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Most prevalent drugs in death cases: a six-year study

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Abstract

The purpose of this study was to determine the most prevalent drugs in postmortem cases encountered by the Alabama Department of Forensic Sciences Toxicology Section. These data span the years 2007 to 2012. Each year was separated into two categories: homicide and non-homicide postmortem cases. Homicide is defined as the killing of one person by another person. The total number of postmortem cases per category and the number of instances of each drug in each category were determined. These drugs included illicit drugs, drugs of abuse, prescription medication, over-the-counter medication, and alcohol. Metabolites, chemical compounds created in biological systems for the purpose of elimination, are commonly analyzed in forensic toxicology and were included in this study. A list of the most prevalent drugs per category per year was compiled and the percentage of each drug per category per year was calculated. Ethanol (drinking alcohol) was the most prevalent drug found in postmortem cases (28% of cases). Ethanol, cocaine, methamphetamine, marijuana, and hydrocodone were the five most prevalent drugs (excluding metabolites) over the entire span of this study. The analysis of these data can be utilized to educate the public on emerging trends of drug abuse.

Keywords: *toxicology, postmortem, ethanol, forensic science, homicide*

Introduction

Formed in 1935, the Alabama Department of Forensic Sciences, the nation's third oldest crime lab, analyzes thousands of cases per year.¹ The Toxicology Section specifically looks for the presence of drugs or alcohol in the body, testing biological specimens such as blood, urine, and vitreous fluid. These biological samples come from law enforcement personnel, coroners, and medical examiners and represent tissue from both living and deceased subjects.² Methods such as enzyme-linked immunosorbent assay (ELISA), gas chromatography/mass spectrometry (GC/MS), liquid chromatography-tandem mass spectrometry (LC/MS/MS), and headspace gas chromatography (HSGC) are used by the Toxicology Section in their analyses. These techniques help to determine which, if any, drugs are in the system at the time the biological sample was obtained and how much of each drug is present.

This study focused on postmortem cases analyzed by the Toxicology Section spanning the years 2007 – 2012. The purpose of this study was to determine which drugs were most prevalent in postmortem cases over this time span. It was not in the scope of this study to determine the lethality of the drugs, but simply their prevalence. The analysis of these data can be used to educate the public on emerging trends in drug abuse by revealing which drugs were most common in death cases in recent years.

Methods

Raw data from the postmortem cases of the Alabama Department of Forensic Sciences Toxicology Section was transferred from the Laboratory Information Management System (LIMS) to a Microsoft Excel spreadsheet. For each year, the data were separated into homicide and non-homicide postmortem cases. Each category was limited to blood analysis only. No evaluation was made of urine and tissue cases since they constitute a small percentage of the cases analyzed. The total number of cases per category per year was determined, and the total number of instances of each drug was determined for each category each year. Any drug with fewer than ten instances in its category was excluded. Once the number of instances of each drug was determined for a given category, the percentage of each drug relative to its category was calculated, and a list of the twenty-five most prevalent drugs was created. In the homicide category, fewer than twenty-five drugs met the ten-or-higher instance requirement in any year.

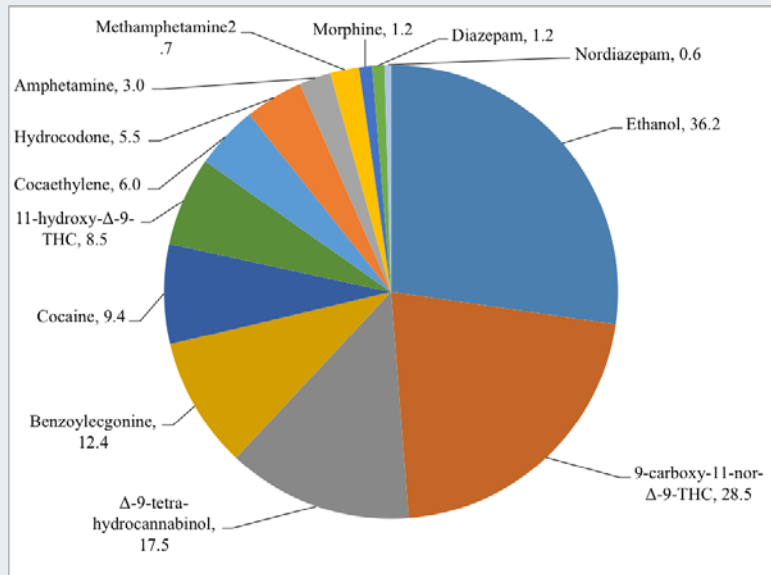


Figure 1. Most prevalent drugs in homicide cases, 2007 – 2012, n=1797 (reported in %).

