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Self-Reported Methamphetamine Use Versus Biological Testing Among Treatment-Seeking Patients

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Abstract

Background: The validity of self-reported methamphetamine use among treatment-seeking patients has been reported as inconsistent and therefore inconclusive.
Objectives: To evaluate the validity of self-reported methamphetamine use versus urinalysis in patients with methamphetamine use disorder at a drug treatment center.
Methods: In this cross-sectional study, we enrolled 71 individuals with methamphetamine use disorder who were referred to the Iranian National Center for Addiction Studies (INCAS) clinic. Self-reported methamphetamine use in the last 72 hours was compared to urinalysis, conducted using the immunoassay technique. Sensitivity, negative predictive value (NPV), Cohen's kappa statistics, percent agreement, and positive percent agreement were estimated.
Results: Only 24.6% of participants reported methamphetamine use during treatment. Self-reported methamphetamine use had a sensitivity of 50.0% and a NPV of 86.0%. The percent agreement, positive percent agreement, and Cohen's kappa statistic between self-reported use and the urine test were 86.0%, 42.8%, and 52.4%, respectively. No significant factors were found to be associated with the agreement between self-reported use and the urine test.
Conclusions: The validity of self-reported methamphetamine use appears to be relatively acceptable and can be used with caution for monitoring treatment.

Keywords: Amphetamine-Type Stimulants, Urinalysis, Diagnostic Accuracy, Addiction, Biological Testing

1. Background

It is estimated that amphetamine-type stimulants (ATS) are used by 0.4% (1.8 million people) of the adult population in the last 12 months in the Eastern Mediterranean region, with the highest estimates in West Asia. In Iran, the prevalence of ATS use in the last 12 months was estimated to be 0.5% in adult men and 0.1% in adult women (1). Methamphetamine use, which is the primary ATS used in the country, emerged in 2008, increased thereafter, and resulted in adverse public health consequences (1-3). According to the latest national survey on people who use drugs (PWUD) in 2018, methamphetamine is the current primary drug of use for 13.7% of users, making it the third most common after opium and heroin (4). Additionally, there has been a rise in the demand for treatment for methamphetamine use disorder in the country (2). Treatment centers provide therapy for methamphetamine use disorder, including psychotherapy (5).

Adherence to and response to treatment are usually monitored via biological testing during and after the treatment (6). Lack of access in some settings, non-cooperation in providing the sample, and the added costs might limit the continuous application of biological tests in treatment programs. Although self-reported use is a cheap and non-invasive alternative to

biological testing, concerns about incorrect reporting exist. Evidence on whether self-reported substance use agrees with biological testing results has been inconclusive. While some studies confirm high levels of agreement, others show the opposite (7-9). Most of our understanding of the validity of self-report comes from studies on other types of substances, especially cocaine, with few studies focusing specifically on ATS use (9).

2. Objectives

We investigated: (1) the sensitivity and negative predictive value (NPV) of self-reported methamphetamine use (SR); (2) the agreement between SR and urine tests (UT); and (3) the factors associated with the validity of SR among patients with methamphetamine use disorder who sought treatment at our drug treatment center.

3. Methods

3.1. Setting, Participants, and Protocol

In this cross-sectional study, conducted from November 2015 to June 2017, we recruited individuals seeking treatment for methamphetamine use disorder at the Iranian National Center for Addiction Studies (INCAS) clinic, an outpatient referral drug treatment center located in downtown Tehran, Iran. Patients were diagnosed with methamphetamine use disorder through psychiatric interviews upon admission. Patients were eligible for the study if they were 15 or older and had received at least one week of treatment. At the time of enrollment, patients were on various treatment schedules, and the number of their visits varied according to the treatment. We identified three phases based on the treatment protocol for methamphetamine use disorder: (a) the "first month;" (b) the "second and third months;" and (c) the "fourth month and afterward." Only the first visit of each individual in each period was used for data analysis.

Clinicians asked the participants about their methamphetamine use in the previous 72 hours and required them to provide a urine sample (20 milliliters) to the INCAS lab. A qualitative assessment of any ATS use was performed on urine samples using a strip test based on immunoassay (Guangzhou Wondfo Biotech Co., China). Cutoffs were 1000 nanograms per milliliter for both amphetamines and methamphetamine. Patients having either a positive UT or positive SR were categorized as "use." Those who had negative results from both UT and SR were labeled "no use." The study protocol was approved by the Tehran University of Medical Sciences Institutional Review Board (IR.TUMS.REC.1394.313).

