Evaluation of the Psychometric Properties of the Lebanon Waterpipe Dependence Scale in a Sample of Iranian Waterpipe Smokers

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Original Article

Abstract

Background: Waterpipe tobacco smoking (WTS) has recently increased in Iran. There is no valid instrument to measure the level of nicotine dependence among its consumers. This study was aimed to investigate the validity and reliability of the Lebanon Waterpipe Dependence Scale-11 (LWDS-11).

Methods: A cross-sectional study was conducted in the year 2017 whereby 367 waterpipe smokers were recruited from Golestan Province of Iran. LWDS-11 scale is composed of 4 subscales: 1) nicotine dependence, 2) negative reinforcement, 3) psychological craving, and 4) positive reinforcement. The validity of the questionnaire was examined using construct validity. Reliability of this scale was examined using test-retest reliability and internal consistency.

Findings: The four-factor model for LWDS [comparative fit index (CFI) = 0.985, Tucker-Lewis index (TLI) = 0.979, standardised root mean residual (SRMR) = 0.059, root mean square error of approximation (RMSEA) = 0.049 (0.031, 0.061)] demonstrated good fit to this data. Cronbach's α was 0.825 for total scale and it was 0.818, 0.746, 0.624, and 0.670 for each individual subscale. The test-retest reliability of the scale was 0.925.

Conclusion: All goodness of fit indices (GFIs) represented a good fit of model. The LWDS-11 scale had an appropriate remarkable validity and reliability for waterpipe consumers to measure the level of nicotine dependence and it appeared to be likely useful for utilizing in the clinical and epidemiological studies.

Keyword: Waterpipe smoking; Nicotine; Tobacco; Iran

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Introduction

Waterpipe smoking (WPS) has dramatically increased globally and it is estimated that more than 100 million people smoke waterpipe.[1] This phenomenon is much more common in Africa, Asia, and specifically in the Eastern Mediterranean region.[2,3] However, it is increasing among young people and students.[4,5]

The prevalence of WPS alarmingly increased in Iran during the last decades. Danaei et al.'s study showed that the prevalence of long-time, current, and daily WPS was 43.8%, 28.8%, and 7.2%, respectively. In addition to this, WPS was 4.9 times more likely among the 18-24-year-olds compared to the 45-year-olds or older.[6] A pooled analysis of National Surveys on Risk Factors of Non-communicable Diseases (STEPS) among the adult population from 2006 to 2009 revealed that the prevalence of WPS ranged from 1.7% to 10.9% in men and 0% to 16.8% in women, and it was highest in the south and southeast.[7] The findings of a study indicated that despite the significant decline in WPS prevalence between 2005 and 2007 compared to 2000, there was generally no considerable change from 2000 to 2011. Besides, there were noticeable increases in WPS prevalence in 15-24-year-olds reaching from 1.6% in 2000 to 4.4% in 2011.[8]

A review study conducted in 2016 has revealed that at one session of waterpipe and cigarette consumption, 4.1 and 1.8 mg of nicotine enters the body, respectively.[9] However, taking a large amount of nicotine during a session of waterpipe increases the risk of nicotine addiction for waterpipe users.[9] Nicotine in all tobacco-containing materials causes addiction and its effect is not neutralized by the passage through the water.[10] Studies conducted in Iran show that consumers believe that waterpipe is not addictive, and this belief is one of the main contributing factors to the waterpipe consumption. The Ozouni Davaji et al. study explained that the vast majority of the participants in their study (71.1%) did not consider themselves addicted to waterpipe.[11]

