

## Study of Methamphetamine Use in Patients Referred to Emergency Ward of a General Hospital at North of Iran in 2017

Pezhman Hadinezhad<sup>1</sup>, Mehran Zarghami<sup>2</sup>, Hosein Montazer<sup>3</sup>,  
Mahmood Moosazadeh<sup>4</sup>, Fattaneh Ghaderi<sup>1</sup>

### Original Article

#### Abstract

**Background:** Acute use of methamphetamine affects the sympathetic system and causes symptoms like tachycardia, hypertension (HTN), tachypnea, peripheral blood vessels constriction, hyperthermia, and mydriasis that can lead to many medical complications. Thus, this study aimed to evaluate the use of methamphetamine, clinical symptoms, and admission causes in patients referred to emergency ward of Imam Khomeini General Hospital in Sari, Iran.

**Methods:** In this cross-sectional study, 3263 patients were enrolled in the census. The population was patients referred to emergency ward of Imam Khomeini Hospital in Sari, in 2017. Clinical signs and symptoms, test results, primary and definite diagnosis, and patients' status during discharge or referral were extracted from medical records. Statistical analysis was performed using SPSS software.

**Findings:** A total of 3263 people were enrolled in the study. The prevalence of positive methamphetamine test in patients referred to the emergency department was 1.2%, which was significantly higher in men ( $P = 0.017$ ). The mean age was  $39.9 \pm 17.2$  years. Methamphetamine users were more likely to be traumatized than the general population. There was a statistically significant difference in seizure ( $P = 0.003$ ), chest pain ( $P < 0.001$ ), tachycardia ( $P < 0.001$ ), palpitation ( $P < 0.001$ ), HTN ( $P = 0.002$ ), tachypnea ( $P = 0.001$ ), visual hallucinations ( $P = 0.001$ ), auditory hallucinations ( $P = 0.001$ ), paranoia ( $P = 0.001$ ), grandiosity ( $P = 0.035$ ), talkativeness ( $P = 0.001$ ), suicidal ideation ( $P < 0.001$ ), homicidal ideation ( $P = 0.001$ ), violence ( $P < 0.001$ ), and disorientation ( $P < 0.001$ ) in positive methamphetamine test group.

**Conclusion:** Methamphetamine use is more frequent in young men in the second and third decades of life. The most common clinical symptoms in these patients were HTN, chest pain, palpitations, tachycardia, seizure, aggression, anxiety, delusions, and hallucinations.

**Keywords:** Emergencies; Hospitals; General; Methamphetamine

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1- Department of Psychiatry, School of Medicine, Mazandaran University of Medical Sciences, Sari, Iran

2- Psychiatry and Behavioral Sciences Research Center, Addiction Institute, Mazandaran University of Medical Sciences, Sari, Iran

3- Department of Emergency Medicine, School of Medicine, Mazandaran University of Medical Sciences, Sari, Iran

4- Department of Health, School of Medicine, Mazandaran University of Medical Sciences, Sari, Iran

Correspondence to: Mehran Zarghami, Email: [mehran.zarghami@gmail.com](mailto:mehran.zarghami@gmail.com)

## Introduction

Methamphetamine is a central nervous system (CNS) stimulant from the amphetamines group. This substance is now rank second worldwide in the table of most widely used recreational drugs.<sup>1</sup> It is a synthetic derivative of amphetamine that is fat-soluble due to a methyl group addition to its chemical structure, which allows it to pass through the blood-brain barrier (BBB) more quickly,<sup>2</sup> resulting in dopamine release at 600 times of normal levels that affects dopamine receptors in the brain, which causes excessive euphoria.<sup>3</sup>

