ORIGINAL ARTICLE

Mizan Khat Use Disorder Index (MizKUDI): tool development and validation in habitual khat users

DILSHAD MANZAR[1], MOHAMMED SALAHUDDIN[2, 3], SHOWKAT AHMAD SHAH[4], TUFAIL AHMAD KHAN[5], JAZI AL OTAIBI[1, CA], AHMED M ALMANSOUR[1], BADER M ALRASHEADI [1], SEITHIKURIPPU R. PANDI-PERUMAL[6]AHMED S. BAHAMMAM[7, 8]

[1]*Department of Nursing, College of Applied Medical Sciences, Majmaah University, Al Majmaah 11952, Saudi Arabia*
[2]*Department of Pharmacy, College of Medicine and Health Sciences, Mizan-Tepi University (Mizan Campus), Mizan-Aman 260, Ethiopia*
[3]*Pharmacology Division, Department of BioMolecular Sciences, University of Mississippi, United States of America*
[4]*Department of Economics, College of Business and Economics, Mizan-Tepi University (Mizan Campus), Mizan-Aman, Ethiopia*
[5]*Department of Management, Oriental Institute of Management, Navi Mumbai, India*
[6]*Somnogen Canada Inc, College Street, Toronto, ON, Canada*
[7]*TheUniversity Sleep Disorders Center, Department of Medicine, College of Medicine, King Saud University, Riyadh, Saudi Arabia*
[8]*National Plan for Science and Technology, College of Medicine, King Saud University, Riyadh, Saudi Arabia*
Correspondence to Jazi Al Otaibi, Email: jalotaibi@mu.edu.sa

ABSTRACT

Background: Habitual khat use is associated with a host of psychophysiological health consequences.There has been no systematic approach to address the totalitarian aspect of khat use on human health. Here, we present the development and validation of the Mizankhatuse disorder index (MizKUDI)-a tool to assess the health aspects of khat use.

Methods: Habitual khat users (n=409, age=27.0±4.0 years), who were purposively selected from the list randomly selected houses in Mizan, Ethiopia participated in a cross-sectional study. Interviewer-administered survey tool with MizKUDI, the severity of dependence for khat (SDS-khat), and a semi-structured socio-demographics tool were employed.

Results: MizKUDItotal score did not show a ceiling effect or floor effect. Cronbach's alpha was 0.67. All item-total score correlations were significant (r= 0.12-0.64, *p*< 0.01/0.05) indicating adequate Internal homogeneity. The area under the curve, sensitivity, and specificity of MizKUDI with respect to SDS-khat were 0.67 (p<0.001), 70% and 60% (at the cut-off score of 15.5), respectively. The Parallel Analysis and the Cumulative variance rule (>40%) indicated a 3-Component model, while the Kaiser's criteria (Eigenvalue≥1) and the Scree test suggested a 5-Components of the MizKUDI.

Conclusion: The MizKUDI has satisfactory psychometric validity to screen for the health consequences of the habitual khat use. This finding of this preliminary study may help in further development and exploration of a holistic psychophysiological measure to assess effect habitual khat use.

Keywords: Dependence, substance use, *Catha edulis*, addiction, validity, Consistency,

INTRODUCTION

Catha edulis is an evergreen shrub grown in East Africa and the south-western Asian peninsula[1,2,3]. The leaves of the plant are habitually chewed, which contains psychoactive alkaloids called cathine and cathinone with stimulant activity,similar to that of amphetamine[1,2,4]. The habitual khat use is associated with dependence and addictive behavior like depression, sleep disturbances, appetite changes and negative mood[5-10]. Khat use increases the chances of dependence or use of other substances including tobacco and alcohol[2,11,12]. Apart from its psycho-social effects, khat use has a plethora of adverse physiological effects that disturbs most of the systems of the body[1,4,13].

