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Prevalence of Kratom Use Disorder Among Kratom Consumers

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Objectives: Kratom leaf products are increasingly consumed in the United States, with many consumers reporting they experience beneficial effects from kratom use. However, there is a growing concern for kratom's potential to result in dependence when used regularly. As such, we sought to assess, using *Diagnostic and Statistical Manual of Mental Disorders, (DSM-5)*, diagnostic criteria for substance use disorder, the prevalence of "kratom use disorder" (KUD) among kratom consumers.

Methods: Our cross-sectional study used an online, anonymous survey between February and May 2023. Through nonprobability sampling, we recruited people older than 18 years who currently consume kratom. Participants were asked about their kratom consumption patterns, adverse effects perceived to stem from kratom consumption, comorbid diagnoses, and components for a *DSM-5*, substance use disorder, adapted for kratom.

Results: Among the total sample ($N = 2061$), KUD criteria were met by 25.5% of participants ($n = 525$); the most commonly reported symptoms were tolerance ($n = 427$, 81.3%) and withdrawal ($n = 357$, 68.0%). After adjusting for age, gender, daily frequency of kratom consumption, and history of either a substance use disorder or a mental health condition, those with a concurrent diagnosis of another substance use disorder had 2.83 times higher odds of meeting KUD criteria (95% CI, 2.19–3.67) compared with those without one.

Conclusions: In this large cross-sectional study, most participants who met the criteria for a KUD diagnosis were categorized as having a mild or moderate KUD. Individual characteristics associated with KUD were related to being male, young, consuming kratom frequently, and having psychiatric and substance use disorder comorbidities.

Key Words: Kratom, *Mitragyna speciosa*, kratom use disorder, substance use disorder, survey, botanicals, *DSM-5*

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Consumption of kratom (*Mitragyna speciosa* Korth.) leaf and extract products in the United States has increased since 2015,^{1,2} with various epidemiological studies estimating the lifetime consumption of kratom to range from 0.9% to 6.1%.^{3–5} Reported reasons for consumption include the non-medical "self-management" of pain, fatigue, and symptoms of psychiatric or substance use disorders (SUDs); this includes using kratom for attenuating opioid and alcohol withdrawal and/or as a replacement for full opioid agonists.^{2,6–10} However, there are emerging reports of adverse effects associated with kratom exposure, including the potential for the development of physical dependence and addiction, or SUD.^{11–13} Given that kratom's alkaloids act on numerous central nervous system receptors (ie, adrenergic, serotonergic, noradrenergic, and opioidergic), any resulting physical dependence may be distinct from traditional substances that fall within one class, such as psychostimulants, cannabis, or opioids.¹⁴

Given the increased global consumption of kratom, there is a growing need to better characterize signs of kratom-related physical dependence and/or addiction. Seminal research from Thailand in 2011 found that among 1118 males who were older than 25 years, the severity of kratom addiction was correlated with the duration and frequency of consumption, as well as quantity consumed.¹⁵ Since then, such dose effects have also been observed among kratom consumers in the United States, with the amount of kratom consumed and the duration of consumption likewise found to be positively associated with greater adverse withdrawal-related symptoms.¹⁶

Although "kratom use disorder," or KUD, is not formally included in the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5)*, the general criteria for a use disorder diagnosis have been applied clinically and in research on kratom consumers; however, this is presently not well documented in the case report literature (ie, case reports on kratom physical dependence or addiction do not use validated assessment or diagnostic methods).^{12,17,18} Furthermore, to our knowledge, only two other surveys to date have assessed participants via *DSM-5* criteria and found approximately 10% to 30% of kratom consumers in their samples to meet past-year KUD criteria.^{8,13}

To build on prior findings and begin developing a better understanding of the prevalence of KUD criteria among adults who consume kratom, we conducted a survey of current kratom

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consumers. We also explored the relationship between participant demographic characteristics and KUD criteria fulfillment to determine whether certain characteristics show an increased likelihood of being associated with KUD.

