



Research Article

Evaluation of drug abuse test analysis: One year experience

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Abstract

Objectives: Drug abuse is a major problem for public health and it has negative impacts on people's health. Drug analysis methods used in our country vary, but the results show that drug abuse is an increasing problem in our country compared to previous years. In our hospital, drug urine screen tests are performed to analyze amphetamines, benzodiazepines, cannabinoids, cocaine, and their metabolites, opiates, and synthetic cannabinoids. Our research aimed to evaluate the frequency of drug use according to age and gender.

Methods: A total of 2172 amphetamine, 2172 benzodiazepine, 2172 cannabinoids, 2169 cocaine and cocaine metabolites, 2168 opiates, and 1906 synthetic cannabinoid analysis results were included in our study. Analyses were performed by Advia® (Siemens Healthineers, Erlangen, Germany) autoanalyzer with a homogeneous immunoassay method that enables qualitative or semi-quantitative analysis of analytes. At every stage of our study, we worked in accordance with the Declaration of Helsinki.

Results: The results were as follows: 1989 (91.6%) were negative, 183 (8.4%) were positive for amphetamine, 1924 (88.6%) were negative, and 248 (11.4%) were positive for benzodiazepine; 2057 (94.7%) were negative and 115 (5.3%) were positive for cannabinoids; 2157 (99.4%) were negative and 12 (0.6%) were positive for cocaine and its metabolites; and 1865 (97.8%) were negative and 41 (2.2%) were positive for synthetic cannabinoids. Males' positive results for amphetamine ($p < 0.001$), cannabinoid ($p < 0.001$), and opiates ($p = 0.026$) were statistically significant when compared according to gender. The adult group's positive results for amphetamine ($p < 0.001$), cannabinoid ($p < 0.001$), and synthetic cannabinoids ($p = 0.046$) were statistically significant when compared according to age.

Conclusion: Sharing drug positivity situations in different age groups and genders may help to draw attention to this problem and maybe preventive. More studies including more than one year of results may be beneficial.

Keywords: Amphetamine, cannabinoids, drug addiction, DSM-5, opiates

How to cite this article: Gok G, Turhan T. Evaluation of drug abuse test analysis: One year experience. Int J Med Biochem 2024;7(2):67–72.

Addiction is defined as continuing to use a substance despite it causing mental, physical, or social problems, not being able to give up despite the desire to quit, and not being able to stop the desire to take the substance [1]. The word "addiction" originates from the Latin word "addicere," which means "to be a slave to someone" or "to devote oneself to something or someone else" [2]. When using drugs for the first time, the individual takes drugs voluntarily, using his or her own will. But as time progresses, the changes occurring in the brain affect the individual's self-control, and the individual's resistance to intense urges to take drugs is prevented [3]. Stimulant substances such as cocaine and amphetamine

cause increased arousal and feelings of well-being and euphoria. The analgesic properties of opiates such as morphine and codeine allow them to be used in clinical settings. Taking high doses of these substances makes the user feel good and may lead to abuse of these substances [4]. The emergence and persistence of substance addiction in a person depends on both genetic and environmental characteristics. People who use substances may experience social, economic, personal, and professional problems. Tolerance develops in individuals, and this developing situation leads to the use of increasingly larger amounts of substances. People who use substances may have more psychological and physical problems com-

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Submitted: January 04, 2024 **Accepted:** March 11, 2024 **Available Online:** April 24, 2024

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pared to other people [5]. In general, substance addiction ranks fourth after occasional use, recreational use, and regular use, and it also causes a chronic condition. Substance use is an important problem for society, so substance use prevention and treatment studies are carried out. In the diagnosis of substance use, the World Health Organization (WHO) and American ICD (International Classification of Diseases) and DSM (Diagnostic and Statistical Manual of Mental Disorders) classifications published by the Psychiatric Association (APA) are used. Addiction definition from DSM-I (1952) to DSM-V has been made. The current classification today is DSM-V (2013). The DSM-V is considered the gold standard for the names, symptoms, and diagnostic features of mental illness. As indicated in the DSM-5, clinically, the situation of those diagnosed with substance use disorder (SUD) is not the same as that of discretionary substance use. According to DSM-5, to be diagnosed with SUD, graded as mild, moderate, or severe, depending on the type of substance used, criteria must be met. Ten substance classes are defined in DSM-V: Alcohol, caffeine, cannabis (hemp), hallucinogens (including phencyclidine and other hallucinogens), volatile substances (inhalants), opiates, sedative-hypnotics, stimulants, tobacco, and others (or unspecified) [6]. Drug use is prohibited in Türkiye under the provision of Article 191 of the Turkish Penal Code No. 5237 [7]. It has been stated that the rate of substance use in Türkiye is increasing day by day [8]. In our hospital, drug urine screen tests are performed to analyze amphetamines, benzodiazepines, cannabinoids, cocaine, and their metabolites, opiates, and synthetic cannabinoids. The aim of our research is to evaluate the frequency of drug use according to age and gender, to draw attention to substance addiction, and to contribute to the literature by sharing the results obtained.