The poor psychophysiological health outcomes of khat use include disturbed sleep, insomnia and depression[1,2,4,6,14], constipation, anorexia and weight loss[1,3], memory deficits[1,6,13,15,16], mood disturbances, general malaise and irritability[1,17], attention issues[14], sexual dysfunctions including impotence, and libido changes[13], fear, anxiety, blurred vision and delusions[13], dental caries and tooth decay[13], migraine and fine tremors[13]. Several studies have investigated the effects of khat use on various aspects of human health. However, there has been no comprehensive and systematic approach to understand the totalitarian aspects of khat use on human health. Such an approach may be useful to address the effects of khat as a spectrum of related health disturbances rather than isolated and individualized problems[13]. Moreover, it can be arguedthat looking only at the isolated roles of khat without developing a systemic totalitarian picture may be physiologically subjectivebecause the accumulated evidence suggeststhat khat use is a systemic disorder. We, therefore, recommend the usage of a new term, 'khat use disorder' to represent the host of adverse effects of the habitual khat use on human health. Indeed there are similar terms to address the psychophysiological aspects of opiate and alcohol habitual use called opiate use disorder and alcohol use disorder[7,8]. The issues of habitual khat use and its associated health consequences have long been neglected. In this study, we present the development and psychometric validation of a questionnaire tool called the MizanKhat Use Disorder Index (MizKUDI) to assess the ill effects of khat on human health (khat use disorder).

MATERIALS AND METHODS

Participants and study design: Seven hundred houses were initially earmarked based on a simple random

sampling using a lottery system to enroll habitual khat chewers for a cross-sectional study at Mizan-Aman, Bench Maji Zone, South Nation Nationalities Peoples' Region (SNNPR), Ethiopia. Four hundred and nine habitual khatusingcommunity-dwelling adults with age=27.0±4.0 years, who were selected purposively from the earmarked houses, participated in this study. Interviewers administered survey tool comprised of the MizanKhat Use Disorder Index (MizKUDI), the Severity of dependence for khat (SDS-khat)[18], and a semi-structured demographics questionnaire. The participants were informed in detail about the aim and procedures of the study and were enrolled after obtaining informedconsent. The subjective account of neuro-psychotic drug use was the exclusion criteria. Habitual khat chewers over the preceding six months who were ≥18 yearswere included in this study[18]. The Human Institutional Ethics Committee, College of Medicine and Health Sciences, Mizan-Tepi University, Mizan campus, Ethiopia had approved the study. The research work complied with the guidelines of Good Clinical Practice (GCP) and the 2002 Declaration of Helsinki (DoH)[19].

MizanKhat Use Disorder Index (MizKUDI): The items of the tool were selected based on the current evidence of khat associated effects on different aspects of human health. Many physiological systems including the cardiovascular system, the central nervous system, the endocrine system, the gastrointestinal system, the genito-urinary system, and the respiratory system are affected by khat use[1,2,4,13]. The preliminary questionnaire comprised 19-items covering various aspects of khat habit and its associated effects. These questions were selected after a comprehensive literature search[1,2,4,5, 6,9,11,13,16,17], and consultation with experts from medicine, physiology, pharmacology, and psychometrics. The 19-item tool was shortened to a 14-item tool after the pre-test in accordance with Wille's strategy[20]. This method involves sequential, one by one, deletion of items, which would lead to an increase in the internal consistency (the Cronbach's alpha test) until a point is reached, wherefrom no further remarkable increase in the internal consistency is possible on the deletion of additional item[20]. The 14-item final tool, henceforth referred to as MizKUDI is shown in appendix-I along with its scoring guideline. It comprised 13 closed-ended items and 1open-ended item. The only open-ended item was finally scored as a dichotomous variable with a score of0-1. The 13 closed-ended items included 5-dichotomous variables scored as 0-1, and 8-items scored as 0-3 (Table 2). The scores of the individual items were added to get the total score in the range from0-33. A higher score indicated an increasing severity of the effect of khat consumption on health. The first four items of the MizKUDIassessed different aspects of khat use habit, while next the 10-items evaluated sleep and dream, appetite, memory, adherence to schedules to finish work, sexual and dental health, headache, stomach pain and tremors in hands (Table 2). Annexure I contain the MizKUDI and its scoring guideline.

