

Driving Under the Influence of Drugs

Uyuşturucu Madde Etkisi Altında Araç Kullanımı

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ABSTRACT Objective: Driving performance can easily be deteriorated as a result of drug use. Many observational studies show an increase in the presence of drugs detected in biological samples among drivers. This is an alarming situation, and the likelihood of drug users being exposed to a fatal accident, especially after multiple drug use, is higher than that of non-users. **Material and Methods:** In our study, cases with requested reports regarding “the effect of drug on safe driving” between 2012 and June 2018, from the 5th Specialized Board of The Council of Forensic Medicine were examined in means of distribution by year, sender judicial authorities, regional distribution, biological samples used during evaluation, the types of drugs and their frequency of detection, the rates of verification analysis performed and the report results of the board. **Results:** It has been determined that cases regarding driving under the influence of narcotic drugs have increased over years. The identified drugs in order of frequency are cannabis, amphetamine, methylenedioxymethamphetamine (MDMA), synthetic cannabinoids, benzodiazepines and opioids. Multiple drug use was detected in 38 out of 88 cases. In 56% of the cases, it was evaluated that the person could not handle and manage the vehicle safely. In 29% of the cases positive for screening test, there was no opinion presented since confirmation analysis in blood was not performed. **Conclusion:** The number of drug users has been increasing over years, and risk assessment and prevention of drug-related vehicle use are becoming increasingly important.

Keywords: Driving under the influence of drug (DUI); biological sample; confirmation analysis; forensic toxicology

ÖZET Amaç: Uyuşturucu madde kullanımının bir sonucu olarak sürüş performansı kolayca bozulmaktadır. Birçok gözlemsel çalışma, sürücüler arasında biyolojik örneklerde tespit edilen uyuşturucu varlığının artmakta olduğunu göstermektedir. Bu endişe verici bir durum olup uyuşturucu kullanan sürücülerin ölümcül bir kazaya maruz kalma olasılığı, özellikle çoklu uyuşturucu kullanımından sonra, kullanıcı olmayanlardan daha yüksektir. **Gereç ve Yöntemler:** Çalışmamızda 2012-2018 yılı Haziran ayı arasında Adli Tıp Kurumu 5. İhtisas Kurulu'ndan “uyuşturucunun güvenli sürüşe etkisi” konusunda rapor istenilen dosyalar, yıllara göre dağılım, gönderen adli makam, bölgesel dağılım, değerlendirme sırasında kullanılan biyolojik örnekler, uyuşturucu maddelerin çeşitleri ve saptanma sıklıkları, doğrulama analizinin yapılma oranları ve kurulun rapor sonuçları açısından incelenmiştir. **Bulgular:** Uyuşturucu madde etkisi altında sürüş olgularının yıllara göre artış gösterdiği tespit edilmiştir. Tespit edilen uyuşturucu maddeler sıklık sırasına göre esrar, amfetamin, etilendi-oksümetamfetamin, sentetik kanabinoidler, benzodiazepinler ve opioidlerdir. Seksen sekiz olgunun 38'inde çoklu uyuşturucu madde kullanımı saptanmıştır. Olguların %56'sında kişinin emniyetli şekilde araç sevk ve idare edemeyeceği değerlendirilmiştir. Tarama testinde pozitif çıkan vakaların %29'unda kanda doğrulama analizi yapılmadığından görüş bildirilememiştir. **Sonuç:** Uyuşturucu uyarıcı madde kullanıcılarının sayısı, geçen yıllar itibarıyla artış göstermekte olup, risk değerlendirmesi ve uyuşturucuya bağlı araç kullanımının önlenmesi giderek önem kazanmaktadır.

