

## DRIVING A VEHICLE UNDER THE INFLUENCE OF PSYCHOACTIVE SUBSTANCES: A CRIMINAL LAW AND FORENSIC TOXICOLOGY OVERVIEW

Daniel Ioan Ureche<sup>1</sup>, George Zlati<sup>2</sup>, Mihai Suian<sup>3</sup>

<sup>1</sup>"Iuliu Hațieganu" University of Medicine and Pharmacy Cluj-Napoca, Legal Medicine Department, Institute of Legal Medicine, Cluj-Napoca, <sup>2</sup>"1 Decembrie 1918" University of Alba-Iulia, Faculty of Law and Social Sciences, Alba-Iulia, <sup>3</sup>"Babeș-Bolyai" University of Cluj-Napoca, Faculty of Law, Cluj-Napoca, Romania

**Abstract.** Due to the prevalence of driving under the influence of psychoactive substances and the possible correlation with a higher risk of traffic accidents, it's necessary to make a review of the legal framework applicable for such a crime and the relevant forensic evidence needed to attest that the driver was under the influence of such substances. This paper emphasizes the most relevant aspects concerning the offence of driving under the influence of psychoactive substances, both from a substantive and criminal procedure law perspective. Nonetheless, several conclusions relevant from a forensic and legal medicine point of view were drawn using data from the archive of the Institute of Legal Medicine Cluj-Napoca during the pandemic year of 2021. The lack of legislative procedures and easy access to various types of psychoactive substances has led to an increase in consumption among teenagers, but especially among vehicle drivers. The authors concur that there is a stringent need for reform owing to the lack of minimum drug detection values in the relevant law, and the lack of emphasis on the clinical manifestation of consumption as it pertains to proving if a person was under the influence of drugs when driving.

**Keywords:** driving under the influence, drugs, psychoactive substances, criminal law, toxicology.

### INTRODUCTION

The European Commission stated in the Recommendation (2001/115/EC) on the maximum permitted blood alcohol content (BAC) for drivers of motorized vehicles [1] that the growth in pedestrians has increased exposure to road accidents. According to a World Health Organization (WHO) study from 2018, road traffic accidents account for about 1.3 million deaths and between 20-50 million non-fatal injuries worldwide [2, 3]. A more recent European study [4] shows that a quarter of the road deaths are associated to driving under the influence of alcohol.

Even if driving under the influence of alcohol is the most prevalent, it is also important to understand the risks of driving under the influence of other psychoactive substances. In this regard, the causation between the consumption of psychoactive substances and road traffic accidents risk has been the focus of several studies [3, 5]. Even if there is an assumption that such substances may impair the visual, cognitive and/or motor abilities of a driver [3, 6], because of the various side effects of each substance there is no

consensus regarding a threshold limit similar to alcohol concentration in blood when driving [3].

In this paper we analyze the issue of driving under the influence of psychoactive substances, from a substantive and procedural criminal law perspective, with the purpose of clarifying the applicable legal framework. Nonetheless, the forensic evidence needed to prove the "influence" under which the driver of the vehicle has been found at the time of driving is also being scrutinized.

### SUBSTANTIVE CRIMINAL LAW

The act of driving a vehicle under the influence of alcohol or other substances is punishable under article 336 of the Romanian Criminal Code. According to the second paragraph of this criminal provision, the act of driving a vehicle under the influence of psychoactive substances is punishable by imprisonment from one to 5 year or a criminal fine. For this offence to be committed the following elements of the crime must be met: (i) an individual must drive (ii) a vehicle for which a driving license is needed (iii) under the influence of

\*Correspondence to: Daniel Ioan Ureche MD, Institute of Legal Medicine, Cluj-Napoca, Romania, E-mail: ureche.daniel.ioan@gmail.com

(iv) psychoactive substances (v) on a public road.

The actus reus consisting in driving a vehicle was clarified by the High Court of Cassation and Justice in a mandatory preliminary judgment – decision no. 6/HP/2019. The Court concluded that the act of driving consists in a technical operation by which a person is moving the vehicle on a public road. It must be emphasized that the act of driving a vehicle does not necessarily imply that the engine is running, or the vehicle transmission is engaged. The simple fact that the vehicle is moving on a slope and the driver has the possibility to control the direction of the vehicle is sufficient to conclude that such an activity consists in driving a vehicle.

According to article 6 of G.U.D. no. 195/2002, a vehicle consists in a mechanical system that moves on the road, with or without means of self-propulsion, which is normally used for the transport of individuals and/or goods or for the performance of different services. Because of this broad definition, it must be emphasized that only those vehicles for which a driving license is needed are relevant when establishing the criminal liability of the driver. Also, it must be noted that a “public road” is any road that is open to the public’s use, whether it be a national road or a private one.

Unlike driving under the influence of alcohol, in which case the blood alcohol level must be above 0.80 g/l, in case of driving under the influence of psychoactive substances there is no such threshold as an essential element of the offence. Thus, article 336(2) of the Romanian Code seems to incriminate the mere act of driving a vehicle under the influence of psychoactive substances. In this context, it is important to clarify the scope of the notion „psychoactive substances” and the circumstances in which a driver can be regarded as under the influence of such substances.