The severity of the dependence for khat (SDS-khat): It is a brief 5-item self-reported measure of the severity of the dependence onkhat (SDS-khat), which was developed at the Queen Mary University, London. The SDS-khat is one of the most rigorously validated measures related to khat addiction behavior[5,6,17]. The tool was culturally adapted by making minor changes i.e., Takzeen-the Arabic word for khat was deleted and 'khat' was replaced with 'chat', which is the locally used term for khat in Ethiopia. All the individual items in the tool have a similar scoring pattern of 0-3, where 0 is for 'Never or almost never' to 3 for 'Always or nearly always'. The scores of all items are added linearly to obtain the total score with a range of 0-15. Higher scores indicate increasing severity of dependence for khat[18]. SDS-khat has been found to be valid in polysubstance using Ethiopian adults.

Statistical analysis: The Statistical Package for the Social Sciences (SPSS) version 23.0 along with syntax was used for the data analysis. Participants' characteristics are presented using descriptive statistics like mean±SD and frequency. Cronbach's alpha test was performed to assess the internal consistency of the MizKUDI. The non-parametric test of the correlation, i.e., Spearman's test evaluated the internal homogeneity. The Receiver operating curve (ROC) analysis assessed the concurrent validity, wherein, SDS-khat score served as the gold standard state variable and the MizKUDI score was the test variable. Sensitivity, specificity, and area under the curve (AUC) were estimated.

Twenty-one outliers were deleted for the Principal component analysis with X^2> 36.12 (Mahalanobis distance (criterion of a = .001 with 14 df (number of variables)[21]. The Principal Components Analysis (PCA) was used to reduce 14 items of the MizKUDI into a set of weighted linear combinations[22]. The PCA for the unrotated solution was employed in the initial extraction. In the final extraction, one of the orthogonal rotations, i.e.,Varimax was employed because the criteria for correlation between the factors were not met[23]. Four measures of component retention including the robust measure of the Parallel analysis were employed[24-27].

RESULTS

Participants' characteristics are shown in Table 1. Most of the habitual khat users (86.4%) were males (Table 1). The majority of the participants (59.9%) reported no athletic activity. It was intriguing to notice that the majority of the habitual khat users (56.7%) reported the presence of chronic conditions, e.g., AIDS, diabetes, epilepsy, hypertension, mental disorders, tuberculosis, etc. (Table 1). Most of the habitual khat users also consumed alcohol (75.5%), cigarette (67.6%) and both tea as well coffee (83.4%) (Table 1). More than one-third of the participants were single, divorcee and widower (Table 1).

The distribution of the MizKUDI items scores isshown in Table 2. The MizKUDI total score had a range of 7 (1.0%)-26(0.8%) and a mean of 15.7±3.2 with a normal distribution (Skewness z=-0.45) in this population of habitual khat users. Cronbach's alpha of the MizKUDI in the study population was 0.67.All the item-total correlations for the MizKUDI scores were significant (r= 0.12-0.64, p< 0.01 or p< 0.05)(Table 3). The diagnostic validity of the MizKUDI with respect to SDS-khat was assessed by the Receiver operating curve (ROC) curve (Figure 1). The sensitivity and the specificity of the MizKUDI at the cut-off

score of 15.5 were 70% and 60%, respectively (Figure 1, Table 4). Table 4 shows the sensitivity and specificity of the MizKUDI at each criterion score in this population of the habitual khat users.

