

Exploring the relationship between khat chewing behaviour and psychological well-being among students of Jazan University

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KEYWORDS

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ABSTRACT:

Background: Khat, a well-known natural stimulant from the *Catha edulis* plant, a flowering evergreen tree or large shrub of the Celastraceae family is taken in few parts of southern province. Being adjacent to Yemen, Khat chewing is a common habit among the population in the Jazan region. khat eating is associated with many health ailments like depression, stress anxiety. **Objectives:** 1. To estimate the prevalence of depression, anxiety and stress in khat chewers 2. To assess the psychological disorders in khat chewers. **Methodology:** A cross-sectional study (survey) conducted and sample size collected with pre designed questionnaire. Data entered in Microsoft excel and processed in SPSS version 23 and the results tabulated. Univariate and multivariate analysis with multilogistic regression done. **Results:** Majority of participants were males and were 21 years old or younger. Notable difference identified between urban (40%) and rural (60%) and this difference was identified as potential distinction in the psychological behaviour of the students. Odds ratio was found to be high in males and in >21-year-old students when compared with females. GPA showed significant difference when observed with psychological status. GPA scores less than 3.75 were found to have more psychological disturbances than GPA>3.75. Interquartile range among depression, anxiety and stress higher among khat chewers when compared with non-khat chewers and the difference found to show high statistical significance. (P<0.01). **Conclusion:** Khat chewing in this area found to be significantly high in students so continuous health education shall be the priority for the policy makers

1. Introduction

Although the Kingdom of Saudi Arabia bans all types of substance abuse, still khat a well-known natural stimulant from the *Catha edulis* plant, a flowering evergreen tree or large shrub of the Celastraceae family that is consumed in few parts of southern province. The plant is referred to by various names in different regions, including Qat in Yemen and Saudi Arabia, Khat in Ethiopia, Mirra in Kenya, and Qaad or Jaad in Somalia. However, in most academic literature, it is commonly identified as Khat [1] [2] Khat is a plant with amphetamine like characteristics with effects including insomnia, euphoria, decreased fatigue and suppressed appetite when chewed [3] The adolescent and young adult population marks a transitional phase, and the misuse of substances can result in significant long-term health repercussions. This age group is often overlooked and has not traditionally been the central focus of national healthcare initiatives. Consequently, the epidemiological data,

treatment approaches for related conditions, and the overall assessment of the prevalence of specific issues remain largely undocumented and unaddressed in many contexts. Khat chewing practice is believed to be rapidly increasing worldwide and it is estimated that 10 million people consume khat daily [4]

Given its proximity to Yemen, the practice of Khat chewing is prevalent among the inhabitants of the Jazan region. The prevalence of this habit in the Jazan population can be attributed to their socio-cultural customs and traditions. Khat consumption is often associated with a temporary boost in energy levels, heightened alertness, improved concentration, enhanced self-esteem, and increased libido [5] [6] However, the habit of chewing khat has been linked to a range of health issues, including depression, stress, and anxiety [7]. Additionally, it can reduce appetite and lead to an increased release of adrenaline [8] Habitual khat chewing exerts a noticeable impact on the physical and psychological well-being of the community [9] [4] and it may result in more severe psychiatric, cardiovascular, dental, and gastrointestinal adverse effects [6] During a khat chewing session, individuals often experience initial feelings of cheerfulness, optimism, and an overall sense of well-being. However, after discontinuing khat use, individuals may begin to encounter health problems, including tension, emotional instability, and irritability, which can progress to feelings of depression, confusion, insomnia, and sluggishness. Various studies have highlighted the hazardous psychological consequences of khat chewing, affecting both individuals and the community at large. Gastrointestinal adverse effects associated with khat chewing encompass anorexia, constipation, and stomatitis. Anorexia can result in malnutrition and an increased susceptibility to infectious diseases, mostly tuberculosis, particularly in underdeveloped regions[10]

Depression, anxiety, and stress have emerged as significant global mental health challenges that affect people from all walks of life[11].. Severe mental health issues can disrupt individuals' emotional, cognitive, and social capabilities, potentially leading to reduced employment opportunities and diminished productivity[12] . Depression is characterized by symptoms such as a loss of interest or pleasure, feelings of sadness, guilt, or low self-esteem, disrupted sleep or appetite, extreme fatigue, and poor concentration (5). It can significantly impact an individual's job performance, sleep quality, daily routines, and overall productivity[13]. Khat chewing is known to induce a psychostimulatory effect, leading to feelings of euphoria and excitement, primarily due to its cathinone content [14] [15]

Justification of the study

Limited research has been conducted in the Jazan region particularly khat chewing in connection with psychosomatic disorders [15] It is imperative to conduct comprehensive university-wide surveys to shed light on Khat chewing behaviours, as well as to identify various risk factors that might influence its adoption among young Saudis. Such studies should consider comparing students from various genders, academic disciplines, and academic years to gain a more comprehensive understanding of this practice.

