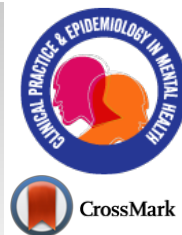


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RESEARCH ARTICLE

Withdrawal Symptoms among Cigarette and Waterpipe Smokers: A Study in Natural Setting

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Abstract:

Background:

The rates of tobacco use, including cigarette and waterpipe smoking, are surging in the Eastern Mediterranean region. The use of these products causes nicotine dependence that makes even short-term tobacco abstinence difficult due to aversive symptoms. During the daytime fasting of the month of “Ramadan”, people accept significant disruption in regular activities, including tobacco smoking. Thus, daytime during Ramadan (before sunset) is likely associated with abstinence symptoms emerging among tobacco smokers. We assessed this hypothesis by measuring tobacco/nicotine abstinence symptoms and craving among smokers of cigarettes or waterpipes during Ramadan.

Methods:

A cross-sectional survey-based study was conducted on a convenience sample of adults. Participants were assessed for general information about tobacco smoking, dependence, and nicotine desire or craving, and withdrawal symptoms using the Minnesota Nicotine Withdrawal Scale (MNWS) and the Tiffany-Drobes Questionnaire on Smoking Urges.

Results:

The study sample included 632 exclusive cigarette smokers and 161 exclusive waterpipe tobacco smokers. After fasting and abstaining from tobacco during the day, approximately 75% of cigarette smokers and 20% of waterpipe smokers reported smoking within the first 30 minutes. In addition, 10% of cigarette smokers and 30% of waterpipe smokers reported smoking within the first 60 minutes. Regarding smoking urge, no significant difference was found between cigarette and waterpipe smokers. For nicotine craving and withdrawal, significant differences between cigarette and waterpipe smokers were found when comparing mean scores for each of the following items: (i) urge to smoke, (ii) craving nicotine, (iii) hunger, (iv) desire for sweets, and (v) depression/feeling blue (P-values < 0.05).

Conclusion:

This study provided evidence from the month of Ramadan that waterpipe smoking is associated with abstinence-induced smoking urge and withdrawal symptoms that are comparable to cigarette smoking. More interdisciplinary research must be focused on developing interventions to reduce tobacco smoking, including waterpipe.

Keywords: Smoking, Waterpipe, Cigarettes, Withdrawal symptoms, Ramadan, Natural environment.

Article History

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1. INTRODUCTION

Developing countries in the Eastern Mediterranean region continue to experience an increase in tobacco use and a rise in tobacco-related morbidities and mortalities [1, 2]. In this region, smoking tobacco in a water pipe, commonly known as a *narghileh* or *shisha*, is a traditional method of tobacco use

[3]. However, over the last decades, Waterpipe Smoking (WPS) has shown a global spread and has become a worldwide public health threat, especially among young age groups [4, 5]. According to reports from the Centers for Disease Control and Prevention (CDC), approximately 20% of 13–15 years old adolescents in the Eastern Mediterranean Region have reported regular WPS that preceded cigarette use [6], and increased susceptibility to cigarette smoking initiation [7, 8]. Regardless of the type of tobacco products, the early age of first tobacco use during adolescence is a significant health challenge

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because of the expected longer lifetime tobacco consumption and thus more related negative health effects [9 - 11]

Similar to cigarette smoking, WPS is associated with many devastating health outcomes [12]. Mounting evidence suggests that the majority of waterpipe tobacco smokers might be nicotine dependent, undergo difficulty abstaining, and experience similar health-related consequences as cigarette smokers [13]. Unfortunately, rigorously tested methods to facilitate WPS cessation are scarce [14]. Thus, in this study, researchers aimed to characterize tobacco abstinence symptoms in a real-world environment “outside laboratory walls,” during a brief period of cessation (daily fasting during “Ramadan”) among cigarette and waterpipe smokers.

A smoke-free environment is among the factors associated with the success rate of smoking cessation [15]. During the month of fasting, “Ramadan,” people accept significant disruption in their smoking behavior, including the inability to use tobacco products between sunrise and sunset. This might trigger smokers to question their reasons for smoking. In addition, such a daily abstinence period (15-18 hours) is considered supportive to assess and evaluate withdrawal among tobacco smokers [16]. Studies have found that, during fasting, several factors may impact health-related outcomes, such as a smoke-free environment [16, 17]. In addition, spirituality and faith are the protective factors against tobacco smoking, which peak to the maximum during the month of “Ramadan” [18]. Thus, the naturally supportive environment during “Ramadan” could be used as a perfect time to assess abstinence symptoms and nicotine craving among smokers. Thus, this study was designed to gather information on withdrawal symptoms and nicotine craving (smoking urge) during the month of “Ramadan” among a sample of tobacco smokers in Jordan.