The MizKUDI scores did not have issues of singularity as indicated by Bartlett's test of sphericity ($p< 0.001$) (Table 5) [28]. The determinant score was 0.05; suggesting that there was no serious issue of multicollinearity in the MizKUDI scores (Table 5) [28]. The middling degree of the KMO of 0.72 indicated that the inter-item correlations were adequate (Table 5) [28]. Four extraction measures were employed in the PCA, which showed a heterogeneous outcome (Table 6). The Parallel Analysis (Monte Carlo PA) (Table 6) and the Cumulative variance rule (>40%) indicated a 3-Component model, while the Kaiser's criteria (Eigenvalue≥1) and the Scree test suggesteda 5-Component model of the MizKUDI(Table 6). The rotated component matrix for the 5-Component model of the MizKUDI is shown in Table 7.

Table 1 Participant characteristics

Characteristics	Mean ± SD/frequency
Age (yr)	27.0±4.0
Gender	
Male	350(86.4)
Female	55(13.6)
Unreported	4(1.0)
Residence	
Urban	400(97.8)
Rural	5(1.2)
Unreported	4(1.0)
Athletic activity	
None	245(59.9)
Upto 1hr/day	93(22.7)
More than 1/hr day	10(2.4)
Unreported	61(14.9)
Presence of chronic disease(s)	
No	170(42.1)
Yes	234(56.7)
Unreported	5(1.2)
Presence of chronic disease(s) in family	
No	181(44.3)
Yes	209(51.1)
Unreported	19(4.2)
Substance use Alcohol	
No	101(24.7)
Yes	307(75.1)
Unreported	1(0.2)
Cigarette	
No	130(31.8)
Yes	277(67.7)
Unreported	2(0.5)
Tea and/or Coffee	
Neither	5(1.2)
Tea	20(4.9)
Coffee	36(8.8)
Both	341(83.4)
Unreported	7(1.7)
Marital status	
Single	103(25.2)
Married	251(61.4)
Divorced	49(12.0)
Widowed	1(0.2)
Unreported	5(1.2)
SDS-Khat global score	6.7±1.4
MizKUDI	15.7±3.2

SDS-Khat:Severity of dependence scale-Khat; MizKUDI: Mizan khat use disorder Index

Table 2: Descriptive statistics of the Mizan khat use disorder Index (MizKUDI) inhabitual khat users

Mizan khat use disorder Index (MizKUDI) items	**Mean±SD**	**Item scores**			
		0 Frequency (%)	**1 Frequency (%)**	**2 Frequency (%)**	**3 Frequency (%)**
Do your parents and/or grandparents chew(ed) Chat?	0.9±0.3	9.3	90.7	N/A	N/A
How long (years) have you been chewing Chat?	0.9±0.3	7.5	92.5	N/A	N/A
How many days of a week do you chew Chat?	2.6±0.7	0	11.5	16.7	71.8
How many bundles of Chat do you use every day?	1.1±0.3	0	90.7	9.3	0
How do yousleep?	1.8±0.7	0.5	36.0	45.3	18.1
How is your appetite?	1.9±0.8	0.2	35.2	41.7	22.8
How is your memory?	1.1±0.4	0.7	93.4	1.7	4.2
Do you often have problems in completing works on time?	0.8±0.4	18.1	81.9	N/A	N/A
How is your sexual life?	1.2±0.5	1.5	83.3	9.6	5.6
Do you feel like dreaming while awake?	0.7±0.5	31.0	69.0	N/A	N/A
Do you have dental problems?	0.6±0.5	40.4	59.6	N/A	N/A
Do you often havestomach pain?	0.9±0.7	20.8	69.6	4.7	4.9
Do you often feel tremors in your hands?	0.6±0.5	37.5	61.0	1.2	0.2
Do you often have headaches?	0.6±0.5	41.4	58.6	N/A	N/A

SD: Standard deviation; N/A: Not applicable

Table 3: Internal consistency of the Mizan khat use disorder Index (MizKUDI) in habitual Khat users