General Objective:

To evaluate the relationship between khat chewing behaviour and psychological well-being among students of Jazan University

Specific Objective:

1. To estimate the prevalence of depression, anxiety and stress in khat chewers
2. To assess the psychological disorders in khat chewers

2. Methodology:

A cross-sectional study (survey) conducted to determine Khat Chewing Habit and Its Association with Depression, Anxiety and Stress Among Students of Jazan University.

2.1 Type of the study: Cross-sectional study

2.2 Sample size estimation: The targeted sample size calculated to be 586 and later rounded to 600 for ease of administration. Calculation of sample size done by the formula:

$$n = N \times X / (X + N - 1),$$

where $X = Z^2 \alpha / 2 \times p \times (1 - p) / MOE^2$; N is the population size, and it is 24,968 (the total number of students admitted to Jazan University in 2021); p is the response distribution, assumed to be 50%; $Z\alpha/2$ is the critical value at a 5% level of significance, equal to 1.96; and MOE is the margin of error, set at 4%.

2.3 Study setting: Study was done in all health-related colleges.

2.4 Study tools: A Pilot tested pre designed questionnaire devised for collecting the sample size. Confidentiality maintained.

2.5 Statistical analysis: Data entered in Microsoft excel and processed in SPSS version 23 for tabulation of results. Chi square testing applied wherever necessary and P values calculated for mentioning the significance. $P < 0.05$ considered statistically significant. Univariate and multivariate analysis with Multilogistic regression done.

2.6 Operational definitions:

- (a) Non-Khat User: a person who had never used Khat in any form;
- (b) Prevalence of ever chewing Khat: the proportion of the study population that had ever chewed Khat in their lifetime;
- (c) Prevalence of current Khat chewing: the proportion of the study population that had chewed Khat within 30 days preceding the study.[14]

2.7 Data collection: Sociodemographic information including age, sex, College, Program, level, residence, marital status, living standard, and grade point average (GPA) and about risk factors, such as khat chewing, smoking, and caffeine consumption. Since how long on khat chewing habit, since how long on smoking habit, how does the habit start, Peer pressure, In addition, the questionnaire contained a section on Depression, Anxiety, and Stress Scale 21 (DASS-21) [16] . Khat use was measured with two questions on whether the respondent had ever used khat and on the frequency of khat use in the preceding 30 days. Respondents were defined as khat users by ever khat use or use of khat in the preceding 30 days. DASS-21 had previously been translated into Arabic and validated. The DASS-21 [17] [18] [19] is a shorter version of the DASS designed to measure the constructs of

depression and anxiety and to address the failure of earlier emotional measures in discriminating between anxiety and depression. DASS-21, developed by Lovibond and Lovibond to reduce administration time, has been used widely in clinical and nonclinical samples to screen for symptoms at different levels of depression, anxiety, and stress. Participants were asked to rate their perceptions using a 4-point Likert scale (with 0 being does not apply and 3 being very applicable/applies most of the time). Scores calculated for depression, anxiety, and stress subscales by summing the scores for each subscale and multiplying by 2.

2.8 DASS-21 Scoring Instructions [20]

The Depression, Anxiety and Stress Scale - 21 Items (DASS-21) is a set of three self-report scales designed to measure the emotional states of depression, anxiety and stress. Each of the three DASS-21 scales contains 7 items, divided into subscales with similar content. The depression scale assesses dysphoria, hopelessness, devaluation of life, self-deprecation, lack of interest / involvement, anhedonia and inertia. The anxiety scale assesses autonomic arousal, skeletal muscle effects, situational anxiety, and subjective experience of anxious affect. The stress scale is sensitive to levels of chronic nonspecific arousal. It assesses difficulty relaxing, nervous arousal, and being easily upset / agitated, irritable / over-reactive and impatient. Scores for depression, anxiety and stress are calculated by summing the scores for the relevant items. The assumption on which the DASS-21 development was based (and which was confirmed by the research data) is that the differences between the depression, anxiety and the stress experienced by normal subjects and clinical populations are essentially differences of degree. Recommended cut-off scores for conventional severity labels (normal, moderate, severe) based on Lovibond (1995) DASS scale are as follows: [20]

	Depression	Anxiety	Stress
Normal	0-9	0-7	0-14
Mild	10-13	8-9	15-18
Moderate	14-20	10-14	19-25
Severe	21-27	15-19	26-33
Extremely severe	28+	20+	34+

Though scores were corresponding to mild, moderate and severe, it was considered as depression, anxiety and stress present or not. However students with high scores of depression and anxiety were referred to University hospital for further evaluation.