METHODS

Sampling Procedures

Between February 10, 2023, and May 11, 2023, our cross-sectional, online survey was open to current kratom consumers and was hosted on Qualtrics (Qualtrics, Provo, UT). Nonprobability sampling was used. We recruited from multiple sources to improve reach and voluntary response rates. These included an email via the American Kratom Association listserv and a post on Facebook by various pro- and anti-kratom groups to encourage member participation (with the respective Facebook group moderators posting the link to closed groups). Members of the listserv and such groups were also able to share the survey downstream on social media platforms (eg, Reddit, Twitter). Participation was voluntary, nonincentivized, and anonymous, with no electronic record tracing responses back to an individual participant.

Human Subjects

Dartmouth-Health's Institutional Review Board (STUDY02001904) determined that this study qualified for exempt not human subject research status. Any identifying information provided by participants was anonymized.

Data Collection and Measurement of KUD

The survey began with an initial screening question to ensure participants reported current kratom consumption and were 18 years or older. Questions and response options were derived from previous studies analyzing the content of social media posts about kratom use.^{13,16,19} Adaptations in response options were made to quantitatively capture respondent's kratom consumption patterns, motives of consumption, as well as to assess the 11 symptoms of the *DSM-5* diagnostic criteria for SUD,¹⁷ adapted for kratom. Participants met criteria for a KUD if they endorsed 2 or more of the 11 *DSM-5* symptoms used to diagnose a SUD for kratom, with any 2 to 3 criteria qualifying as mild, 4 to 5 criteria qualifying as moderate, and 6 or more criteria qualifying as severe. Information regarding adverse effects, comorbid psychiatric and SUD diagnoses, and demographics was also collected (see Kratom Survey in Appendix 1, <http://links.lww.com/JAM/A490>).

Statistical Analysis

The dataset was restricted to those who (a) completed the survey in a period that is expected for a survey of its length (ie, people were excluded if they took longer than 1 hour or less than 3 minutes, to remove potential bots) and (b) finished the survey. Categorical variables were analyzed as frequencies and proportions, while continuous variables were summarized as means and standard deviations. To compare participants who met KUD criteria and those who did not, a *t* test was used for continuous variables and a χ^2 test for categorical variables. Single and multiple logistic regression was used to explore correlates of

meeting KUD criteria that were found to be statistically significant in bivariate analyses. *P* values <0.05 were considered significant. All statistical analyses were performed using SAS software, version 9.4, for Windows (SAS Institute, Inc).

RESULTS

Characteristics of the Sample

There were 2824 responses to our online survey. Two hundred fifty-three participants were screened out because of not actively using kratom, an additional 380 responses were removed after completing processes described above to address potential bots, and another 130 participants were excluded from analyses because of not completing the survey. After restricting the dataset, a total of 2061 participants were included in the analysis, with 52.3% of the sample identifying as male (*n* = 1078) and a mean age of 47.8 years (*SD* = 13.5). Participant characteristics, for the full study sample and stratified by KUD presence, are presented in Table 1. The majority of participants lived in the United States, with most distributed heavily in the South, followed by West and Midwest, with fewest in the Northeast. Across the sample, 25.5% met the criteria for KUD (*n* = 525). There was a statistically significant difference in the distribution of age, gender, marital status, and geography between respondents with KUD and respondents without KUD, with respondents with KUD tending to be younger, male, single, and located in the Midwest.

Kratom Use Disorder Symptoms

Table 2 provides the frequencies and percent of reported specific KUD symptoms for the total sample, as well as stratified by those who met KUD criteria and those who did not. Of the 11 KUD symptoms evaluated, the most frequently reported were the two pharmacologic criteria: tolerance (*n* = 648, 31.4%) and withdrawal (*n* = 447, 21.7%). Furthermore, the following 3 other KUD symptoms were also endorsed at notable levels: cravings (*n* = 340, 16.5%), using kratom in larger amounts or over a longer time than intended (*n* = 305, 14.8%), or being unsuccessful at controlling consumption (*n* = 183, 8.9%). For those who met KUD criteria, the most commonly reported symptoms were tolerance (*n* = 427, 81.3%) and withdrawal (*n* = 357, 68.0%). All of the 11 *DSM-5*-derived KUD symptoms evaluated had a statistically significant difference in distribution when comparing those who met KUD criteria and those who did not. Of those who met the KUD criteria, most met criteria for a mild KUD (*n* = 347, 66.1%).

