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Original Research Article

Forensic Evaluation of Alcohol-Related Deaths in Medicolegal Autopsies: A One-Year Retrospective Study

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Abstract:

Background: Alcohol consumption is a major risk factor for unnatural deaths, particularly in road traffic accidents, suicides, and violent crimes. Forensic autopsy evaluation of alcohol-related fatalities provides crucial insights into the demographic profile, manner of death, and toxicological findings, which are vital for public health and medico-legal interventions.

Materials and Methods: A retrospective observational study was conducted in the Department of Forensic Medicine at a tertiary care center in western Gujarat over one year period. All medicolegal autopsies with confirmed alcohol consumption based on toxicological analysis or circumstantial evidence were included, while decomposed or incomplete cases were excluded. Data on age, sex, cause and manner of death, and blood alcohol concentration (BAC) levels were collected and analyzed using descriptive statistics. Institutional Ethics Committee approval was obtained prior to the study.

Results: Out of 236 medicolegal autopsies, 54 cases (22.9%) were alcohol-related. Males predominated (90.7%), with the 21–40 years age group most affected (61.1%). Road traffic accidents were the leading category (40.7%), followed by suicides (29.6%), homicides (16.7%), and other accidental deaths (12.9%). Toxicological analysis revealed that 68.5% of cases had BAC above the legal intoxication limit (>80 mg/dl), with 35.2% showing severe intoxication (>150 mg/dl).

Conclusion: Alcohol is a significant contributory factor in unnatural deaths, predominantly affecting young adult males, with road traffic accidents and suicides being the major categories. Elevated BAC levels in most victims highlight the urgent need for strict enforcement of drink-and-drive laws, routine toxicological testing in autopsies, and targeted public health interventions to reduce alcohol-related mortality.

Keywords: Alcohol-related deaths, medicolegal autopsy, blood alcohol concentration, road traffic accidents.

Introduction

Alcohol consumption is a major public health issue worldwide and is strongly linked to increased mortality and morbidity. [1] The World Health Organization estimates that alcohol accounts for approximately 3 million deaths globally each year, representing 5% of all deaths. [2] In India, rapid urbanization, changing social habits, and easy availability have contributed to rising alcohol consumption, particularly among young adults. [3] The intoxicating and disinhibiting effects of alcohol significantly increase the risk of accidents, violent behavior, and suicidal tendencies. [4,5,6]

From a forensic perspective, alcohol frequently emerges as an important contributory factor in medicolegal autopsies, especially in road traffic accidents, assaults, suicides, and accidental deaths. [7,8] Blood alcohol concentration (BAC) estimation during autopsy is an important tool in determining alcohol involvement. Despite its significance, limited regional data are available on the patterns of alcohol-related deaths. [9,10]

This study was undertaken to analyze the demographic distribution, manner of death, and toxicological profile of alcohol-related fatalities in medicolegal autopsies conducted at a tertiary care center over a one-year period.

Materials and Methods

This retrospective observational study was carried out in the Department of Forensic Medicine in a tertiary care centre of western Gujarat, India, covering a period of one year. All medicolegal autopsies conducted during this period were reviewed, and cases with evidence of alcohol consumption were selected for detailed analysis. Information was collected from autopsy registers,

police inquest papers, case files, and toxicology reports maintained in the department. Prior approval for conducting the study was obtained from the Institutional Ethics Committee. Confidentiality of records and anonymity of cases were strictly maintained throughout the study.

The inclusion criteria comprised all medicolegal autopsy cases where alcohol consumption was confirmed either by toxicological analysis of blood samples or through circumstantial evidence such as smell of alcohol at autopsy, witness history, or inquest details. Cases with advanced decomposition where toxicological testing was not feasible, and those with incomplete or missing records were excluded from the study to maintain reliability of findings. Data pertaining to age, sex, cause and manner of death (accidental, suicidal, homicidal, or undetermined), and blood alcohol concentration (BAC) levels were extracted. BAC values were grouped into three categories: <80 mg/dl (below legal intoxication limit), 81–150 mg/dl (intoxicated), and >150 mg/dl (severe intoxication).

The collected data were compiled and analyzed using descriptive statistical methods, and results were expressed as numbers and percentages for better interpretation.

Results

A total of 236 medicolegal autopsies were performed during the study period, of which 54 cases were associated with alcohol consumption. Demographic details are shown in Table 1.