Anahtar Kelimeler: Uyuşturucu etkisi altında sürüş; biyolojik örnek; doğrulama analizi; adli toksikoloji

Narcotic drugs have a medical use, although the incidence of driving under the influence of drugs, which are often abused, has increased in recent years. Various studies have been conducted on this subject, which has increasingly been put on the agenda of countries. The substances

that affect driving safety, include the drugs that are prescribed (e.g., benzodiazepines, opioid analgesics, and antidepressants), illegal psychotropic substances (e.g., cocaine, heroin, amphetamines, and cannabis), and new psychoactive substances (e.g., synthetic cannabinoids or cathinone).¹ These drugs negatively affect driving ability by causing disrupted motor skills, decreased visual acuity, increased tendency to search for excitement, decreased self-regulation, loss of conditional reflexes, slowed reaction times, disrupted judgment and decision-making mechanisms, and increased possibility of fatal accidents.²

It was shown that the combined use of multiple psychoactive substances or drugs has a great effect in impairing driving ability. In addition, an increase was also reported in drivers who use drugs and alcohol together.³ Today, various precautions are taken in order to avoid traffic accidents, and one of the applications in this field is Roadside Screening Tests for detecting drivers who drive vehicles under the influence of drugs and stimulants on motorways.

In our country, although Roadside Screening Tests have been used for a long time for detecting alcohol, such tests have not been added to the agenda of psychoactive drugs until very recently. The first local survey in this field was conducted in 2010-2011.⁴ According to the results reported by this and another similar study, it is not frequently investigated whether drivers are under the influence of any drugs during roadside controls carried out after traffic accidents or during routine traffic inspections in our country; and since only alcohol levels are checked, many of these drugs go undetected due to the methods used in rare screenings. Knowing this, some drivers may use these drugs. For this reason, it should not be considered sufficient to check for alcohol during routine traffic screenings. Especially in post-accident processes, the analysis of narcotics and/or stimulants must also be carried out.⁵ In Article 19 of the Law No. 6487, which was accepted on 24.05.2013 and published on June 11, 2013 in the Official Gazette 28674, several amendments were made to the Highway Traffic Law 2918, accepted on 13.10.1983, and the legal ground was prepared for roadside psychoactive drug testing.⁵

As for the occurrence of “Endangering Traffic Safety,” mentioned in Turkish Penal Code No. 5237, Article 179/3, the driver must be found to be using the vehicle although s/he is not able to handle the vehicle safely, because s/he is under the influence of alcohol or drugs or for any other reasons. An expert opinion must be sought concerning “whether or not the drug detected in the driver eliminates the safe driving of the vehicle”.⁶

The purpose of the present study was to determine the forensic, medical and legal problems in this field by investigating the files that were submitted to the Forensic Medicine Institution, 5th Specialization Board, in order to determine whether the safe driving ability of the drivers were disrupted by any drug.

MATERIAL AND METHODS

Cases concerning the effects of drugs on safe driving, in the files sent to this Board by judicial authorities, during the period between 2012 and 2018 June, from the Forensic Medicine Institution, 5th Specialization Board, were included in the study. The files were examined in terms of the judicial authority, geographic region, analysis method, the drug in question, the biological sample investigated, the verification analysis conducted, the evaluation of the Board and the reports prepared in this respect.

RESULTS

The total number of the cases that were examined was 88, and the distribution of the cases, by year, is given in [Figure 1](#). The distribution of the cases according to the seven geographical regions of our country is given in [Figure 2](#), and the distribution of the cases according to the judicial authorities is given in [Figure 3](#). In [Figure 4](#), the percentage distribution of the drug types detected in the examined cases are provided. While one single type of narcotics was detected in 50 of the 58 cases, in 38 cases, more than one narcotic was detected. When the detected substances were evaluated in terms of their types, it was found to be Marijuana in 55 cases; amphetamine in 20 cases; MDMA (Methyl-