3.2. Statistical Analyses

All analyses were performed using STATA 14 software. The validity of SR, including sensitivity, NPV, false-negative rate, false omission rate, and 95% confidence intervals, was estimated for each time interval using the "diagt" command. A multilevel model was used since some participants were tested at different time intervals. The "kap" and "kapci" commands were used to assess the agreement of SR and UT for methamphetamine use, percent agreement, positive percent agreement, and Cohen's kappa statistics. Bivariate and multivariate multilevel logistic regression with the "melogit" command was used to assess the agreement between SR and UT and the association between study variables.

4. Results

4.1. Participants' Characteristics

For this study, 71 patients with methamphetamine use disorder were recruited. The patients did not report any other drug use in the last month. Most of the patients were male (88.7%), with a mean age of 34.2 years (range 15 - 49, SD: 7.1). All patients lived in stable housing; 62.3% were married, 30.4% were never married, and 7.3% were previously married. Almost half (56.5%) of the patients had a high school education or higher, and 64.3% had full-time or part-time jobs. One-third (33.8%) reported a previous history of incarceration, and 9.9% reported a history of injecting drug use in their lifetime. Overall, 57.7% of patients received behavioral drug and risk reduction counseling (BDRC), while 42.3% received other types of psychological therapy.

4.2. Self-Reported, Urine Tests, and Validity Indices

A total of 114 SRs and UTs were evaluated (Appendix 1 in the Supplementary File). The number of visits included in the study varied from one to three. Almost half of the samples were gathered in the "first month," 31.6% in the "second and third months," and 20.2% in the "fourth month and afterward." The prevalence of "use"

Table 1. Validity Measurements of Self-Reported Among Patients with Methamphetamine Use Disorder

Time	Frequency of Tests	Methamphetamine Use [a] % (95% CI)	Sen [b] (95% CI)	FNR [c] (95% CI)	NPV [d] (95% CI)	FOR [e] (95% CI)	PA	PPA	K [f] (95% CI)
First month	55	30.9 (19.1 - 44.8)	64.7 (38.3 85.8)	35.3 (14.2 - 61.7)	86.4 (72.6 - 94.8)	13.6 (5.2 - 27.4)	85.4 (76.1 - 94.8)	52.9 (29.2 - 76.7)	60.0 (35.4 - 84.6)
2nd and 3rd months	36	22.2 (10.1 - 39.2)	25.0 (3.2 - 65.1)	75.0 (34.9 - 96.8)	82.4 (65.5 - 93.2)	17.6 (6.8 - 34.5)	83.3 (71.1 - 95.5)	25.0 (0 - 55.0)	34.1 (-2.1 - 70.3)
4th month and afterward	23	13.0 (2.8 - 33.6)	33.3 (0.8 - 90.6)	66.7 (9.4 - 99.2)	90.9 (70.8 - 98.9)	9.1 (1.1 - 29.2)	91.3 (79.8 - 100)	33.3 (0 - 86.7)	46.5 (-13.3 - 100)
Total	114	24.6 (17.0 - 33.5)	50.0 (30.6 - 69.4)	50.0 (30.6 - 69.4)	86.0 (77.6 - 92.1)	14.0 (7.9 - 22.4)	86.0 (79.6 - 92.3)	42.8 (24.5 - 61.2)	52.4 (32.8 - 72.0)

Abbreviations: Sen, sensitivity; FNR, false negative rate; NPV, negative predictive value; FOR, false omission rate; PA, percent agreement; PPA, positive percent agreement; K, cohen's kappa statistics.

[a] Methamphetamine use either by UT or by SR.

[b] The percentage of methamphetamine users who report using the drug.

[c] The percentage of methamphetamine users who didn't report using the drug. (FNR = 1-true positive rate or Sen).

[d] The percentage of people with negative SR who had negative UT.

[e] The percentage of people with negative SR who had positive UT. (FOR = 1-NPV).

[f] Agreement between SR and UT.

in the past 72 hours was 24.6%, ranging from 30.9% in the "first month" to 13.0% in the "fourth month and afterward" (Table 1). SR had a sensitivity of 50.0%, with the highest value of 64.7% in the "first month." Self-reported had a NPV of 86.0%, with the highest value (90.9%) in the "fourth month and afterward" (Table 1).

4.3. Agreement Between .Self-Reported Use and Urine Tests

Between SR and UT, the percent agreement, positive percent agreement, and Cohen's kappa statistics were 86.0%, 42.8%, and 52.4%, respectively (Table 1). There were no significant factors associated with the agreement between SR and UT in multilevel bivariate logistic regression (Table 2).