Self-reported Kratom Consumption and Medical History

Participants' self-reported kratom consumption and medical history are presented in Table 3. More than half of the sample reported using kratom by mixing it into either water or juice (*n* = 1051, 51.0%), but 23.9% of respondents indicated multiple methods of kratom consumption (*n* = 492). Overall, 16.3% endorsed having a non-kratom SUD diagnosis, while 45.2% reported having been diagnosed with a psychiatric condition. The most common comorbid conditions were anxiety (*n* = 767, 37.2%), major depressive disorder (*n* = 446, 21.6%), posttraumatic stress disorder (*n* = 341, 16.6%), and attention-

TABLE 1. Demographic Characteristics of Survey Participants, Stratified by Qualifying for a Potential KUD

Sample Characteristics	Full Sample (N = 2061)		KUD (n = 525)		No KUD (n = 1536)		P*
	Frequency	%	Frequency	%	Frequency	%	
Age							<0.0001
18–20 yr	22	1.1	11	2.1	11	0.7	
21–30 yr	176	8.5	72	13.7	104	6.8	
31–40 yr	492	23.9	153	29.1	339	22.1	
41–50 yr	531	25.8	132	25.1	399	26	
51–60 yr	414	20.1	83	15.8	331	21.6	
>61 yr	426	20.7	74	14.1	352	22.9	
Gender							0.0002
Male	1078	52.3	315	60.0	763	49.7	
Female	945	45.9	200	38.1	745	48.5	
Nonbinary	19	0.9	7	1.3	12	0.8	
Prefer not to say	19	0.9	3	0.6	16	1.0	
Education							0.4186
High school graduate/GED	456	22.6	118	22.5	347	22.6	
College	1031	50.0	249	47.4	782	50.9	
Technical school	207	10.0	57	10.9	150	9.8	
Postgraduated education	348	17.4	101	19.2	257	16.7	
Marital status							<0.0001
Single	600	29.1	196	37.3	404	26.3	
Married	1123	54.5	253	48.2	870	56.6	
Divorced	256	12.4	57	10.9	199	13.0	
Widowed	55	2.7	8	1.5	47	3.1	
Separated	27	1.3	11	2.1	16	1.0	
Geography†							0.0223
Northeast	202	10.1	57	11.2	145	9.7	
South	856	42.6	189	37.1	667	44.5	
Midwest	376	18.7	115	22.6	261	17.4	
West	439	21.9	115	22.6	324	21.6	
Outside United States	136	6.8	33	6.5	103	6.9	

* P value is for chi-square test, comparing KUD with no KUD.

† N = 2009 (KUD = 509, no KUD = 1500).

KUD indicates kratom use disorder.

deficit/hyperactivity disorder (n = 336, 16.3%). There was a statistically significant difference in the distribution of kratom consumption method, the frequency of consumption, the quantity

(in grams) consumed per day, and history of both SUD and psychiatric conditions when comparing those who met KUD criteria with those who did not, with respondents who met

TABLE 2. KUD Symptoms Reported by Survey Participants, Stratified by Qualifying for a Potential KUD

Sample Characteristics	Full Sample (N = 2061)		KUD (n = 525)		No KUD (n = 1536)		P*
	Frequency	%	Frequency	%	Frequency	%	
Kratom use disorder symptoms							
Tolerance	648	31.4	427	81.3	221	14.4	<0.0001
Withdrawal	447	21.7	357	68.0	90	5.9	<0.0001
Cravings	340	16.5	298	56.8	42	2.7	<0.0001
Increased use	305	14.8	281	53.5	24	1.6	<0.0001
Inability to cut down use	183	8.9	179	34.1	4	0.3	<0.0001
Continue to use despite physical/psychological problems	106	5.1	104	19.8	2	0.1	<0.0001
Continue to use despite social or interpersonal problems	83	4.0	75	14.3	8	0.5	<0.0001
Spending time to obtain, use, or recover	58	2.8	55	10.5	3	0.2	<0.0001
Impacts work or social life	49	2.4	49	9.3	0	0	<0.0001
Using in physically hazardous situations	44	2.1	42	8.0	2	0.1	<0.0001
Failing to fulfill work, home, or school obligations	34	1.7	33	6.3	1	0.1	<0.0001
Severity							
Mild	—	—	347	66.1	—	—	
Moderate	—	—	105	20.0	—	—	
Severe	—	—	73	13.9	—	—	

* P value is for chi-square test, comparing KUD with no KUD.