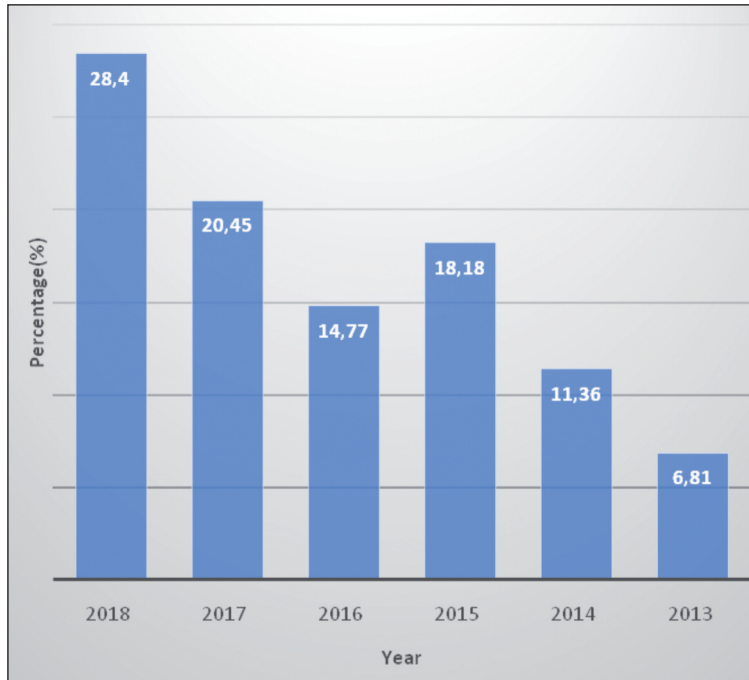


FIGURE 1: Percentage distribution of cases during the period between 2012 and 2018 June.

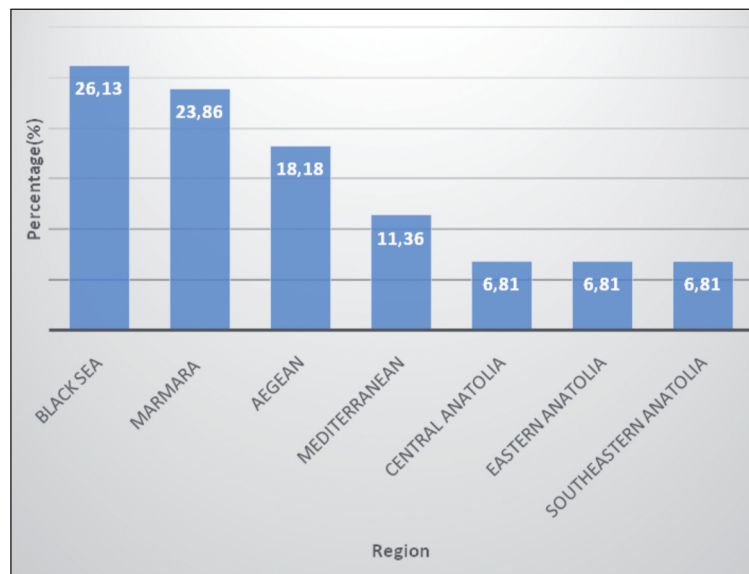


FIGURE 2: The distribution of the cases according to the seven geographical regions of our country.

enedioxymethamphetamine) and MDA (Methylenedioxyamphetamine) in 18 cases; synthetic cannabinoid (5F-PB-22, 5F-ADB, ADB-FUBINACA, ADB-CHMINACA, UR-144, XLR-11, JWH-018, or MAM-2201) in 12 cases; benzodiazepine (chlordiazepoxide, alprazolam, diazepam, temazepam, oxazepam, clonazepam, or midazolam)

in 11 cases; opioid (morphine, methadone, tramadol, or buprenorphine) in 11 cases; cocaine in 8 cases; and olanzapine, biperiden and gabapentin, which are known to be abused by narcotics users, were detected in 3 cases. In Figure 5, the types and percentage distributions of the biological samples used in the analysis of the cases are given. Multiple