3. Results:

While the data collected from all health-related colleges in Jazan University. Multi stage sampling method was utilized for collecting the data. Sample collected till 600 questionnaires received keeping in mind any unfilled questionnaires.

Table-3.1: Background Characteristics of the Participants

Variable		Frequency (n=600)	Percentage
Gender	Male	479	79.8
	Female	121	20.2
Age	<=21	397	66.2
	> 21	203	33.8
Residence	Urban	240	40.0
	Rural	360	60.0
Marital Status	Un Married	502	83.7
	Married	98	16.3
Grade Point Average	< 3.75	181	30.2
	> = 3.75	419	69.8
Income	< 9000	271	45.2
	>=9000	329	54.8

In the sample size 80% were males and the rest females. significant majority of participants were 21 years old or younger (66.2%). Notable difference identified between urban (40%) and rural (60%) and this difference was identified as potential distinction in the psychological behaviour of the students. 83.7% were unmarried in the sample size. The distribution of Grade Point Averages (GPA) showcased a clear majority (69.8%) with a GPA greater than or equal to 3.75. while income of the study subjects was seen to be more than 9000 per month in 54.8% of students.

Table-3.2 Background Characteristics Association with Khat Chewing Habit

Variable		Odds Ratio	95% Confidence Interval		P-Value
			Lower	Upper	
Gender	Male	5.42	3.15	9.33	0.001
	Female	-	-	-	-
Age	<=21	-	-	-	-
	> 21	1.80	1.28	2.54	0.001
Residence	Urban	-	-	-	-
	Rural	1.08	0.78	1.51	0.634

Marital Status	Un Married	1.48	0.94	2.35	0.092
	Married	-	-	-	-
Grade Point Average	< 3.75	3.26	2.27	4.68	0.001
	> = 3.75	-	-	-	-
Income	< 9000	1.10	0.80	1.54	0.537
	>=9000	-	-	-	-

While the background variables were seen for association with khat chewing habit revealed that males showed significantly higher odds ratio (OR) of 5.42 (95% CI: 3.15–9.33, $p < 0.01$) compared to females. This result suggested males are highly associated with observed outcome. Participants aged 21 or older demonstrated an significantly increased odd of the outcome, with an OR of 1.80 (95% CI: 1.28–2.54, $p < 0.01$) compared to those aged 21 or younger. Residence in rural areas did not exhibit a statistically significant association with the outcome (OR = 1.08, 95% CI: 0.78–1.51, $p = 0.634$). While unmarried individuals demonstrated a higher odds ratio (OR = 1.48, 95% CI: 0.94–2.35, $p = 0.092$) compared to their married counterparts, this association did not reach statistical significance.

significance is observed in Grade point Average (GPA) with an OR of 3.26 (95% CI: 2.27–4.68, $p = 0.001$) for individuals with GPAs below 3.75. Income, with an odds ratio of 1.10 (95% CI: 0.80–1.54, $p = 0.537$) for individuals earning less than 9000, displayed limited predictive power. The non-significant association suggests that income may not be a significant independent predictor of the outcome

Table-3.3 Background Characteristics Association with Psychological status

Variable		Depression		Anxiety		Stress	
		Odds Ratio	95% CI	Odds Ratio	95% CI	Odds Ratio	95% CI
Gender	Male	1.380	0.92 - 2.07	0.87	0.58 - 1.30	1.65*	1.03 - 2.65

	Female	-	-	-	-	-	-
Age	<=21	-	-	-	-	-	-
	> 21	1.61**	1.15-2.26	1.30	0.92-1.83	0.94	0.65-1.36
Residence	Urban	-	-	-	-	-	-
	Rural	1.34	0.96-1.86	1.42*	1.02-1.97	1.11	0.77-1.58
Marital Status	Un Married	1.05	0.68-1.61	1.04	0.67-1.60	1.09	0.68-1.78
	Married	-	-	-	-	-	-
Grade Point Average	< 3.75	1.97**	1.38-2.81	2.60**	1.79-3.77	2.43**	1.67-3.52
	>= 3.75	-	-	-	-	-	-
Income	< 9000	1.43*	1.03-1.97	0.891	0.65-1.23	1.29	0.91-1.84
	>=9000	-	-	-	-	-	-