KUD indicates kratom use disorder.

TABLE 3. Sample Characteristics of Survey Participants, Stratified by Qualifying for a Potential KUD

Sample Characteristics	Full Sample (N = 2061)		KUD (n = 525)		No KUD (n = 1536)		P*
	Frequency or Mean	% or SD	Frequency or Mean	% or SD	Frequency or Mean	% or SD	
Kratom use method							0.0035
Capsules/tablets	359	17.4	68	13.0	291	19.0	
Mixed in water/juice	1051	51.0	303	57.7	748	48.7	
Brewed as a tea	145	7.0	30	5.8	115	7.5	
Chewed leaf	10	0.5	4	0.8	6	0.4	
Smoked dry leaf	4	0.2	1	0.2	3	0.2	
Selected multiple methods	492	23.9	119	22.7	373	24.3	
How often use kratom							<0.0001
Once daily	224	10.9	48	9.1	176	11.5	
Twice daily	438	21.3	85	16.2	353	23.0	
Three times daily	464	22.5	109	20.8	355	23.1	
Four times daily	373	18.1	112	21.3	261	17	
Five times daily	151	7.3	63	12.0	88	5.7	
Six times daily	93	4.5	35	6.7	58	3.8	
Other	318	15.4	73	13.9	245	16	
Length of kratom use							
Years† (mean, SD)	5.9	3.4	5.8	3.5	5.9	3.3	0.2987
Months‡ (mean, SD)	5.1	3.7	5.5	4.3	5.0	3.5	0.3450
Amount used on typical day							
Grams § (mean, SD)	15.2	13.4	19.5	16.3	13.6	11.69	<0.0001
Spoons ¶ (mean, SD)	7.0	11.6	8	11.4	6.7	12.5	0.4928
Capsules/tablets # (mean, SD)	17.2	20.7	20.7	22.6	16.3	20.1	0.3139
Leaves ** (mean, SD)	41.9	40.0	52.0	39.2	38.7	40.1	0.4016
Diagnosed with a substance use disorder (n = 2037)	332	16.3	160	31.1	172	11.3	<0.0001
Specific substance use disorders diagnosed with							
Opioid use disorder	188	9.1	95	18.1	93	6.1	<0.0001
Alcohol use disorder	164	8.0	81	15.4	83	5.4	<0.0001
Cannabis use disorder	34	1.7	18	3.4	16	1.0	0.0002
Stimulant (cocaine) use disorder	26	1.3	14	2.7	12	0.8	0.0008
Stimulant (methamphetamine) use disorder	30	1.5	17	3.2	13	0.9	<0.0001
Tobacco use disorder	87	4.2	51	9.7	36	2.3	<0.0001
Other	46	2.2	17	3.2	29	1.9	0.0706
Receive treatment for a substance use disorder ††	243	75.5	115	74.2	128	76.7	0.6092
Diagnosed with a mental health condition	932	45.2	291	55.4	641	41.7	<0.0001
Specific mental health condition diagnosed with							
Anxiety	767	37.2	239	45.5	528	34.4	<0.0001
Major depressive disorder	446	21.6	160	30.5	286	18.62	<0.0001
Posttraumatic stress disorder	341	16.6	110	21.0	231	15.0	0.0016
Attention-deficit/hyperactivity disorder	336	16.3	123	23.4	213	13.9	<0.0001
Bipolar disorder	133	6.5	42	8.0	91	5.9	0.0947
Schizophrenia	11	0.5	4	0.8	7	0.5	0.4059
Other	193	9.4	50	9.5	143	9.31	0.8845

* P value is for chi-square test for categorical variables and t-test for continuous variables, comparing KUD with no KUD.