The most common methamphetamine using routes are smoking, sniffing, injection, and eating.<sup>4</sup> In Iran, smoking is the most common method of use.<sup>4</sup> According to the recent reports from the Drug Control Center (DCC) in Iran, only 3.6% of the drug abusers in Iran used methamphetamine, although its use has increased in recent years, due to increased production inside country and reduced prices.<sup>5</sup> Informal reports indicate that methamphetamine is the second or third highest recreational drug used in Iran.<sup>6</sup> Inexpensive and affordable materials such as alcohol, gasoline, acetone, ammoniac, kitchen salts, acidic solutions, common cold medications, or any other medications containing ephedrine or pseudoephedrine are the primary ingredients of the glass, which causes an increased production and use of this substance.<sup>7</sup>

Methamphetamine directly affects most body organs and causes hypertension (HTN), tachycardia, and cardiovascular events including myocardial infarction (MI), cardiac dysrhythmias, ventricular hypertrophy (VH), pulmonary edema, pulmonary HTN, cerebral hemorrhage, stroke, seizure, psychosis, and eventually death.<sup>8</sup> Methamphetamine users are more likely to suffer from skin infections, oral and dental problems, as well as accidents caused by reduced consciousness and quarrels. In addition to psychosis, anxiety, panic attacks, and mood disorders are also common in these people.<sup>6,9-11</sup> Acute use of methamphetamine affects the sympathetic system and causes symptoms like tachycardia, HTN, tachypnea, peripheral blood vessels constriction, hyperthermia, and mydriasis,<sup>12</sup> and could cause irreversible damage to brain blood vessels, leading to stroke. Other effects of amphetamines include respiratory

problems, irregular heart rate, severe anorexia, and psychological problems.<sup>13</sup>

In recent years, psychosis has increased with methamphetamine use in Iran.<sup>14</sup> Psychotic symptoms from methamphetamine use are different. There is controversy in psychotic symptoms associated with methamphetamine use which some authors believe it is similar to the symptoms of schizophrenia and other authors believe it is different. Studies in Iran have suggested that psychiatric manifestations of methamphetamine use differ from schizophrenia.<sup>15</sup> The most common psychiatric symptoms associated with methamphetamine use in Iran include aggression, spousal violence, persecutory delusions, delusion of reference, delusion of grandeur, delusional jealousy, visual and auditory hallucinations, and homicidal and suicidal ideation.<sup>16</sup>

This study aimed to evaluate the use of methamphetamine, clinical symptoms, and admission causes in patients referred to emergency ward of Imam Khomeini Hospital in Sari, Iran.

## Methods

In this cross-sectional study, 3263 patients were enrolled in the census. The population was patients referred to emergency ward of Imam Khomeini Hospital in Sari, in 2017. Urine test was taken and the patients with positive and negative test results were followed up for diagnostic and therapeutic procedures, and then these two groups were compared with each other. Clinical signs and symptoms, test results, primary and definite diagnosis, and patients' status during discharge or referral were extracted from medical records.

Statistical analysis was performed using the SPSS software (version 20, IBM Corporation, Armonk, NY, USA). Chi-square and Fisher's exact tests were used to compare between qualitative variables; and comparison of mean age among two variables was done with independent t-test and for more than two variables was performed by analysis of variance (ANOVA). Logistic regression test was used to verify the odds ratio (OR) of related variables. A significance level of  $P < 0.050$  was used. Data were expressed as mean and standard deviation (SD).

## Results

A total of 3263 people were enrolled in the study, 2084 (63.9%) were men and 1179 (36.1%) were

women. There were 32 (1.0%) men and 7 (0.2%) women with positive methamphetamine tests. The prevalence of positive methamphetamine test in patients referred to the emergency department was 1.2%. Positive test results for methamphetamine were significantly higher in men ( $P = 0.017$ ). The mean age was  $39.9 \pm 17.2$  years with the range of 15-94 years. The mean age for methamphetamine users was 31.23 years which was significantly lower than all patients' mean age ( $P < 0.001$ ).