It is fundamental to implement the intervention programs to quit smoking based on the level of dependence of the consumers. Otherwise, the intervention programs would not be successful. There are some scales which measure the nicotine dependency, but most of them are designed for cigarettes or smokeless tobacco. Shiffman et al. developed a multidimensional scale to measure nicotine dependence named as the Nicotine Dependence Syndrome Scale (NDSC) including five factors: drive, priority, tolerance, continuity, and stereotypy.[12] The Hooked on Nicotine Checklist (HONC) is another instrument which includes 10 items to evaluate loss of autonomy over tobacco in adolescent smokers.[13] Bahelah et al. used it to measure the nicotine dependency among Lebanese adolescents who smoke a waterpipe.[14] Auf et al. used the Fagerstrom Test for Nicotine Dependence (FTND) for waterpipe users due to no validated tools available for the assessment of nicotine dependence among waterpipe smokers in Egypt.[15] But there was no tool that specifically measured nicotine dependence in hookah users until Salameh et al. introduced the nicotine dependency scale as the Lebanon Waterpipe Dependence Scale-11 (LWDS-11). It is an 11-item scale measuring nicotine/tobacco dependence specifically among waterpipe smokers. A principal component analysis indicted four dimensions: psychological craving, physiological dependence, positive reinforcement, and negative reinforcement.[16]

The validity and reliability of this scale were approved by Primack et al. with ten items among Jordanian students.[17] Due to increased prevalence of waterpipe usage in Iran, it is also necessary to develop a valid tool to measure nicotine dependency especially among teenagers and young people. Therefore, the goal of this study was to assess the validity and reliability of the LWDS-11 scale among waterpipe smokers in Golestan Province of Iran.

Methods

Participants and procedure: In this cross-sectional study, a convenience sample of 367 waterpipe users from different cities of Golestan Province were recruited in 2017. Participants were selected from waterpipe cafes across the province. An eligibility criterion was people who have smoked waterpipe at least once in the last 30 days. First, the study aims were described to the potential participants and then they consented to be part of the study. The questionnaires were carefully filled by three adequately-trained students of public health. For illiterate people, the questionnaires were filled by the interviewers in face-to-face sessions. The study protocol was granted by

Mazandaran University of Medical Sciences, Sari, Iran (IR.MUZUMS.REC.13963048).

Measurement: The LWDS-11 introduced by Salameh et al. has been used in this study.[16] The questions were first translated into Persian and then translated back into English. The original scale and back translated version were compared and approved by an English language specialist. The final version of the questionnaire was given to twenty waterpipe smokers and based on their comments, minor changes were made.

In this study, the factorial structure with 4 factors was studied. These 4 factors were: 1) physiological nicotine dependence (items 1-4), 2) termination of dysphoric states or negative reinforcement (items 5 and 6), 3) psychological craving (items 7-9), and 4) positive reinforcement (encompassing pleasure and social interaction, items 10 and 11). In addition to this, the study examined three-factor loading analysis recommended by Primack et al.[17] These were: 1) physical dependence (6 items), 2) relaxation/pleasure (2 items), and 3) psychosocial (2 items). This study also examined the two-factor loading analysis recommended by Kassim et al.[18] which includes: 1) physiological nicotine dependence (6 items) and 2) negative reinforcement (4 items).

Construct validity of the stated scale was examined using confirmatory factor analysis (CFA). All indicator variables were measured in an ordinal scale including "yes, always", "yes, mostly", "yes, occasionally", and "no, never". Given the ordinal scale of variables, diagonally weighted least squares (DWLS) estimation method was used in factor analysis. Indices including Tucker-Lewis index (TLI), comparative fit index (CFI), standardised root mean residual (SRMR), and root mean square error of approximation (RMSEA) were used to assess the goodness of fit of the factorial structure of the model. In case of TLI and CFI greater than 90%, SRMR and RMSEA smaller than 0.10 and 0.08 were considered as acceptable and in case of TLI and CFI greater than 95%, SRMR and RMSEA smaller than 0.10 and 0.08 were considered as acceptable and in case of TLI and CFI greater than 95%, SRMR and RMSEA smaller than 0.10 and 0.08 were considered an excellent fit. Reliability of the scale was assessed using internal consistency and test-retest reliability. Test-retest reliability was done on 26 samples in a two-week interval. All analysis was performed using the lavaan package in R 3.5.0.

