

Comparative Assessment of Clinical and Psychiatric Profiles in Subjects Using Methamphetamine and Synthetic Cathinones

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Received: 25-06-2023 / Revised: 28-07-2023 / Accepted: 30-08-2023

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Conflict of interest: Nil

Abstract:

Background: Synthetic Cathinones are widely used for the treatment of various psychiatric conditions including self-harm, violence, and psychosis as they exert psychoactive effects similar to methamphetamine. However, the differences in clinical presentation patterns of methamphetamine and synthetic cathinone remain unclear.

Aim: The present study aimed to comparatively assess the clinical and psychiatric profiles of subjects using Methamphetamine and Synthetic Cathinones.

Methods: The study assessed subjects with intoxication admitted to the Department of Psychiatry of the institute. In all the subjects, the interview was done to collect psychopathological, lifestyle, and sociodemographic data. Liquid chromatography–quadrupole time-of-flight mass spectrometry and immunoassay was done to assess substance from the urine sample. Logistic regression was used to assess physical complications and associations between the two groups.

Results: 12 subjects were identified with synthetic cathinone intoxication that were matched with 24 subjects with methamphetamine intoxication. In the two groups, a high risk of self-harm and violence was seen along with similar severity in the clinical psychotic symptoms. Habitual drinkers, smokers, unemployed, and unmarried subjects were dominant in both groups. High physical complications and lower history of family substance use were seen in synthetic cathinone intoxication compared to methamphetamine use.

Conclusion: The present study concludes that the subjects with methamphetamine and synthetic cathinone intoxication have similar tendencies for self-harm, violence, and psychosis. However, a higher risk of physical complications is associated the synthetic cathinone intoxication which is commonly used in the psychiatry emergency department.

Keywords: Cathinone, Methamphetamine, Psychoactive Agents, Psychosis, Substance Use.

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Introduction

The most commonly used substances in the field of psychiatry are novel psychoactive substances (NPSs) as many of these agents pose psychoactive effects comparable to the traditional illicit substances. However, they remain unregulated. At the global level, more than 500 types of these novel psychoactive substances are known. [1] based on the clinical psychoactive characteristics of these substances; these novel psychoactive substances can be classified as hallucinogens, sedatives, and stimulants. In Asia, synthetic cathinone is one of the most common types of novel psychoactive substances that can exert effects similar to methamphetamine. [2] In India, the most commonly used illicit substances are ketamine,

methamphetamine, and heroin which are abused for decades and pose high threats to the mental and physical health of users. The literature data reports a marked increase in the use of these substances in recent times with reported data being underestimated as subjects might use NPSs mixed with other permissible substances. [3] Synthetic cathinone is usually circulated and used mixed in snacks, tea bags, or coffee packets. The use of mephedrone and 3,4-methylenedioxypyrovalerone has been illegal in India. However, these substances are usually circulated by modifying their chemical structure and making their use legal to evade the law. Still, synthetic cathinone in

different types is unregulated in India making their potential harm underestimated. [4]

Subjects using synthetic cathinones can present to the emergency department of Psychiatry present the symptoms related to acute intoxication. Treatment suggestions and safety concerns are being considered by the psychiatrists when these subjects present with self-harm or agitation. [5] The presenting symptoms of synthetic cathinone intoxication are similar to those of acute exacerbation of psychosis and stimulant intoxication including hallucinations, paranoia, and agitation. [6]

Subjects with stimulant use disorder usually present with the combined comorbid psychiatric disorder which when not managed adequately puts these subjects at high risk of physical illness and psychosocial dysfunction including infection, cardiovascular complications, high-risk sexual activity, and criminality. [7] Compared to subjects using traditional stimulants, subjects using NPSs may use additional substances unintentionally including the non-prescription sedatives decreasing their sympathomimetic toxidromes. However, owing to their limitations of clinical examination efficacy and the cost of using NPSs, it is difficult to distinguish methamphetamine intoxication from synthetic cathinone intoxication depending on the initial chief complaints or psychiatric manifestations alone. [8]

The risk of death, vital organ failure, and violence from the intoxication of synthetic cathinone can be underestimated. Addiction interventions and individual personalized treatment can be easily done if the subjects with psychiatric or physical complications and stimulant intoxication are rapidly identified as subjects using synthetic cathinones. [9] Hence, the present study aimed to comparatively assess the clinical and psychiatric profiles of subjects using Methamphetamine and Synthetic Cathinones.