Materials and Methods

In this retrospective study, the results of patients whose urines were analyzed for amphetamines, benzodiazepines, cannabinoids, cocaine and their metabolites, opiates, and synthetic cannabinoids at Ankara Bilkent City Hospital between 01.05.2022 and 31.05.2023 were included. Test results, age, and gender information of individuals who underwent urine drug test analysis were accessed from the hospital information system. The present study involves only the first result of patients who underwent more than one urine drug test analysis between the specified dates. Analyses were performed by Advia® (Siemens Healthineers, Erlangen, Germany) autoanalyzer with a homogeneous immunoassay method that enables qualitative or semi-quantitative analysis of analytes. The measurement is based on competition for antibody binding sites between the substance and the enzyme glucose 6 phosphate dehydrogenase (G6PDH). The enzyme activity decreases after binding to the antibody, thus making it possible to measure the concentration of the substance in the sample as enzyme activity. In the presence of Glucose 6 phosphate (G6P), the active enzyme converts nicotinamide adenine dinucleotide (NAD) to reduced nicotinamide ade-

nine dinucleotide (NADH), causing an absorbance change that can be measured spectrophotometrically at 340/410 nm. At every stage of our study, we worked in accordance with the Declaration of Helsinki.

Statistical analyses

Descriptive statistics data were expressed as mean, standard deviation, and numerically, and categorical variables were expressed as percentages. A chi-square test was performed for comparing categorical data among the groups. A p-value <0.05 was accepted as statistically significant. Statistical analyses were performed by IBM SPSS Statistics for Windows, Version 27.0 (IBM Corp., Armonk, NY, USA).

Results

A total of 2172 amphetamine, 2172 benzodiazepine, 2172 cannabinoids, 2169 cocaine and cocaine metabolites, 2168 opiates, and 1906 synthetic cannabinoid analysis results were included in our study. The data obtained in the study were evaluated separately according to gender and age groups: pediatric (0–18 years), adult (18–64 years), and geriatric (65 years and over) for each test. The mean and standard deviations of the pediatric, adult, and geriatric age groups in the analyses of amphetamine, benzodiazepine, cannabinoids, cocaine and cocaine metabolites, and opiates were the same. They were as follows: 15 (± 3.81), 33.9 (± 11.2), 74.1 (± 7.51), respectively.

The mean and standard deviations of the pediatric, adult, and geriatric age groups of Synthetic cannabinoids were as follows: 15 (± 3.6), 34 (± 11.2), and 73.9 (± 7.49) respectively. The minimum substance level values expressed as minimum drug levels as threshold values to be considered drug-positive used in the analysis were 500 $\mu\text{g/L}$ for amphetamine, 300 $\mu\text{g/L}$ for benzodiazepine, 50 $\mu\text{g/L}$ for cannabinoids, 150 $\mu\text{g/L}$ for cocaine and its metabolites, 2000 $\mu\text{g/L}$ for opioids, and 5 $\mu\text{g/L}$ for synthetic cannabinoids. Drug Abuse Test Analysis Data is presented (Table 1).

The positive results of amphetamine 35 (19.1%), benzodiazepine 170 (68.5%), cannabinoid 98 (85.2%), cocaine and its metabolites 11 (91.7%), opiates 31 (83.8%), synthetic cannabinoids 32 (78%) were all higher in males. Males' positive results of amphetamine ($p < 0.001$), cannabinoid ($p < 0.001$), and opiates ($p = 0.026$) were statistically significant (Table 2). There were no positive results for the pediatric group of synthetic cannabinoids and the geriatric groups of amphetamine, cannabinoids, cocaine and its metabolites, and opiates.

The positive results of amphetamine 178 (97.3%), benzodiazepine 199 (80.2%), cannabinoid 113 (98.3%), cocaine and its metabolites 10 (83.3%), opiates 36 (97.3%), synthetic cannabinoids 40 (97.6%) were all higher in each test's adult groups and the positive results of amphetamine ($p < 0.001$), cannabinoid ($p < 0.001$), and synthetic cannabinoids ($p = 0.046$) were statistically significant (Table 3).