### ***Psychoactive substances***

Firstly, it could be argued that even alcohol is a psychoactive substance. However, the law makes a clear distinction under article 336 of the Romanian Criminal Code between driving under the influence of alcohol (first paragraph) and driving under the influence of psychoactive substances (second paragraph). The scope of the notion „psychoactive substances” was clarified in a mandatory preliminary judgment by the High Court of Cassation and Justice. The Court concluded in decision no. 48/HP/2021 that this notion covers all the substances mentioned in the following laws: Law no. 194/2011 on countering operations with products

likely to have psychoactive effects, other than those provided for in existing legislation; Law no. 143/2000 on preventing and countering illicit drug trafficking and illegal drug use; Law no. 339/2005 on the legal status of narcotic and psychotropic plants, substances, and other products.

According to the Constitutional Court (see decision no. 452/2021, par. 28), the aim of the legislation was to include under the scope of the notion „psychoactive substances” any substance which can result in the stimulation or inhibition of the central nervous system, resulting in changes in mental functions and processes and behavior or the creation of a state of dependence, either physical or mental. This view is also reflected in article 2(e) of the Law no. 194/2011. In the previous version of the offence – stipulated under article 87(2) of O.U.G. no. 195/2002 – the law criminalized the act of driving a vehicle under the influence of substances or other products with a narcotic effect or any medication with a similar effect.

Taking into consideration this legal framework and the High Court of Cassation and Justice mandatory preliminary judgment previously mentioned, it must be concluded that the notion „psychoactive substances” referenced by article 336 (2) of the Romanian Criminal Code covers the following: high risk drugs mentioned in Table no. 1 and 2 of Law no. 143/2000 (e.g. heroin, cocaine, amphetamine, ecstasy, etc.); risk drugs mentioned in Table no. 3 of Law no. 143/2000 (e.g. cannabis, ketamine, etc.); substances, plants and mushrooms with psychoactive effects covered by Law no. 194/2011 (e.g. ethnobotanical substances); psychotropic plants, substances and other products with narcotic effects covered by Law no. 339/2005.

### ***Being under the influence of psychoactive substances***

Similar to driving under the influence of alcohol, in order for article 336(2) of the Romanian Criminal Code to be applicable, the prosecution must prove beyond a reasonable doubt that the driver was under the influence of a psychoactive substance at the time of driving - see also the Constitutional Court decision no. 732/2014 regarding driving under the influence of alcohol. For this requirement to be met, the psychoactive substances must be consumed by the driver – according to article 2(f) of Law no. 194/2011 such an act refers to the introduction into the human body of the substance, whether dissolved, impregnated, dispersed or diluted, in one of the following ways: orally or injected, inhaled, smoked or applied externally on the skin.

It is irrelevant if the consumption of psychoactive substances was voluntary or involuntary. However, the prosecution must prove a criminal intent in the sense that the driver knew that he is under the influence of such substances at the time of driving, or that he was indifferent in this regard (*dolus eventualis*) and accepted that he may be under such influence. If the driver consumed psychoactive substances without his knowledge, he cannot be found criminally liable.

The issue here is that in some cases the driver is being tested days after he consumed the psychoactive substance in question, regardless of the method of administration. There is also the issue of establishing the level of concentration at the time of driving, taking into consideration that any blood or urine samples are being tested a period of time after the act of driving was completed. According to the Constitutional Court decision no. 238/2021 (see par. 17), determining the level of alcohol intoxication by reference to the time at which the biological samples were taken from the driver is not in accordance to article 7 of the European Convention on Human Rights because it relies on a random criterion which is external to the conduct of the suspect. The Court concluded that the concentration of alcohol found in the suspect blood must be established at the time of driving. We argue that this conclusion should be applicable *mutatis mutandis* in case of driving under the influence of psychoactive substances.

Thus, if the conclusion regarding the diagnosis of being under the influence of a psychoactive substance is solely based on a toxicology report, the finding of such substances in the blood or urine of the suspect in accordance with article 7(1) of the Ministry of Health Ordinance no. 1512/2013 would result in a criminal liability based on strict liability. Such a conclusion would be unfair for the suspect because traces of different psychoactive substances can be found in his blood or urine for a long period of time after the consumption of such substances. After a long period of time after the consumption of psychoactive substances it is unreasonable to assume that an individual can foresee that he is still under the influence of such substances.

In case of driving under the influence of alcohol it is reasonable to presume that a concentration of alcohol above 0.80 g/l, taking into consideration all the studies regarding the effects of alcohol, impairs the driving abilities and creates a relevant risk that justifies the intervention of criminal law. In contrast, in case of driving under the influence of psychoactive substances there is no threshold regarding the concentration of the substances found in the blood or urine of the suspect.

Thus, a broader interpretation of article 336(2) of the Romanian Criminal Code could make the driver of a vehicle criminal liable if any traces of psychoactive substances are being found in his blood or urine. Such a broad interpretation can create the premises for an arbitrary prosecution incompatible with article 7 of the Convention.