Materials and Methods

The present retrospective clinical study aimed to comparatively assess the clinical and psychiatric profiles of subjects using Methamphetamine and Synthetic Cathinones. The study was done at the tertiary care centre for a period of 6 months with effect from May 2019, the clearance was taken from the Institutional Ethical Committee. The study subjects were from the emergency department of Psychiatry. Initial urine toxicology was done in subjects presenting with a history of using NPS, first-episode psychosis, and acute delirium. The urine samples were collected and subjected to immunoassay to detect methamphetamine (limit 500 ng/ml urine), cocaine, methadone, benzodiazepines, barbiturates, phencyclidine, tetrahydrocannabinol, and/or morphine. For >100

NPSs detection including the cathinones, liquid-chromatography-quadrupole time-of-flight mass spectrometry was done.

The study assessed 60 subjects from both genders having stimulant intoxication depending on the reports of their urine examination and the clinical profiles following the DSM-5 (Diagnostic and Statistical Manual of Mental Disorders- 5th edition. The BPRS (Brief Psychiatric Rating Scale) was used to assess the psychopathological manifestations having 18 items and scoring of 1-7. All subjects were interviewed and the psychologists gathered necessary information including substance use-related factors, personal history, family psychiatric history, alcohol use, smoking status, lifestyle, marital status, occupation, educational status, age, and gender. The violent behaviour was considered following the WHO (world health organization) stating: "The intentional use of physical force or power, threatened or actual, against oneself, another person, or against a group or community, that either result in or has a high likelihood of resulting in injury, death, psychological harm, maldevelopment or deprivation."

The crime rates were compared in subjects using methamphetamine and synthetic cathinones. The physical complications were defined as related to stimulant intoxication including muscle weakness, dystonia, acute kidney failure, and rhabdomyolysis. Transfer subjects were those that were shifted to other wards for unstable vital signs secondary to physical complications. Based on the results of urine toxicology testing, intoxication with synthetic cathinones was considered in 12 subjects that were age-matched with 5 years deviation and were gender-matched with 24 subjects with only methamphetamine intoxication and constituted the control group. From the previous institutional data, hospitalization duration, length of stay in the psychiatry department, serum parameters, and vital signs were assessed.

The data gathered were analyzed statistically using the SPSS software version 26.0 (Chicago, IL) and an independent t-test to compare the continuous and categorical data between the two groups. The Mann-Whitney U test was done to compare the laboratory data in two groups. Logistic regression was used to assess the association between physical complication risk and the use of synthetic cathinones. The significance level was taken at $p < 0.05$.

Results

For the clinical characteristics of the two groups of study subjects, Group I was methamphetamine and Group II had cathinones users. The mean age of Group I and Group II study subjects was 31.3 ± 5.5 and 30.2 ± 6.3 years respectively (0.46). The gender,

marital status, employment status, alcohol use, and smoking status had non-significant differences between the two groups with p-values of 1.000, 1.000, 0.23, 0.32, and 0.33 respectively. The history of bipolar disorder, depressive disorder, and psychotic disorder had a non-significant difference in the two groups with $p=0.33$. Concerning family history, substance, and psychotic disorder had a non-significant difference in the two groups with $p=0.33$ and 0.37 respectively. However, mood disorder was significantly higher in methamphetamine users compared to cathinone users with $p=0.02$. The crime history was significantly higher in methamphetamine users with $p=0.01$. Self-harm, violence, and BPRS had non-significant differences among the two groups with $p=0.33$, 1.000 , and 0.13 respectively. Psychotic complications including delusions, hallucinations, and thought disorders had non-significant differences among the two groups with $p=0.43$, 0.44 , and 0.55 respectively. Physical complications were significantly higher in cathinone users compared to methamphetamine users with $p<0.001$ as shown in Table 1.