Table 1. Drug abuse test analysis data

Analytes	Negative		Positive	
	n	%	n	%
Amphetamine (µg/L)	1989	91.6	183	8.4
Benzodiazepine (µg/L)	1924	88.6	248	11.4
Cannabinoid (µg/L)	2057	94.7	115	5.3
Cocaine and its metabolites (µg/L)	2157	99.4	12	0.6
Opiates (µg/L)	2131	98.3	37	1.7
Synthetic cannabinoids (µg/L)	1865	97.8	41	2.2

disorders such as attention deficit hyperactivity disorder and narcolepsy [12]. Amphetamines have appetite suppressant effects and, due to this effect, they can also be used for weight loss purposes [13]. Amphetamines, also known as "speed," are synthetic psychoactive substances that provide pleasure [14]. They can be easily synthesized from cheap and readily available chemicals, which plays a role in the spread of amphetamine addiction and abuse [15]. In our study, amphetamine was the second most positive drug and it was found to be higher in men ($p < 0.001$) when compared according to gender, and in the adult group ($p < 0.001$) when compared accord-

Table 2. Drug abuse test analysis data among genders

	Female		Male		p*
	n	%	n	%	
Amphetamine (µg/L)					
Negative	689	34.6	1300	65.4	<0.001
Positive	35	19.1	148	80.9	
Benzodiazepine (µg/L)					
Negative	648	33.7	1276	66.3	=0.484
Positive	78	31.5	170	68.5	
Cannabinoid (µg/L)					
Negative	708	34.4	1349	65.6	<0.001
Positive	17	14.8	98	85.2	
Cocaine and its metabolites (µg/L)					
Negative	721	33.4	1436	66.6	0.072
Positive	1	8.3	11	91.7	
Opiates (µg/L)					
Negative	715	33.6	1416	66.4	0.026
Positive	6	16.2	31	83.8	
Synthetic cannabinoids (µg/L)					
Negative	618	33.1	1247	66.9	0.132
Positive	9	22	32	78	

*: Chi-square Test.

Discussion

Drug abuse including opiates, amphetamine derivatives, and cannabis is a major problem for public health [9]. According to the results of the research conducted by the Turkish Drug and Drug Addiction Monitoring Center in 2011; the rate of trying any illegal addictive substance at least once in the population for individuals between the ages of 15–64 was 2.7% (3.1% for males, 2.2% for females), it was 1.5% for individuals between the ages of 15–16 (2.3% for males, 0.7% for females) [10]. Each test in our research was evaluated in 3 groups according to age: pediatric (0–18 years), adult (18–64 years), and geriatric (65 years and over). The use of amphetamine first began in the 1930s, and its use in different areas of medicine was investigated in the following years [11]. Amphetamine, which has a strong stimulating effect on the central nervous system, is used for the treatment of central nervous system

ing to age groups. Karakükçü et al. [16] stated that illicit drug use was higher in men than in women and that the highest use was between the ages of 20 and 29, in their study.

A face-to-face study indicated that men's prevalence of substance use is higher than women's and the frequency of substance use is higher in the 15–24 age group than in those over 25 years of age [17]. Our results were consistent with all these studies [13, 14].

Benzodiazepines are known as the most commonly prescribed drugs in the world, such as anesthetics, tranquilizers, hypnotics, anticonvulsants, or muscle relaxants to treat depression, anxiety, insomnia, and epilepsy [18]. In our study, the most positive results were benzodiazepines. This may be due to its medical use and/or its illicit use. In an epidemiological study conducted

Table 3. Drug abuse test analysis data among age groups

	Pediatric group		Adult group		Geriatric group		p*
	n	%	n	%	n	%	
Amphetamine (µg/L)							
Negative	255	12.8	1634	82.3	97	4.9	<0.001
Positive	5	2.7	178	97.3	0	0	
Benzodiazepine (µg/L)							
Negative	227	11.8	1615	83.9	82	4.3	=0.273
Positive	34	13.7	199	80.2	15	6	
Cannabinoid (µg/L)							
Negative	259	12.6	1701	82.7	97	4.7	<0.001
Positive	2	1.7	113	98.3	0	0	
Cocaine and its metabolites (µg/L)							
Negative	258	12	1802	83.5	97	4.5	=0.684
Positive	2	16.7	10	83.3	0	0	
Opiates (µg/L)							
Negative	259	12.2	1775	83.3	97	4.6	=0.073
Positive	1	2.7	36	97.3	0	0	
Synthetic cannabinoids (µg/L)							
Negative	215	11.5	1559	83.6	91	4.9	=0.046
Positive	0	0	40	97.6	1	2.4	

*: Chi-square Test.

in Germany, the prevalence of benzodiazepine dependence was 1.3% among women and 1.4% among men according to the DSM-IV criteria [19]. In our study, positive benzodiazepine results were higher in men and the adult group but statistically, there was no difference among the genders and the age groups. For this reason, our results may not be accepted as in line with the previous studies [16, 17, 19].

