortem* y las características de las víctimas de la violencia homicida, con edades entre 10 a 19 años en la ciudad de Belo Horizonte, Minas Gerais, en el período 2005-2009. Se realizó un estudio descriptivo de base poblacional a partir de datos obtenidos del Sistema de Información sobre Mortalidad (SIM). Entre las 4.159 víctimas de homicidio de todas las edades, 1.008 (24,2 %) tenían 13 a 19 años. En este grupo de edad, eran del sexo masculino (95 %), solteros (98,8 %), negros (81,2 %), con un máximo de 8 años de educación (68,8%), muertos por armas de fuego (87,5%) en la calle (68,8%). ET + se presentó en 80 casos (7,9 %). La positividad de ET y el nivel de alcohol en la sangre aumentaron con la edad hasta los 18 años. Cabe destacar la similitud entre las características de las víctimas adolescentes con ET los casos restantes. Es de destacar que no fue posible determinar el tiempo transcurrido entre el asalto, la muerte y el examen de la autopsia. Dado el aumento de la mortalidad por agresiones entre adolescentes brasileños, los resultados del estudio sugieren que el uso de alcohol como un factor que debe incluirse en las políticas públicas destinadas a reducir la violencia y la cultura de paz.

**Palabras clave:** Homicidio; Adolescente; Trastornos Relacionados con el Alcohol; Consumo de Bebidas Alcohólicas.

## INTRODUCTION

Alcoholic beverage consumption and often abuse, as well as its ubiquitous presence in the media, are commonly accepted by the Brazilian population. Harmful consequences of this easy acceptance include a high and worrying pattern of consumption, especially among adolescents and young adults, who are more vulnerable to the negative consequences of alcohol consumption. Acute episodes of abuse (binge drinking), i.e., drinking five or more doses on a single occasion, often leading to poisoning, is more common among younger populations.<sup>1,2</sup>

The World Health Organization considers excessive alcohol consumption a serious public health problem and it has become the third risk factor for diseases worldwide.<sup>3</sup> In addition to social risks and high morbidity, it is estimated that alcohol abuse entails 2.5 million deaths each year.<sup>3</sup> External causes of death, especially from traffic accidents and assaults are associated with alcohol use.<sup>3</sup>

Wide-ranging social and academic debates have reflected on the complex network that involves violence and which must consider macrosocial and macroeconomic policies. To a greater or lesser extent, factors cited include forms of social organization, government, community participation, and subjectivity. Important factors associated with violent behavior and antisocial attitudes in adolescents include the use and abuse of alcoholic beverages.<sup>2</sup>

Various forms of homicide were the leading causes of death among Brazilian adolescents in 2010, accounting for 45.2% of deaths in this age group.<sup>4</sup> Belo Horizonte ranks eighth among the capitals with the highest teenage homicide rates.<sup>4</sup>

This study thus aims to describe the frequency of positive *post-mortem* toxicology for alcohol use among adolescent homicide victims aged 10-19 years<sup>5</sup> in Belo Horizonte (BH) in 2005-2009.

## METHODS

Cross-sectional population-based study of adolescent victims of homicide among residents of Belo Horizonte (BH) taking place in the city between January 2005 and December 2009. Mortality data on adolescents aged 10-19 years<sup>5</sup> were obtained from the Mortality Information System (SIM, in Portuguese), as made available by the Municipal Health Office of Belo Horizonte (SMSA/BH).

Homicides – defined as injuries inflicted by another person with intent to injure or kill, by any means – were selected using the *assault* grouping codes X85-Y09 under the International Statistical Classification of Diseases and Related Health Problems of Diseases (ICD-10).<sup>6</sup> Assaults were disaggregated by type of weapon; assault by use of firearms (X93-X95) and assault by other types of weapon (X85-X92 and X96-Y09).<sup>6</sup> So-

ciodemographic and epidemiological characteristics (sex, age, race/ethnicity, marital status, level of education, year and place of occurrence) were also obtained from SIM database. Victims aged 10 to 19 years<sup>5</sup> were selected for inclusion as adolescent cases. Ethnic identification was defined as white or black. The decision to include those identified both as black and *pardo*<sup>7</sup> (a mixed-race term used in the official census) to compose the black category was based on two main factors, mainly the difficulties in characterizing *pardos* and to allow greater comparability with other studies.<sup>8</sup> Marital status was categorized as single or not single. Cases were grouped by education level into two groups,  $\leq 7$  years and more than eight years of study.<sup>9</sup> As for place of occurrence we considered deaths that took place in public streets and highways, hospitals, and others. It should be noted that place of occurrence of the assault itself was not analyzed because it is unavailable in the SIM. Moreover, increase in time elapsed between assault, death, and subsequent autopsy negatively influences the likelihood of obtaining a positive toxicology report for alcohol, which is extremely volatile.