The Constitutional Court stated in several cases (e.g., decision no. 452/2021, par. 22; decision no. 101/2019, par. 24) that because of the wide range of substances likely to have psychoactive effects, the legislation cannot objectively establish a minimum threshold of concentration as an essential element of the offence. The Constitutional Court reasoning is correct taking into consideration that such substances have various effects at different levels of concentration. Even if the level of impairment caused by alcohol is also influenced by several factors (e.g., individual's tolerance, weight, food consumption, etc.) [3], it is reasonable to presume that a concentration of alcohol above 0.80 g/l can impair the oculomotor function, motor coordination, the ability to divide attention, reaction time, concentration, etc. of the driver [3]. Instead, in case of driving under the influence of psychoactive substances we need to make an *in concreto* analysis. For example:

a. Amphetamines and amphetamine-type substances (e.g., MDMA, ecstasy, etc.) have a proven stimulant effect on the central nervous system [7]. However, some studies have demonstrated that a low dose of amphetamines could actually improve some psychomotor skills relevant for driving ability and can even help fatigued drivers [8]. In this case, it could be argued that even if the driver is under the influence, the amphetamines may not have a direct negative effect over the driving ability. Nonetheless, it is considered that the abuse of amphetamines can cause hypersomnolence at the end-of-binge [9] and it can also have a negative impact on automated driving performance [10]. The most worrying aspect is that amphetamines can provide a sense of adequate performance that is not in accordance with the actual performance of the driver [3, 10].

The relevant question here is what dose of amphetamine can have a negative effect on the driver. For example, one study shows that a dose of 10-40 mg of amphetamine on a healthy individual does not produce a different effect than a placebo treatment [3, 11]. Instead, cut-off values for amphetamines are debated, various studies or experts arguing for different concentration values: 0.27-0.53 mg/l [7], 20 ng/ml [12], 41 ng/ml [13], etc.

b. Cannabis (containing THC) is rapidly absorbed and distributed in the body through smoking and is considered to be the most commonly abused drug in the world. Even if there is a trend towards decriminalization of recreational and medicinal cannabis use (see, Canada, Uruguay, USA, etc.), various studies show a correlation between driving under the influence of cannabis and the risk of traffic accidents [3, 14, 5], especially in case of acute cannabis intoxication [15]. However, the research on this topic seems to be inconclusive [3, 15].

With regard to cut-off values for cannabis, studies argue on different values of concentration 1 ng/ml [12], 1.3 ng/ml [13], 5 ng/ml [16], etc. Several studies show that blood THC levels in frequent cannabis users may persist above 2 ng/mL for several days [14].

c. Cocaine. A fair solution would be to corroborate the toxicology report with other evidence to prove that at the time of driving the suspect was actually under the influence of psychoactive substances. It could also be taken into consideration that the negative effects of psychoactive drugs can be worsened by the coexistent consumption of alcohol [17]. Thus, even if the alcohol concentration is below 0.80 g/l, finding traces of psychoactive substances in the blood or urine of the suspect can be detrimental for the suspect.

The Constitutional Court stated in decision no. 101/2019 (see par. 23) that in order to establish the consumption of psychoactive substances – as an essential element of the offence – a laboratory analysis is necessary to determine the existence of such substances in the body of the suspect driver. Hence, the result of an oral fluid drug test is not reliable in the absence of a laboratory test. We also argue that a toxicological report can be used as evidence against the suspect, but it is not sufficient per se in order to conclude that at the time of driving the vehicle the subject was under the influence of psychoactive substances.

## **CRIMINAL PROCEDURE LAW**

From a procedural point of view, investigating and proving the offence of driving under the influence of psychoactive substances presents challenges not encountered when handling the same offence in the case of alcohol consumption. These manifest in a need for the police to be equipped with devices that can detect psychoactive substances, which is only a recent concern for Romanian authorities.

The most frequent situation encountered in judicial practice is that of a person who is stopped by

the police, either randomly as part of a routine check or because of a violation of the Highway Code – O.U.G. nr. 195/2002 on driving on public roads. In such a case, the person may or may not present symptoms of psychoactive substance consumption which may or may not be dissimilar to those of alcohol consumption. Depending on the equipment found on the police at that time, there is the option of an oral fluid screen, by using devices such as Drager DrugTest 5000 and AquilaScan, that are in use by the Romanian Police, or directly directing the person for a biological test (immunoassay).

Under the provisions of article 185 par. 3 of Regulation for application of the Highway Code, a driver found under the influence of psychoactive substances by a preliminary screening is mandated to permit the obtaining of a blood sample or other relevant biological samples for the presence of the substances to be further investigated. Under the relevant special legislation, the Ministry of Health Order 1512/2013, both urine and blood samples must be obtained.

This contrasts with the measures in the case of alcohol consumption, where a biological sample must be obtained only if the preliminary screening indicates over 0.40 mg/l alcohol in the Breathalyzer test or if there was an accident and there was a vehicle transporting dangerous goods.