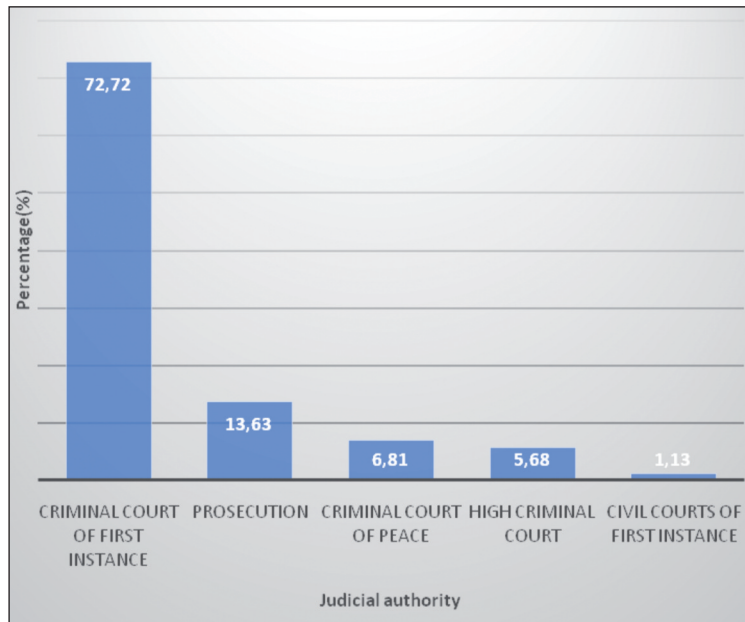


FIGURE 3: The distribution of the cases according to the judicial authorities.

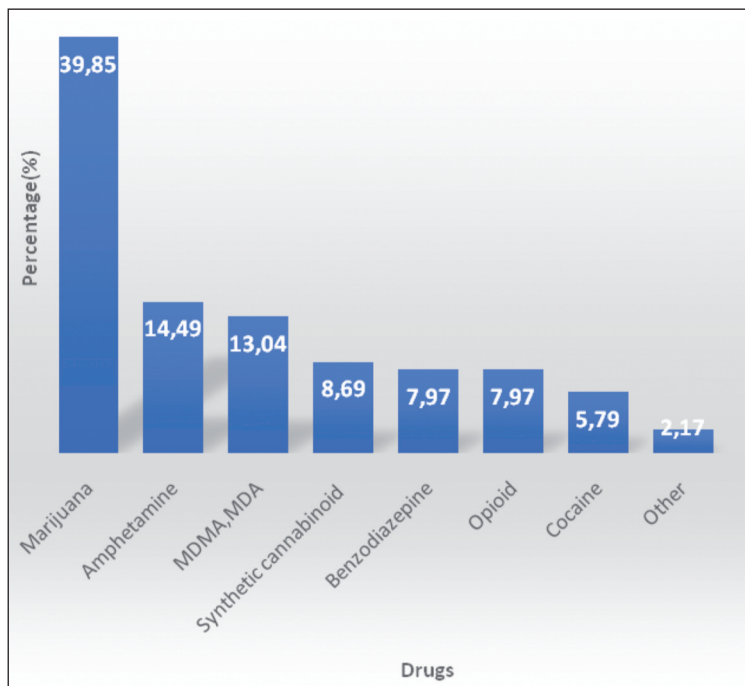


FIGURE 4: The percentage distribution of the drug types.

biological samples consist of double (blood-urine) or triple (blood-urine-hair) analyses. In Figure 6, the percentages of the cases that were not confirmed by years according to the total number of cases, are provided. No confirmation analyses were made in 10 of the 25 cases in 2018; 6 of the 18 cases

in 2017; 8 of the 13 cases in 2016; 2 of the 16 cases in 2015; 2 of the 10 cases in 2014; and 1 of the 6 cases in 2013. The percentage distribution of the results of the evaluations of the Forensic Medicine Institution, 5th Specialization Board is given in (Figure 7). It was reported that, in 56 of the 88

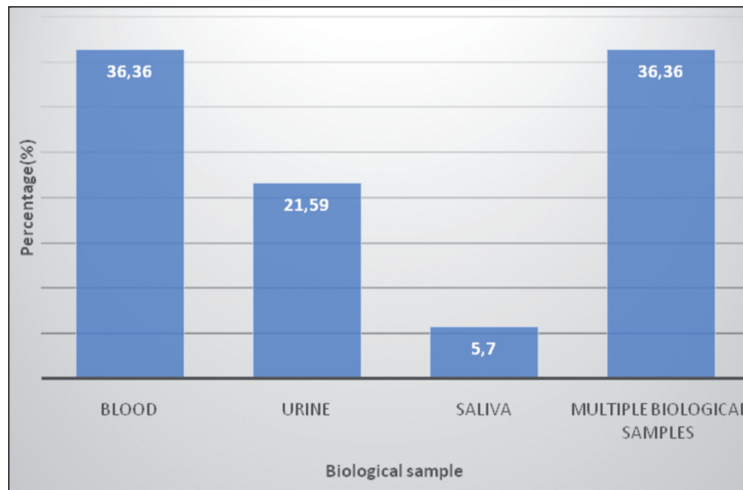


FIGURE 5: The types and percentage distributions of the biological samples.