On comparing the subjects requiring hospitalization and not requiring hospitalization, 24 subjects needed hospitalization and 12 subjects were not hospitalized. The mean age of study subjects needing and not needing hospitalization was 30.6 ± 6.1 and 31.6 ± 5.2 years respectively ($p=0.46$). The gender, marital status, employment status, alcohol intake, and smoking status had non-significant differences among hospitalized and non-hospitalized subjects with $p=0.44$, 0.23 , 0.23 , 0.82 , and 0.33 respectively.

The history of bipolar, depressive, and psychotic disorders was significantly higher in non-hospitalized subjects compared to hospitalized subjects with $p=0.006$. Family history, substance, and psychotic disorders had non-significant differences among hospitalized and non-hospitalized subjects with $p=0.44$ and 0.34 respectively, whereas, mood disorder was higher in

non-hospitalized subjects with $p=0.02$. Crime history, BPRS, violence, self-harm, physical complications, thought disorders, hallucinations, and delusions had non-significant differences among hospitalized and non-hospitalized subjects with $p=0.82$, 0.87 , 0.43 , 1.000 , 1.000 , 0.75 , 0.63 , and 0.43 respectively as depicted in Table 2.

In the present study, 29 subjects had physical complications and 7 subjects had no physical complications. The mean age of the subjects with and without physical complications was 30.6 ± 5.7 and 32.1 ± 6.2 years respectively ($p=0.36$). The gender, marital status, employment status, alcohol intake, and smoking status had a non-significant difference in subjects with and without physical complications with $p=1.000$, 1.000 , 1.000 , 0.55 , and 0.74 respectively. Personal history of bipolar, depressive, and psychotic disorder was non-significantly higher in subjects with physical complications with $p=0.73$. The family history of substance, mood, and psychotic disorder was significantly higher in subjects with physical complications with respective p-values of 0.16 , 0.74 , and 1.000 respectively. BPRS was significantly higher in subjects with no physical complications compared to subjects with physical complications with $p=0.003$. Violence, self-harm, physical complications, thought disorder, hallucinations, and delusions had a non-significant difference in subjects with and without physical complications with $p=1.000$, 1.000 , 0.13 , 0.34 , 0.26 and 0.54 respectively as shown in Table 3.

On assessing the correlation of physical complications risk and synthetic cathinones intoxication related to substance intoxication, for BPRS, OR was 1.06 and 1.05 for multivariate and univariate analysis and p-value of 0.005 and 0.27 respectively. For subjects using methamphetamine and synthetic cathinones, OR was 9.33 and 8.57 in multivariable and univariate analysis and p-values of <0.001 and 0.002 respectively as shown in Table 4.

Table 1: Clinical characteristics of two groups of study subjects

Characteristics	Group I- Methamphetamine (n=24)	Group II- cathinones (n=12)	synthetic	p-value
Mean age (years)	31.3±5.5	30.2±6.3		0.46
Gender male	21 (87.5)	10 (83.33)		1.000
Marital status-married	3 (12.5)	2 (16.6)		1.000
Employed	11 (45.83)	8 (66.6)		0.23
Alcohol	15 (62.5)	6 (50)		0.32
Smoking	18 (75)	11 (91.66)		0.33
Personal history				
Bipolar disorder	1 (4.16)	1 (8.33)		0.33
Depressive disorder	2 (8.33)	3 (25)		
Psychotic disorder	6 (25)	3 (25)		
Family history				
Substance disorder	4 (16.6)	0		0.33

Mood disorder	5 (20.83)	2 (16.6)	0.02
Psychotic disorder	2 (8.3)	1 (8.3)	0.37
Crime History	13 (54.16)	3 (25)	0.01
BPRS	71.5±13.6	67.1±11.4	0.13
Violence	14 (58.33)	7 (58.33)	1.000
Self-harm	6 (25)	2 (16.6)	0.33
Physical complications	2 (8.3)	6 (50)	<0.001
Psychotic symptoms			
Thought disorder	7 (29.16)	3 (25)	0.55
Hallucination	12 (50)	7 (58.33)	0.44
Delusions	16 (66.6)	9 (75)	0.43