Results

The mean and standard deviation (SD) of participants' age was 29.41 ± 10.00 years and the mean age of starting smoking was 21.18 ± 8.19 years. Furthermore, most of the respondents (75.5%) were men. More information about demographic characteristics of the participants has been presented in table 1.

Cronbach's alpha of subscales ranged from 0.624 to 0.818. The Cronbach's alpha of the whole model was 0.825. The test-retest reliability of the scale was 0.925. The four-factor models were tested. These models demonstrated good absolute fit with an SRMR value of 0.059, and good incremental fit, with a CFI value of 0.985. The model showed parsimonious fit; however, it was less than satisfactory, with RMSEA = 0.049 (0.031, 0.066). All the standardized factor loadings and correlations between factors in these models were statistically significant.

Table 1. Demographic characteristics of the study groups

Variable		n (%)
Gender	Men	277 (75.5)
	Women	90 (24.5)
Marital status	Single	139 (37.9)
	Engaged	36 (9.8)
	Married	164 (44.7)
	Divorced	28 (7.6)
Education	Illiterate	23 (6.3)
	Primary school	12 (3.2)
	Middle school	27 (7.3)
	High school	48 (13.2)
	Diploma	150 (40.9)
	Associate degree	47 (12.8)
	Bachelor's degree	55 (15.0)
	Master's degree	5 (1.3)

Standardized factor loading of factorial structure varied from 0.32 to 1.00 as shown in table 2. The smallest correlation was between physiological craving and positive reinforcement and the largest correlation was between positive and negative reinforcement. There were large-moderate positive correlations between negative reinforcement and physiological dependence and between negative reinforcement and physiological craving. There were smaller positive correlations between physiological dependence and physiological craving, as well as physiological dependence and positive reinforcement.

Table 2. Standardized load factors for Lebanon Waterpipe Dependence Scale-11 (LWDS-11) (four factors)

#	Items	Factor 1#	Factor 2#	Factor 3#	Factor 4#	Cronbach's alpha if item deleted	Corrected item-total correlation
1	Number of times you could stop waterpipe for > 7 days	0.767				0.592	0.802
2	Percent of your income you would spend on waterpipe	0.711				0.569	0.805
3	Number of days you could spend without waterpipe	0.762				0.565	0.804
4	Number of waterpipes smoked per week	0.690				0.563	0.804
5	Smoking waterpipe to relax nerves		0.827			0.611	0.799
6	Smoking waterpipe to improve morale		0.720			0.539	0.807
7	Smoking waterpipe when seriously ill			0.400		0.414	0.817
8	Smoking waterpipe alone			0.507		0.444	0.815
9	Are you ready not to eat in exchange for a waterpipe?			0.556		0.549	0.806
10	Smoking waterpipe for pleasure				1.000	0.448	0.815
11	Smoking waterpipe to please others (conviviality).				0.328	0.157	0.839
	Reliability	0.818	0.746	0.624	0.670		
	Total scale reliability						

The three-factor [CFI = 0.973, TLI = 0.963, SRMR = 0.068, RMSEA = 0.065 (0.048, 0.083)] and the two-factor models had good fit [CFI = 0.962, TLI = 0.950, SRMR = 0.075, RMSEA = 0.075 (0.059, 0.092)] (Tables 3 and 4). However, these two models showed less fit than the four-factor loading.

Discussion

The current study is the first study to evaluate the psychometric properties of the LWDS-11 in Iran. The results of the current study revealed that the LWDS-11 scale had good validity and reliability among waterpipe users in Iran. In the original version, there were four subscales that each of them had good validity and reliability in the current study with the ability to show the different dimensions of dependence. Salameh et al. recommended a 4-factor structure model which

has been used in this study.[16] Besides, our findings showed sufficient goodness of fit with both three-factorial and two-factorial structure suggested by Primack et al.[17] and Kassim et al.[18] studies.