2. METHODS

2.1. Participants

During the month of Ramadan, a convenience sample of adults from the public was approached by a research assistant, who was trained on how to recruit participants and collect data about their smoking behaviors. Public places, such as parks, shopping malls, and markets, were among the target locations. Participants were included in the study if they were ≥ 18 years of age, identified themselves as tobacco smokers of either cigarettes or WP, and were generally in a good health. Only fasting participants were recruited; thus, all participants were abstinent from all tobacco products. The timing of data collection and recruitment to participate was consistent (after mid-day 2:30 pm – 3:30 pm) to make sure that participants did not smoke in the last 8 hours. Participants were excluded if they reported dual smoking behavior (cigarettes and WP), were pregnant, or were breastfeeding.

2.2. Design and Procedures

In this cross-sectional study, each participant completed a self-administered questionnaire with five main parts covering: (i) demographics, (ii) general information about tobacco smoking either cigarettes or waterpipe (e.g. quantity and

frequency of tobacco smoking, age of first use, the time between fasting and tobacco smoking), (iii) dependence on WPS (e.g. monthly expenditure on WPS, trials to quit WPS, reasons for WPS), (iv) clinical scale of nicotine desire or craving and withdrawal symptoms (Minnesota Nicotine Withdrawal Scale (MNWS) [19], and (v) clinical scale of Tiffany–Drobes Questionnaire on Smoking Urges (QSU-brief) [20]. Participants spent between 10-15 minutes completing the questionnaire. Participation was voluntary and incentives were not offered.

2.3. Clinical Scales

Nicotine craving and withdrawal symptoms were assessed using subjective measures of tobacco abstinence. These measures were translated into Arabic, tested, and applied previously in research studies [21, 22]. The brief QSU contained ten Likert items, with two subscales (five items for each): one about the intention to smoke (desire to smoke for reward), and the second about the anticipation of relief from withdrawal (need to smoke for relief) [20]. Each item in the brief QSU was rated on a scale ranging from 0 (strongly disagree) to 6 (strongly agree). The total QSU score and the scores of each subscale were calculated and evaluated separately. The Minnesota Nicotine Withdrawal Scale (MNWS) contains 11 items that were presented as a visual analog scale anchored with “not at all” on the left side and with “extremely” on the right side. These clinical measures have been examined and used extensively in research [23]. Internal consistency among the study sample was examined for both scales and their reliability estimates were found to be good (the coefficient alpha reliability estimates were 0.89 and 0.88 for brief QSU and MNWS, respectively).

2.4. Data Analysis

Data were entered into Excel and then imported into SPSS version 23 (SPSS Inc., Chicago, IL, USA) for statistical analysis. Descriptive and comparative analyses were performed as appropriate. Socio-demographics, smoking behaviors, and withdrawal symptoms were assessed among cigarette smokers and waterpipe smokers. An alpha of 0.05 was set to define statistical significance.

3. RESULTS

3.1. Characteristics of the Study Sample

A total of 793 questionnaires were obtained, in which 632 participants responded to the cigarette smoking instrument, and 161 respondents responded to the WPS instrument. The same instruments were used in both groups with minor amendments on the type of smoked tobacco, items were directed toward cigarettes for cigarette smokers and waterpipe for waterpipe smokers. In the study sample, males comprised 95.6% and 91.3% of cigarette smokers and waterpipe smokers, respectively. The mean age of participants was higher among cigarette smokers than waterpipe smokers. The early age of first use was more prominent among waterpipe users than cigarette smokers (Table 1). The majority of respondents had low income (<700 JD) and a bachelor’s degree as their level of education. The majority of cigarette smokers reported the

consumption of ≥ 16 cigarettes per day, whereas the majority of waterpipe smokers reported the consumption of ≥ 2 heads per day. Among the cigarette smokers, 63.9% reported smoking fewer cigarettes on regular days as compared to fasting days during “Ramadan,” whereas 36.6% of waterpipe smokers

reported fewer waterpipe sessions on regular days as compared to fasting days. After fasting and abstaining from tobacco in “Ramadan,” approximately 75% of cigarette smokers and 20% of waterpipe smokers reported smoking within the first 30 minutes (Table 1).

Table 1. Characteristics of the study sample.