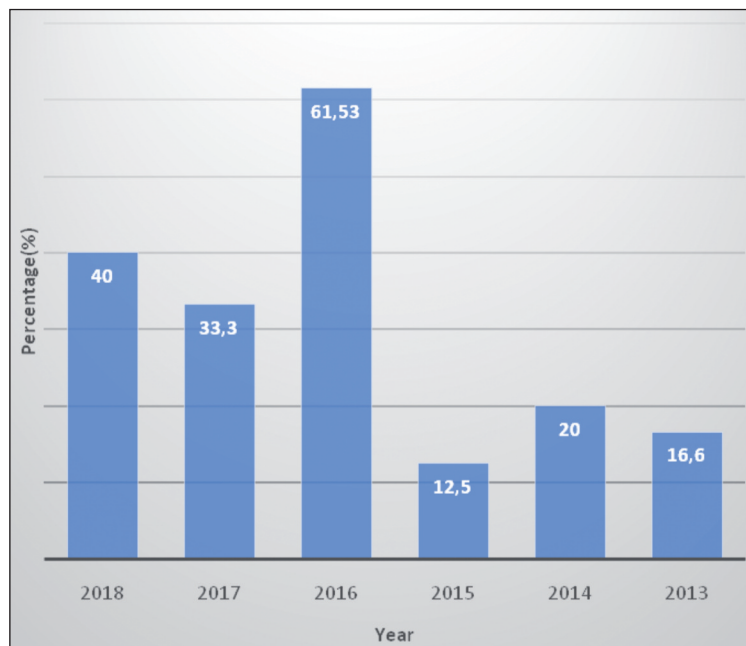


FIGURE 6: The percentages of the cases that were not confirmed by years according to the total number of cases.

cases, the person could not manage the vehicle due to the use of narcotics, and no expert opinions were reported in 29 of these cases, because the confirmation analysis could not be made using blood. No expert opinions were reported in 3 of these cases, because the date and time of the sampling were not stated in the samples, reporting whether the driver was under the influence of a drug that would affect his/her safe driving.

DISCUSSION

It was observed that driving under the influence of drugs was associated with a risky driving style, leading to accidents.^{6,7} Self-control is considered to be reduced with the use of narcotics, and the possibility of forming crime-related behaviors increases. Moreover, the problems related to the loss of self-control cause crimes that are related to angry vehicle driving and car races.⁸⁻¹⁰

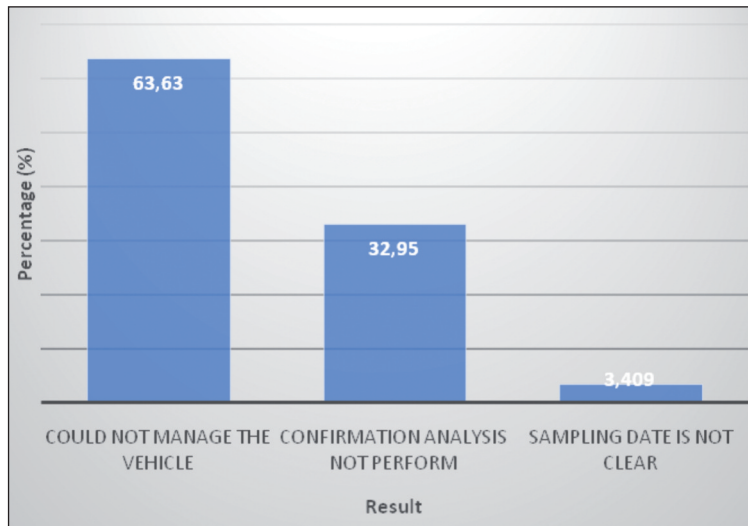


FIGURE 7: The percentage distribution of the results of the evaluations of the Forensic Medicine Institution, 5th Specialization Board.

