

The Use of Kratom (*Mitragyna speciosa* Korth.) Among People Who Co-use Heroin and Methamphetamine in Malaysia

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Objectives: Kratom (*Mitragyna speciosa* Korth.), an indigenous medicinal plant, has been widely used as a traditional remedy in Southeast Asia. However, its combined consumption with other substances has received scarce attention. This study investigates the use of kratom among adults with a history of using heroin and methamphetamine in Malaysia.

Methods: A total of 332 patients who were mandated to undergo drug rehabilitation participated in this cross-sectional study. The study data were collected through *face-to-face* interviews using a semi-structured questionnaire.

Results: The majority were males (95%, $n = 314/332$) and Malays (98%, $n = 325/332$) with a mean age of 32.3 years ($SD = 9.16$). Over two thirds of the respondents used kratom to alleviate heroin withdrawal symptoms and to reduce methamphetamine intake; 59% used it as a substitute for heroin and methamphetamine. A similar proportion used kratom to reduce heroin intake (58%), while only 15% used it for its euphoric effects. Multivariate analysis

showed that previous attendees of government rehabilitation programs had lower odds of using kratom as a heroin substitute.

Conclusions: The potential of kratom to alleviate heroin withdrawal symptoms, and to reduce methamphetamine and heroin intake, among people who co-use heroin and methamphetamine warrants further research.

Key Words: heroin, Kratom, Malaysia, methamphetamine, *mitragynine*, opioid

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The United Nations Office on Drugs and Crime (UNODC) observed that amphetamine-type stimulants (eg, methamphetamine and amphetamine) have emerged as a “main drug of concern in treatment” among enrollees in rehabilitation programs in Southeast Asia.¹ Having grappled with the long-standing opioid use problem, Malaysia is facing a new threat from the rising use of methamphetamine. This is a trend common to other areas in Southeast Asia where opioid use is widespread and is being used concurrently with methamphetamine to augment or potentiate euphoria or attenuate the side effects of opioid agonist therapy.^{1,2} The co-use of opioids with stimulants can potentially lead to overdose and other adverse health consequences.³ These findings are, however, not unique to this region; for example, deaths from stimulant overdose, often involving opioids, have also been documented in the United States.⁴

In Malaysia, the popularity of methamphetamines appears to have outpaced heroin among newly identified people who use drugs.⁵ However, unlike people who use heroin who have access to methadone maintenance treatment (MMT) programs,⁶ people who co-use methamphetamine with heroin face difficulties in enrolling for treatment. In fact, their participation can be affected by a variety of factors such as having a positive human immunodeficiency virus (HIV) status, or having psychiatric problems, or because they are imprisoned and sent to compulsory drug detention centers (CDDCs) under prevailing drug laws.⁷ The CDDCs have been criticized for their poor provision of healthcare services and, occasionally, human rights abuses.⁸ Furthermore, medicine-assisted treatments for methamphetamine use are either rare or nonexistent in CDDCs.⁹ Psychosocial treatment and

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behavioral interventions, on the other hand, have been shown to have varying degrees of effectiveness in treating methamphetamine dependence.^{3,9} Farrell et al⁹ (p. 1 of Abstract) notes that: “No effective pharmacotherapies are available that reduce stimulant use, and the available psychosocial interventions (except for contingency management) have a weak overall effect.” As discussed by Farrell et al⁹, stimulant dependence includes primarily amphetamine-based substance dependence.

Despite the availability of MMT programs, a number of local studies have documented the unobtrusive use of an indigenous medicinal plant known as kratom (or *biak*) among heroin users in rural settings in Malaysia, even though individuals caught possessing kratom leaves or processed juice can be jailed.^{10,11} Kratom (*Mitragyna speciosa* Korth.) has been widely used as a substitute for heroin because it is deemed effective, easily and cheaply available, and avoids the stigma of being seen at MMT centers.^{10,12} In the US, kratom has been used to self-treat opioid dependence, poly-drug use including amphetamine, alcohol, etc,^{13–17} chronic pain and various psychiatric symptoms,^{13,16} although there is no documented scientific evidence to show its effectiveness in treating these maladies, including dependence on opioids or other drugs. However, the risk of adverse effects requiring medical attention appears to be rare.^{13,18,19} Although the risk of death due to the exclusive use of kratom, or when used in combination with other substances, cannot be ruled out, it is relatively low, when compared to opioids.^{15,20} This was also reflected in the statement of the United States Assistant Secretary for Health, issued after reviewing kratom: “there is still debate among reputable scientists over whether kratom by itself is associated with fatal overdose.”²¹