Laboratory results of blood alcohol performed *post mortem* were obtained from data in Part II of the death certificate, where these results are routinely recorded in the city, using ICD10 codes.<sup>6</sup> In Brazil, toxicology tests on homicides victims is not mandatory, unlike among victims of traffic accidents. In homicide cases, tests are performed when the police authority considers they can contribute in solving the crime. BAC, when positive, was identified by codes in the Y90.0 to Y90.9 range (comprising blood alcohol concentrations  $< 20$  mg/mL to  $> 240$  mg/mL). According to the ICD10<sup>6</sup> coding, cases of positive BAC dosage were grouped into: a) BAC of less than 20 mg/100 ml to BAC between 20 and 39 mg/mL; b) BAC between 40 and 59 mg/ml to 100-119 mg/ml; c) BAC between 120 and 199 mg/ml to 200-239 mg/ml. Several factors compromise adequate BAC estimation, some inherent to the person who ingested alcohol, to the type of drink consumed or the time elapsed between ingestion and test. Factors related to processes associated with ethanol absorption and its distribution in the tissues before and after death, metabolism/elimination of ethanol, and endogenous ethanol production, especially after death should also be considered. Such factors were not controlled in this study, which may have underestimated both the positivity of the exams and their BAC levels.

The study was approved by the UFMG Research Ethics Committee (CAAE 0294.0.14.685.1130.0000.514).

## RESULTS

In the period 2005-2009, a total of 4,159 homicides were registered in Belo Horizonte involving residents of the city, with no sample loss. 1,008 (24.2%) of these were aged between 13 and 19.

The years 2006 and 2007 had the highest proportions of deaths. There were no homicides among minors aged less than 13.

Table 1 shows the characteristics of all homicide victims in BH, highlighting the adolescent cases, according to result for alcohol in the toxicology screen. Approximately a fourth (24.3%) of all assault victims was less than 19 years old. Among them, 80 (7.9%) tested positive for alcohol (TS+) at autopsy. The percentage of TS+ cases ranged from 2.4 to 28.8% among victims aged 14 to 19 years, respectively. The highest TS+ percentage was observed among those aged 18 years (28.8%). No cases of TS+ were recorded among adolescents aged 13. The sex ratio for TS+ victims was 11.0 for all victims; 11.2 for ST- adolescents; and 19 for the TS+.

Firearms were used in most homicides (88.7%). There was a slightly higher percentage (93.9%) of the use of firearms as the mechanism for assault among the TS- adolescents than in the other groups. The homicide mortality rate specifically among TS+ adolescents ranged from 4.34/100 thousand in 2005 to 4.81/100 thousand in 2009, peaking in 2006 (Table 1).

Table 1 - Frequency of toxicology screens positive for alcohol use among adolescents aged 13-19 years, homicide victims in Belo Horizonte, 2005-2009

Categories	Total Deaths		13-19 year-old Deaths			
			Alcohol -		Alcohol +	
	n	%	n	%	n	%
Male	3813	91.7	852	91.8	76	95.0
Female	346	8.3	76	8.2	4	5.0
<b>Age</b>						
13 years	21	0.5	21	2.3	0	0
14 years	43	1.0	41	4.4	2	2.4
15 years	71	1.7	69	7.4	2	2.4
16 years	169	4.1	160	17.2	9	11.3
17 years	211	5.1	192	20.7	19	23.8
18 years	265	6.4	240	25.9	25	31.3
19 years	228	5.5	205	22.1	23	28.8
Others	3151	75.7	0	0	0	0
<b>Education</b>						
≤ 7 years	2716	65.3	618	66.6	55	68.8
> 8 years	1383	33.3	299	32.2	24	30.0
Unknown	60	1.4	11	1.2	1	1.2
<b>Marital status</b>						
Single	3545	85.2	920	99.1	79	98.8
Other	614	14.8	8	0.9	1	1.2

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Table 1 - Frequency of toxicology screens positive for alcohol use among adolescents aged 13-19 years, homicide victims in Belo Horizonte, 2005-2009

Categories	Total Deaths		13-19 year-old Deaths			
			Alcohol -		Alcohol +	
	n	%	n	%	n	%
<b>Race/Skin Color</b>						
White	971	23.3	209	22.5	15	18.8
Black	3173	76.3	712	76.7	65	81.2
Other	15	0.4	7	0.8	0	0
<b>Underlying Cause</b>						
Firearm	3687	88.7	870	93.8	70	87.5
Others	472	11.3	58	6.2	10	12.5
<b>Place of Occurrence</b>						
Hospital	1344	32.3	322	34.7	8	10.0
Street or highway	1901	45.7	424	45.7	55	68.8
Others	914	22.0	182	19.6	17	21.2
<b>Year of Occurrence</b>						
2005	971	23.3	204	22.1	12	15.0
2006	869	20.9	198	21.3	23	28.8
2007	913	22.0	221	23.8	19	23.8
2008	758	18.2	171	18.4	15	18.7
2009	648	15.6	134	14.4	11	13.7
<b>Mortality Rate</b>						
2005	350.82	78.04	4.34			
2006	310.75	79.03	8.22			
2007	393.49	103.44	8.19			
2008	330.34	81.06	6.54			
2009	283.64	63.47	4.81			

Source: Mortality Information System. Municipal Health Office of Belo Horizonte (SMSA/BH).