The typical side effects, observed after the use of psychoactive drugs, are cardiac, neurological and psychological symptoms, such as agitation, difficulty in breathing, palpitation, dizziness, panic, paranoia, and acoustic and visual hallucinations.¹¹ The neurological and psychological symptoms, in particular, may have important effects in disrupting the driving ability of individuals.

As can be seen in Figure 2, the increase in the number of cases from the Black Sea Region attracts attention. The number of cases from other regions, with similar populations, is similar. When the region population, monthly income level per house, night life dynamics, sociocultural situation, and the Forensic Medicine Institution in the region are considered to be similar, it is expected that the cases coming from this region will be higher. However, these results suggest that roadside screening controls are not carried out with sufficient frequency and in enough locations in Istanbul, which is a megacity.

The majority of the cases were sent from the Criminal Courts of First Instance, as shown in Figure 3. As well known, these courts are the courts where cases involving traffic accidents that have caused the death of a person are heard, and if more than one person died in the accident, the case then becomes the responsibility of the High Criminal Court. In the case of reckless accidental wounding in traffic accidents, the case is heard in the Crimi-

nal Court of Peace, and if the crime has an organized basis, the case is still heard in the Criminal Court of First Instance. In case the elements of the abstract danger offense, defined in Article 179/3 of the TPC (Turkish Penal Code), occur, the case is heard in the Criminal Court of First Instance, since the sanction of the crime is imprisonment for up to two years, although it does not cause death. For this reason, we believe that the reason why most of the cases that were dealt with in our study were heard by this authority was that the scope of the working area of the abovementioned authority is wider. Cases involving pecuniary and non-pecuniary damages as a result of fatal/injurious traffic accidents are heard by the Civil Courts of First Instance. It was determined that the files coming from these courts were brought to the board, although in smaller numbers (Figure 3).

In many previous studies, it was observed that marijuana was usually the most common drug detected in drivers who had accidents, followed by benzodiazepines, cocaine, amphetamines and opioids. It was also determined that multiple drug use among drivers who were involved in accidents was also common.¹² In our study, similar data were obtained. It was found that marijuana was the most frequently detected drug in drivers (Figure 4), and that it was detected in nearly half of the cases involving multiple drug use. In an article that was compiled with the data obtained from 66 interna-

tional studies, it was concluded that amphetamine, benzodiazepine, marijuana, cocaine and opioid use were associated with fatal traffic accident risk.¹³ Similarly, the Road Safety Report of the World Health Organization stated that amphetamine was responsible for 51% of the drug-related traffic accidents, followed by marijuana (22%), cocaine (14%) and opioids (13%).¹⁴ In the study conducted by Quaglio et al. in Italy, heroin-related deaths were the third most common cause of death in traffic accidents, and 10% of all these deaths happened after accidents.¹⁵ In studies conducted in Australia between 1990-93 and 1997-99, it was determined that the frequency of detecting alcohol in the deaths that occurred after motor vehicle accidents decreased from 33% to 28%, while the frequency of detecting narcotic substances increased from 20% to 27%.¹² According to the studies that were conducted in the United States of America between 2007 and 2010, alcohol-related traffic accidents decreased, while drug-related accidents increased.¹⁶ In studies that were conducted on drivers in Europe in 2009-2010, alcohol or narcotics were detected at a rate of 7.43% in the analyses of blood or saliva.¹⁷ In previous studies conducted in the USA and Canada, drugs were found to be positive at a rate of 12-15% in the sampling that was carried out during evening hours and on weekends, which was almost twice as high as that in Europe.¹⁷ Marijuana was the most common substance detected in such cases in the USA. However, in Australia, methamphetamine and MDMA were reported to be more common.¹⁸ In the present study, it was found that the number of cases increased over the years (Figure 1). The reason for this might be the increase in drug use, as well as the increased roadside drug and stimulant tests carried out by security forces due to new legal regulations. However, we still believe that we are far from claiming that these tests are performed in a nationwide and regular manner, within certain standards, and that a systematic approach, involving all of the stakeholders in this context, must be developed immediately.