The oral fluid testing device can be used to detect cannabis, opiates, amphetamines, methamphetamine, MDMA, cocaine and benzodiazepines [18]. However, it is considered that such a test can result in false positive results due to cross-reactivity and other factors [18]. Thus, a blood or urine toxicology report is needed to compensate the risk of a false positive test result, due to the specific equipment used Drager DrugTest 5000 and AquilaScan.

Thus, a blood or urine toxicology report is needed to compensate the risk of a false positive when using oral fluid screening. This measure assures consistency in the legal framework regarding toxicology exams in the way that oral fluid tests or breathalyzer tests are not seen as evidence that can prove the consumption of alcohol or psychoactive substances but are clues that raise the suspicion on said consumption. From a procedural point of view, the initial screening for alcohol or psychoactive substance use constitutes an administrative procedure for the police but if the result suggests the commission of an offence, the test results are grounds for opening a criminal investigation, under article 293 of the Criminal Procedure Code. This is of a great procedural importance as any further actions

made by the police must be undertaken under the provisions on the Criminal Procedure Code, otherwise any evidence obtained is inadmissible in court.

The following of strict procedural steps is of utmost importance, and the obtaining of the test samples for blood and urine must be secondary. Thus, after establishing that there is a suspicion of committing a crime by using the positive test from the oral fluid screening exam, the police officer (if he is empowered with judicial functions according to Law nr. 364/2004 on the organization and operation of the judicial police) must start the criminal investigation by issuing the order pursuant to article 305 par. 1 of the Criminal Procedure Code. This formal document must be done in writing. In particular cases, it has been observed that this procedure is done after the physical examination due to the hasty decisions made by the police. The price for such a lack of vision is the expungement of any evidence gathered, rendering the case null and impossible to be reformed in any way.

Subsequently, the police officer must order the physical examination of the person pursuant to article 190 of the Criminal Procedure Code, as a general norm that permits an external and internal examination of a person and the collection of biological samples, with or without being given consent to do so. There are provisions under article 190 par. 8 of the Criminal Procedure Code that address the issue of drivers caught under the influence of alcohol or drugs and instruct the obtaining of biological samples under the order of the police by a doctor, medical nurse, or any other person with special medical training. The samples must be collected at a medical institution – the Institute of Legal Medicine (or subdivisions) or at any hospital.

The Criminal Procedure Code does not detail how the examination will take place, the tests involved or the exact procedure of obtaining the biological samples, this provided by the Ministry of Health Order 1512/2013 that approved the norms regarding ‘the collection, storage and transportation of biological samples for the purpose of obtaining evidence by establishing the blood alcohol level or the presence of psychoactive substances in the body in the case of persons involved in events or circumstances related to road traffic’. It divides the establishment of consumption of alcohol or psychoactive substances into two parts – the medical examination and the toxicological examination. The latter can be done only at medico-legal institutes in toxicology laboratories, and the former can be done at hospitals.

If a physical examination is ordered by the police, from a medical point of view it is necessary

to have a medical examination of the person for the clinical interpretation of the recent consumption of alcohol and psychoactive substances, accord to the provisions of article 16 of the norms issued through the Ministry of Health Order 1512/2013. The importance of the medical examination is that it could prove if the person suspected of consuming psychoactive substance is impaired by a recent consumption. In this sense, the relevant medical norms refer to a recent consumption, which underlines the importance of a clinical interpretation of any toxicological results that may indicate consumption but not impairment, i.e. a lack of influence on the behavior of a person.

In contrast to the provision regarding biological samples, that may be obtained by nurses or people with specific medical training, the clinical examination must be done by a doctor at the time the biological samples are taken. This ensures that any clinical interpretation of the behavior of the person is clinically attested by a professional.

Unfortunately, the form that doctors must fill out is standardized and does not impose a personal description from the doctor, since he must choose from predetermined responses. In the form we have questions regarding attire (orderly/disorderly), attitude (adequate/inadequate to the situation – cooperative/uncooperative), behavior (calm/agitated hostile/aggressive vindictive/expansive) communication (coherent/incoherent), orientation – temporal, spatial, alophsychic, autopsychic, laughing/crying, trouble balancing, motor problems, face pallor, eye examination (pupil reaction, nystagmus, hippus, motor reflexes) and other aspects declared by the patient. The medic must conclude if he finds that there are any clinical elements attributed to the consumption of alcohol or psychoactive substances.

Regarding the biological evidence which must be collected, there are separate kits for alcohol and drugs, they are distributed to hospitals and are sealed and certified. Upon the request of the police, they are opened in front of the person subjected to the examination. A minimum of 15 ml of blood is drawn and is distributed in three vacuum containers of 5ml each – one without any anticoagulants and two with such substances. In contrast to collection of blood for alcohol concentration tests, there is no second blood sample taken because the metabolism of psychoactive substances varies and is too unpredictable to scientifically prove when consumption took place with any degree of certainty. As the situation presents itself, any determination via the rate of elimination of

drugs from the person's body is incompatible with the certainty required by a criminal trial.