In summary, the sociodemographic characteristics of TS+ and TS- adolescents as well as the kinds of assaults they suffered were quite similar. Both groups showed a predominance of males, blacks, singles, with seven years or less of formal education, killed by firearms in public streets. Deaths on streets or highways were more frequent in the TS+ group with (68.8%), probably due to shorter wait time between death and autopsy. We also detected slightly higher proportions of black males among the TS+ adolescents.

Although high BAC levels (239 mg/100mL) were observed, in 48.8% of cases BAC values were less than 39 mg/100 ml. This may be due to alcohol metabolism and the elapsed time for the completion of the autopsy (Table 2).

Table 2 - Frequency of body alcohol content levels in positive toxicology screens among adolescents aged 14-19 years, homicide victims in Belo Horizonte, 2005-2009

BAC levels	n	%
Less than 39 mg/100 mL	39	48.8
40 – 99 mg/100 mL	24	30.0
100 – 239 mg/100 mL	14	21.2

Source: Mortality Information System. Municipal Health Office of Belo Horizonte (SMSA/BH).

Higher *post mortem* alcohol concentrations were found in victims aged 16+ (Table 3).

## DISCUSSION

This study makes pioneering use of data and information on mortality obtained through health services, which, despite some limitations, highlight two major public health problems in the country: the use and abuse of alcohol and violence. Positive results upon toxicology screens carried out *post mortem* were found at a lower proportion than reported in studies on the drinking patterns of young Brazilians,<sup>10,11</sup> perhaps because of the methodology used. It may be related, among other possibilities, to the lack of control over the time between alcohol ingestion, time of death, and the autopsy examination. However, even with positivity levels lower than that found in the other studies, the precocity of alcohol consumption and engagement with homicidal violence configure a warning to the state capital.

The results show the potentialities for the use of data obtained and analyzed from information routinely incorporated into the SIM based on medical and police reports obtained in the forensic medicine institute (IML in Portuguese), which remains largely unexplored. Routine integration of information from these sources and their qualification enables advances in epidemiological research and public health measures, such as preventive actions for increasingly early alcohol use, as well as those to prevent, control, and fight violence among young Brazilians.<sup>12</sup>

Repercussions of violence frequently experienced within health services, especially for victims of trauma. The information produced by professionals has increasingly been used to provide subsidies for the development of public policies. Nevertheless, it is important to recognize the complexity of violence in Brazil. For Minayo,<sup>13</sup> there are three main forms of expression of violence in our country: structural violence (which arises from the social system itself, generating naturalized discrimination by race, sex and age); resistance violence (which expresses the cry of the discriminated groups and classes); and delinquency (the common sense as violence, considered an attribute of the poor and the blacks, as observed in this study). Violence and crime are thus considered consequences of social inequality, the devaluation of moral norms and values, the desire for easy profit, loss of cultural references arising from the alienation of individuals, as well as to the cult of strength and macho culture.

The profile of the adolescent homicide victim with a TS+ for alcohol found in this study does not differ from the well-known profile of homicide victims: men, blacks, whose murder was perpetrated with firearms on public streets and highways. Other studies show that, in addition to social inequality, racial inequality plays an important part, together forming links in this complex chain that generates the inequality observed in mortality profiles in Brazil,<sup>13-15</sup> especially with regard to death by assault. The increased vulnerability of males to the early use of alcohol and to violence is also linked to cultural processes that have been widely discussed in Brazil in the past decades. More freedom is offered to boys from childhood, whereas girls are raised, in general, under more strict rules and vigilance,<sup>16</sup> thus characterizing a sexist society. This study appropriates the notion of masculinity grounded in aggression and in the use of force to resolve disagreement and conflict.<sup>17</sup> Moreover, many boys consider alcohol use a way of expressing virility and a means to “draw attention” within a group of friends and women. These findings appear to support the hypothesis that there is no pattern of low risk alcohol drinking among teenagers and that the use of alcohol by minors is often associated with death from external causes, in this case, murder.