In group with positive test result, 15 were married, 20 were single, and 4 were divorced. In general, the frequency of positive methamphetamine test in married people was 0.7%, in singles was 1.9%, and in divorced patients was 5.3%. The difference was statistically significant ( $P < 0.001$ ). Also, in these subjects, 14 had under diploma educational level (1.6%), 14 had diploma (1.0%), and 11 had undergraduate and bachelor degrees (1.4%), and there were no statistically significant differences between them.

In negative test group, 1868 patients came by themselves, 1353 by others, and 3 were taken by the police. In positive test group, 10 people came by themselves, 27 by others, and 2 were taken to the emergency by the police. The frequency of people who were positively tested and came by others or by the police was higher and this difference was statistically significant ( $P < 0.001$ ).

In order to better assess the time of referral to the emergency department, we divided the 24 hours into 4 groups. The first group is from 12 midnight to 7 am (from the end of the night and generally the sleep hour for the people), the second group from 7 am to 2 pm (office hours, etc.), the third group from 2 pm to 8 pm (evening shift or second job time), and the fourth group from 8 to 12 pm (early night and entertainment time). The results indicated that more than half (53.1%) of the patients with positive test referred in fourth time group, which was statistically significant ( $P = 0.003$ ).

Multi substance use in methamphetamine positive group was reported as 5 were smoking cigarette, 3 had alcohol consumption, 3 were cannabis users, and 5 were opium users at the same time, but no heroin use was reported in patients. Comorbidity of drugs was significantly higher in methamphetamine users compared to the general population ( $P < 0.001$ ) (Table 1).

**Table 1.** Signs and symptoms in methamphetamine positive group

Signs and symptoms	Methamphetamine positive group (%)	P
Headache	13.4	0.050
Dizziness	19.7	0.050
Nausea and vomiting	22.6	0.050
Loss of consciousness	12.9	0.050
Seizure	2.4	0.003
Chest pain	6.7	0.001
Tachycardia	3.4	< 0.001
Palpitation	6.2	< 0.001
HTN	3.0	0.002
Tachypnea	2.6	0.001
Dyspnea	4.6	> 0.050
Visual hallucinations	1.7	0.001
Auditory hallucinations	1.7	0.001
Paranoia	2.1	0.001
Grandiosity	1.7	0.035
Violence	3.8	< 0.001
Talkativeness	2.1	0.001
Suicidal ideations	2.8	< 0.001
Homicidal ideations	1.7	0.001
Disorientation	2.6	< 0.001
Skin problems	2.2	> 0.050
Dental problems	3.5	> 0.050
Trauma	19.3	> 0.050

HTN: Hypertension

Table 2 shows the cause of referral in all patients who referred to emergency ward of general hospital and registered by physician at the emergency ward.

**Table 2.** Cause of referral in all patients

Cause of referral	n (%)
Poisoning	88 (2.7)
Chest pain	90 (2.7)
Anxiety	15 (0.5)
Headache and dizziness	153 (4.6)
Digestive problems	82 (2.5)
Weakness and lethargy	162 (4.9)
Abdominal pain	359 (10.8)
Fever-ascites	66 (2.0)
Testicular pain	35 (1.1)
Kidney problems and urinary retention	115 (3.5)
Dyspnea-pulmonary problems	92 (2.8)
Vomiting-nausea	96 (2.9)
Suicide	65 (2.0)
Fever and chills	46 (1.4)
Seizures-loss of consciousness	61 (1.8)
Limbs pain	103 (3.1)
Low back pain	83 (2.5)
Bite	31 (0.9)
Cirrhosis	84 (2.5)

588 cases were traumatized, of which 14 were in positive group and 574 were in negative group. Positive methamphetamine test was reported more significantly in people who were referred to the emergency department with trauma due to quarrels and car accidents ( $P = 0.003$ ).