However, the corrected item-total correlation of item "Do you smoke waterpipe to please others?" was very low (r = 0.157). In addition to this, the factor loading of this item was very low (λ = 0.328) (Table 2). In a study by Kassim et al.,[18] it was observed that this item was the least important indicator variable of factor 2 (λ = 0.344). When we tested two-factorial model, the number of "λ = 0.241" was observed. All of these indicated that this question was not useful to determine the positive domain. This finding is consistent with Kassim et al. study. In such a scenario, it is recommended that such items either to be rewritten or to be deleted.[18]

Table 3. Standardized load factors for Lebanon Waterpipe Dependence Scale-11 (LWDS-11) (three factors)

#	Items	Factor 1	Factor 2	Factor 3
1	Number of times you could stop waterpipe for > 7 days	0.757		
2	Percent of your income you would spend on waterpipe	0.702		
3	Number of days you could spend without waterpipe	0.754		
4	Number of waterpipes smoked per week	0.673		
5	Smoking waterpipe when seriously ill	0.410		
6	Smoking waterpipe alone	0.555		
7	Smoking waterpipe to relax nerves		0.831	
8	Smoking waterpipe to improve morale		0.717	
9	Smoking waterpipe for pleasure			1.000
10	Smoking waterpipe to please others (conviviality)			0.310
11	Number of times you could stop waterpipe for > 7 days	0.757		

Table 4. Standardized load factors for Lebanon Waterpipe Dependence Scale-11 (LWDS-11) (two factors)

#	Items	Factor 1	Factor 2
1	Number of times you could stop waterpipe for > 7 days	0.755	
2	Percent of your income you would spend on waterpipe	0.704	
3	Number of days you could spend without waterpipe	0.752	
4	Number of waterpipes smoked per week	0.676	
5	Smoking waterpipe when seriously ill	0.414	
6	Smoking waterpipe alone	0.551	
7	Smoking waterpipe to relax nerves		0.856
8	Smoking waterpipe to improve morale		0.730
9	Smoking waterpipe for pleasure		0.592
10	Smoking waterpipe to please others (conviviality)		0.241
11	Number of times you could stop waterpipe for > 7 days	0.755	

Primack et al.[17] recommended three-factor loading with 10 indicator variables for LWDS. These factors named "physical dependence", "relaxation/pleasure", and "psychosocial". In this factorial structure, physical dependence was determined by 6 indicator variables and each of other two factors was determined by two indicator variables. This factorial structure showed good fit for Iranian population. This discrepancy might be likely due to the difference in population behaviours because students who have specific behaviours and perceptions can answer the questions differently. However, the results of Kassim et al. study conducted among United Kingdom (UK) smokers indicated that the question "Are you ready for not eating in exchange for a waterpipe?" did not differentiate between samples. They concluded that the welfare system within the UK provided a system of support in UK which might have enabled the respondents to afford to meet their basic needs.[18]

Other scales were developed and used for nicotine dependence in WPS. For example, Waterpipe Tolerance Questionnaire (WTQ) is an adaptation of the modified Fagerstrom Tolerance Questionnaire (FTQ). This construct consists of two factors which are measured by 5 indicator variables. Researchers believe that waterpipe dependence is different from cigarette dependence. This is because in waterpipe consumers, not only waterpipe dependence is important, but the social dimension is also critical.[19] In a study conducted by Berlin et al., seven dimensions were cited for cigarette consumption, but none of these dimensions were observed in waterpipe consumption.[20]

Questions number 5 and 6 of the questionnaires which were used in this study represent negative reinforcement dimensions showing that the respondents probably were not addicted to nicotine and only were using waterpipe to increase their mentality and serenity. In general, numerous scholars believe that nicotine dependence can be observed in various forms.[21,22]

Conclusion

The presented findings show that the LWDS has good validity and reliability in the Iranian waterpipe consumers and can be used as a validated tool in developing public health programs, clinical assessment of the patients, and epidemiological investigations.

