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The prevalence of illegal substance use of the Balıkesir region in Turkey; A laboratory data mining study

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Abstract

The purpose of this study is showed the prevalence of illegal substance use in our region according to the drug abuse screening test results of our laboratory. In this study, the data of urine specimens were retrospectively analyzed from the biochemistry laboratory information system of Balıkesir State Hospital between July 2016 and November 2018 in Turkey. After the samples are taken, the properties of urine (quantity, temperature, appearance) and composition of urine (creatinine, pH, density, nitrite, oxidant) are analyzed for convenience. In our laboratory; drug abuse screening is performed for amphetamine, benzodiazepine, opiate, cocaine, cannabinoid, buprenorphine, barbiturate, ecstasy, and synthetic cannabinoid -1, 2, 3 tests. During this period, A total of 3071 samples of 1093 patients were accepted for urine analysis (M: 97.4%, F: 2.6%). 95.6% of the cases were of probation, 1.2% of the clinics (emergency and intensive care) and 3.2% of came for the job application. The positivity rate was 19.3% according to the number of patients, was 12.9% according to the total number of samples analyzed. The most commonly used substance was cannabinoid. This was followed by ecstasy, amphetamine, synthetic cannabinoid-3, and benzodiazepine. In conclusion, analysis of the substance use profile based on the laboratory data, information on substance use prevalence and profile is thought to be useful for preventive studies.

Keywords: Probation, drug abuse screening test, urine, cannabinoid

Introduction

Drug addiction is a public health and safety problem that threatens the individual and social life in the world as well as in our country [1]. The analysis of substances that determine substance use is also an important tool in the fight against drugs. In our country, substance analyzes are performed in two steps. The first step is the laboratory analysis of the search for the presence of substances and metabolites. Screening tests are fast and cheap. The second step is the validation analysis, in which the substance is verified, and the quantity is measured. It is superior in diagnostic terms, but the cost of the device investment is very high, application difficulties are more and more experienced and require experienced staff. All of these substances analyzes are carried out by the relevant legislation of the Ministry of Health [2]. In urine, drug abuse screening tests are performed for clinical toxicology (poisoning diagnosis, treatment), forensic toxicology (probation, traffic control, forensic crime cases), social toxicology (sportsman, job application) [3].

Data mining provides valuable information from large databases in health and medicine and makes a great contribution in terms of

both medical and healthcare quality [4]. The use of data mining has an important place in medicine. Data-based scientific studies are increasing in medicine. Studies on data mining in hospitals can provide useful information about patient profile determination, decision support system in diagnosis of diseases, early diagnosis, and removal of cancer map [5]. Laboratory data is very important in this respect.

Determining the prevalence of illegal substance use is an important step for preventive studies. In Turkey, studies showing the prevalence of illegal drug-in-use are mostly surveyed studies. In the surveys, it is possible for the participants to answer the questions incorrectly because substance use is not legal.

In this regard, laboratory data is both evidence-based and quite large. This study aims to obtain information about the illegal substance use profile, substance use prevalence, age and gender profile of patients according to the data obtained from laboratory information system (LBS) as an example of laboratory data mining applications.

Material and Methods

In this study, data of urine samples of patients participating for substance analysis to Biochemistry Laboratory of Balıkesir State

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Hospital between July 2017 and October 2018 were recruited. The study was approved by the clinical research ethical committee of Medicine faculty of Balikesir University (Decision no: 2019/28).

Urine samples came from clinics (emergency services, intensive care), and probation applications and job application patients. All of the patients who received urine samples (except for emergency and intensive care services) were applied to the surveillance chain, and their consent was obtained. Immediately after samples collecting, the urine characteristics were examined for amount, temperature and appearance of urine. The urine temperature was measured within four minutes after the sample was taken; urine samples whose temperature was not between 32-37 °C were rejected. Urine samples were analyzed within one week at the latest. Urine samples were stored at +4 C until the analysis period. Before the analysis of urine samples, urine integrity/compliance tests were analyzed according to creatinine, pH, density, nitrite, oxidant substance tests. The urinary integrity test was performed to determine whether the urine sample from the laboratory was diluted or not and to be urine or not. Inappropriate urine samples were rejected. Urine samples were screened for a broad range of common drugs of abuse, including legal drugs with abuse potential and illegal drugs. Urine samples were screened with Syva's EMIT II method (enzyme- multiplied immunoassay technique) (Siemens Healthcare Diagnostics, Inc., Newark, DE) for amphetamine/methamphetamine, benzodiazepine, opiate (morphine, codeine, heroin), cocaine (benzoylecgonine), cannabinoid [Δ 9tetrahydrocannabinol (THC); active ingredient in cannabis], buprenorphine, barbiturate (pento, seco and phenobarbital) and ecstasy [methylenedioxymphetamine(MDA)/ methylenedioxymphetamine (MDMA)] tests and were screened with enzyme immunoassay (EI) method (Immunalysis Corporation) for synthetic cannabinoid-1 (JWH-018,073, AM-2201), synthetic cannabinoid-2 (UR-144) and synthetic cannabinoid 3 (AB-PINACA) tests. Vivo pro E (Siemens Healthcare Diagnostics, Inc., Newark, DE) autoanalyzer was used in the measurements of abuse drug. Results above the legal cutoff concentration were considered as positive. Results below legal cutoff concentration were considered as negative. This legal cutoff concentration of the abuse substance is shown in Table 1.