Urine is collected by the persons suspected, after the blood sample, in a special container, under the surveillance of the police, taking into regard the issue of privacy and decency. Care must be taken that the person who is examined does not possess any substances that may be introduced into the container and alter the results. At least 20ml of urine is necessary for the toxicological examination.

Both blood and urine samples are put back in the kit, and it is sealed and signed by all parties and remanded to the police, which then takes them for analysis to the competent medico-legal institution. Subsequently, a forensic examination report (toxicological report) is issued with the results.

The main problem in the Romanian medical forensic system is the fact that the samples taken from the driver are subjected to a qualitative determination, which only identifies the substance that has been found in the blood/urine. It does not evaluate the quantity of drugs in the body of the driver, and there are no legal provisions for cut-off values, and such values are only the ones inherent for the equipment used in oral fluid tests, not in urine and blood assays. Such a view is in accordance with the Ministry of Health Order 1512/2013 which provides only that the presence of psychoactive substances must be determined, not their quantity.

In our opinion, due to the reduced extent of the clinical examination and due to the nature of the toxicological tests, further evidence may be needed to gather evidence beyond a reasonable doubt of innocence. A further forensic examination of the biological samples should be made if there is an inconsistency between the clinical aspects observed and the toxicological results. A quantitative test can be ordered and another toxicological examination can determine the exact amount of drugs or other psychoactive substances found in the body.

If a quantitative test would find only trace amounts of drugs, then there is sufficient evidence for an acquittal on the base of the person not being under the influence of psychoactive substances, especially if it is backed by the clinical examination made at the time the biological samples were collected.

## **FORENSIC EVIDENCE**

The medico-legal forensic examination in the case of psychoactive substance consumption is

carried out at the request of the police or other criminal investigation bodies. The objectives of the examination are to establish the nature of the psychoactive substance, the quantity, and ways of administration. Also, if possible, under certain circumstances, the approximate date and time of administration can be established by estimating the chronology of events from the time of administration to the time of the first symptoms. Determining the individual or incidental factors that favored how the substance manifests, like pre-existing pathological condition, habitual state, hypersensitivity state, or for the determination of the applicable offence (differentiating murder, suicide, accident) and making a positive diagnosis of death by intoxication are other questions that can be addressed in a medico-legal examination report.

From a medical point of view, there is no possibility for establishing the amount of psychoactive substance by retroactive calculation [19, 20] in contrast to well established practices regarding the consumption of alcohol. For example, studies show that the concentration levels of THC can fluctuate over time, even if most frequent the THC levels declines steadily with time [14].

In order to answer the questions issued by the judicial authorities, the expertise must go through certain stages that may vary, related to the examination of a living person or of a deceased person, represented by the on-site investigation, evaluation of clinical symptoms, the anatomic-pathological examination and the toxicological method used [19].

The toxicological examination is the most important stage, with the aim of identifying and dosing the substance in blood, urine, or in some cases also in organs and other bodily fluids. It consists of qualitative methods, which aim to identify the psychoactive substance, and quantitative methods, which establish the concentration of the identified substance. Blood and urine are the only types of samples that allow obtaining qualitative or quantitative results, both in the case of a living or deceased individual. Urine is a very useful sample for drug use tests because it is available in large quantities and concentrations of the substances identified are generally higher than in blood [19, 21].

The most widely used urine screening method is the immunoassay, due to its relatively low cost, rapid response time, ease of use, and ability to detect multiple classes of substances. The principle of immunoassay is that a certain antibody specific for a drug binds to it, and the complex formed is detected by enzymatic reaction, radioisotope detection or fluorescence methods [21].

Screening tests typically include major psychoactive substances classes such as amphetamines, cannabinoids, cocaine and opioids. They target specific analytes within each class. Therefore, for methamphetamine-amphetamine or deaminated derivatives can be determined in the urine, for cocaine - the inactive metabolite of delta-9-tetrahydrocannabinol (THC), delta-9-carboxy-THC (THCA), and for opioids-precursors can be detected from the morphine class. The tests are performed using the required cut-off concentrations to say that the test is positive for that substance. Positive samples are confirmed by liquid chromatography-mass spectrometry (LC-MS) or gas chromatography-mass spectrometry (GC-MS) [22].

In this paper, in addition to presenting the legal situation at the national level in the case of the consumption of psychoactive substances, we want to present some statistical data that capture the problem of psychoactive substances abuse, especially among drivers. In this sense, we conducted a study on the analysis of samples collected to determine the consumption of psychoactive substances in the toxicology laboratory of the Institute of Legal Medicine Cluj-Napoca.

## MATERIALS AND METHOD

This study on monitoring the use of psychoactive substances is a retrospective, observational and descriptive study. The data in use was collected from the archive of the Institute of Legal Medicine Cluj-Napoca and is relevant for the year 2021. The criteria for inclusion in this study were persons, either male or female, regardless of age or county of origin, who had at least one positive urine or blood test for at least one psychoactive substance. Individuals which were suspected but had both negative tests were excluded from the study. Correlations have been made between

different variables: the gender of the subjects, the psychoactive substances consumed, the association of two or more types of substances, the county of origin, the presence of clinical elements and the age of the subjects.