The diagnosis frequency in methamphetamine positive group was reported as acute coronary syndrome (ACS) (1 case), acute abdomen (1 case), emotional distress (2 cases), asthma (1 case), chest pain (2 cases), drug toxicity (9 cases), deep vein thrombosis (DVT) (1 case), car accidents (10 cases), sepsis (2 cases), self-injury (1 case), stab wound (1 case), fever and chills (1 case), and beating (6 cases).

As mentioned in table 3, diagnosis in patients referred to emergency ward is very different because of the variety of physicians who registered the diagnosis.

**Table 3.** Diagnosis in patients referred to emergency ward

Diagnosis	n (%)
Abdominal pain	251 (7.7)
ACS	9 (0.3)
Acute abdomen	30 (0.9)
Alcohol toxicity	7 (0.2)
Anemia	84 (2.6)
Ankle sprain	58 (1.8)
Emotional distress	12 (0.4)
Asthma or COPD	80 (2.5)
Chest pain	84 (2.6)
Direct trauma	621 (19.0)
Renal failure	7 (0.2)
Drug toxicity	128 (3.9)
DVT	6 (0.2)
Gastroenteritis	42 (1.3)
GI bleeding	33 (1.0)
Headache	51 (1.6)
Head trauma	147 (4.5)
Low back pain	79 (2.4)
Decreased LOC	33 (1.0)
Car accident	580 (17.8)
Sepsis	12 (0.4)
Renal colic	74 (2.3)
Self-injury	31 (1.0)
Stab wound	42 (1.3)
Testis pain	32 (1.0)
BPH	6 (0.2)
Vertigo	75 (2.3)
Vomiting	75 (2.3)
Weakness	103 (3.2)
Influenza	29 (0.9)
Epilepsy	10 (0.3)
Insect bite	30 (0.9)
Fighting	78 (2.4)
Others	324 (9.9)
Total	3263 (100)

ACS: Acute coronary syndrome; COPD: Chronic obstructive pulmonary disease; DVT: Deep vein thrombosis; GI: Gastrointestinal; LOC: Level of consciousness; BPH: Benign prostatic hyperplasia

## Discussion

In a study that took place in 16 Emergency Centers for Recreational Drugs from October 2013 to September 2014 in ten European countries, the mean age of drug users was 31 years and 75.4% of them were men.<sup>17</sup> All participants in our study were 3263 people, 39 (1.2%) of them were using methamphetamine and mean age of methamphetamine users was similar to the previous study. Also in our study, methamphetamine use was significantly higher in men than women. The results of these two studies are similar to each other. But the previous study did not mention the clinical signs and symptoms, diagnoses, and treatment process for methamphetamine users in emergency ward. Liakoni et al. evaluated the acute health problems caused by recreational drug use in a referral to an urban emergency center from October 2013 to September 2014 in Switzerland, 16% of them were taking methamphetamine. The study did not specifically address the clinical signs and symptoms of methamphetamine use, but overall, the most common signs and symptoms were tachycardia (31%), anxiety (27%), nausea and vomiting (23%), and agitation (22%); moreover, 68% of the patients were discharged, 8% were admitted for intensive care, and 9% were referred to psychiatric centers. The prevalence of signs and symptoms reported in this study was for all recreational substances and not just methamphetamine.<sup>18</sup> In our study, there was a statistically significant relationship between seizure, chest pain, tachycardia, palpitations, HTN, tachypnea, visual and auditory illusions, paranoia, grandiosity, aggression, suicidal and homicidal ideations, and disorientation with positive methamphetamine test results.

Hendrickson et al. study in the University of Oregon, Portland, United States of America (USA), showed that most methamphetamine abusers were male, white, and with no insurance. The main four medical problems associated with methamphetamine use were psychiatric disorders (18.7%), trauma (18.4%), skin infections (11.1%), and dental disorders (9.6%).<sup>19</sup> The results of this study are similar to those of our study. The most frequent abusers of methamphetamine were unemployed men and methamphetamine use also was significantly related to skin problems, dental disorders, as well as traumatic accidents in our study.