Items of the MizKUDI	Item-Total Correlation	Cronbach's Alpha if Item Deleted
MizKUDI-1	.19**	0.67
MizKUDI-2	.21**	0.67
MizKUDI-3	.58**	0.63
MizKUDI-4	.15**	0.67
MizKUDI-5	.44**	0.67
MizKUDI-6	.47**	0.67
MizKUDI-7	.20**	0.67
MizKUDI-8	.21**	0.68
MizKUDI-9	.12*	0.68
MizKUDI-10	.52**	0.65
MizKUDI-11	.53**	0.64
MizKUDI-12	.60**	0.61
MizKUDI-13	.62**	0.63
MizKUDI-14	.64**	0.63

*P<0.05; **p <0.01

Table 4: Sensitivity and specificity of the Mizan khat use disorder Index (MizKUDI) at each cut-off score in habitual Khat users

Cut-off Score	Sensitivity	Specificity
6.0	1.0	.0
7.5	1.0	.0
8.5	1.0	.0
9.5	1.0	.0
10.5	1.0	.1
11.5	.9	.2
12.5	.9	.2
13.5	.9	.3
14.5	.8	.5
15.5	***.7***	***.6***
16.5	.5	.7
17.5	.4	.8
18.5	.2	.9
19.5	.1	1.0
20.5	.0	1.0
21.5	.0	1.0
22.5	.0	1.0
23.5	.0	1.0
25.0	.0	1.0
27.0	.0	1.0

Table 5 Sample size adequacy measures of the Mizan khat use disorder Index (MizKUDI) in habitual Khat users

Measures	Total
Anti-image matrix	0.48-0.82
Bartlett's test of Sphericity	<0.001
Communality	0.39-0.73*
Determinant	0.05
Inter-item Correlation	-0.04 to 0.66
Kaiser-Meyer-Olkin Test of Sampling Adequacy (KMO)	0.73

*Principal component analysis with initial unrotated solution

Table 6: Summary of the factor extraction measures used in the Principal component analysisof the Mizan khat use disorder Index (MizKUDI) in habitual Khat users

No. of factors	Eigen value			Cumulative Variance Explained (%)	Above point of inflection on Scree plot	Decision to extract			
	Actual	Mean of random order	95% of the random order			Parallel analysis (95% of the random order Eigenvalue > actual Eigenvalue)	Kaiser's criteria (Eigenvalue≥1)	Cumulative variance rule >40%)	Scree test
1	3.276	1.338	1.413	23.40	Yes	√	√	√	√
2	1.723	1.257	1.311	35.71	Yes	√	√	√	√
3	1.374	1.196	1.244	45.52	Yes	√	√	√	√
4	**1.180**	**1.144**	**1.184**	53.95	Yes	X	√	X	√
5	1.016	1.096	1.132	61.21	Yes	X	√	X	√
6	0.961	1.053	1.087	68.08	No	X	X	X	X

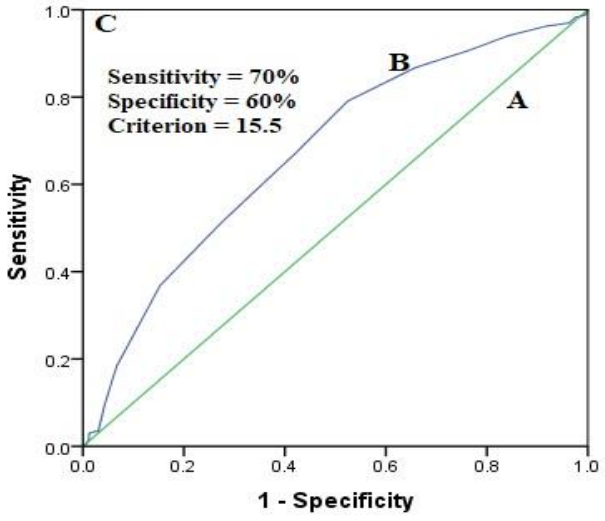
√ indicates extraction criteria fulfilled, X indicates otherwise

Table 7 Rotated component matrixof the Mizan khat use disorder Index (MizKUDI) in habitual Khat users