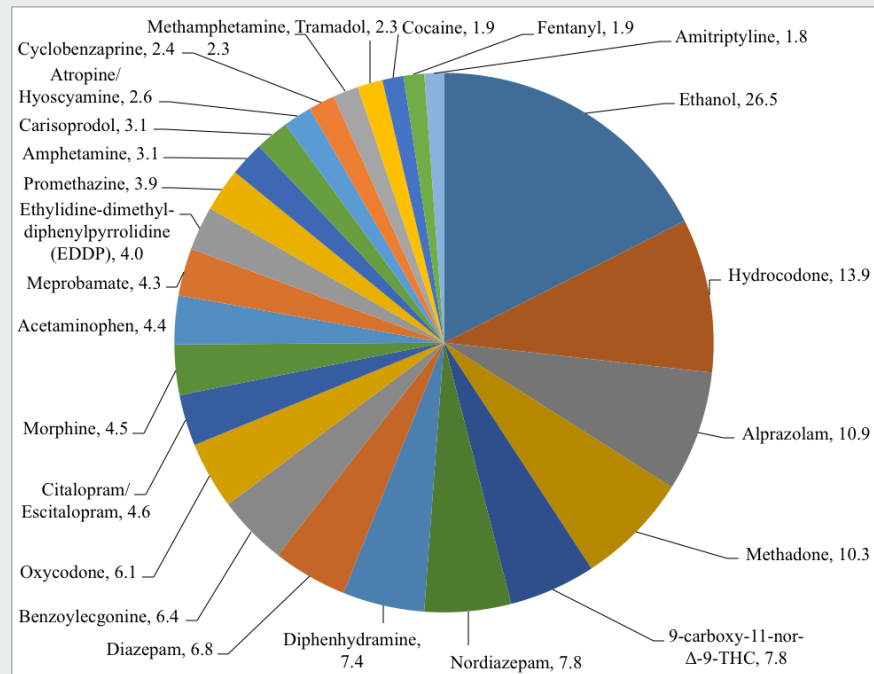


Figure 2. Most prevalent drugs in non-homicide cases, 2007 – 2012, n=11 487 (reported in %).

Results and Discussion

Figures 1 and 2 depict the top drugs in the homicide and non-homicide categories. Ethanol was the most prevalent drug found in homicide (36%) and non-homicide (26%) cases. It was present in 28% of all cases over this span (data not shown). Its prevalence in death cases is consistent with its acceptance and prevalence in society. Marijuana (THC and metabolites)

was the second most prevalent drug in homicide cases. Cocaine (and/or its metabolites) and methamphetamine were among the top five drugs in homicide cases. The percentage of cases which reported these drugs for each year can be seen in Table 1.

Table 1. Most prevalent drugs (%) in the homicide category each year.

	2007	2008	2009	2010	2011	2012
Ethanol	35.4	35.0	37.8	33.5	33.0	41.3
Marijuana	27.4	26.3	30.2	31.2	26.1	29.8
Cocaine	8.5	15.1	13.8	11.5	12.9	11.8
Methamphetamine	5.2	4.3	N/A*	4.1	N/A*	3.2

*Methamphetamine did not meet the 10-case threshold in 2009 and 2011; therefore, the percentage was not calculated.

Table 2. Most prevalent drugs (%) in the non-homicide category each year.

	2007	2008	2009	2010	2011	2012
Ethanol	31.4	26.2	26.3	26.9	24.7	26.4
Hydrocodone	13.3	12.8	13.5	14.2	15.5	14.5
Methadone	12.3	11.2	10.5	9.1	9.0	10.2
Alprazolam	13.1	7.9	8.7	13.1	12.4	12.4

In the non-homicide category, hydrocodone (the prescription painkiller Lortab®) was the second most prevalent drug. Methadone (used for pain management, acute pain, and opioid addiction recovery) and alprazolam (the prescription anti-anxiety medication Xanax®) were in the top five drugs in non-homicide deaths overall. Table 2 provides the percentage of cases which reported these drugs for each year.

Marijuana use as indicated by the presence of 9-carboxy-11-nor- Δ^9 -THC was 114% more prevalent in homicide cases than in non-homicide cases. Marijuana is an illicit drug that carries heavy prison sentencing; therefore, individuals who use marijuana are more likely to be in high risk, volatile environments and are more prone to violent behavior, thus providing one possible explanation for the vast difference between the homicide and non-homicide categories.³ Cocaine (and/or its metabolites) was 64% more prevalent in homicide cases than in non-homicide cases. Methamphetamine was 16% more prevalent in homicide cases. These drugs are also both illicit drugs, and individuals who use these drugs are more likely to be in situations similar to those involved in obtaining marijuana. Thus, the prevalence of cocaine and methamphetamine in the homicide category are consistent with the risks involved in obtaining the drugs.

Hydrocodone was 87% more prevalent in non-homicide cases. This prevalence is consistent with the fact that hydrocodone is the most prescribed medicine in the United States.⁴ Methadone and alprazolam were only present in the non-homicide cases in this study. Alprazolam was among the 25 most-prescribed medications in the United States during this span, and its use increased by 56% from 2008 – 2012 in non-homicide death cases.⁴

Conclusion

Ethanol was the most prevalent drug overall in this study. Marijuana, cocaine, and methamphetamine were among

the five most prevalent drugs in the homicide category. Hydrocodone, methadone, and alprazolam were among the five most prevalent drugs in the non-homicide category. The data collected in this study will help the public (citizens, law enforcement agencies, substance abuse specialists, physicians, and healthcare professionals) by providing additional data on drug abuse and drug prevalence.

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