Table 1. Demographic profile of alcohol-related deaths

Parameter	Number (n=54)	Percentage (%)
Sex		
Male	49	90.7
Female	5	9.3
Age group (years)		
0–20	6	11.1
21–30	19	35.2
31–40	14	25.9
>40	15	27.8

As shown in Table 2, Road traffic accidents (RTAs) were the leading category in manner of deaths, rest are shown below:

Table 2. Distribution of cases based on manner of death

Manner of death	Number (n=54)	Percentage (%)
Road traffic accidents	22	40.7
Suicides	16	29.6
Homicides	9	16.7
Other accidental deaths*	7	12.9
*Includes burns, falls, drowning		

Table 3 shows the distribution of cases according to BAC levels indicating that more than two-thirds of alcohol-related deaths occurred with BAC above the legal limit.

Table 3. Distribution of cases according to blood alcohol concentration (BAC) levels

BAC Level	Number (n=54)	Percentage (%)
<80 mg/dl	17	31.5
81–150 mg/dl	18	33.3
>150 mg/dl	19	35.2

Discussion

In our one-year retrospective study, 22.9% of all medicolegal autopsies were alcohol-related. This prevalence aligns with findings from Amritsar, where Arora et al. (2013) [11] reported approximately 23% of fatal road-traffic accident victims consumed alcohol prior to death. Similarly, Mohanty et al. (2013) [12] observed a 30.23% positivity for alcohol among homicide victims in southern India. These comparable prevalence rates reinforce that alcohol remains a substantial contributor to unnatural deaths in Indian forensic autopsies.

Regarding age and sex distribution, our study showed that males comprised 90.7% and the 21–40 year age group accounted for 61.1% of alcohol-related deaths. Arora et al. (2013) [11] similarly noted that most alcohol-positive road-accident victims were aged 21–40 years. In homicide cases, Mohanty et al. (2013) [12] also

found a male predominance, with victims primarily in young to middle adulthood. These consistent demographic patterns underscore that young adult males are particularly vulnerable to alcohol-related fatalities in the medicolegal context.

In terms of manner of death, road traffic accidents accounted for 40.7% of our alcohol-related cases, followed by suicides (29.6%) and homicides (16.7%). While specific Indian comparative data for suicides and other categories is sparse, Arora et al. (2013) [11] focused on road-traffic fatalities in which alcohol was a prominent factor, reflecting the high proportion seen in our study. For homicides, Mohanty et al. (2013) [12] reported 30% alcohol positivity, although without breakout into manners; yet the notable overlap suggests alcohol contributes across multiple categories. Thus, our findings regarding manner of death both mirror established trends and add novel insight, particularly in the suicide domain.

Analyzing blood alcohol concentration (BAC), our study found 68.5% of cases exceeded the legal limit (>80 mg/dl), with 35.2% showing severe intoxication (>150 mg/dl). Likewise, Arora et al. (2013) [11] reported that 57% of alcohol-positive accident victims had BAC between 100–149 mg%, indicating moderate to high intoxication levels similar to ours. An earlier study in fatal RTAs in Manipur by Chhetri et al. (2021) [13] reported 32.5% of cases with BAC 91–120 mg%, and 17.5% above 180 mg%, again supportive of the trend toward high-level intoxication in fatal cases. These comparisons affirm that lethal outcomes are frequently accompanied by markedly elevated BAC.

Although our study did not directly examine the link between BAC levels and specific manners of death, the high rates of intoxication suggest a strong contributory role. Internationally, Issa et al. (2016) [14] reported that among violent deaths with positive ethanol, 23.3% had BAC in the 81–160 mg/dl range, paralleling our moderate intoxication group.

Furthermore, Holmström et al. (2022) [15] found that over 27% of sudden cardiac death victims had alcohol detected postmortem, often implicating alcohol as a triggering factor even at varied levels. These patterns strengthen the inference that higher BAC, as seen in our cohort, likely exacerbates risk of fatal outcomes across different contexts.

Taken together, these comparisons demonstrate that our findings regarding prevalence, demographics, manner of death, and BAC distribution are robustly supported by regional and international literature, while our inclusion of suicides and detailed BAC stratification offers valuable additions to the forensic knowledge base. This study has several limitations. Being a single-center, retrospective analysis, findings may not generalize across different geographic or institutional settings. Some cases relied on circumstantial evidence for alcohol involvement when toxicology was unavailable, potentially introducing classification bias.

Conclusion

This one-year retrospective analysis demonstrates that alcohol is a significant contributory factor in unnatural deaths, accounting for nearly one-fourth of medicolegal autopsies. Young adult males were disproportionately affected, with road traffic accidents and suicides forming the leading categories. The majority of victims had blood alcohol concentrations above the legal intoxication limit, underscoring the role of impaired judgment and disinhibition in fatal outcomes.

These findings highlight the urgent need for stricter enforcement of drink-and-drive regulations, mandatory toxicological testing in all autopsies, and targeted public health interventions aimed at reducing harmful alcohol consumption. Strengthening community awareness and implementing preventive strategies may help reduce the burden of alcohol-related mortality.

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