Pasic et al. study showed that methamphetamine users were notably young men, referred by the police, with clinical signs and symptoms of cardiac problems, psychosis, and agitation; also they had fewer previous diagnosis of schizophrenia, a history of previous psychiatric disorder, and a history of suicide attempts. This study showed that HTN and tachycardia in the time of arrival to emergency and psychosis and agitation of methamphetamine use had no relation to the diagnosis of schizophrenia.<sup>20</sup> In our study, methamphetamine users were more likely to be referred by police or ambulance in comparison to the general population, and their clinical signs and symptoms, including visual and auditory hallucinations, agitation, tachycardia, and HTN were significantly more than the general population.

Hirabayashi et al. showed that the prevalence of methamphetamine abuse in emergency departments of Japan was lower than that of USA emergencies.<sup>21</sup> The results of our study are more similar to USA emergencies.

Mattson survey in USA extracted data of methamphetamine abusers who referred to emergency departments from 2007 to 2011. Patient referral rates increased in 2011 compared to 2007, which was the same for both men and women. 64% of patients were discharged after the visit and treatment. The results of this study showed that majority of patients seen for medical emergencies involving methamphetamine were simply treated and released.<sup>22</sup> In our study, 16 cases were discharged, 2 were referred, 11 were consulted, 8 were consulted and then released, and 2 were consulted and then referred. It is essential to educate and better inform the emergency staff so that they better know the clinical signs and symptoms of methamphetamine use.

In another retrospective study by Richards et al. at a trauma center in USA, patients who referred to the hospital from May 2016 to August 2016 were examined and the results were compared to the similar study that was conducted 20 years ago in 1996.<sup>23</sup> In 3 months, 20203 patients referred to hospital and 3013 of them were tested for drug toxicity by urine test which 638 ones were positive for methamphetamine, a significant increase compared with the results of 20 years ago. The age of methamphetamine users was higher than the previous study; the type of

referral was more by ambulance, but it was lower than the previous study, alcohol and cocaine use at the same time was similar to 20 years ago, hospitalization was reduced, but was same in prisoners. Patients with chest pain symptom increased and blunt trauma decreased as compared with the previous study.<sup>23</sup> The results of this study were similar to the results of our study. However, our study can also be repeated in the coming years to compare the results with the current results.

McKetin et al. study reported that health service use was high in methamphetamine users. Comorbid mental health disorders, unemployment, unstable housing, attending drug treatment, low income, and lower education were also high in these patients.<sup>24</sup> In this study, methamphetamine consumption was similar to our study. In our study, methamphetamine users had similar symptoms like agitation, anxiety, psychosis as well as unemployment and lower educational level.

Khanjani et al. survey in Shiraz, Iran, showed that generally, drug and alcohol use was increasing the risk of traffic crashes. This study was conducted only on population of motorcycle drivers with aim to investigating the increase in accidents.<sup>25</sup> In our study, methamphetamine users were more likely to be traumatized than the general population. Nonetheless, the study of Khanjani et al.<sup>25</sup> was not only for methamphetamine use and was conducted for general drugs.

Our results showed that methamphetamine users had a higher incidence of seizure than general population. This result is consistent with the result of Behnoush et al.<sup>26</sup> study, which was conducted in Baharlou Hospital in Tehran, Iran.