Table 2: Clinical characteristics of study subjects requiring and not requiring hospitalization

Characteristics	Hospitalized (n=24)	Non-hospitalized (n=12)	p-value
Mean age (years)	30.6±6.1	31.6±5.2	0.46
Gender male	21 (87.5)	10 (83.33)	0.44
Marital status-married	4 (16.6)	1 (8.33)	0.23
Employed	13 (54.16)	5 (41.66)	0.23
Alcohol	14 (58.33)	7 (58.33)	0.82
Smoking	18 (75)	11 (91.66)	0.33
Personal history			
Bipolar disorder	1 (4.16)	2 (16.6)	0.006
Depressive disorder	3 (12.5)	2 (16.6)	
Psychotic disorder	4 (16.6)	5 (41.66)	
Family history			
Substance disorder	3 (12.5)	2 (16.6)	0.44
Mood disorder	3 (12.5)	4 (33.3)	0.02
Psychotic disorder	1 (4.16)	2 (16.6)	0.34
Crime History	11 (45.83)	4 (33.3)	0.82
BPRS	68.4±13.4	69.2±11.2	0.87
Violence	13 (54.16)	7 (58.33)	0.43
Self-harm	5 (20.83)	3 (25)	1.000
Physical complications	5 (20.83)	3 (25)	1.000
Psychotic symptoms			
Thought disorder	6 (25)	4 (33.3)	0.75
Hallucination	13 (54.16)	6 (50)	0.63
Delusions	16 (66.6)	10 (83.33)	0.43

Table 3: Clinical characteristics of study subjects with and without physical complications

Characteristics	Physical complications (n=29)	No Physical complications (n=7)	p-value
Mean age (years)	30.6±5.7	32.1±6.2	0.36
Gender male	25 (86.20)	7 (100)	1.000
Marital status-married	4 (13.79)	1 (14.28)	1.000
Employed	15 (51.82)	3 (42.85)	1.000
Alcohol	17 (58.62)	4 (57.14)	0.55
Smoking	22 (75.86)	7 (100)	0.74
Personal history			
Bipolar disorder	2 (6.89)	1 (14.28)	0.73
Depressive disorder	3 (10.34)	2 (28.57)	
Psychotic disorder	7 (24.13)	2 (28.57)	
Family history			
Substance disorder	5 (17.24)	0	0.16
Mood disorder	6 (20.68)	1 (14.28)	0.74
Psychotic disorder	2 (6.89)	1 (14.28)	1.000
Crime History	14 (48.27)	1 (14.28)	0.08
BPRS	66.3±11.6	77.4±11.2	0.003
Violence	16 (55.17)	4 (57.14)	1.000
Self-harm	5 (17.24)	3 (42.85)	1.000
Physical complications	5 (17.24)	3 (42.85)	0.13

Psychotic symptoms			
Thought disorder	9 (31.03)	1 (14.28)	0.34
Hallucination	14 (48.27)	5 (71.42)	0.26
Delusions	20 (68.96)	6 (85.71)	0.54

Table 4: Correlation of physical complications risk and synthetic cathinones intoxication with substance intoxication

Variables	Multivariable analysis		Univariate analysis	
	OR (95% CI)	p-value	OR (95% CI)	p-value
BPRS	1.06	0.005	1.05	0.27
Methamphetamine	-	<0.001	-	0.002
Synthetic cathinones	9.33		8.57	

Discussion

The present retrospective clinical study aimed to comparatively assess the clinical and psychiatric profiles of subjects using Methamphetamine and Synthetic Cathinones. Group I included subjects using methamphetamine and Group II had cathinones users. The mean age of Group I and Group II study subjects was 31.3 ± 5.5 and 30.2 ± 6.3 years respectively (0.46). The gender, marital status, employment status, alcohol use, and smoking status had non-significant differences between the two groups with p-values of 1.0000, 1.000, 0.23, 0.32, and 0.33 respectively. The history of bipolar disorder, depressive disorder, and psychotic disorder had a non-significant difference in the two groups with $p=0.33$. Concerning family history, substance, and psychotic disorder had a non-significant difference in the two groups with $p=0.33$ and 0.37 respectively. However, mood disorder was significantly higher in methamphetamine users compared to cathinone users with $p=0.02$. The crime history was significantly higher in methamphetamine users with $p=0.01$. Self-harm, violence, and BPRS had non-significant differences among the two groups with $p=0.33$, 1.000, and 0.13 respectively. Psychotic complications including delusions, hallucinations, and thought disorders had non-significant differences among the two groups with $p=0.43$, 0.44, and 0.55 respectively. Physical complications were significantly higher in cathinone users compared to methamphetamine users with $p<0.001$. These findings were consistent with the studies of Lo TW et al [10] in 2020 and Zuba D et al [11] in 2013 where authors reported similar clinical characteristics of the subjects using methamphetamine and cathinones in their study as of the present study.

