



Full length article

## Acute and chronic alcohol use correlated with methods of suicide in a Swiss national sample



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### ABSTRACT

**Objectives:** Chronic and acute alcohol use are highly associated risk factors for suicides worldwide. Therefore, we examined suicide cases with and without alcohol use disorder (AUD) using data from the SNSF project “Suicide in Switzerland: A detailed national survey”. Our investigations focus on correlations between acute and chronic alcohol use with reference to suicide and potential interactions with the methods of suicide.

**Methods:** We used data from the SNSF project in which all cases of registered completed suicide in Switzerland reported to any of the seven Swiss institutes of legal and forensic medicine between 2000 and 2010 were collected. We extracted cases that were tested for blood alcohol to use in our analysis. We compared clinical characteristics, blood alcohol concentrations, and methods of suicide in cases with and without AUD.

**Results:** Out of 6497 cases, 2946 subjects were tested for acute alcohol use and included in our analysis. Of the latter, 366 (12.4%) persons had a medical history of AUD. Subjects with AUD significantly had higher blood alcohol concentrations and were more often in medical treatment before suicide. Drug intoxication as method of suicide was more frequent in cases with AUD compared to NAUD.

**Conclusion:** Overall, we found a high incidence of acute alcohol use at the time of death in chronic alcohol misusers (AUD). The five methods of suicide most commonly used in Switzerland differed considerably between individuals with and without AUD. Blood alcohol concentrations varied across different methods of suicide independently from the medical history in both groups.

### 1. Introduction

In 2012, an estimated 800,000 suicide deaths occurred worldwide, representing an annual, global age-standardized suicide rate of 11.4 per 100,000 population (WHO, 2015). At the same time about 5.9% of all global deaths and 5.1% of the global burden of disease and injury were attributable to alcohol misuse (WHO, 2014). Moreover, among psychiatric disorders, alcohol use disorder (AUD) is one of the most frequent diagnoses found in psychological autopsy studies and has an estimated lifetime risk of suicide between 7% and 15% (Schneider, 2009; Inskip et al., 1998).

A strong relationship between chronic alcohol misuse and suicide, as well as suicide behavior, is, therefore, unquestioned. Several studies have found a positive correlation between the amount of alcohol consumption and suicide rates (Stack, 2000; Ramstedt, 2005; Westman et al., 2015). AUD was found to be an important risk factor for suicide irrespective of other psychiatric comorbidities (Flensburg-Madsen et al., 2009). Furthermore, in a recently published case-control study, subjects

with alcohol dependence had an excessive suicide mortality compared with the general population (Hung et al., 2015).

At the same time acute alcohol intake often precedes attempted suicides as it leads to impulsive behavior and increases the risk of self-harm (Brady, 2006). Acute alcohol use has been found in about one third of cases with attempted or completed suicides in various populations (Pirkola et al., 2000; Cherpitel et al., 2004; Bagge et al., 2013). Taken together, the high incidence of chronic and acute use of alcohol with suicide leads to the question how far they correlate with each other and on the interaction with the chosen method of suicide. With reference to the first question preceding studies found a frequent but not compelling association between misuse of alcohol in the medical history and at the time of death (Galway et al., 2016; Pirkola et al., 2000).

With reference to the methods of suicide, one study in a national US sample did not find differences in the presence of alcohol across different methods (Conner et al., 2014). On the other hand, in a national study in Finland, the prevalence of acute alcohol differed in various

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methods of suicide, independently from chronic alcohol misuse (Pirkola et al., 2003). In one cohort of suicide attempters, alcohol was used in order to numb fears or pains and to increase the motivation for attempting suicide, predominantly in patients with AUD (Bagge et al., 2015). In sum, there is some evidence for the interaction between acute alcohol use and the chosen method of suicide but there is less knowledge about acute alcohol use in suicides of subjects with a chronic misuse.

The availability of a complete data set of individuals that died by suicide in ten years in Switzerland, in combination with clinical characteristics and detailed information about the methods of suicide provided us with the possibility to assess the relationship between chronic alcohol misuse (referred to as AUD in this publication), acute alcohol use and completed suicide. As seen in other clinical subgroups at risk for suicide, we hypothesized that patients with AUD may use predominantly specific methods of suicide and have different risk factors compared to subjects without alcohol use disorder (NAUD). We compared cases of AUD and NAUD by analyzing socio-demographic and clinical characteristics as well as the five most often used methods of suicide in Switzerland (BFS, 2014). If available, quantitative alcohol blood concentrations were considered in the analysis of both groups and in the methods of suicide. Finally, on the basis of our results, we will discuss possible suicide prevention measures for the group of AUD.