The reliable correlation of the pharmacological effects of drugs is based on blood/serum concentrations.¹⁹ Urine, on the other hand, yields a

wider window for substance detection. However, it does not correlate with blood levels.¹⁹ Blood is the golden standard in the evaluation of cases involving driving under the influence of substances.²⁰ Since the presence of a drug in the blood shows an active substance effect and reflects an impaired driving ability, it is considered as the best matrix for verification analyses.²¹ It is possible to detect a substance in the blood as unchanged, and the blood matrix is partially homogeneous. In routine practices in Norway, cases in which an impaired driving ability under the influence of any drug is suspected, urine analysis is carried out. If morphine is detected in the blood, urine analysis is carried out to differentiate from which heroin, morphine or codeine drug this stems from.²² Another condition in which the urine samples are analyzed is when the blood volume does not suffice for screening and quantitative analyses. Screening for drugs is carried out in the urine, and verification analysis is carried out in the blood. In the past decade, oral fluid use is preferred for detecting drugs, as an alternative to urine analysis.²³ Improved analytical techniques have made possible the analysis of multiple drugs with a small amount of oral fluid.²⁴ The biggest advantage of oral fluid use over urine analysis is that it is an easy, fast and non-invasive sampling procedure.²⁵ In addition, previous studies in the literature report that oral fluid use reflects the most recent drug use better, when compared to the metabolites that are detected in urine for days or even weeks after the use of any drug. In addition, there are several studies reporting that less false positives are detected in oral fluid screening tests than in urine scans, which is explained by the fact that the detection window of the oral fluid is closer to that of the blood.²⁶

In Germany, the legal outcomes depend on the detection of drugs in the blood of drivers. It is imperative to draw blood and have consecutive toxicological analysis in all cases where the driver shows indications of drug use and/or if the screening test is positive. Similarly, in cases sent to the Forensic Medicine Institution, 5th Specialization Board, the evaluation of safe driving ability is carried out according to the results of blood analysis.¹⁹

Validation analyses of the urine were carried out in four cases by the Board, although no expert opinions were reported, because it was not performed on the blood. For this reason, the verification analysis must be carried out on the blood in cases of positive results in saliva or urine screening tests. In our study, although a decrease was determined in the cases where no verification analyses were carried out, compared to 2015 and before, it may be claimed that there was a decrease in the period of the first five months of the year, 2018. Since validation tests were not carried out in nearly 33% of the cases, it was stated in the reports that it could not be claimed that the involved people definitely used the substance according to the positive results obtained only by the screening tests (Figure 7). Again, in the same graphic, since the date and time of the biological sample taken from the individuals were not specified in 3.5% of the cases, no expert opinions could be stated about the effect of the positive substance on the driving safety.

The test parameters, which could be used for prescreening, must be in the form of a panel that aims to detect more than one substance, because many different substances are used in society, and one person may use more than one substance simultaneously. Since the usage profile of medical, judicial and social needs are different in every country, even in every region, it is difficult to standardize this panel. For this reason, every country must determine a test panel that covers the substances with a high-risk potential and those that are often abused, in relation to their own data. The data obtained by the Turkey Drug Addiction Monitoring Center may be used in selecting the substances that will be in the panel to be used in our country. In commercially sold panels, as the number of items scanned increases, the price of the panel also increases. When a ready-made panel that is in the market is chosen, it may even be possible that a substance that is an exception in terms of abuse may be included in the panel content. For this reason, panels that contain the minimum number of drugs that can cover the needs of our country must be ordered as special productions, according to the above-mentioned criteria. The widespread use of screening

tests all over the country and sustaining this attitude will deter drivers from driving under the influence of substances.

Considering the fact that no test is 100% reliable and has the specificity at this rate in drugs, stimulant screening and other healthcare areas, it is inevitable that there will be false negativity or false positivity during the application of these tests, even if the most advanced technology and methods are used.⁵ It must not be forgotten that, although the current laws are fictionalized for deterrence, rehabilitation and the protection of social order, they are also responsible for protecting the rights of individuals. For this reason, receiving false positive results may cause consequences like “the suspension of driver’s license, punishment by fine, and even limitation of freedom by applying the provisions of the Turkish Penal Code”. For this reason, as it is the case in the whole world, the positive results received in roadside screening tests must be confirmed with advanced laboratory techniques, such as Gas Chromatography/Mass Spectrometry (GC/MS) or Liquid Chromatography/Sequential Mass Spectrometry (LC-MS/MS), which have a higher reliability and specificity.^{27,28} According to the European Workplace Narcotics Testing Community, all validation analyses must be quantitative.²⁹