Goudarzi et al. study in Shiraz showed that glass was the most consumed stimulant (46.5%) and sniffing (60.8%) was more frequent than other methods. Hallucination in women and dyspnea in men were significantly higher. Complete recovery was significantly higher in the younger ages. After treatment, 2.8% had complete recovery and 18.8% were discharged with some complications from drug use. Coma was reported in 5.1% of the patients, but there was no death in these patients.<sup>27</sup> In our study, 26 cases of 39 methamphetamine users did not report multidrug consumption. But 11 people consumed 1 more



substance at the same time, one case had concurrent use of 2 more substances, and another one mentioned concurrent use of 3 more substances. Substance use comorbidity in methamphetamine users was significantly higher than the general population ( $P < 0.001$ ), and in our study, the diagnoses in amphetamine users were ACS (1 case), acute abdomen (1 case), emotional distress (2 cases), asthma (1 case), chest pain (2 cases), drug toxicity (9 cases), DVT (1 case), car accidents (10 cases), sepsis (2 cases), self-injury (1 case), stab wound (1 case), fever and chills (1 case), and beating (6 cases).

In Zarghami et al. study, the most frequent symptoms in methamphetamine users were aggression, decreased sleep, paranoia, and self-talking, respectively. They reported that, the pattern of substance consumption was changing from opioid to methamphetamine in Iran.<sup>28</sup> In the present study, the prevalence of methamphetamine use in the general hospital was lower than the psychiatric emergency. Symptoms in patients referred to psychiatric emergency were mostly mental problems, and other medical complications have not been evaluated. But our study at the general hospital emergency showed that in addition to psychiatric signs and symptoms, recent use of methamphetamine could cause many medical signs and symptoms, including cardiovascular events, seizures, accidents and quarrels, as well as other less common complications such as skin and dental disorders.

Limitations: Given the fact that the study was conducted in a census and physicians were present at different shifts in the hospital, clinical evaluations and diagnosis of patients were performed by different physicians. Unfortunately,

in many cases, instead of diagnosis, the symptoms of the disease were recorded, and medical records in the emergency department did not have an International Statistical Classification of Diseases (ICD) code. Similarly, other studies have highlighted the number of physicians and the difficulties in including multiple diagnoses in the study limitations.<sup>23</sup>

## Conclusion

According to the results of other studies in methamphetamine use and this study, notably the clinical presentations of methamphetamine use in different individuals have a wide range, and methamphetamine use is more frequent in young men in the second and third decades of life. The most common clinical symptoms in these patients were HTN, chest pain, palpitations, tachycardia, seizure, aggression, anxiety, delusions, and hallucinations. This highlights the need for more focus on identifying these patients in public hospitals, especially emergency departments, and also for highly educated and trained emergency staff in this field.

## Conflict of Interests

The Authors have no conflict of interest.

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# بررسی مصرف مت‌آمفتامین در مراجعه‌کنندگان به اورژانس بیمارستان عمومی شمال ایران در سال ۱۳۹۶

پژمان هادی‌نژاد<sup>۱</sup>، مهران ضرغامی<sup>۲</sup>، حسین منتظر<sup>۳</sup>، محمود موسی‌زاده<sup>۴</sup>، فثانه قادری<sup>۱</sup>

## مقاله پژوهشی

## چکیده

**مقدمه:** مصرف حاد مت‌آمفتامین با اثر بر سیستم سمپاتیک بدن، منجر به بروز علایمی مانند افزایش ضربان قلب، آریتمی، پرفشاری خون، افزایش تعداد تنفس، تنگ شدن عروق خون محیطی، گشادی مردمک، تشنج، علایم روان‌پزشکی و علایم متنوع دیگر می‌شود و می‌تواند باعث آسیب غیر قابل بازگشت به عروق خونی مغز گردد. به علت تظاهرات بالینی متعددی که مصرف مت‌آمفتامین ایجاد می‌کند و همچنین، با توجه به مصرف گسترده این ماده در جامعه، بررسی و مطالعات بیشتری در این زمینه ضروری به نظر می‌رسد.

**روش‌ها:** در مطالعه توصیفی- مقطعی حاضر، ۳۲۶۳ نفر از افراد بستری شده در بخش اورژانس بیمارستان امام خمینی (ره) ساری در سال ۱۳۹۶ به صورت سرشماری (نمونه‌های در دسترس) مورد بررسی قرار گرفتند. تست ادرار جهت بررسی مصرف مت‌آمفتامین گرفته شد و یافته‌های بالینی ثبت گردید. بیماران با تست مثبت و منفی، از لحاظ تشخیصی و اقدامات درمانی پیگیری و سپس با هم مقایسه شدند.