## RESULTS

In 2021, 149 positive analyses were recorded for at least one psychoactive substance at the Institute of Legal Medicine Cluj-Napoca. Percentage wise, 96% of psychoactive substance users are men and only 4% are women. The male to female ratio is 23.83:1. Compared to the territorial distribution of cases, the most consumers are from the counties of Bistrița-Năsăud 37% and Cluj 29%, followed by Maramureș 22%, Sălaj, 11%, and Alba 1%.

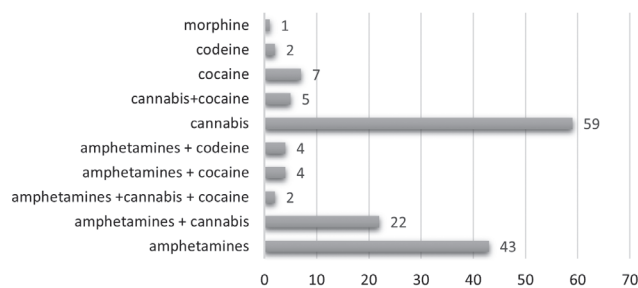
Regarding the circumstances that led to the toxicological evaluation of the subjects, 90% are drivers, stopped in traffic, during routine checks or for suspicious driving behavior, 7% of the subjects were involved in road accidents, which resulted in material damage or casualties, and 3% are other diverse cases, including attempted rape, driving an unregistered vehicle and car theft (joyriding). The distribution by age ranges of the group highlights the fact that the majority of subjects, namely 42%, fall into the 21-25 age group followed by the 15-20 years with 22% and the 26-30 years with 21%, the remaining 15% having an age over 31 years.

The relationship between the distribution of abuse substances among the subjects and the county of origin, reveals the fact that the most common drug in Bistrița-Năsăud county was cannabis (23 people out of 56), followed by the use of amphetamine (16 people out of 56), and the combination of cannabis and amphetamine (in 7 people). The only 2 reported cases of codeine consumption were from Bistrița-Năsăud.

In contrast, the most common psychoactive substance found among the subjects in Cluj county was amphetamine (18 people out of 43), followed by cannabis (15 people out of 43) and the combination of cannabis and amphetamine (5 people). Cluj was the only county where the combination of amphetamine, cannabis and cocaine was found in 2 people.

Cannabis was the most consumed psychoactive substance in Maramureș county (15 people out of 33) followed by the association between cannabis and amphetamine, in 6 people, and the association between cannabis and cocaine found in 4 people. Cocaine, alone, was the most frequently encountered drug in Maramureș

**Distribution of substances of abuse in the study group**



**Figure 1.** The distribution of the type of drug consumed can be found in the graph below.

county, in 3 cases. In Sălaj county, the most common drug detected was cannabis, (6 people out of 16) followed by the consumption of amphetamine (4 people), or the combination of amphetamine with other substances: with cannabis (4 cases) or codeine (1 case).

Analyzing the relationship between the presence of clinical elements and the type of psychoactive substance consumed, we observe that in cannabis users, out of 59 individuals, only 25.42% had characteristic clinical elements, the remaining 74.57% had no clinical elements suggestive of consumption. In the case of those who co-used amphetamine, out of 43 individuals, 69.67% did not present clinical elements, while 27.9% presented typical clinical symptomatology. Also, among amphetamine users we observed one of the 2 cases of death due to the consumption of psychoactive substances. The other case of death was among morphine users.

## DISCUSSIONS

In the current paper, we wanted to present an overview of the consumption of psychoactive substances in several Romanian counties, in a year in which the Covid-19 pandemic was ongoing, the year 2021. By analyzing the data of a previous study, which addressed the consumption of narcotic drugs among the population aged 14-30, over a period of 5 years (2005-2009) we notice an increase in cases in 2021, where in a single year there were 127 subjects from this category (aged 14-30), compared of 124 subjects over the 5 years [23]. This comparison does not help us to draw conclusions on the influence of the pandemic on consumption, because it was an old study, but it is the only statistic available at the level of Cluj and the counties under the Cluj-Napoca Legal Medicine Institute. Therefore, a larger study is needed, over several years, to observe the trends in the consumption of illegal substances and the impact of the pandemic on these counties.

As previously mentioned, in 2021, there were 149 positive tests for psychoactive substances registered at the Cluj-Napoca Forensic Medicine Institute from which 96% of the subjects were male and only 4% were female. This result matches the statistics both nationally and internationally, where men are the biggest users of illegal substances [24, 25]. The very large difference between the two genders is most likely due to the too small group data in the current study. According to the latest study by the World Health Organization, the difference between the two genders differs depending

on the psychoactive substance used. Regarding the use of cannabis, in South-East Europe, a clear difference is seen between men (80%) and women (20%), but this difference almost disappears when it comes to the use of amphetamine (55% men and 45% women) [26].