*Statistically significant ($p < 0.05$)

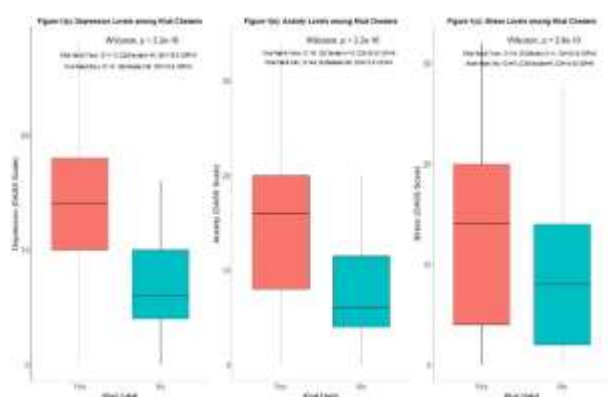
**Highly statistically significant ($p < 0.01$)

Psychological behaviour of the student while examined along background variables revealed intricate relationships. In the study population males were having more preponderance towards depression (OR = 1.38, 95% CI: 0.92-2.07) and stress with (OR = 1.65, 95% CI: 1.03–2.65). Participants aged 21 or older exhibited increased odds of depression (OR = 1.61, 95% CI: 1.15–2.26). Residence in rural areas

was associated with higher odds of anxiety (OR = 1.42, 95% CI: 1.02–1.97). This unexpected result prompts a nuanced exploration of the unique stressors or protective factors in rural environments that may influence anxiety levels. Marital status of student didn't show any significant association with depression, anxiety and stress however slightly higher values were witnessed for unmarried study population.

GPA showed association with depression (OR = 1.97), anxiety (OR = 2.60), and stress (OR = 2.43) among individuals with GPAs below 3.75. Income disparities were associated with increased odds of depression among individuals earning less than 9000 (OR = 1.43).

Figure1: Psychological behaviour among khat chewers



Wilcoxon Manwhitney U's test, $P < 0.05$ significant, $P < 0.01$ highly significant,

DASS: Depression Anxiety and stress scale

Interquartile range among depression, anxiety and stress higher among khat chewers when compared with non-khat chewers and the difference found to show high statistical significance. ($P < 0.01$). This suggests significant variability in reported mental health scores among individuals who chew khat. The median depression score for khat chewers is higher than that of non-khat chewers, suggesting a potentially higher central tendency of depression scores in the khat chewing group. The IQR for the khat chewing group is larger than that of the non-khat chewing group, indicating greater variability in depression scores among khat chewers. Across all three measures (depression, anxiety, and stress), the khat chewing group consistently exhibits higher median scores, indicating a tendency for higher reported levels of mental health issues.

4. Discussion:

Although the sample collected in health-related colleges, it corresponds with all colleges in the university as khat chewing habit here signifies the cultural aspect of the society. The current study builds on previous efforts [17] [14] [6] and aims at khat chewing correlations with depression, anxiety and stress. Many studies identified high association between khat chewing and the psychological disorders [21]. The prevalence of khat chewing habit was observed to be five times greater in males compared to females. This aligns with the findings of a study conducted by Mahfouz et al. in 2015, where the prevalence of khat chewing in males was four times higher than in females (Mahfouz et al., 2015) It was identified majority of the khat chewers were residing in rural areas. Similar results obtained in the study done by Ageeli et al [6] and in a study done by Alem et al in Ethiopia [22] This

captures khat chewing habit association with cultural aspects prevailing at large in rural areas in comparison with urban area. Unfortunately khat chewing prevalence in the students of Jazan increased to 40% and this was found to happen sequentially as it was found in the study done by Ageeli et al, prevalence was 15.2 % and 23.1% in the study done by Alsanosy et al [14]. In the meta-analysis done by the Ayano et al [23] it is significantly noted that in Saudi Arabia 18.8% of students were in to this habit and it was found to be highest in comparison with other countries. In spite of Government efforts to contain this habit of khat chewing it was found increasingly significant. This effect of khat on physical and mental health of the students will emphasise the enormous deterioration in health finding implications on academic performance of the students. With 3.75 established as the midpoint for Grade Point Average (GPA) scores among students, those attaining a GPA higher than 3.75 exhibited a 3.26 times lower likelihood of engaging in this habit compared to students with lower grades. 20% of the khat chewers were found to spend more than 1000 riyals per month which will affect financially to the chewer and to the family. In the study done by Zerrihun et al it was found khat chewing affects severely in relation with home finances [24]. Students with family income more than 9000 were found to spend more on khat chewing when compared with students having family incomes less than 9000 riyals.. It was found that affluent society students were more in to this habit as it shows significant difference.