## 2. Materials and methods

### 2.1. Data source

All of the research was performed according to the ethical guidelines as approved by the Expert Commission for secrets in medical research, Swiss Federal Department of Home Affairs. In the present study, we extract data from the SNSF project, “Suicide in Switzerland: A detailed national survey of the years 2000–2010”. We, therefore, focus retrospectively on all cases of completed suicide in Switzerland that have been investigated by autopsy, postmortem examination or simple external examination in which blood alcohol concentrations have been determined. All institutes of legal and forensic medicine (ILM) in Switzerland (Basel, Bern, Chur, Geneva, Lausanne, St. Gallen, Zurich) have participated. The databases of all of these institutes were searched for suicides occurring in the period 2000–2010 and identified 6,497 cases that could be included in this study.

### 2.2. Measures

In Switzerland, medical examiners perform their external examination and define the manner of death in cases with an uncertain cause of death. Whether an autopsy is done or not depends on the local cantonal practice and the individual decision of the investigator. Only clearly defined suicide cases were included in the national survey and were, therefore, considered in our study. Searches within the different institutes had to be adjusted: Some institutes had an electronic system in place, whereas in others the whole database had to be searched manually. An assessment sheet with sociodemographic variables and detailed items on the main suicide methods was used. This instrument was developed by the research group after a pilot study (Habenstein et al., 2013) and focuses on details for the most common methods of suicide according to ICD-9-CM codes (gas and other intoxications, shooting, drowning, strangulation, jumping, cutting). Other suicide methods could be specified by writing in a blank text block. Master students who had been instructed by the same academic research assistant (inter-rater reliability guaranteed) collected data from the different institutes in Switzerland between spring 2011 and winter 2013. All data were anonymized. Completed questionnaires were transferred with an automatic scan, double-checked manually, and transferred to SPSS 21.

Psychiatric diagnoses were derived from medical records. All cases

with a lifetime history of alcohol dependence or alcohol abuse documented in the medical records were classified as AUD. Subjects with no alcohol dependence or abuse in their medical records were classified as NAUD. The following psychiatric diagnoses were included in our analysis, as they represent the most frequent comorbidities in AUD (Lindenmeyer, 2005; Regier et al., 1990): Unipolar depression, bipolar disorder, schizophrenia, borderline personality disorder (BPD), and sedative use disorder.

For our analysis we used the five most often applied methods of suicide in Switzerland (BFS, 2007): Hanging, Firearms, jumping from high places, jumping or lying in front of a moving object, drug intoxication. Further methods (other intoxications, Drowning, Suffocation, Cutting and Piecing and unspecified means) were subsumed in the category “Other methods of suicide”. All 14 methods of suicide were ranked on an ordinal scale from 1 to 14, with 1 being considered the most and 14 the least lethal method. The main method was determined hierarchically by exclusion (e.g., if in one subject two methods were found (e.g., 1 = firearm and 10 = drug intoxication), the more lethal method was chosen as main method of suicide). Only main methods were used in our analysis.

In autopsy cases the legal and forensic institutes in Switzerland measured the alcohol concentrations by applying spectrometric qualitative investigations.

### 2.3. Statistical analyses

We used SPSS 21 software to perform the retrospective data analysis. Differences between socio-demographic characteristics and methods of suicide for the cases with AUD and NAUD were calculated by performing Chi-square tests and *t*-tests. A significance level of  $p < 0.05$  was chosen. All findings were adjusted by using the Bonferroni method.

## 3. Results

### 3.1. Study sample

Out of 6497 cases in the whole data set an autopsy was conducted in 3239 cases (50.8%), a postmortem examination was conducted in 3136 cases (49.2%), and in 122 cases (1.9%) the data were missing. Screening for quantitative alcohol concentration was conducted in 2946 cases (45.3%), from which 2558 (86.8%) was part of an autopsy and 388 (13.2%) was part of a postmortem examination. The prevalence of positive blood alcohol concentration in the tested sample was 39.5%. Of those with a positive blood alcohol concentration, subjects with AUD (75.3%) had a mean blood alcohol concentration (BAC) of 1.86 g/kg (SD 7.2) whereas NAUD subjects had a mean BAC of 0.56 g/kg (SD 4.8). Only the cases with blood alcohol testing were used for further analysis.

### 3.2. Clinical characteristics

Suicide decedents with AUD were most often found to be 46–65 years of age and predominantly males. Bivariate analysis yielded statistically significant different results between the groups for the following parameters: Subjects with AUD were more often in psychiatric inpatient treatment within the last month before they died. There were no differences between the groups for preceding suicide attempts or psychiatric inpatient treatment at time of death. AUD subjects had far more often a positive blood alcohol test and higher BACs. In subjects with AUD, there were significantly more cases with sedative use disorder (Table 1).

### 3.3. Methods of suicide

Overall, alcohol use was most often found in drug intoxication

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