Items of the MizKUDI	Factor-1[a]	Factor-2[a]	Factor-3[a]	Factor-4[a]	Factor-5[a]
MizKUDI-1	.16	.16	**.57**	.06	-.08
MizKUDI-2	.03	.03	**.70**	-.02	.08
MizKUDI-3	**.61**	.07	**.50**	-.02	-.04
MizKUDI-4	-.02	**.42**	-.33	**.47**	.23
MizKUDI-5	.01	**.84**	.03	-.01	.00
MizKUDI-6	.00	**.78**	.23	.01	.00
MizKUDI-7	.21	-.05	-.23	-.04	**-.67**
MizKUDI-8	.24	-.01	-.28	-.03	**.71**
MizKUDI-9	-.12	-.05	.04	**.82**	-.01
MizKUDI-10	**.77**	.02	-.09	-.24	-.09
MizKUDI-11	**.64**	.00	.01	.15	-.17
MizKUDI-12	**.56**	.08	.11	**.58**	-.10
MizKUDI-13	**.77**	-.13	.31	-.04	.11
MizKUDI-14	**.80**	.05	.07	.00	.26

Principal component analysis (PCA)with Varimax rotation with Kaiser Normalization was performed
[a] Latent factors derived from PCA

Figure 1: Receiver operator curves (**A**) No discrimination (AUC=0.5) (**B**) Experimental test [0.67 (p<0.001)] and (**C**) Perfect test (AUC=1.0) in habitual khat users



DISCUSSION

The findings of this study support the psychometric validity of the newly developed tool, i.e., the MizKUDI as a composite measure of human health in habitual khat users. MizKUDI is perhaps the first of its kind tool whereasa single measure assessesthe effect of habitual khat use on several aspects of human health. The findings of the study may help in the development of similar tools to address the health consequences of dependence and addiction involving other drugs and substances. The MizKUDI total score did not show either the Ceiling or the floor effect, as determined by the absence of a minimum of 15% response rate for the highest or the lowest scores, respectively[29,30,31]. Therefore, the MizKUDI total scores are expected to show discriminative validity even at both extremes of scores[30] .

The value of the Cronbach's alpha test in this population of the habitual khat users for the MizKUDI indicated that the internal consistency was moderate. This is expected given the tool is a composite index of habitual khat use on different aspects of human health. However, the Cronbach's alpha of the MizKUDI is comparable to that of a related tool, i.e., SDS-khat[6,18]. The Cronbach's alpha of the SDS-khat has been reported to be in the range of 0.54 to 0.76[6,18]. The MizKUDI had adequate internal homogeneity as indicated by the test of the Item-total correlations; the correlation coefficients were all significant and showed a weak to a moderate relationship.

There are no similar tools or clinical diagnostic protocol to assess the health consequences of habitual khat use or any other substance use. Therefore, one of the most related as well as the most validated measure of khat use, i.e., SDS-khat was used to assess the concurrent validity of the MizKUDI. The values of the AUC and the diagnostic validity indices, i.e., specificity and sensitivity were moderate at the cut-off score of 15.5. The values might have been higher if compared with a more similar construct. However, it is notable to recognize that the findings further reaffirm the reliability and validity of self-report data from substance user groups in the general and habitual khat users in particular[6,18,32].

It is favorable to indicatethe construct validity of the 3-Component model because the two tests, i.e., the Cumulative variance rule, as well as the robust measure of the parallel analysis, revealed a 3-Component model of the MizKUDI in the habitual Khat users[27]. There is a degree of acceptance of the parallel analysis as a more robust and better measure of the component retention[22,25,26,27]. The value of the 95th percentile of the random order Eigenvalue was higherthan the actual Eigenvalue for the 4th component. This suggests the validity of the 3-Component model of the MizKUDI[22,25].

In summary, this study showedevidenceto supportthe psychometric validity, i.e., no ceiling and floor effect for the total score, internal consistency, internal homogeneity, concurrent validity with SDS-khat, and construct validity of the MizKUDI in the habitual khat users.