All the events that led to the biological samples to determine the consumption of psychoactive substances constituted crimes, which show the susceptibility of psychoactive substance users to commit illegal acts [27, 28, 29]. Also, it was showed that different addictive behaviors like alcohol, psychoactive substances or gambling are a serious public health problem and are strongly related to a criminal behavior [30, 31]. Since most of the sample testing requests were sent by the Road Safety Bureau of the Police Inspectorate, the database of this study included a large part of the subjects investigated by this authority, therefore those who present themselves with acute intoxication with psychoactive substances in the ICU were excluded from the results. The study remains relevant, as all persons involved in a crime or a suspected crime are subject to forensic examinations fulfilled exclusively by Legal Medicine institutes.

The most consumed drug in the present study was cannabis, present alone in 59 subjects, but also in combination with amphetamine in 22 subjects, in 5 subjects with cocaine, and with cocaine and amphetamine in 2 subjects. This result overlaps with national and international results where cannabis is the most used drug [24, 25].

In 2020, according to several studies, 4% of the global population had used cannabis.[26] In second place was amphetamine – either alone (43 subjects) or in various combinations (32 subjects). Cocaine and opioid cases were among the last in our study. Opioids, although not the most used among subjects, represent a major public health problem, being considered the most lethal class of drugs, 2/3 of deaths directly caused by drugs being due to them, mostly through overdose [26]. Although at the European level, amphetamine is after cocaine, in our study amphetamine is more frequent than cocaine, most likely for financial reasons, the price of cocaine on the market in the years 2016-2018, in Romania, being almost 10 times higher than that of amphetamine [24, 26].

**In conclusion**, in the absence of a legal threshold regarding the concentration of psychoactive substances found in the blood or urine of the suspect it is imperative to establish if at the time of driving the suspect was effectively under the influence of such substances. In order to prove this essential element



of the offence the toxicological report should be corroborated with any other evidence that suggests that at the time of the driving the suspect was impaired in any way by the psychoactive substances found in his body. In our opinion, the mere fact that a person has a certain psychoactive substance in his body does not automatically prove that there were any effects of such substance at the time of driving, and that conclusion should be reached only through evidence regarding the symptoms of said consumption, the existence of an impairment caused by psychoactive substance or by evaluating the quantity of the substance in his body.

From a forensic and medical point of view, the following conclusions could be stated:

1. The consumption of psychoactive substances remains a public health problem in the counties of Romania.

2. Most drug users are male (96%).

3. Young people are the biggest consumers, the average age being 24 years.

4. The most used drug by drivers is cannabis, alone or in some combinations with other substances.

5. Stimulants (amphetamine, cocaine) are in second place in terms of consumption, alone or in combinations.

6. The county with the most consumers is Bistrita-Năsăud, followed by Cluj and Maramureş, from the five counties that report to the Medico Legal Institute in Cluj.

7. The majority of consumers do not present clinical elements characteristic of consumption during the objective examination, the substance being detected through toxicological examinations.

8. Cluj county remains in first place in terms of amphetamine consumption.

### Conflict of interest

The authors declare that they have no conflict of interest.

### References

1. Commission of the European Communities. Recommendation of 17 January 2001 on the maximum permitted blood alcohol content (BAC) for drivers of motorised vehicles. <https://eur-lex.europa.eu/>, 2001. (Accessed 10 October 2022).
2. WHO. Global status report on road traffic. <https://www.who.int/publications-detail-redirect/9789241565684>, 2018. (Accessed 26 September 2022).
3. Blandino A, Cotroneo R, Tambuzzi S, Di Candi D, Genovese U, Zoja R. Driving under the influence of drugs: Correlation between blood psychoactive drug concentrations and cognitive impairment. A narrative review taking into account forensic issues. *Forensic*

