K11 Forensic Medical Evaluation of Fatalities Resulting From Lighter Gas Inhalation

Erdinc Ozdemir, The Council of Forensic Medicine, Mus Courthouse, Forensic Medicine, Mus, TURKEY; Ibrahim Üzün, Council of Forensic Medicine, Istanbul, TURKEY; Muhammet Demir, Istanbul Adli Tip Kurumu, Istanbul, TURKEY; and Huseyin Es, Department of Forensic Medicine, Bingol, TURKEY*

After attending this presentation, attendees will have insight regarding the effects of lighter gas inhalation-related intoxications, forms of utilization, and prevention.

This presentation will impact the forensic science community by illustrating the roles of the forensic toxicology and forensic pathology experts in cases of inhalation intoxication by lighter gas.

Voluntary inhalation/abuse of volatile substances is an important public health problem which especially affects adolescent and young populations worldwide and may be encountered in all socioeconomic and cultural levels. Volatile substance abuse is seen worldwide and is the second most common after marijuana among young people in the United States. A study from Turkey revealed that 15%-20% of the total population have tried volatile substances and its prevalence for life-long use was reported to be 7%-11%. In Turkey, 8.8% of the population have tried volatile substances at least once. Lighter gas abuse-related death is still an important health problem in Turkey. Although some studies on the harmful effects of lighter gas abuse on human health have been conducted in developed countries, detailed epidemiological data on the use of lighter gas abuse is not available in Turkey, although it is known that this problem is gradually becoming widespread.

Volatile substance inhalation is responsible for considerable morbidity and mortality. Sudden death is the most common cause of volatile substance-related deaths. The mechanism of sudden death in volatile substance abuse is clear and includes cardiac arrhythmia, hypoxia, and respiratory depression. In addition to anaesthetic and narcotic effects of n-Butane and isobutane on the central nervous system, its concentration of 0.5%-15% in the air may cause fatal arrhythmia. Reports suggest that n-butane and isobutane increase the level of myocardial catecholamines, and resultant alarm or hard muscle activity/exercise (e.g., running or fright) may accelerate death. Propane is less toxic than n-butane and isobutane. Its cardiac effects are negligible. The Lethal Dose, 50% (LD50) value of propane is higher when compared to n-butane, which makes it less lethal.

Lighter gas abusers directly consume the gas they voluntarily obtain by releasing the gas into a plastic bag in order to increase the effects of the substance. The reason for this is to prolong the duration of inhalation and increase the concentration of the substance. In this way, sudden death may occur due to the tendency of acute asphyxia.

In this study, cause-of-death reports written in the First Forensic Medicine Specialization Board of Forensic Medicine Institution Presidency between 2012 and 2014 were retrospectively analyzed. A cause of death of lighter gas inhalation was found in 37 cases. Biological samples were collected during the autopsy and stored at +4°C for further toxicological analysis. Toxicological analyses were conducted in the forensic toxicology laboratory on various biological samples (blood, urine, bile, vitreous humor, gastric content, brain, lung, liver, and kidney) sent from either the mortuary department where the medicolegal autopsies were performed or from other forensic facilities across the country. Headspace/Gas Chromatography/Mass Spectrometry (HS/GC/MS) was used during analyses. The gas-tight vials were stored at -20°C for further toxicological examination, if needed. All subjects were male with a mean age of 16.3 years. It was determined that 24.3% of the cases used a plastic bag to increase the effects of lighter gas and 75.7% inhaled the lighter gas via their mouth and nose. In 91.8% of the cases, crime scene investigation teams found lighter gas tubes, while no evidence of lighter gas use was found in 8.2% of the cases. Toxicological analysis revealed no lighter gas active ingredients (n-butane, isobutane, propane) in 62.2% of the cases, while n-butane and n-butane+propane were detected in 35.1% and 2.7% of the cases, respectively.

The importance of lighter gas inhalation-related deaths in Turkey has been increasing. Strict measures against the abuse of these very dangerous substances should be undertaken by the mutual efforts of medical specialists and legislators.

Volatile Substance, Sudden Death, Poisoning