5. Discussion

In our study, half of the patients who had used methamphetamine reported their use (sensitivity of SR). Almost nine out of ten patients who did not report using methamphetamine had a negative UT (NPV). Overall, one-fourth of the patients continued to use methamphetamine during treatment.

The prevalence of use during treatment was higher (30.9%) in the first month and dropped considerably over time. This reduction in the prevalence of methamphetamine use in patients under treatment is expected and could be linked to the efficacy of the treatment (10, 11). Self-report had the highest sensitivity (64.7%) during the first month of treatment. However, changes over time cannot be interpreted due to the limited sample size in the time intervals.

Our study's finding of a 50% sensitivity rate closely aligns with the overall estimates from studies evaluating the sensitivity of SR of methamphetamine use in the last week (9). The sensitivity of SR ranged from 4% to 89% in the past 1 - 4 days and from 14% to 99% in the past month (9). Sensitivity rates might be affected by various factors, including patients' sex, motivations for treatment, the approach and duration of treatment, timeframe of SR, and the characteristics of therapists (9, 12-14). Randomized controlled trials demonstrated higher sensitivity rates compared to observational studies or real-world data (7, 9, 13).

In our study, SR showed a high NPV, particularly in the later stages of treatment. Lower methamphetamine use contributed to the increase in NPV over time; however, even in the first month, the NPV was acceptable. Yet, our study's NPV is relatively lower compared to the pooled estimate of NPV in Bharat's systematic review, which reported an NPV as high as 97% for the subgroup of studies on people with dependence and for studies evaluating SR of ATS use in the past 1 - 7 days (9).

The validity of SR might vary based on the type of substance used. Patients with opioid use disorder in a similar study showed higher sensitivity of SR and agreement with UT (15). This may be due to higher levels of stigmatization of methamphetamine use in Iran, which is consistent with existing evidence (9). The psychopathology of people with ATS use disorder might

Table 2. Multilevel Bivariate Logistic Regression of Factors Associated with Agreement Between Self-Reported and Urine Tests

Variables	Odds Ratio	95% CI	P-Value
Age	0.99	0.91 - 1.07	0.735
Sex [a]	NE	NE	NE
History of incarceration	1.52	0.46- 5.09	0.494
Married [b]	0.79	0.25 - 2.47	0.688
Unemployed [d]	2.03	0.54 - 7.66	0.293
Educational status [c]	0.91	0.44 - 1.86	0.788
Time since treatment initiation [d]	1.21	0.60 - 2.43	0.602
History of lifetime Injection drug use	1.52	0.18 - 12.85	0.703

Abbreviation: NE, not estimated.

[a] Male vs. female. Since SR and UT agreed in every female patient, they were eliminated from the model.

[b] Married versus never married and ex-married.

[c] As ordinal variable (illiterate, primary school, middle school, high school, university).

[d] As ordinal variable (first month, second and third months, and fourth months and afterward).

be different from those with other drug use disorders. Future studies can address the differences between various types of substances and the role of underlying factors.

5.1. Conclusions

Although the NPV of SR was satisfactory, the results for sensitivity and agreement indices were less than desirable. In settings with restricted access to biological testing, relying on SR can be clinically useful. Future studies with larger sample sizes and different settings can help in deciding on the necessity of biological testing in various contexts.

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Supplementary Material

Supplementary material(s) is available here [To read supplementary materials, please refer to the journal website and open PDF/HTML].

Footnotes

Authors' Contribution: Study concept and design, B. S., and A.R.M.; acquisition of data, S.B., and Y.R.A.; analysis and interpretation of data, J.G., Y.R.A., and S.B.; drafting of the manuscript, M.A., Y.R.A., and S.B.; critical revision of the manuscript for important intellectual content, J.G., B.S., and A.R.M.; statistical analysis, J.G., S.B., and Y.R.A.; administrative, technical, and material support, B.S.; study supervision, B.S., J.G., and A.R.M.

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Data Availability: The dataset presented in the study is available on request from the corresponding author during submission or after publication. The data are not publicly available due to privacy and other restrictions.

Ethical Approval: The Tehran University of Medical Sciences Institutional Review Boards approved all study procedures (Ethics code no: IR.TUMS.REC.1394.313), and all ethical guidelines were followed.

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Informed Consent: All participants were informed about the study. All participants consented to participate in the study. All participants, regardless of their decision to participate or not, continued to receive their services.

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