† For full sample, n = 1963; for KUD, n = 503; for no KUD, n = 1460.

‡ For full sample, n = 676; for KUD, n = 199; for no KUD, n = 568.

§ For full sample, n = 1377; for KUD, n = 383; for no KUD, n = 994.

¶ For full sample, n = 636; for KUD, n = 150; for no KUD, n = 486.

For full sample, n = 314; for KUD, n = 60; for no KUD, n = 254.

** For full sample, n = 322; for KUD, n = 14; for no KUD, n = 43.

†† For full sample, n = 322; for KUD, n = 155; for no KUD, n = 167.

KUD indicates kratom use disorder.

KUD criteria tending to mix kratom in water or juice compared with other methods, use kratom 4, 5, and 6 times daily, use a higher mean number of grams per day, as well as having a previously diagnosed SUD and/or mental health condition. Of note, all of the comparisons for non-kratom SUDs were statistically significant between the KUD and non-KUD groups, while for mental health conditions, only anxiety ($P < 0.0001$), major depressive disorder ($P < 0.0001$), posttraumatic stress disorder ($P = 0.0016$), and attention-deficit/hyperactivity disorder

($P < 0.0001$) were significantly different between the KUD and non-KUD groups.

Correlates of Qualifying for a KUD

Table 4 presents both an unadjusted and adjusted logistic regression model to explore associations between sample characteristics and presence of KUD. Based on our model selection processes (ie, using variables that were statistically significant

in bivariate analyses), we adjusted for age, gender, frequency of kratom consumption per day, and history of diagnosis of either a SUD or a psychiatric condition. After adjusting for these variables, those who were younger tended to have a significantly higher odds of meeting KUD criteria than those 61 years or older, with the exception of those aged 51 to 60 years. In addition, those with a concurrent diagnosis with another SUD had 2.83 times higher odds of meeting KUD criteria (95% CI, 2.19–3.67) than those without a diagnosed SUD.

DISCUSSION

Our study found that approximately 25% of surveyed kratom consumers endorsed symptoms consistent with the *DSM-5*-derived criteria for KUD. Furthermore, for participants who met KUD criteria, the symptoms we identified reflect kratom tolerance, withdrawal (including experienced withdrawal when use was stopped or continued kratom use for the purposes of avoiding withdrawal), cravings, and consuming kratom in larger amounts or over longer periods than intended. The distribution of *DSM-5* use disorder severity for KUD was primarily mild and moderate, with a severe disorder being present among 13.9% of participants.

Our findings are both similar to and distinct from 2 previous studies using the same criteria. In a 2020 published survey

of current kratom consumers, *DSM-5*-derived past-year SUD for kratom was found for 12.3% of the 2798 participants.⁸ In that study, participants who were using kratom as a means to reduce opioid use, SUD severity for kratom was not significantly different compared with participants who were using for other purposes. In a 2022 survey of 129 adults with extensive kratom use history, but from whom not all were current regular consumers, 29.5% met past-year KUD criteria; however, an additional 17.8% were assessed to have at one point in their life met KUD criteria but whom were considered remitted (ie, did not meet diagnostic criteria within the past year); just more than half (52.7%) never met KUD criteria.¹³ In this survey, females were less likely to meet KUD criteria than males.

These surveys likewise found that the largest proportion of those who met KUD criteria were classified as having KUD with mild severity. In the 2020 survey, severity was as follows: 9.9% mild severity, 1.8% moderate, and 0.6% severe.⁸ In the 2022 survey, severity was 14% mild, 7.0% moderate, and 8.5% severe.¹³ Similar to our findings, the most prevalent KUD symptoms were tolerance, withdrawal, and using larger amounts than intended.¹³ In a small substudy conducted in 2022, 10 long-term, regular whole-leaf kratom product consumers were assessed for KUD; 5 did not meet KUD diagnostic criteria, whereas 3 had mild, 1 had moderate, and 1 had severe KUD.⁹ Dose amount was typically higher among those with

TABLE 4. Logistic Regression Model of Correlates of Qualifying for a KUD among Survey Participants (N = 2061)