Indian hemp 'Cannabis sativa', which has been used for relaxing purposes for approximately 4000 years, has antiemetic, analgesic, anticonvulsant, and intraocular pressure-lowering effects and is today used in many diseases such as Huntington's, multiple sclerosis, epilepsy, Alzheimer's, and Parkinson's [20]. The common name for cannabinoids is marijuana, and it is one of the most illegal substances that are widely produced and consumed for malicious purposes [21]. Cannabinoids are divided into three groups: natural, endogenous, and synthetic. Delta 9-tetrahydrocannabinol is the best-known and most abundant natural cannabinoid and is also the main component of marijuana. Anandamide, arachidonylglycerol, noladinether, virodamine, and N-arachidonyldopamine are endogenous cannabinoids [20]. Synthetic cannabinoids are produced in laboratories and their numbers are increasing daily. Marijuana and synthetic cannabinoids both act on the same receptors, but synthetic cannabinoids are much more potent than marijuana. Long-term use of synthetic cannabinoids may play a role in the emergence of severe psychological and physical symptoms in people [22]. Many studies show that men use drugs more than women [16, 17, 23, 24]. Our

study was in line with the previous studies presenting higher positive cannabinoid ($p<0.001$) results for males [16, 17, 23, 24]. Gökler and Koçak stated in their article that gender and age factors are effective in substance use, that the 12–17 age period is the most dangerous period in drug use, and that the number of addicts increases in the 17–25 age period [24]. In our study, the positive results of cannabinoids ($p<0.001$), and synthetic cannabinoids ($p=0.046$) were higher in the adult group consistent with their article [24].

Cocaine, which has stimulant properties, is obtained from the Coca plant. Cocaine suppresses the neuronal reuptake of monoamine neurotransmitters serotonin, noradrenaline, and dopamine and increases the concentration of these neurotransmitters in the synaptic gap [25]. The psychic addiction to cocaine is strong [26]. Friedman and Eisenstein indicate cocaine use as an epidemic in their review article [27]. Some studies found higher cocaine usage in women compared to men [28, 29] and some others found just the opposite [30–32]. In our study, positive cocaine results were higher in men and the adult group but statistically, there was no difference among the genders and the age groups. For this reason, our results may not be accepted as in line with the previous studies [28–30].

Heroin, morphine, and some other types of opiates are drugs that are effective in the clinical management of chronic pain [33]. It was stated that men have higher opioid use misuse rates. In our study males' positive results of opiates ($p=0.026$) were statistically significant and consistent with the literature [34]

Strengths and limitations

There are survey studies conducted to investigate drug use in our country. These studies, generally carried out in psychiatric clinics, aim to obtain information about the drugs used and their frequency of use [16]. The fact that drug use is prohibited under Turkish law may have prevented correct answers to the questions. The other strengths of our study are that we evaluated each analyte we analyzed in urine according to gender and age groups and that we included only the first result of each patient. In our hospital, urine drug analysis tests are not performed under strict monitoring, so urine samples are open to dilution and replacement with samples belonging to another person. These are the limitations of our study.

Conclusion

Drug abuse has negative impacts on people's health. Drug analysis methods used in our country vary, but the results are similar. However, compared to other European countries or the United States, the prevalence of substance use in our country is still lower; it is an increasing problem in our country compared to previous years [17]. We think that sharing drug positivity situations in different age groups and genders may help to draw attention to this problem and may be preventive. More studies including more than one year of results may be beneficial.

Ethics Committee Approval: The study was approved by The Ankara Bilkent City Hospital no 1 Clinical Research Ethics Committee (No: E1-23-3776, Date: 12/07/2023).

Authorship Contributions: Concept – G.G., T.T.; Design – G.G., T.T.; Supervision – G.G., T.T.; Funding – G.G., T.T.; Materials – G.G.; Data collection &/or processing – G.G.; Analysis and/or interpretation – G.G., T.T.; Literature search – G.G., T.T.; Writing – G.G., T.T.; Critical review – G.G., T.T.

Conflict of Interest: The authors declare that there is no conflict of interest.

Use of AI for Writing Assistance: Not declared.

Financial Disclosure: The authors declared that this study has received no financial support.

Peer-review: Externally peer-reviewed.

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