4. Allsop R. Drink Driving as the Commonest Drug Driving – A perspective from Europe. *International Journal of Environmental Research and Public Health*. 2020; 17(24):1-14.
5. Elvik R. Risk of road accident associated with the use of drugs: A systematic review and meta-analysis of evidence from epidemiological studies. *Accident Analysis & Prevention*. 2013; 60:254-267.
6. Barone R, Pelletti G, Garagnani M, Giusti A, Marzi M, Rossi F, Roffi R, Fais P, Pelotti S. Alcohol and illicit drugs in drivers involved in road traffic crashes in Italy. A 8-year retrospective study. *Forensic Science International*. 2019; 305:1-8.
7. Busardo FP, Pichini S, Pellegrini M, Montana A, Lo Faro AF, Zaami S, Graziano S. Correlation between Blood and Oral Fluid Psychoactive Drug Concentrations and Cognitive Impairment in Driving under the Influence of Drugs. *Current Neuropharmacology*. 2018; 16(1):84-96.
8. Dini G, Bragazzi NL, Montecucco A, Rahmani A, Durando P. Psychoactive drug consumption among truck-drivers: a systematic review of the literature with meta-analysis and meta-regression. *Journal of Preventive Medicine and Hygiene*. 2019; 60(2):124-139.
9. Gustavsen I, Mørland J, Bramness J. Impairment related to blood amphetamine and/or methamphetamine concentrations in suspected drugged drivers. *Accident Analysis & Prevention*. 2006; 38(2):490-495.
10. Veldstra J, Brookhuis K, de Waard D, Molmans B, Verstraete A, Skopp G, Jantos R. Effects of alcohol (BAC 0.5%) and ecstasy (MDMA 100 mg) on simulated driving performance and traffic safety. *Psychopharmacology*. 2012; 222(3):377-390.
11. Jones AW, Holmgren A, Ahlner J. High prevalence of previous arrests for illicit drug use and/or impaired driving among drivers killed in motor vehicle crashes in Sweden with amphetamine in blood at autopsy. *International Journal of Drug Policy*. 2015; 26(8):790-793.
12. Walsh M, Verstraete A, Huestis M, Mørland J. Guidelines for research on drugged driving. *Addiction*. 2008; 103(8):1258-1268.
13. Vindenes V, Jordbru D, Knapskogg A.-B., Kvan E, Mathisrud G, Slørdal L, Mørland J. Impairment based legislative limits for driving under the influence of non-alcohol drugs in Norway. *Forensic Science International*. 2012; 2019(1-3):1-11.
14. Peng YW, Desapriya E, Chan H, Brucacher J. Residual blood THC levels in frequent cannabis users after over four hours of abstinence: A systematic review. *Drug and Alcohol Dependence*. 2020; 216:108177.
15. Dahgreen M, Sagar K, Smith R, Lambros A, Kuppe M, Gruber S. Recreational cannabis use impairs driving performance in the absence of acute intoxication. *Drug and Alcohol Dependence*. 2020; 208:107771.
16. Wolff K, Brimblecombe R, Forfar JC, Forrest AR, Gilvarry E, Johnston A, Morgan J, Osselton MD, Read L, Taylor D. Driving under the influence of drugs. 2013:55.
17. Saloner R, Polillo E, Umlauf A, Moore D, Heaton R, Grant I, Cherner M. Conditional Effects of Lifetime Alcohol Consumption on Methamphetamine-Associated Neurocognitive Performance. 2019; 25(8):787-799.
18. Avcioglu G, Yilmaz G, Sahiner SY, Kozaci D, Bal C, Yilaz FM. Evaluation of the diagnostic performance of an oral fluid screening test device for substance abuse at traffic controls. *Clinical Biochemistry*. 2021; 93:112-118.
19. Dermengiu D, Iftene V. *Curs Universitar Medicină Legală*. Editura C.H. Beck 2019 Bucuresti: 489-498. Romanian.
20. Saukko P, Knight B. *Knight's Forensic Pathology 4th ed*. ISBN 9780340972533. CRC Press, 2016: 567-570.
21. Smith, M.L. (2020). Immunoassay. In: Levine, B.S., KERRIGAN, S. (eds) *Principles of Forensic Toxicology*. Springer, Cham.
22. Legea nr. 143 din 26 iulie 2000 privind combaterea traficului și consumului ilicit de droguri. *Portal Legislativ [Internet]*. [cited 2022 Oct 10]. Available from: <https://legislatie.just.ro/Public/DetaliuDocumentAfis/23629>.

23. Alexandra Corina S. Consumul de stupefiante în rândul populației de 14-30 de ani. Cluj-Napoca. Universitatea de Medicină și Farmacie “Iuliu Hatieganu” Cluj-Napoca; 2011
24. EMCDDA. Raportul european privind drogurile: Tendințe și evoluții. 2022. [cited 2022 Oct 10]; Available from: [www.emcdda.europa.eu](http://www.emcdda.europa.eu).
25. Agenția Națională Antidrog. Raport Național Privind Situația Drogurilor. România Noi Evoluții Și Tendințe. Reitox. 2016 Available from: <http://ana.gov.ro/wp-content/uploads/2018/11/raport-NATIONAL-2006.pdf>
26. UNODC. World Drug Report 2022\_Booklet 2 [Internet]. [cited 2022 Oct 11]. Available from: [https://www.unodc.org/unodc/en/data-and-analysis/wdr-2022\\_booklet-2.html](https://www.unodc.org/unodc/en/data-and-analysis/wdr-2022_booklet-2.html).
27. Walsh JM, de Gier JJ, Christopherson AS, Verstraete AG. Drugs and driving. *Traffic Inj Prev.* 2004; 5(3):241–53.
28. Ray O., Ksir C.: *Drugs, Society & Human Behavior.* 6th Ed., Mosby, St. Louis, 1993.
29. Merkinaitė S, Grund JP, Frimpong A. Young people and drugs: next generation of harm reduction. *Int J Drug Policy.* 2010; 21(2):112–114.
30. Delcea C, Enache A. Personality Traits as Predictor of Crime. *Rom J Leg Med.* 2021; 29(2): 227-231.
31. Nasui BA, Popa M, Buzoianu AL, Pop VN, Varlas VN, Armean SM, Popescu CA. Alcohol Consumption and Behavioral Consequences in Romanian Medical University Students. *Int. J. Environ. Res. Public Health.* 2021, 18(14): 7531.