The initial widespread use of opioids (heroin) resulted in the proliferation of drug treatment programs designed to address this problem, but they are less suitable for people who use heroin along with methamphetamine.^{22,23} The use of kratom among the latter group of people suggests that at least some of them who spent time in CDDCs were finding relief from kratom. The objective of this study was, therefore, to investigate the motivations for using kratom by people who co-use heroin and methamphetamine and are currently undergoing court-mandated drug rehabilitation in formal treatment facilities. It is hoped that the findings will motivate further research into the potential applicability of kratom to alleviate heroin withdrawal symptoms, and reduce methamphetamine and heroin intake, among people who co-use heroin and methamphetamine.

METHODS

Study Design and Respondents

A total of 332 incarcerated adults who had current history of co-using heroin with methamphetamine participated in this cross-sectional study. We used purposive and convenience sampling approach to recruit respondents from 5 formal drug rehabilitation centers (Community Care and Rehabilitation Centres – CCRCs) across Malaysia. Since illicit drug and kratom use can result in significant legal issues, and given that people who use opioids comprise a

hidden population subject to stigma, it was relatively difficult to recruit illicit drug users from the community. Treatment in CCRCs is based on psychosocial interventions and the rehabilitation program is typically for a period of two years. All the participants provided their written informed consent.

Study Inclusion and Exclusion Criteria

The study inclusion criteria were; (1) being 18 years old and above, (2) having used heroin and methamphetamine in the last 12-months, and (3) having used kratom in the last 12-months before their confinement in CCRCs. We excluded those who had no history of kratom consumption or were unwilling to provide a written informed consent.

Study Measures

The study was carried out in CCRCs through *face-to-face* interviews by 2 trained research assistants. A semi-structured questionnaire was designed to collect (1) socio-demographic information such as sex, ethnicity, current age, marital status, accommodation, and HIV status; (2) previous incarceration and drug rehabilitation histories; (3) history of drug use, including heroin and methamphetamine use history; (4) kratom use history, such as duration of kratom use, daily quantity and frequency of kratom use; and (5) motivations for using kratom. All the interviews were conducted in the local Malay language, and each interview session lasted about 25–35 minutes.

Ethics

This study was approved by the Human Ethics Committee of Universiti Sains Malaysia (USM/JEPEN/19040224).

Statistical Analysis

The data were analyzed using the Statistical Package for Social Sciences (SPSS) version 26. First, descriptive statistics were computed to describe the respondent's socio-demographic characteristics, and reasons for kratom use. Two multivariate logistic regressions were calculated; one, to determine factors associated with kratom use as a substitute for heroin and the other, to examine the factors associated with using kratom as a substitute for methamphetamine.

The relevant adjusted Odds Ratios and 95% confidence intervals were computed for significant variables. The statistical significance was set at $P < 0.05$.

RESULTS

The Socio-demographic Characteristics of Respondents

The socio-demographic characteristics and the drug use history of respondents are shown in Table 1. A majority were males (95%, $n = 314/332$); and Malays (98%, $n = 325/332$). The mean age of respondents was 32.3 years ($SD = 9.16$), while 64% ($n = 211/332$) were between 18 and 35 years old. Almost two thirds (64%, $n = 212/332$) were single, and 86% ($n = 287/332$) lived with their parents/family.

Three-fifths (61%, $n = 202/332$) of the respondents had been incarcerated for drug-related offenses between 1 and 2 times, and 36% ($n = 119/332$) had been mandated to undergo

TABLE 1. Respondents' Socio-demographic Characteristics Drug and Kratom Use History (n = 332)