CONCLUSIONS

The newly developed MizKUDI has satisfactory psychometric validity to screen for the health consequences of the khat use disorder. This finding of this preliminary study may help in further development and exploration of a holistic psycho-physiological measure to assess effect habitual khat use.

Limitations of the study: The recognition of the khat use disorder and the establishment of its clinical assessment modeled on the Diagnostic and Statistical Manual-5 (DSM-5)[7] is needed. Then, the application of the ROCanalysis with such a gold standard would be more accurate than that with the SDS-Khat scale. The fact that fewerfemales participated in the study is a limitation but, it may be noted that the prevalence of the habitual khat use is generally lower in the females[2,3,6].

Ethics approval and consent to participate: The study was approved by the Human Institutional Ethics Committee of Mizan-Tepi University, and informed consent and consent for publication was obtained from all participants.
Ethics approval for involving animals: Not applicable
Competing interests: The authors declare that they have no competing interests.
Disclosure of potential conflicts, real and perceived, for all named authors: All authors declare no issues of conflict of interest.
Funding: The authors extend their appreciation to the Deanship of Scientific Research at Majmaah University for funding this work under Project Number No (RGP-2019-40).
Acknowledgments: We are grateful to the participants of the study. The authors extend their appreciation to the Deanship of Scientific Research at Majmaah University for funding this work under Project Number No (RGP-2019-40). The authors are grateful to Mizan-Tepi University.