The data obtained from the hospital information management system through the data mining method were transferred to Microsoft Excel. This data was analyzed. On the erroneous records, data cleaning and editing process were performed. Organized data to determine the profile of patients coming were classified according to age, sex, test and outcome status criteria. This data was analyzed by descriptive. The results of statistically analyzed data were expressed as mean (X) $\pm$ standard deviation (SD) numerically and categorical variables as a percentage.

Results

One thousand ninety-three patients (Males: 95.4%, Females: 4.9%) and 3071 samples were accepted to our laboratory. Thirty-three thousand seven hundred eighty-one tests were performed. The analytical variation coefficients and legal drug cut off concentrations of the tests are listed in Table 1. 95.6% of the incoming samples were from probation applications, 1.2% was from clinics (emergency and intensive care), and 3.2% were from patients who came for job application. According to the results of

laboratory analysis, gender and age distributions of persons who were found to be using illegal/addictive substances were shown in Table 2. Among the substance users, 94% of the samples with at least one sample positive were males and the most common age was 20-29. In our study, the most frequently used substance according to the number of samples was determined as a cannabinoid. This was followed by ecstasy, amphetamine, benzodiazepine and bonzai 3. The distribution of positivity rates of the substances is shown in Figure 1.

Table 1. The analytical variation coefficients and legal drug cut off concentrations of the tests

Drugs	Cut off	CV1, CV2
Amphetamine/Methamphetamine	500 ng/mL	9.9%, 4.6%
Benzodiazepine	300 ng/mL	6.4%, 6.2%
Opiate (Morphine, Codeine, Heroin)	2000 ng/mL	5.0%, 5.6%
Cocaine (Benzoylecgonine)	150 ng/mL	9.7%, 7.5%
Cannabinoid (Δ 9tetrahydrocannabinol)	50 ng/mL	%6.9, 6.4%
Buprenorphine	5 ng/mL	%7.3, %3.0
Barbiturates (Pento, Seco and Fenobarbital)	200 ng/mL	6.6%, 4.9%
Ecstasy (MDA/MDMA)	500 ng/mL	7.3%, 10.1%
Synthetic cannabinoid-1 (JWH-018, 073, AM-2201)	20 ng/mL	6.9%, 4.9%
Synthetic cannabinoid-2 (UR-144)	10 ng/mL	8.4%, 7.3%
Synthetic cannabinoid 3 (AB-PINACA)	10 ng/mL	14.6%, 5.8%

CV1: The coefficient of variation for normal levels of internal quality control. CV2: Coefficient of variation for high levels of internal quality control. MDA/MDMA: methylenedioxymphetamine/ methylenedioxymphetamine

Table 2. The frequency of abuse drug use according to patients number, gender and ages groups

	Pozitif n (%)	Total n
Patients number	207 (19.3%)	1093
Samples number	399 (12.9%)	3071
Drug test number	506 (1.5%)	33781
Gender		
Male	195 (19.5%)	1027
Female	10 (15.8%)	66
Ages (x $\pm$ SD)	30.1 $\pm$ 10.1	
<20 years	21 (10.1%)	208
20-29 years	82 (39.6%)	431
30-39 years	65 (31.5%)	291
40-49 years	33 (15.7%)	106
50-59 years	5 (2.5%)	44
$\geq$ 60 years	1 (0.6%)	13