	N = %	
Sex		
Male	314	95
Female	18	5
Ethnicity		
Malay	325	98
Non-Malay	7	2
Mean age	32.3 yr (SD = 9.16)	
Age		
18–35 yr	211	64
>35 yr	121	36
Marital status		
Single	212	64
Married	120	36
Living quarters		
Parents/Family	287	86
Renting/friends/employer/others	45	14
Incarceration history		
1–2 times	202	61
>2 times	130	39
Drug rehabilitation history		
Once	213	64
More than once	119	36
HIV status		
Positive	6	2
Negative	326	98
Mean age of first drug use	17.80 yr (SD = 5.64)	
Mean duration of heroin use	11.59 yr (SD = 7.65)	
Duration of heroin use		
≤10 yr	178	54
>10 yr	154	46
Mean duration of methamphetamine use	7.59 yr (SD = 5.23)	
Duration of methamphetamine use		
≤6 yr	164	49
>6 yr	168	51
<i>Kratom use history</i>		
Mean age of first kratom use	23.47 yr (SD = 8.73)	
Mean duration of kratom use	6.94 yr (SD = 2.28)	
Duration of kratom use		
≤6 yr	194	58
>6 yr	138	42
Mean quantity of daily kratom use	3.59 glasses (SD = 2.28)	
Daily quantity of kratom use		
≤3 glasses	192	58
>3 glasses	140	42
Mean frequency of daily kratom use	3.32 times (SD = 1.88)	

drug rehabilitation more than once. Only 2% (n = 6/332) self-reported being HIV positive.

Drug Use History

All the respondents self-reported the use of heroin and methamphetamine. The respondents' mean age of first drug use was 17.8 years (SD = 5.64), their mean duration of heroin use was 11.6 years (SD = 7.65), and mean duration of methamphetamine use was 7.6 years (SD = 5.23), respectively. More than half of the respondents (54%, n = 178/332) were using heroin for <10 years, whereas 51% (n = 168/332) had been using methamphetamine for more than 6 years.

Kratom Use History

The mean age of first kratom use in the sample was 23.5 years (SD = 8.73), and the mean duration of kratom use was

6.9 years (SD = 2.28). Fifty-eight percent (n = 194/332) had used kratom for 6 years or less, whereas the rest (42%, n = 138/332) have been using it for >6 years. Slightly over half (58%, n = 192/332) ingested 3 glasses or less daily, whereas 42% (n = 140/332) consumed >3 glasses. The average daily consumption was 3.6 glasses. Since respondents came from different parts of the country the *mitragynine* content per glass could not be estimated.

Reasons for using Kratom and Its Association Between Short and Long-Term Heroin Users

The reasons for using kratom are indicated in Table 2. Kratom users were divided into short and long-term users using an arbitrary cut-off point of ≤10 years to indicate short-term users and the rest being classified as long-term users (>10 years) based on their duration of heroin use. This was done for convenience in the bivariate analysis as no standard cut-off is prescribed in the literature for this categorization. However, continuous values were used in the multivariate analyses.

The self-reported reasons for using kratom were to treat heroin withdrawal (cited by 77% of the respondents), to reduce methamphetamine intake (71%), as substitute for heroin (59%) or methamphetamine (59%), and to reduce heroin intake (58%). Thirty percent of the respondents cited it as a substitute for methadone specifically, although all participants had been exposed to methadone therapy. Fifteen percent of the respondents relied on it for its euphoric effects, as shown in Table 2.

Bivariate analyses indicated no significant differences in reasons for using kratom between short and long-term heroin users, with one exception. A significantly higher proportion of long-term users reported using kratom to reduce heroin intake compared to short-term users ($\chi^2_{(1)} = 4.47$, $P = 0.035$).

Factors Associated with Kratom Use as a Heroin Substitute

A multivariate logistic regression was used to determine factors associated with kratom use as a substitute for heroin. The dependent variable was a binary dummy assigned a value of 1, if the respondent used kratom as a substitute for heroin, and 0, if otherwise. Seven independent variables were considered. Age, duration of heroin, methamphetamine and kratom use, and daily quantity of kratom consumed were entered as continuous values. Binary dummies were used for marital status (married = 1), and previous participation in a drug rehabilitation program (Yes = 1). Given the small number of females in the sample, sex was not entered into the equation. The robustness of the estimated equation was confirmed by the log-likelihood ratio statistic ($\chi^2_{(7)} = 17.79$; $P = 0.013$), and a non-significant Hosmer-Lemeshow (H-L) statistic ($\chi^2_{(8)} = 7.657$; $P = 0.468$).

