

The influence of alcohol and drug consumption in sea drowning fatalities

Utjecaj alkohola i droge kod fatalnih utapanja u moru

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Summary

The aim of the study is to investigate the influence of alcohol and drug consumption in all types of sea drowning lethal cases occurred in Split-Dalmatian County from September 2001 to August 2006, autopsied (89) and toxicologically analyzed (62). The autopsy reports of the Department of Forensic Medicine, Split University Hospital and School of Medicine were reviewed. Alcohol was regarded as a contributive death factor if the blood concentration was positive (BAC > 0.5 g/kg).

Most of the victims were middle-aged to elderly males. The predominating cause of drowning fatalities was by accident. In 15 cases the concentration of alcohol in blood was positive. No victims were intoxicated by any kind of drug at the time of their death.

It can be concluded from the above said that the majority of drowning deaths in Split-Dalmatian County were not drug related. Alcohol, which was the only type of drug detected, plays a minor role in such deaths.

Key words: alcohol, drowning, death, forensic toxicology

Sažetak

Cilj ove studije je ispitati utjecaj konzumacije alkohola i opojnih droga na sve oblike utapanja u moru u Splitsko-Dalmatinskoj županiji, u periodu od rujna 2001. do kolovoza 2006. godine, a koji su bili obducirani (89) i toksikološki obrađeni (62). Kao izvor podataka korišteni su obdukcijски zapisnici i kemijsko-toksikološki nalazi Kliničkog odjela za sudsku medicinu, Kliničke bolnice Split. Alkohol kao rizičan faktor, doprinio je utapanju, ako je njegova koncentracija bila pozitivna, tj. ako je koncentracija bila veća od 0,5 g/kg.

Žrtve utapanja bili su većinom muškarci srednje životne dobi. Dominantan uzrok smrtnog utapanja bio je nesretan slučaj. U 15 slučajeva koncentracija alkohola u krvi bila je pozitivna. Nijedna žrtva nije bila pod utjecajem lijekova, droga niti drugih sredstava ovisnosti.

Iz navedenog se može zaključiti da nijedna žrtava utapanja u Splitsko-Dalmatinskoj županiji, u ispitivanom periodu, nije bila pod utjecajem droga. Kod malog broja žrtava koncentracija alkohola bila je pozitivna, a u navedenim smrtnim slučajevima imala je malu ulogu.

Ključne riječi: alkohol, utapanja, smrt, sudska toksikologija

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Introduction

During toxicological analysis in autopsy cases, a number of drugs, alone or in combination with ethanol, are identified having direct or indirect implication in the cause of death. Among the factors that contribute mostly to human mortality, alcohol stands next to tobacco, unhealthy food and physical inactivity.¹ It also plays a significant role in traffic accidents, accidents and criminal acts. The suicide rate is significantly higher among alcohol abusers.²

No reliable epidemiological data on the amount and frequency of alcohol consumption in the drowning

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population in Split-Dalmatian County, are available. The objective of this study was to provide more information and to investigate the influence of alcohol and drug consumption in all types of sea drowning.

Materials and methods

The autopsies' reports of the Department of Forensic Medicine, Split University Hospital and School of Medicine, were examined concerning cases of sea drowning (n = 89) that occurred in Split-Dalmatian County in the 5-year period (2001-2006). During the autopsies victims' blood samples were collected and stored at 4°C until they were analyzed in order to establish the alcohol concentration and drug distribution. Samples were screened for ethanol, common drug abuse and other basic drugs. Solid-phase extraction was performed using Amberlite XAD-2, polyaromatic adsorbent resin (Supelco; SIGMA ALDRICH, Taufkirchen, Germany).³ Underivatized specimens were analyzed using Shimadzu GC-2010 with ion trap mass spectrometer (mass selective detector, MSD).⁴ The chromatographic column was RTX-5MS (5% diphenyl-95% dimethyl polysiloxane, 30 m, and 0.25 mm i.d, with a 0.25 µm thick film). The initial column temperature of 90°C

was held for 3 min, then programmed to 270°C at 20°C/min, and held for 25 min. Ultra-pure grade helium was used as the carrier gas at a flow rate of about 1.5 ml/min. Blood-alcohol concentration (BAC) was measured with Shimadzu GC-2010 with headspace and flame ionization detector (FID). Ter-Butanol was used as a standard solution.