Limitations: The limitations of this study include lack of biochemical measurements of nicotinic metabolites, such as plasma cotinine, or their concentration in the open air to assess the criterion-related validity. Moreover, due to the domestic law which prohibited the use of waterpipe in the sampling time, the hard access to a waterpipe in cafes in Golestan Province was another limitation that made it harder to access more samples. Therefore, a study with larger sample size in other parts of the country along with measurement of biochemical nicotine metabolites such as cotinine is recommended.

Conflict of Interests

The authors have no conflict of interest.

Authors' Contribution

Contributed in data analysis, data interpretation:

BP and AR; designed and conceptualized the study, literature review, and data interpretation: AC, SAN, and RBO; reviewed and edited the final manuscript: FZ; contributed in preparing the draft manuscript: SSS and KM; contributed in data acquisition: AM, MSH, and AR; revised critically and finalized the manuscript: MSH, MSH, and EP.

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ارزیابی خصوصیات روان‌سنجی مقیاس وابستگی به قلیان لبنان در نمونه‌های ایرانی مصرف‌کننده قلیان

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مقاله پژوهشی

چکیده

مقدمه: مصرف قلیان در ایران به تازگی افزایش پیدا کرده است. هیچ ابزار معتبری برای اندازه‌گیری میزان وابستگی به نیکوتین در افراد مصرف‌کننده آن در کشورمان وجود ندارد. پژوهش حاضر با هدف تعیین روایی و پایایی مقیاس وابستگی به قلیان لبنان-۱۱ (۱۱-LWDS یا Lebanon Waterpipe Dependence Scale-11) در کشورمان انجام شد.

روش‌ها: این مطالعه مقطعی در سال ۱۳۹۶ بر روی ۳۷۶ فرد مصرف‌کننده قلیان در استان گلستان انجام گردید. مقیاس وابستگی به لبنان ۱۱ از چهار زیرطبقه «وابستگی به نیکوتین، تقویت منفی، میل روانی و تقویت مثبت» تشکیل شده است. روایی پرسش‌نامه با استفاده از روایی سازه مورد بررسی قرار گرفت. پایایی این مقیاس با استفاده از آزمون مجدد و ثبات داخلی بررسی گردید.

یافته‌ها: مدل چهار عاملی برای مقیاس وابستگی به نیکوتین قلیان [(۰/۰۳۱-۰/۰۶۱) ۰/۰۴۹ = Root mean square error of approximation (RMSEA)، ۰/۰۵۹ = Standardised root mean residual (SRMR)، ۰/۹۷۹ = Tucker-Lewis index (TLI)، ۰/۹۸۵ = (CFI) Comparative fit index] برازش خوبی را برای داده‌ها نشان داد. مقدار Cronbach's alpha برای کل مقیاس، ۰/۸۲۵ بود و برای دیگر مقیاس‌های چهارگانه به ترتیب ۰/۸۱۸، ۰/۷۴۶، ۰/۶۲۴ و ۰/۶۷۰ به دست آمد. پایایی آن از طریق آزمون مجدد، ۰/۹۲۵ گزارش گردید.

نتیجه‌گیری: تمام مقیاس‌ها از برازش خوبی برای این مدل برخوردار بودند. مقیاس ۱۱-LWDS روایی و پایایی مناسب و قابل توجهی را برای اندازه‌گیری سطح وابستگی به نیکوتین در بین مصرف‌کنندگان قلیان نشان داد و به نظر می‌رسد استفاده از آن برای مطالعات بالینی و اپیدمیولوژیک مفید است.

واژگان کلیدی: مصرف قلیان؛ نیکوتین؛ تنباکو؛ ایران

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