Full length article

Postmortem blood alcohol content among late-middle aged and older suicide decedents: Associations with suicide precipitating/risk factors, means, and other drug toxicology

Namkee G. Choi[a],[*], Diana M. DiNitto[a], Atami O. Sagna[b], C. Nathan Marti[a]

[a] The University of Texas at Austin Steve Hicks School of Social Work, United States
[b] The University of Texas at Austin School of Nursing, United States

ABSTRACT

Background: This study examined blood alcohol content (BAC) among suicide decedents aged 50+ and its associations with suicide precipitating/risk factors, means, and other drug toxicology.

Methods: The National Violent Death Reporting System, 2005–2015, provided data (N = 56,118 for all suicide decedents and N = 29,115 with alcohol test results). We used logistic regression models, with BAC > 0.0 (BAC positive) and BAC > = 0.08 (intoxication) as the dependent variables.

Results: Almost a third of decedents who were tested for alcohol were BAC positive, and almost two-thirds of those who were positive had a BAC > = 0.08. Alcohol problems prior to suicide (AOR = 6.71, 95% CI = 6.24–7.21), relationship problems (AOR = 1.53, 95% CI = 1.44–1.63), and death/suicide of family/friends (AOR = 1.22, 95% CI = 1.11–1.35) were associated with greater odds of a positive BAC, but suicide means were not significantly associated with a positive BAC. Alcohol problems (AOR = 2.98, 95% CI = 2.68–3.31), relationship problems (AOR = 1.18, 95% CI = 1.06–1.30), firearm use (AOR = 1.85, 95% CI = 1.59–2.16), and hanging/suffocation (AOR = 1.38, 95% CI = 1.16–1.64) were associated with greater odds of a BAC > = 0.08. A toxicology positive for antidepressants, marijuana, cocaine, or amphetamines was associated with greater odds of a positive BAC; however, a toxicology positive for antidepressants, opiates, or amphetamines was associated with lower odds of a BAC > = 0.08. BAC > = 0.08 rates increased over the study period.

Conclusions: Alcohol intoxication may have contributed to using more violent suicide means. The significant association between relationship problems and intoxication before suicide calls for restricting access to alcohol and suicide means for individuals with these problems. Suicide prevention may require crisis counseling/support for acute life stressors and ongoing emotional support.

1. Introduction

From 2000 to 2014, age-adjusted US suicide rates increased 24%, from 10.5 to 13.0 per 100,000 population. Rates increased for both genders and all age groups up to 74 years, with the most notable increases in the 45–64 age group (from 21.3 to 29.7 per 100,000 population for men and 6.2–9.8 for women) (Centers of Disease Control and Prevention (CDC), 2015a; Heron, 2016). While rates for men and women aged 75–84 and 85+ decreased or held steady, the rates for men in these two older age groups (34.8 and 49.9 per 100,000 population, respectively, in 2014) remain the highest of all age groups (CDC, 2015a). Because higher proportions of late-life suicides (vs. early-life suicides) involve more lethal means, especially firearms, older adults die from attempted suicide at rates far higher than younger adults

(Conwell, 2013; Conwell et al., 1998; Kaplan et al., 2009; Liu et al., 2013). Along with psychiatric disorders, physical health problems that are often accompanied by unremitting pain, loss of independence, and perceived burdensomeness are significant suicide precipitants in late life (Choi et al., 2017a).

US epidemiologic data show that alcohol use, high-risk drinking, and alcohol use disorder increased substantially between 2001/2002 and 2012/2013 among all demographic groups; however, the increases were greater among adults aged 45+ years (Grant et al., 2017). A study of postmortem toxicology reports using the 2003–2011 National Violent Death Reporting System (NVDRS) also found that about a third of suicide decedents aged 50–59 were alcohol positive at the time of injury (a rate slightly lower than that of the 21–49 age group) and that rates decreased with age: 32.0% and 11.1% of men and 22.2% and 12.6% of

women in the 60–64 and 75+ age groups, respectively (Kaplan et al., 2014). However, acute heavy alcohol ingestion/intoxication (blood alcohol content [BAC] > = 0.08 g/dL) among suicide decedents aged 60+ years was significantly higher compared to heavy alcohol use (4+ drinks at a sitting for women and 5+ drinks for men on a typical drinking day) among their living age peers who drank before their interviews for a nationally representative sample survey. The odds of drinking prior to suicide in the deceased sample relative to the living sample were 5.71 for men and 22.65 for women, after adjusting for race/ethnicity and alcohol problems (Kaplan et al., 2014). A study using 2005–2010 NVDRS data also found that the mean BAC levels of all suicide decedents aged 74 years or younger were highest among firearm users, followed by those who used hanging, and then those who used poisoning (Conner et al., 2014). The authors found that among decedents age 75+, mean BAC levels were higher among those who used poisoning than firearms or hanging; however, they did not provide potential reasons for this finding.

According to the three-step theory of suicide (3ST; Klonsky and May, 2015), progression from suicide ideation to action results from a combination of pain (psychological/physical) and hopelessness, lack of connectedness, and the capacity to attempt suicide due to dispositional contributors (e.g., genetic predisposition to pain sensitivity), acquired contributors (habituation to experiences associated with pain, injury, and death), and practical contributors (e.g., concrete factors such as knowledge of and access to lethal means). Alcohol use is a significant contributing factor for suicide. In particular, heavy alcohol use can lead to impaired judgment, dysphoria, myopia, aggression, impulsive actions, high risk-taking, and loss of inhibition, which in turn can predispose vulnerable individuals to take fatal suicidal actions (Bagge et al., 2013; Conner et al., 2014; Holmgren and Jones, 2010). Alcohol and/or drug use may also increase the intensity of suicidal ideation by exacerbating mental health problems and interpersonal conflicts.