Results and discussion

During the observed period (September 2001 to August 2006) 1483 victims were autopsied at the Department of Forensic Medicine, Split University Hospital and School of Medicine. There were 89 or 6% sea drowning victims. Most of them were male (75.3%) and 40-60 years of age (39.3%). For four persons data were not available (Table 1).

Accidents, as a type of violent death, predominated with 51 or 57%, 38 persons used drowning as a means of suicide, of which 50% were men and 50% were woman. Thirty-two people who had committed suicide by drowning were older than 40, of which 11 were elderly people (≥70). Not one person who had drowned by accident or suicide was younger than twenty.

Table 1. Drowning fatalities distributed per year, age and gender in Split-Dalmatian County (September 2001–August 2006)

Tablica 1. Sudbonosna utapanja raspoređena po godini, starosnoj dobi te spolu u Splitsko-dalmatinskoj županiji (rujan 2001. – kolovoz 2006.)

Year Godina	Age /Starost														Gender / Spol			
	20-30		30-40		40-50		50-60		60-70		≥70		Without data Bez podataka		Male Muško		Female Žensko	
	A*	S†	A	S	A	S	A	S	A	S	A	S	A	S	A	S	A	S
9-12/2001	2	-	1	2	-	-	-	1	1	-	-	1	-	-	3	2	1	2
2002	1	-	3	-	4	1	1	-	-	3	2	4	-	-	10	3	1	5
2003	1	-	-	1	4	2	-	4	1	-	1	2	-	2	6	4	1	7
2004	-	-	1	-	1	1	-	2	3	-	-	-	1	-	5	3	1	-
2005	2	1	-	-	-	4	4	-	4	1	3	4	-	-	12	6	1	4
1-8/2006	1	-	2	-	3	-	1	2	-	-	2	-	1	-	9	1	1	1
Total Ukupno	7	1	7	3	12	8	6	9	9	4	8	11	2	2	45	19	6	19
Total Ukupno	8		10		20		15		13		19		4		64		25	

* Accident / Nesretan slučaj

† Suicide / Samoubojstvo

Most of the drownings, 54%, occurred during the period July-September, 63% of them were accidental. Most of them had some disease, e.g. cardiac disease or they were bad swimmers. For example, among individuals who had drowned while swimming, none were on a beach with lifeguards. In the period April – June there were 24 drownings, and 17 of them were suicides. Sixteen drownings happened during the period October-December, and January-March, 11 as suicide and 6 as accidents. The number of drowning fatalities did not change during the years observed.

Toxicological analysis was performed on cases where specimens were submitted (62). Alcohol was regarded as a contributive death factor if the blood concentration was positive (BAC > 0.5 g/kg), which was established in 15 cases (Table 2). No victims were intoxicated by any kind of drug at the time of their death.

Alcohol appears to be widely used in association with recreational aquatic activities, and an important risk factor for drowning associated with those activities.⁵ In this study BAC was below 0.5 g/kg in most cases (75.8%). In an American study of drowning, 44% of a group of adults and in a large Australian study, 37% of male victims had positive blood test.^{6,7}

The predominance of males as victims of accidental submersion has been shown by many authors.⁸ The results of a telephone interview study performed in the USA illustrated the fact that men had a greater exposure to aquatic environments and especially high-exposure activities, and they drank more alcohol than women on or near the water.⁸

Table 2. Drowning fatalities distributed per year and BAC (g/kg) in Split-Dalmatian County (September 2001–August 2006)

Tablica 1. Sudbonosna utapanja raspoređena po godini, te BAC (g/kg) u Splitsko-dalmatinskoj županiji (rujan 2001. – kolovoz 2006.)

Year Godina	BAC g/kg						Total Sveukupno
	< 0.5	0.5-1.5	1.5-2.5	2.5-3.5	> 3.5	Without Data Bez podataka	
9-12/2001	3	-	1	1	-	3	8
2002	9	-	1	1	-	8	19
2003	11	-	2	2	-	3	18
2004	4	1	1	1	1	1	9
2005	10	-	1	-	-	12	23
1-8/2006	10	1	1	-	-	-	12
Total Sveukupno	47	2	7	5	1	27	89

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