Table 3 - Distribution of body alcohol content levels in positive toxicology screens among adolescents by age

BAC levels	Age											
	14 years		15 years		16 years		17 years		18 years		19 years	
	n	%	n	%	n	%	n	%	n	%	n	%
Less than 20 up to 39 mg/100 ml	2	2.5	1	1.25	4	5.0	9	11.25	12	15.0	11	13.75
40-99 mg/100 mL	-		1	1.25	3	3.75	9	11.25	7	8.75	4	5.0
100 – 239 mg/100 mL	-		-		2	2.5	1	1.25	6	7.5	8	10.0

Source: Mortality Information System. Municipal Health Office of Belo Horizonte (SMSA/BH).

The percentage of underage adolescents with TS+ for alcohol in this study was 39.9%. This result reveals that obtaining alcohol is easy. The large media presence of advertisements linking alcohol use to “glamorous” and sensual lifestyles and the easy procurement of alcohol is reflected in early and widespread consumption in our society. There are in Brazil few initiatives for preventing excessive alcohol consumption, particularly with regard to restrictions on alcohol advertisements.<sup>18</sup> Aggressive marketing anchored in beverage commercials indicates a permissive social connotation especially targeted for the young. These commercials come to be seen as influencing drinking and the belief that advertisements speak the truth may compromise the ability to cope with real life situations.<sup>18</sup>

This study could not assess whether there was alcohol abuse by perpetrator, which can be considered a limitation. Although this is not the scope of this study, it should be pointed out that aggression is often mutual and consumption patterns of peers and partners are significant for becoming victim or perpetrator.<sup>19</sup> Consumption establishes a pattern of group behavior that places adolescents simultaneously in roles of perpetrator and victim. For some young people violence is seen as a possibility of obtaining power or of preventing its decline.

In addition to the use and abuse of alcohol, firearms also figure in macho symbolism and is associated with power of life or death.<sup>19</sup> Of the 80 adolescent homicide victims in Belo Horizonte, 87.5% were killed by firearms. This object, introduced early in the boy's life as a toy, becomes part of the masculine universe. Despite laws restricting trade and possession of firearms, smuggling facilitated by the lack of border surveillance allows easy access to firearms and their use for perpetrating homicides.<sup>20</sup> The use of firearms to commit murders, whose victims were mostly black and with low levels of education was addressed in this study and is consistent with other research.<sup>21</sup> The Disarmament Statute, which resulted from broad social mobilization in an attempt to reduce violence, has not yet produced the expected results, even after 10 years since it was adopted.

The involvement of adolescents in illegal activities such as trafficking and use of illicit drugs, as well as the easy access to firearms in the country probably constitute some of the most important factors associated with deaths due to this mechanism. In São Paulo, for example, a high prevalence of alcohol consumption among homicide victims of the male sex was observed, especially by firearms (40.7%).<sup>22</sup>

Factors involved in violent deaths are various, and include personal, family, economic, social, and environmental aspects. Therefore, violence must be addressed concurrently by various segments of society, including health areas. Defining the profiles of adolescent victims of homicidal violence under the influence of alcohol can contribute to a better understanding of the sociodemographic characteristics of these

groups, further contributing to the development of more effective health policies and programs.

Cultural changes are key to reducing and overcoming violent behavior among Brazilians, especially in relation to homicidal violence affecting this vulnerable segment of society, the adolescents. In this sense, the principles proposed in the United Nations' Manifesto 2000 for a Culture of Peace, based on promoting a culture of peace through education to: promote economic and social development; respect for human rights; guarantee equality between men and women; promote democratic participation; invest in understanding, tolerance and solidarity; foster participatory communication; and promote peace and security can serve as guiding frameworks for changes in individual, family, institutional, and social relations and bring with it the possibility of overcoming violence.<sup>23</sup>

## CONCLUSIONS

The frequency of *post-mortem* drug screens positive for alcohol among adolescent victims of homicidal violence in this study reinforces the need for reflection and action in the Brazilian society as a whole to address this serious public health problem.

The research cannot comprehend the problem of alcohol use and abuse of and violence among adolescents in all its aspects, but identifies the weight of homicides among young black men, aged 14-19 years, who had consumed alcohol in the moments before death. The harmful use of alcohol among young people reduces self-control and increases the likelihood of their adopting risk behaviors, which makes it a growing concern. The need to regulate the advertising of alcoholic beverages, which is often abusive, and to control more effectively the conditions for obtaining and bearing firearms should be discussed widely and maturely in our society. Efforts to reduce these fully preventable deaths should be on the agenda of health segments and of the whole society, which should attempt to articulate itself in active solidarity.

## ACKNOWLEDGEMENTS

The authors acknowledge financial support for research awarded by the Fundação de Amparo à Pesquisa de Minas Gerais – FAPEMIG under APQ-number 01579-11

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