Along with alcohol, suicide decedents often test positive for pharmaceuticals and illicit psychoactive drugs even when the cause of death is not overdose/poisoning. For example, a study of suicide decedents by hanging found two-thirds had at least one positive toxicology for antidepressants, anxiolytics, analgesics, THC, cocaine, or methamphetamines/other stimulants in addition to alcohol (San Nicolas and Lemos, 2015). Other studies have found that, compared to homicide and unintentional drug overdose victims, suicide decedents were more likely to have had toxicologies positive for antidepressants, opioids, benzodiazepines, or antipsychotics (Austin et al., 2017; Sheehan et al., 2013). High rates of these drug toxicologies are not surprising given the high rates of depression, other psychiatric disorders, and substance use disorders, as well as related treatment, among suicide victims and others who engage in suicidal and other self-injurious behaviors (Choi et al., 2017b; Hanuscin et al., 2018; Koo et al., 2017; Nock et al., 2010). In addition, given that chronic pain is a significant late-life suicide precipitant (Choi et al., 2017b), positive opiate toxicologies among older decedents is expected. A study of Australian non-overdose suicide victims also showed that, in addition to alcohol and drug abuse histories, alcohol problems were more common when relationship problems were noted, and that a toxicology positive for pharmaceuticals was more common when a previous attempt was noted (Darke et al., 2009). A recent psychological autopsy study of Australian suicide decedents also found that those with alcohol use disorders had significantly higher rates of other substance-use disorders, verbal and physical aggression, and history of interpersonal conflicts (Kõlves et al., 2017).

Increased suicide and alcohol and drug poisoning (along with chronic liver diseases and cirrhosis) were found to be responsible for marked increases between 1999 and 2013 in all-cause mortality of non-Hispanic White men and women aged 45–54 years in the US (Case and Deaton, 2015). During this same period, mortality by suicide, unintentional/undetermined poisoning, and chronic liver diseases and cirrhosis also increased in all age groups 30–64 (Case and Deaton, 2015). Although researchers have examined BAC and suicide means among

suicide decedents of all age groups, little research has been done on potential associations between positive alcohol toxicologies and intoxication with suicide precipitating/risk factors and other drug toxicology in late-middle-aged and older adults. Given their high suicide rates, examining associations between BAC levels and these other factors among late-middle-aged and older decedents may help in developing more informed prevention strategies.

Using 2005–2015 NVDRS data, we examined the following research questions: (1) Did suicide decedents aged 50+ with and without a positive BAC differ on precipitating/risk factors and suicide means? (2) Among those with a positive BAC, did those with a BAC < 0.08 g/dL and BAC > = 0.08 g/dL differ on precipitating/risk factors and suicide means? (3) Were BAC levels associated with other drug toxicologies? Hypotheses, based on previous studies of all age groups, were that: (H1) prior alcohol problems and partner/family/other relationship problems will be associated with higher odds of a positive BAC and a BAC > = 0.08; (H2) compared to other means, firearm use will be associated with higher odds of a positive BAC and a BAC > = 0.08; and (H3) a toxicology positive for prescription and/or illicit drugs (i.e., antidepressants, opioids, marijuana, cocaine, amphetamines) will be associated with a positive BAC. Sociodemographic variables were examined as covariates.

2. Material and methods

2.1. Data source

The NVDRS is an incident-based violent death reporting system that provides detailed data on all individual victims and/or suspects of suicides, homicides, deaths from legal intervention (i.e., victim killed by law enforcement acting in the line of duty), deaths of undetermined intent, and unintentional firearm deaths in participating states since 2003 (Blair et al., 2016; Centers for Disease Control and Prevention (CDC), 2015b). In 2003 and 2004, seven and 13 states, respectively, participated in the NVDRS. In 2005 through 2014, 16 states (Alaska, Colorado, Georgia, Kentucky, Maryland, Massachusetts, New Jersey, New Mexico, North Carolina, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Virginia, and Wisconsin) provided data; Ohio joined in 2011; Michigan in 2014; and Arizona, Connecticut, Hawaii, Kansas, Maine, Minnesota, New Hampshire, New York, and Vermont in 2015 (CDC, 2015b).

NVDRS links data from death certificates and coroner/medical examiner and law enforcement (CME/LE) reports that are based on the injury/death scene, ongoing investigations, or family/friend accounts and, when available, crime lab and toxicology reports. Decisions to conduct alcohol and/or other toxicology testing are made by CMEs. In addition, the NVDRS includes variables on the circumstances of death that were "calculated" ("Yes/Present" or "No/Not Present/Unknown") from the multiple original data sources (e.g., reports from family/friends, suicide notes) (CDC, 2016b). Some of these variables (e.g., physical health, relationship, and legal problems) are coded 'Yes' only when they were believed or appeared to have caused/led to death (i.e., precipitants), while others (e.g., depressed mood and other mental health, alcohol/substance, and job/financial/housing problems) are coded "Yes" without the need for any indication that they directly contributed to the death (i.e., were precipitants/risk factors) (CDC, 2016b).

In this study, we excluded data from 2003 and 2004 to minimize potential state by time confounding effects. We first examined records of all suicide decedents aged 50+ at the time of injury (N = 56,118 after excluding suicides that followed multiple homicides) and then the 29,115 decedents (51.9% of all decedents) whose BAC was recorded. (Although toxicology reports show that 33,144 decedents [59.1% of all decedents] had an alcohol test, valid [i.e., nonmissing] test results were recorded for 29,115 individuals.)