Correlates	Unadjusted OR (95% CI)	Adjusted OR* (95% CI)
Age		
18–20 yr	4.76 (1.99 to 11.38)	3.95 (1.58 to 9.90)
21–30 yr	3.29 (2.23 to 4.87)	2.69 (1.76 to 4.11)
31–40 yr	2.15 (1.57 to 2.94)	1.67 (1.19 to 2.34)
41–50 yr	1.57 (1.14 to 2.16)	1.42 (1.01 to 1.98)
51–60 yr	1.19 (0.84 to 1.69)	1.10 (0.76 to 1.59)
>61 yr	Ref	Ref
Gender		
Male	1.54 (1.25 to 1.89)	1.54 (1.23 to 1.92)
Female	Ref	Ref
Nonbinary	1.33 (0.64 to 2.79)	1.19 (0.54 to 2.63)
How use kratom		
Capsules/tablets	Ref	—
Mixed in water/juice	1.73 (1.29 to 2.33)	—
Brewed as a tea	1.12 (0.69 to 1.81)	—
Chewed leaf	2.85 (0.78 to 10.40)	—
Smoked dry leaf	1.43 (0.15 to 13.92)	—
Selected multiple methods	1.37 (0.98 to 1.91)	—
How often use kratom		
Once daily	Ref	Ref
Twice daily	0.88 (0.59 to 1.31)	0.79 (0.52 to 1.19)
Three times daily	1.13 (0.77 to 1.65)	0.99 (0.66 to 1.48)
Four times daily	1.57 (1.07 to 2.32)	1.47 (0.98 to 2.21)
Five times daily	2.63 (1.67 to 4.14)	2.40 (1.48 to 3.89)
Six times daily	2.21 (1.31 to 3.75)	2.09 (1.20 to 3.64)
Other	1.09 (0.72 to 1.65)	0.96 (0.62 to 1.49)
Diagnosed with a substance use disorder		
Yes	3.55 (2.78 to 4.54)	2.83 (2.19 to 3.67)
No	Ref	Ref
Diagnosed with a mental health condition		
Yes	1.74 (1.42 to 2.12)	1.40 (1.12 to 1.75)
No	Ref	Ref

Bolded data are statistically significant.

* Adjusted for age, gender, how often the participant uses kratom, self-reported substance use disorder, and self-reported mental health condition.

CI indicates confidence interval; OR, odds ratio; KUD, kratom use disorder.

KUD and kratom withdrawal has shown a dose-effect relationship elsewhere.¹⁵ In-depth interviews with participants found that tolerance symptoms perceived to be well managed with “tolerance breaks” and that withdrawal symptoms were mild to moderate and, in some cases, not experienced.⁹ Overall, the few prior studies that have evaluated KUD did not examine other relevant factors such as dosing amount, frequency, or product type, nor were demographic characteristics examined in detail.

In our sample, certain characteristics were correlated with a higher odds of meeting KUD criteria, including age (ie, younger participants have higher odds of meeting KUD criteria compared with older participants) and gender (ie, male participants have higher odds of meeting KUD criteria compared with female participants). Regarding kratom consumption practices, we found a relationship between KUD and several factors. First, the frequency of daily kratom consumption was correlated with a higher odds of meeting KUD criteria wherein consuming kratom more often throughout the day was more likely to be found among the KUD group compared with the non-KUD group. In addition, having a comorbid psychiatric or non-kratom SUD was correlated with a higher odds of meeting KUD criteria. This aligns with common knowledge of the bidirectional association between substance use and psychiatric disorders, regardless of the substance involved.²⁰ More so, cross-addiction has been established for most drug classes.²¹

Among our survey participants, the majority of motives for kratom consumption included use for self-treatment of a medical condition (eg, pain management, to improve mood, energy, and symptoms of psychiatric conditions, to abstain from alcohol or opioids) (Supplemental Table 1, <http://links.lww.com/JAM/A491>). These findings are aligned with prior surveys that evaluated the consumption patterns of kratom.^{22,23} Our survey also explored participants’ history with adverse effects that could reasonably be related to their kratom consumption, with the most frequently reported adverse effects being withdrawal and tolerance (Supplement Table 2, <http://links.lww.com/JAM/A491>). One of the caveats in diagnosing a SUD is that tolerance and withdrawal can occur in appropriate therapeutic doses and for medical use of prescribed medications. When these 2 occur in the context of prescribed pharmacotherapies, they are not considered toward diagnosing a SUD, as the threshold of 2 or more of the 11 criteria for an SUD diagnosis would be invalid.¹⁷