The Forensic Medicine Institution, 5th Specialization Board, decided that the drivers were not able to use vehicles safely in 63.63% of the cases. In some countries, although the blood levels are checked in terms of disrupting driving safety, as in the case of alcohol screening, it is considered sufficient to determine the substances in the blood of the drivers in terms of the effects on their decision-making abilities.³⁰⁻³² In the justification of this decision, even though the substance usage is low in the blood of the individual who uses it, a chronic user will, due to the drug use, have disrupted motor skills, decreased self-control, will be disrupted in terms of the decision-making mechanism, might have personality problems, and other psychological and psychiatric findings will affect safe driving negatively. If it is the driver’s first use of a substance, the driver will be exposed to more negative effects, even at low doses. A similar application is

found in some states of the USA (Arizona, Utah, Michigan, Georgia, and Indiana). No threshold values are defined, and it is claimed that the decision in favor of the view that the presence of drugs will disrupt safe driving will deter drivers from driving under the influence of substances.^{31,33}

If the drug is not detected in the blood, but rather only in the urine, the Board decides that driving safety is not impaired, because it is not possible to determine how long ago the consumption took place. The result of a sample report is as follows:

“If the THC metabolite THC-COOH, which is the active substance of marijuana, is detected as a result of the analysis of urine that is received from a person, it is decided that the person has used marijuana in the time period before the urine sample was received; and since marijuana is among the drugs mentioned in Article 188 of the Law 5237 of the Turkish Penal Code; since it is not investigated whether or not the marijuana is present in the blood of the person on the date of the incident; since the findings on neurological examinations like attention, perception, balance, reflex, psychomotor and neuromotor coordination are missing; and since findings on ophthalmological examination like nystagmus, accommodation, and visual acuity are missing; and the detailed findings on the general situation of the person are missing, which may determine the driving safety of the person at the time of the incidence, it may not be decided that the person cannot manage and use a vehicle with the present findings.”

CONCLUSION

Driving is a complex activity in which the driver details and responds to the data that are received from the outside environment in a constant manner. For this reason, it is obvious that driving performance might be disrupted by any drug, which might influence brain functions and/or mental processes. Many aspects of driving performance may be affected differently by illegal drugs. However, there are still missing data on the effects of drug concentration/deterioration relation and dose-dependent acute and chronic effects on psy-

chomotor functions. Future studies on this issue might be important in terms of evaluating the risks on motorways.

It has been demonstrated in many previous studies that narcotics and stimulant tests are of great importance in terms of ensuring traffic safety. The cost that would be incurred, as a consequence of failing to carry out these tests in the proper manner, are clear in relation to protecting human health and young generations from bad habits, protecting the economy and deterring crime in the country. For this reason, it is necessary to perform drug scans from saliva for reasons, such as the ease in application, less false positivity, when compared to urine analysis, and because the use of the most recent drug by drivers, who are suspected of risky driving in routine traffic controls and/or in traffic, is more accurately determined. In case the screening result is positive, it is essential that a blood test and a validation analysis are carried out with advanced analytical techniques. If the screening test is considered adequate, years of judiciary proceedings may be concluded in favor of the driver, which is in line with the “the suspect benefits from suspicion” principle.

Informing

Due to the presence of the name of the journal editor's among the authors, the assessment process of the study was conducted by the guest editor.

Source of Finance

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: Faruk Aşicioğlu; **Design:** Faruk Aşicioğlu, Emre Mutlu; **Control/Supervision:** Faruk Aşicioğlu, Mustafa Okudan; **Data Collection and/or Processing:** Emre Mutlu, Mustafa Oku-

dan; **Analysis and/or Interpretation:** Faruk Aşıcıoğlu, Emre Mutlu; **Literature Review:** Emre Mutlu, Mustafa Okudan; **Writ-**

ing the Article: Faruk Aşıcıoğlu, Emre Mutlu; **Critical Review:** Faruk Aşıcıoğlu, Mustafa Okudan.

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