In the present study, 24 subjects needed hospitalization and 12 subjects were not hospitalized. The mean age of study subjects needing and not needing hospitalization was 30.6 ± 6.1 and 31.6 ± 5.2 years respectively ($p=0.46$). The gender, marital status, employment status, alcohol intake, and smoking status had non-significant differences among hospitalized and non-

hospitalized subjects with $p=0.44$, 0.23, 0.23, 0.82, and 0.33 respectively. The history of bipolar, depressive, and psychotic disorders was significantly higher in non-hospitalized subjects compared to hospitalized subjects with $p=0.006$. Family history, substance, and psychotic disorders had non-significant differences among hospitalized and non-hospitalized subjects with $p=0.44$ and 0.34 respectively, whereas, mood disorder was higher in non-hospitalized subjects with $p=0.02$. Crime history, BPRS, violence, self-harm, physical complications, thought disorders, hallucinations, and delusions had non-significant differences among hospitalized and non-hospitalized subjects with $p=0.82$, 0.87, 0.43, 1.000, 1.000, 0.75, 0.63, and 0.43 respectively. These results were in agreement with the studies of Tran MTN et al [12] in 2021 and Weng TI et al [13] in 2020 where authors reported comparable clinical characteristics of subjects with substance use and requiring hospitalization.

It was seen that 29 subjects had physical complications and 7 subjects had no physical complications. The mean age of the subjects with and without physical complications was 30.6 ± 5.7 and 32.1 ± 6.2 years respectively ($p=0.36$). The gender, marital status, employment status, alcohol intake, and smoking status had a non-significant difference in subjects with and without physical complications with $p=1.000$, 1.000, 1.000, 0.55, and 0.74 respectively. Personal history of bipolar, depressive, and psychotic disorder was non-significantly higher in subjects with physical complications with $p=0.73$.

The family history of substance, mood, and psychotic disorder was significantly higher in subjects with physical complications with respective p-values of 0.16, 0.74, and 1.000 respectively. BPRS was significantly higher in subjects with no physical complications compared to subjects with physical complications with $p=0.003$. Violence, self-harm, physical complications, thought disorder, hallucinations, and delusions had a non-significant difference in subjects with and without physical complications with $p=1.000$. 1.000, 0.13, 0.34, 0.26, and 0.54

respectively. These results were comparable to the previous studies of Orsolini L et al [14] in 2019 and Wong AH et al [15] in 2020 where authors suggested similar physical characteristics in subjects with and without physical complications. The study results showed that for the correlation of physical complications risk and synthetic cathinones intoxication related to substance intoxication, for BPRS, OR was 1.06 and 1.05 for multivariate and univariate analysis and a p-value of 0.005 and 0.27 respectively. For subjects using methamphetamine and synthetic cathinones, OR was 9.33 and 8.57 in multivariable and univariate analysis and p-values of <0.001 and 0.002 respectively. These results were in line with the findings of Palamar JJ et al [16] in 2016 and Paillet-Loilier M et al [17] in 2014 where authors reported a similar correlation between physical complications risk and synthetic cathinones intoxication related to substance intoxication.

Conclusion

Considering its limitations, the present study concludes that the subjects with methamphetamine and synthetic cathinone intoxication have similar tendencies for self-harm, violence, and psychosis. However, a higher risk of physical complications is associated the synthetic cathinone intoxication which is commonly used in the psychiatry emergency department.

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