While several natural substances, such as cannabis and psychedelic mushrooms, are viewed with increasing favorability by state researchers and legislators for potential therapeutic benefits related to assisting in the treatment of SUDs, pain, and some psychiatric disorders, the novelty of kratom and lack of controlled clinical studies will likely exclude it from such favorable perception or medically accepted uses in the coming years.²⁴ Kratom and its alkaloids, in any form, have not been systematically evaluated nor approved by the US Food and Drug Administration as a drug or dietary supplement. As such, they have not undergone a formal evaluation for safety, dependence, and abuse potential. Although kratom is not scheduled under the Controlled Substances Act, it is currently considered an unregulated new dietary ingredient by the Food and Drug Administration. While kratom tolerance and withdrawal symptoms were reported as the most bothersome adverse effects of routine

consumption, they may be symptoms that are acceptable to consumers given the perceived benefits from kratom. Indeed, qualitative interview data from regular kratom consumers suggests that tolerance is largely well managed and is a trade-off with perceived daily benefits.¹⁰ Nonetheless, the current absence of any federal kratom regulation that would at least mandate adequate labeling with regard to dosing and frequency of use does not provide consumers with information as to the potential for development of a kratom use disorder.

Study limitations include that there was no objective way to verify study respondents are truly unique consumers of kratom who answered truthfully, although we made efforts for post hoc data cleaning to remove any potential bots or erroneous responses. Second, retrospective self-report data collection methodologies can be prone to multiple cognitive biases, including a perceived therapeutic benefit of kratom despite its nonapproved status and reporting medical diagnoses that have not been confirmed by a medical professional. Few participants endorsed KUD symptoms related to risky or hazardous use or to impairment in psychosocial and occupational functioning. These findings may arise from selection bias (ie, participants volunteered to engage in this research), perhaps representing a specific sample of kratom consumers without impairments in psychosocial and occupational functions. Likewise, people who are actively trying to reduce kratom consumption or quit may not be engaged in platforms on which the survey was advertised or may not have been willing to engage with a survey on kratom.

Ultimately, improved understanding about the risks of KUD development would help the medical community that interacts with patients who consume kratom. Likewise, policy makers will benefit from a clearer clinical understanding of the now known potential harms that could result from kratom consumption that is frequent or involves high doses. Adequate federal regulation with mandated labeling can also inform consumers what doses and frequency of use are less likely to cause adverse effects or lead to dependence development while providing kratom vendors and distributors with clear guidance. Given the continued presence of kratom products in US markets, clinicians should routinely assess for kratom consumption, evaluate individual patient circumstances including types and amount of kratom product consumed (eg, whole leaf plant versus liquid extract), and assess for and report in the medical literature cases of KUD. Presently, clinicians are best positioned to identify, assess, and document KUD. Doing so will help researchers identify next steps and will provide policy makers with much needed guidance at both the state and federal level for the interest of public health.

CONCLUSIONS

As the number of kratom consumers increases worldwide, there is a pressing need to characterize the risk of physical dependence and possible addiction from prolonged kratom consumption. Our survey study of current kratom consumers found that approximately 25% met *DSM-5*-derived criteria for KUD—with most of these participants qualifying as having mild or moderate KUD. Symptoms were primarily characterized by those related to physical dependence, defined as tolerance or

withdrawal. Improved information and increased awareness about the potential for KUD development, including the potential for withdrawal after regular or prolonged kratom use, would serve consumers and would be consumers making decisions about their kratom use routines (eg, frequency or amount of use). It would also assist policy makers and clinicians trying to make the best decisions for regulations and therapeutic intervention, respectively. Presently, there is a need to better ensure the health and safety of kratom consumers within regulatory and clinical frameworks.

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