**یافته‌ها:** ۲۰۸۴ نفر از بیماران مرد (۶۳/۹ درصد) و ۱۱۷۹ نفر (۳۶/۱ درصد) زن بودند. شیوع کلی مصرف مت‌آمفتامین در مراجعه‌کنندگان به اورژانس بیمارستان، ۱/۲ درصد گزارش شد که در مردان به صورت معنی‌داری بیشتر بود ( $P = ۰/۰۱۷$ ). میانگین سنی مصرف‌کنندگان مت‌آمفتامین،  $۱۷/۲ \pm ۳۹/۹$  سال بود. نمونه‌ها بیشتر متارکه کرده بودند. سطح تحصیلات پایین‌تر داشتند، بیکار بودند و توسط آمبولانس یا پلیس و بیشتر در ساعات ابتدایی شب به مرکز آمده بودند. ارتباط معنی‌داری بین تشنج ( $P = ۰/۰۰۳$ )، درد قفسه سینه ( $P < ۰/۰۰۱$ )، تاکی‌کاری ( $P < ۰/۰۰۱$ )، تپش قلب ( $P < ۰/۰۰۱$ )، پرفشاری خون ( $P = ۰/۰۰۲$ )، تاکی‌پنه ( $P = ۰/۰۰۱$ )، توهم بینایی ( $P = ۰/۰۰۱$ )، توهم شنوایی ( $P = ۰/۰۰۱$ )، بدبینی ( $P = ۰/۰۰۱$ )، خودبزرگ‌بینی ( $P = ۰/۰۳۵$ )، پرحرفی ( $P = ۰/۰۰۱$ )، افکار خودکشی ( $P < ۰/۰۰۱$ )، افکار دگرگشی ( $P = ۰/۰۰۱$ )، خشونت ( $P < ۰/۰۰۱$ )، هوشیار نبودن ( $P < ۰/۰۰۱$ ) و تست مثبت مت‌آمفتامین مشاهده گردید.

**نتیجه‌گیری:** با توجه به تنوع علایم بیماران به ویژه علایم روان‌پزشکی، قلبی- عروقی و سامانه اعصاب، توصیه می‌شود به ویژه در آقایان در دهه سوم عمر، سوء مصرف مت‌آمفتامین در مراجعان به اورژانس بیمارستان‌ها مورد توجه قرار گیرد.

**واژگان کلیدی:** اورژانس، بیمارستان عمومی، مت‌آمفتامین

**ارجاع:** هادی‌نژاد پژمان، ضرغامی مهران، منتظر حسین، موسی‌زاده محمود، قادری فثانه. بررسی مصرف مت‌آمفتامین در مراجعه‌کنندگان به اورژانس بیمارستان عمومی شمال ایران در سال ۱۳۹۶. مجله اعتیاد و سلامت ۱۳۹۷؛ ۱۱ (۱): ۲۵-۱۸.

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۱- گروه روان‌پزشکی، دانشکده پزشکی، دانشگاه علوم پزشکی مازندران، ساری، ایران

۲- مرکز تحقیقات روان‌پزشکی و علوم رفتاری، پژوهشکده اعتیاد، دانشگاه علوم پزشکی مازندران، ساری، ایران

۳- گروه طب اورژانس، دانشکده پزشکی و بیمارستان امام خمینی، دانشگاه علوم پزشکی مازندران، ساری، ایران

۴- گروه بهداشت، دانشکده پزشکی، دانشگاه علوم پزشکی مازندران، ساری، ایران

Email: mehnan.zarghami@gmail.com

نویسنده مسؤول: مهران ضرغامی