The results are shown in Table 3. The only significant factor associated with kratom use as a substitute for heroin was participation in an earlier/previous drug rehabilitation program; previous drug rehabilitation participants had significantly *lower* adjusted odds of using kratom as substitute for heroin (OR = 0.404; confidence intervals: 0.234–0.700; $P = 0.001$). The finding that long-term kratom users had

TABLE 2. Reasons for Using Kratom Cited by Short and Long-term Heroin Users

	Total (N = 332) N = %		Short-term users ≤6 yr (N = 178) N = %		Long-term users >6 yr (N = 154) N = %		X ²	P-value
To treat heroin withdrawal								
Yes	256	77	141	79	115	75	0.963	0.326
No	76	23	37	21	39	25		
To reduce methamphetamine intake								
Yes	237	71	133	75	104	67	2.088	0.148
No	95	29	45	25	50	33		
As a heroin replacement								
Yes	196	59	105	59	91	59	0.000	0.985
No	136	41	73	41	63	41		
As a methamphetamine replacement								
Yes	197	59	113	63	84	54	2.734	0.098
No	135	41	65	37	70	46		
To reduce heroin intake								
Yes	193	58	94	53	99	64	4.470	0.035*
No	139	42	84	47	55	36		
To increase energy								
Yes	164	49	86	48	78	51	0.180	0.671
No	168	51	92	52	76	49		
As a methadone replacement								
Yes	100	30	54	30	46	30	0.009	0.926
No	232	70	124	70	108	70		
To obtain euphoria								
Yes	50	15	28	16	22	14	0.135	0.714
No	282	85	150	84	132	86		

*Denotes P value at 0.05.

higher odds of using it to reduce heroin intake, observed in the bivariate analysis, was not supported by the multivariate logistic model.

Factors Associated with Kratom use as a Substitute for Methamphetamine

A similar logistic regression was run to examine the factors associated with using kratom as a substitute for methamphetamine. The independent variables describe above were also used in this model. The dependent variable was a binary dummy with a value of 1, if the respondent used kratom as a substitute for methamphetamine, and 0, if otherwise. However, there were no significant predictors of kratom use as a substitute for methamphetamine (results not shown).

DISCUSSION

The rising problems associated with heroin and other opioids that are often used with methamphetamine, cocaine, and other stimulants are not unique to Malaysia but is also an escalating problem in the United States and other countries.³

Our study looked at motivations behind the use of kratom in a sample of subjects undergoing treatment in 5 rehabilitation centers in Malaysia with recent history of heroin and methamphetamine co-use. Although kratom is widely used among heroin poly-drug users in Malaysia,^{10,24} as far as we are aware, this is the first study to examine kratom use among people who co-use heroin with methamphetamine. Given that amphetamine-type stimulants use is linked to a variety of health issues such as HIV transmission,²⁵ criminal activity,²⁶ and psychiatric problems in the country,²⁷ thus it was vital to investigate the causes underlying the increased prevalence of kratom use among people using a combination of 2 high-risk and widely available substances, such as heroin and methamphetamine.²⁴

The findings show that respondents in the sample who co-used heroin with methamphetamine reported benefits from consuming kratom (*Mitragyna speciosa* Korth.). A majority of respondents in our sample claimed that kratom helped to reduce their heroin (58%) and methamphetamine (71%) intake. A large percentage (59%) also perceived kratom as

TABLE 3. Factors Associated With Using Kratom as a Substitute for Heroin

	B	S.E.	Wald	df	Sig.	Exp(B)	95% CI	
Age	0.005	0.019	0.060	1	0.807	1.005	0.968	1.043
Married	-0.011	0.286	0.001	1	0.970	0.989	0.565	1.733
Previously attended drug rehabilitation	-0.906	0.280	10.459	1	0.001	0.404	0.234	0.700
Methamphetamine use duration	0.037	0.026	2.040	1	0.153	1.038	0.986	1.092
Opiate use duration	0.027	0.023	1.364	1	0.243	1.027	0.982	1.074
Kratom use duration	-0.040	0.023	2.974	1	0.085	0.960	0.917	1.006
Quantity of daily kratom use	-0.082	0.056	2.148	1	0.143	0.921	0.825	1.028
Constant	0.655	0.632	1.071	1	0.301	1.924	-	-

a safer substitute for heroin and methamphetamine. These findings suggest that further investigations into kratom's pharmacological potential in treating methamphetamine dependence are warranted.