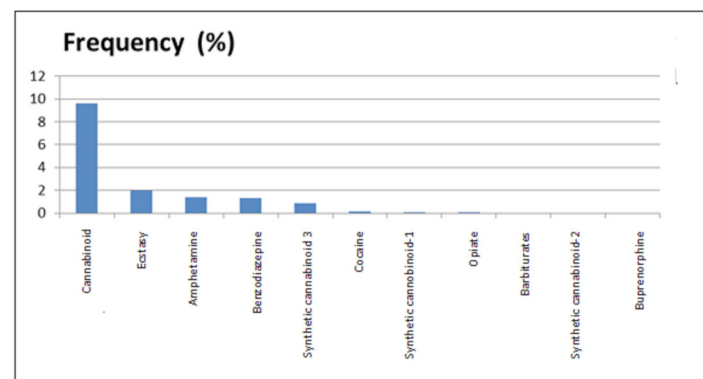


Figure 1. Profile of abuse drug use in Balikesir region

Discussion

In the present study, we determined the substance use profile of our region and distribution of age and sex by using laboratory data. According to TUBIM's (Turkey Monitoring Center for Drugs and Drug Addiction) 2018 Turkey drug report data, while the total number of suspects drug-related was 114 276 in 2016, this number had increased by 48.9% in 2017. When the distribution of these persons by type of crime is looking, a drug for use buying /accepting/holding is 71.5%. As can be seen, the use of drugs is increasing significantly from year to year [6]. Drug use creates serious problems related to social, economic and health. Therefore, the fight against illegal substance use is very important, and medical laboratories are an important tool in combating and preventing illegal substances. According to TUBIM drug report, drug use rate is approximately 0.15% in Turkey. In our study, the rate of illegal substance use was found to be 19.3% according to laboratory applications. When the number of positive patients was proportional to the province population, the illicit drug use rate for the whole province was determined as 0.09%.

There is no evidence-based research to measure the prevalence of addictive drug use routinely in Turkey. Studies to determine substance use and profile are usually surveys. According to TUBIM's report in 2014, 8045 people were reached in 25 provinces and the lifetime prevalence of substance use among the ages of 15-64 was 2.7% [7]. According to the United Nations Drug and Crime Office's 2018 world drug report, the prevalence of substance use was reported as 5.6% in the 15-64 age group [8]. Kulaksızoğlu et al. found a 47.8% rate of illegal/addictive substance use among probation patients in their study in Antalya in 2014 [9]. In their study in Kayseri of Karakükçü et al., in urine samples submitted to our laboratory from various clinics that is AMATEM (alcohol substance addiction treatment center), probation and other clinics (clinical toxicity and social toxicity) were detected as 23% rate of illegal / addictive substance use between 2014-2016 [10].

According to the 2018 report of the European drug and drug addiction monitoring center, cannabis is the most commonly used illicit drug substance in Europe as well as in the world [11]. In this report, the rate of cannabinoid use was found to be 7.2% in 2017, and this rate was 14.1% in 15-34 years of age. World drug report reported that the diversity of drug use in the young population varies from country to country according to socioeconomic status. In some studies, in Turkey as well as in different regions and different usage profiles, it was shown to vary according to the year of this kind of drug used. For example, in the study conducted in Kayseri, cannabinoid for 2014-2015 and amphetamine for 2016 was the most commonly used substance [9]. In our study, cannabinoid was the most commonly used addictive substance. The second item used was ecstasy.

This difference between the prevalence of gender prevalence varies according to the socio-cultural structures of the countries. In Pakistan, the use of substance among adults aged 15-64 for 2013 was about 7% for men and 1% for women. There is a similar rate of usage between the sexes in countries such as Afghanistan and Iran which have the same socio-cultural characteristics [12,13]. In Europe with a different socio-cultural structure in 2016, there was a narrow difference between the prevalence of substance use among women and men in most countries [14]. Like the socio-

cultural structure of our country in our study, it was seen that males used more substances than women.

Both in the world according to the United Nations Office on Drugs and Crime 2018 world drug report and in Turkey according to TUBIM drug report, the prevalence of substance use among young adults is higher when compared to the general population [6,8]. While the rate of cannabinoid use was found to be 7.2% for individuals aged between 15 and 65 years in according to European drug report, this rate was reported as 14.1% between 15 and 34 years [10]. In England and Wales, the prevalence of annual drug use was highest in the 20-24 age group for all drug types in 2016-2017. For people 45 years and over, the prevalence of annual drug use was very low [15]. The average age of drug use in studies in Turkey found to be 27 years for Antalya in 2017, 33 years for Rize in 2011, 32 years for Trabzon in 2008 and 29 years for Kayseri in 2016 [8,10]. In our study, the mean age of drug use was 30.1 ± 10.1 ten years. The most common positivity rate was among young people (20-29 years). This information was consistent with the literature.

The limiting feature of our study was that the applications for substance screening in urine were in the fields of forensic, clinical and social toxicology, but most applications were forensic toxicology within the scope of probation. This situation increased the prevalence of drug use of our study. Therefore, there is a need for studies to be performed in socio-demographic information based on the general population by using evidence-based laboratory results.

As a result, the number of studies that were analyzed retrospectively analyzed the illicit drug policies in the fight against drugs in Turkey is quite limited. This is the first study showing the prevalence of drug use for the province of Balıkesir using laboratory data. Obtaining information on the prevalence and profile of illegal substance use is an important first step for protective/preventive studies. We believe that our study will contribute to this goal.

Competing interests

The authors declare that they have no competing interest.

Financial Disclosure

All authors declare no financial support.

Ethical approval

The study was approved by the clinical research ethical committee of Medicine faculty of Balıkesir University (Decision no: 2019/28).

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