While Psychological behaviour of the students examined with background variables, males were found to be have more depression and stress than females. In the study done by Prangya P in post graduate students in India [25], similar results obtained and it was also found depression and stress are correlated. Age is found to be directly related with depression and anxiety as advancing age corresponded to increase in level of depression and anxiety. People residing in rural areas have more preponderance for depression as compared with urban dwellers and this was found to be highly statistically significant. Anxiety and stress also found to be high in rural dwellers. GPAs below 3.75 were nearly twice as likely to experience depression compared to those with higher GPAs. The association indicates that lower academic performance might be a contributing factor or indicator of a higher risk of depression in this population. The Odds Ratio of 2.60 indicates that individuals with GPAs below 3.75 have 2.6 times higher odds of experiencing anxiety compared to their counterparts with higher GPAs. This suggests a stronger association between lower academic achievement and heightened anxiety levels, emphasizing the potential impact of academic performance on mental well-being. With an Odds Ratio of 2.43, individuals with GPAs below 3.75 are 2.43 times more likely to experience stress than those with higher GPAs. This finding underscores a substantial correlation between academic performance and stress levels, implying that academic struggles may contribute to increased stress among this group. Addressing mental health concerns in this context may involve targeted interventions, support systems, and resources to alleviate the impact of academic challenges on overall well-being. Additionally, these findings could guide educational institutions and healthcare providers in implementing strategies to identify and assist students who may be at a higher risk of mental health issues based on their GPA.

Majority of khat chewers felt psychological disturbances when khat is unavailable and this stage may lead to somatoform disorders in the students and well documented evidences available regarding this stage affecting the academic education of the students [14] [22]. Fortunately, it was found that one third of the participants want to quit this habit, and it gives a hope that if health awareness campaigning and health education is provided to the students, then this habit will not be

there in this region. In an interventional study done by Marina Widmann in Kenya it was found that intervention played major role in modulating khat chewing habit in Somali refugees[26]

Psychological disorders like depression, anxiety and stress were found to be high among khat chewers when compared with non-khat chewers. Increased median levels of depression, anxiety and stress in khat chewers captures higher reporting of mental health issues. Being in similar environment with no variation in cultures, this increase in median levels of mental health issues attribute the influence of khat heavily on the society warranting immediate action for increasing health awareness levels of the students and the community to contain the khat chewing habit. Similar results obtained in the studies done by studies [27] [28] [26], anxiety neurosis was found to be in one third khat chewers. 7% felt depressed. Majority of the students said that the situation explained in the question applies to them to some extent. Students identified tremors mostly in hands. Similar results obtained in other studies [29] [30]. With this ill effects on mental health, this habit of khat chewing should be curtailed by health education at different levels of the society.

5. Conclusions:

Majority of participants were males and were 21 years old or younger. Notable difference identified between urban (40%) and rural (60%) and this difference was identified as potential distinction in the psychological behavior of the students. Odds ratio was found to be high in males and in >21-year-old students when compared with females. GPA showed significant difference when observed with psychological status. GPA scores less than 3.75 were found to have more psychological disturbances than GPA>3.75.

Interquartile range among depression, anxiety and stress higher among khat chewers when compared with non-khat chewers and the difference found to show high statistical significance. ($P<0.01$). This suggests significant variability in reported mental health scores among individuals who chew khat. The median depression score for khat chewers is higher than that of non-khat chewers, suggesting a potentially higher central tendency of depression scores in the khat chewing group. The IQR for the khat chewing group is larger than that of the non-khat chewing group, indicating greater variability in depression scores among khat chewers. Across all three measures (depression, anxiety, and stress), the khat chewing group consistently exhibits higher median scores, indicating a tendency for higher reported levels of mental health issues.

6. Limitations:

The current study was done only in subset of population, (Jazan university students) so it cannot be generalized to whole Saudi population. The sample size may not be competent for further analysis and data collection was constrained due to lack of time

7. Recommendations:

1) Health awareness campaigning and health education training regarding khat chewing habit should be given 2) Mass media campaigning can be done to demonstrate the ill effects of khat chewing.

8. Conflicts of interest: None

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