Kratom, and particularly, its primary alkaloid, *mitragynine* has been used for the self-management of opioid abuse.^{10,12,13,16,17} Consistent with such self-reported use are the findings in laboratory studies involving rodent models of opioid self-administration and withdrawal that suggest *mitragynine* administration can reduce morphine,²⁸ and heroin self-administration,²⁹ and reduce morphine withdrawal symptoms.³⁰ The evidence from the present study suggests that kratom may be potentially useful in reducing methamphetamine intake as well. This finding is potentially significant since there are currently no approved pharmacological treatments for methamphetamine or cocaine dependence.^{3,9} Furthermore, the opioid agonist treatment (eg, MMT, buprenorphine) currently available is not designed to treat poly-drug use. This means that people who co-use heroin and methamphetamines may be at greatest risk for poor treatment outcomes.²³

Our findings are consistent with studies that indicate the potential utility of kratom as a harm-reduction tool,³¹ and its increasing use among diverse populations with substance use and misuse histories, including poly-drug use.^{13,14,16,17} Findings from laboratory studies indicate that kratom use generally does not lead to severe physical dependence,³² or possess significant addictive potential,³³ although field studies and surveys indicate that some people report “addiction” and “withdrawal” effects.^{10,11} Of course, it is unclear if the reduction in methamphetamine use reported in our study was caused by kratom *per se* or was the result of the reduction in heroin use resulting in a concurrent reduction in methamphetamine use.

More than half of the sample (59%) claimed using kratom to replace heroin. However, a previous history of being detained in CDDCs for drug rehabilitation lowered the odds of substituting heroin with kratom. It is worth noting that until recently people who use heroin and were confined in CDDCs did not receive methadone treatment, but were able to obtain it without charge from government-run clinics after their release.⁸ Thus, individuals who have not been previously confined in CDDCs had a higher likelihood of using kratom, possibly because they are unaware of methadone as a substitute for heroin. It could also be that they perceived methadone as carrying greater risks. Finally, seeking treatment at MMT clinics exposes the patient to the possibility of being detained by law enforcement officers outside the clinics and being subjected to involuntary urine drug tests. Such firm-handed tactics by law enforcers may undermine or decrease the incentive to seek methadone therapy voluntarily.

Finally, although some enforcement agencies allege that kratom alkaloids (*mitragynine* and *7-hydroxymitargyine*) have significant abuse potential, only 15% in our sample used kratom for its euphoric effects. In fact, surveys in the United States have similarly found that only a small percentage use kratom for euphoric effects although the percentage varied across studies.^{13,16,17} Also, as in the current study, kratom was more commonly reported to be used to self-manage opioid dependence and withdrawal, rather than to get high. Smith and

Lawson¹⁴ found that kratom was neither a preferred nor a drug of choice, as compared to heroin and amphetamine, among a sample of treatment attendees who reported kratom use.

LIMITATIONS

There are several limitations to this study. First, the predominance of men in our sample precluded gender-based conclusions. The poor representation of females may well reflect the fact that kratom is less prevalent among women than men. Field studies of kratom use in the region suggest this.^{34,35} It could also be that women are more discreet in their use making them less likely to be apprehended. Furthermore, the greater stigma associated with women who use illicit substances may explain their reluctance to volunteer participation in such studies.³⁶ Second, since the study relied on a sample of treatment-mandated patients who knew we were investigating the effects of kratom, it is possible that at least some were exaggerating the benefits of kratom use, resulting in social-desirability bias. Third, we did not collect any processed kratom samples to measure *mitragynine* content in the amount of kratom reportedly consumed. As respondents came from different states in the country, the *mitragynine* content probably varied as well. Fourth, the study questions might have been better answered by the inclusion of a non-kratom using group of people who co-use heroin with methamphetamine for comparison. Future research might consider this addition. Finally, it was impossible to isolate the exact role of kratom in reducing the intake of heroin or methamphetamine, or as their substitutes, as the reported effects were based on self-reports.

CONCLUSIONS

To conclude, these preliminary findings indicate that, based on self-reports, kratom is being used by people who co-use heroin and methamphetamine largely to reduce the intake of these substances or to serve as substitutes for them. The findings strengthen the case for further studies to evaluate the therapeutic properties of kratom and its potential to assist people co-using heroin and methamphetamine.

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