REFERENCES

1. Manzar MD, Salahuddin M, Sony P, Maru TT, Pandi-Perumal SR, et al. (2017) Sleep disturbances and memory impairment among pregnant women consuming khat: An under-recognized problem. Ann Thorac Med 12: 247-251.
2. Manzar MD, Salahuddin M, Alamri M, Tesfaye TM, Pandi-Perumal SR, et al. Poor sleep in concurrent users of alcohol, khat and tobacco smoking in community-dwelling Ethiopian adults. Annals of Thoracic Medicine: In press.
3. Mahfouz MS, Rahim BE, Solan YM, Makeen AM, Alsanosy RM (2015) Khat Chewing Habits in the Population of the Jazan Region, Saudi Arabia: Prevalence and Associated Factors. PLoS One 10: e0134545.
4. Manzar MD, Salahuddin M, Maru TT, Dadi TL, Abiche MG, et al. (2017) Sleep correlates of substance use in community-dwelling Ethiopian adults. Sleep Breath 21: 1005-1011.
5. Kassim S, Croucher R, al'Absi M (2013) Khat dependence syndrome: a cross sectional preliminary evaluation amongst UK-resident Yemeni khat chewers. J Ethnopharmacol 146: 835-841.
6. Nakajima M, Dokam A, Alsameai A, AlSoofi M, Khalil N, et al. (2014) Severity of khat dependence among adult khat chewers: the moderating influence of gender and age. J Ethnopharmacol 155: 1467-1472.
7. American Psychiatric Association (2013) Diagnostic and Statistical Manual of Mental Disorders (DSM-5®): American Psychiatric Publishing.
8. World Health Organization, WHO (1992) The ICD-10 Classification of Mental and Behavioural Disorders: Clinical Descriptions and Diagnostic Guidelines. Geneva: Royal College of Psychiatrists.
9. Nakajima M, Hoffman R, al'Absi M (2017) Level of khat dependence, use patterns, and psychosocial correlates in Yemen: a cross-sectional investigation. East Mediterr Health J 23: 161-167.
10. Young JT, Butt J, Hersi A, Tohow A, Mohamed DH (2016) Khat Dependence, Use Patterns, and Health Consequences in Australia: An Exploratory Study. J Stud Alcohol Drugs 77: 343-348.
11. Kassim S, Rogers N, Leach K (2014) The likelihood of khat chewing serving as a neglected and reverse 'gateway' to tobacco use among UK adult male khat chewers: a cross sectional study. BMC Public Health 14: 448.
12. Odenwald M, al'Absi M (2017) Khat use and related addiction, mental health and physical disorders: the need to address a growing risk. East Mediterr Health J 23: 236-244.
13. (2006) " Expert Committee on Drug Dependence". Geneva. 9789241209427 9789241209427.
14. Al-Habori M (2005) The potential adverse effects of habitual use of Catha edulis (khat). Expert Opin Drug Saf 4: 1145-1154.
15. Colzato LS, Ruiz MJ, van den Wildenberg WP, Hommel B (2011) Khat use is associated with impaired working memory and cognitive flexibility. PLoS One 6: e20602.
16. Hoffman R, Al'absi M (2013) Concurrent use of khat and tobacco is associated with verbal learning and delayed recall deficits. Addiction 108: 1855-1862.
17. al'Absi M, Nakajima M, Dokam A, Sameai A, Alsoofi M, et al. (2014) Concurrent tobacco and khat use is associated with blunted cardiovascular stress response and enhanced negative mood: a cross-sectional investigation. Hum Psychopharmacol 29: 307-315.
18. Kassim S, Islam S, Croucher R (2010) Validity and reliability of a Severity of Dependence Scale for khat (SDS-khat). J Ethnopharmacol 132: 570-577.
19. World Medical Association (2001) World Medical Association Declaration of Helsinki. Ethical principles for medical research involving human subjects. Bull World Health Organ 79: 373-374.
20. Wille GW (1996) The Stepwise Procedure for the Empirical Assessment of Latent Variable Models: University of Port Elizabeth.
21. Jaccard J, Wan CK (1996) LISREL approaches to interaction effects in multiple regression. Thousand Oaks, Calif: Sage Publications.
22. Costello AB, Osborne J (2005) Best Practices in Exploratory Factor Analysis: Four Recommendations for Getting the Most From Your Analysis. Practical Assessment, Research & Evaluation 10: 1-9.
23. Tabachnick BG, Fidell LS (2007) Using Multivariate Statistics. Needham Heights, MA: Allyn & Bacon, Inc.
24. O'connor BP (2000) SPSS and SAS programs for determining the number of components using parallel analysis and Velicer's MAP test. Behavior Research Methods, Instruments, & Computers 32: 396-402.
25. Manzar MD, Zannat W, Moiz JA, Spence DW, Pandi-Perumal SR, et al. (2016) Factor scoring models of the Pittsburgh Sleep Quality Index: a comparative confirmatory factor analysis. Biological Rhythm Research 47: 851-864.
26. Manzar MD, Zannat W, Hussain ME, Pandi-Perumal SR, Bahammam AS, et al. (2016) Dimensionality of the Pittsburgh Sleep Quality Index in the collegiate young adults. Springerplus 5: 1550.
27. Manzar MD, BaHammam AS, Hameed UA, Spence DW, Pandi-Perumal SR, et al. (2018) Dimensionality of the Pittsburgh Sleep Quality Index: a systematic review. Health Qual Life Outcomes 16: 89.
28. Field AP (2000) Discovering Statistics Using SPSS for Windows: Advanced Techniques for Beginners. Sage Publications, Inc., Thousand Oaks, CA.
29. Salahuddin M, Maru TT, Kumalo A, Pandi-Perumal SR, Bahammam AS, et al. (2017) Validation of the Pittsburgh sleep quality index in community dwelling Ethiopian adults. Health Qual Life Outcomes 15: 58.
30. Lim CR, Harris K, Dawson J, Beard DJ, Fitzpatrick R, et al. (2015) Floor and ceiling effects in the OHS: an analysis of the NHS PROMs data set. BMJ Open 5: e007765.
31. Manzar MD, Salahuddin M, Maru TT, Alghadir A, Anwer S, et al. (2018) Validation of the adapted Leeds sleep evaluation questionnaire in Ethiopian university students. Health Qual Life Outcomes 16: 49.
32. Babor TF, Brown J, del Boca FK (1990) Validity of self-reports in applied research on addictive behaviors: Fact or fiction? Behavioral Assessment 12: 5-31.