	Cigarette Smokers (n=632)	Waterpipe Smokers (n=161)
-		
Demographic characteristics	% (n)	% (n)
Age [§]	29.2 (11)	22.2 (5.7)
Gender	-	-
Male	95.6% (604)	91.3% (147)
Female	4.4% (28)	8.7% (14)
Educational Level	-	-
Lower than high school	9% (57)	7.5% (12)
High school	25.9% (164)	18% (29)
Bachelor's degree	58.1% (367)	70.8% (114)
Graduate level	7% (44)	3.7% (6)
Number of family members [§]	5.7 (2.9)	5.8 (2.2)
Number of house rooms [§]	4.6 (1.7)	5.1 (1.9)
Monthly income	-	-
< 300 JD	11.1% (70)	7.5% (12)
300 – 500 JD	28.3% (178)	26.7% (43)
501 – 700 JD	19.8% (125)	18% (29)
701 – 900 JD	11.1% (70)	13% (21)
901 – 1100 JD	9.2% (58)	6.8% (11)
> 1100 JD	20.47% (129)	28% (45)
	Missing: 0.03% (2)	
Living	-	-
Urban area	63.5% (401)	54.7% (88)
Rural area	34.4% (217)	44.1% (71)
Desert area	2.05% (13)	1.2% (2)
	Missing: 0.05% (1)	
Smoking related characteristics	% (n)	% (n)
Age of 1 st use	-	-
<11 years	12.2% (77)	31.1% (50)
11 – 14 years	24.1% (152)	21.1% (34)
15 – 17 years	30.1% (190)	25.5% (41)
18 – 21 years	23.9% (151)	15.5% (25)
>21 years	9.7% (62)	6.8% (11)
Average number of tobacco smoking (Cigarettes vs. Waterpipe heads)	1-2: 5.7% (36) 3-4: 4.4% (28) 5-6: 3.8% (24) 7-10: 13.3% (84) 11-15: 13.6% (86) 16-20: 26.4% (167) >20: 32.4% (205) Missing: 0.3% (2)	1: 44.1% (71) 2: 39.8% (64) 3: 12.4% (20) 4: 2.5% (4) > 4: 1.2% (2)
Average number of daily smoking sessions relative to that during “Ramadan”:	-	-
Less	-	-
Similar	63.9% (404)	36.6% (59)
More	27.5% (174) 8.2% (52) Missing: 0.3% (2)	30.4% (49) 32.9% (53)
Time to first smoking after sunset in “Ramadan”:	-	-
≤ 30 minutes	74.5% (471)	19.9% (32)
39 – 59 minutes	10% (63)	29.8% (48)
60 – 119 minutes	7.4% (47)	22.4% (36)
120 – 179 minutes	2.7% (17)	17.4% (28)
≥ 180 minutes	4.7% (30)	10.6% (17)
	Missing: 0.6% (4)	

[§]: variables represented by mean (standard deviation) Abbreviations: JD: Jordanian Dinar

Table 2. Comparative analysis between cigarettes and waterpipe smokers related to the main study measures.

Clinical Measure	Cigarettes Mean (SD)	Waterpipe Mean (SD)	Δ
QSU _{total}	34.24 (17.43)	33.81 (16.39)	0.43 t = 0.292 (P=0.77)
QSU ₁ (intention to smoke)	17.99 (9.93)	17.72 (9.31)	0.276 t = 0.330 (P=0.74)
QSU ₂ (Anticipation of relief from withdrawal)	16.22 (9.05)	16.09 (8.41)	0.137 t = 0.181 (P=0.85)
MNWS	1.6 (0.97) (n= 630)	1.5 (0.86) (n= 161)	0.041 t = 0.527 (P=0.599)
1. Urges to smoke	1.81 (1.39)	1.36 (1.32)	0.43 t = 3.68 (P=0.0001)
2. Irritability/frustration/anger	1.39 (1.39)	1.19 (1.21)	0.19 t = 1.75 (P=0.08)
3. Anxious	1.24 (1.32)	1.30 (1.24)	-0.06 t = -0.587 (P= 0.56)
4. Difficulty concentrating	1.57 (1.35)	1.52 (1.19)	0.05 t = 0.46 (P= 0.65)
5. Restlessness	1.81 (1.39)	2.04 (1.42)	-0.22 t = -1.78 (P= 0.077)
6. Hunger	1.59 (1.49)	1.86 (1.42)	-0.27 t = -2.12 (P= 0.035)
7. Impatient	1.55 (1.39)	1.60 (1.39)	-0.057 t = -0.46 (P=0.64)
8. Craving nicotine	1.83 (1.50)	1.45 (1.30)	0.37 t = 2.9 (P= 0.002)
9. Drowsiness	1.65 (1.37)	1.57 (1.32)	0.09 t = 0.75 (P=0.46)
10. Depression/feeling blue	1.15 (1.31)	1.57 (1.36)	-0.42 t = -3.5 (P= 0.001)
11. Desire for sweets	1.87 (1.57)	1.52 (1.45)	0.35 t = 2.68 (P= 0.008)

Regarding smoking urge measures, the average total scores (QSU_{total}) and both subscales: (i) desire to smoke for reward (QSU₁), and (ii) anticipation of relief from withdrawal (need to smoke for relief) (QSU₂) were assessed among both smoking types (Table 2). No significant difference was found between the two different tobacco smoking methods (cigarette vs. waterpipe) on any of the reported scores that were evaluated during fasting time.

For nicotine craving and withdrawal symptoms, each item score (symptom) within MNWS was assessed and a comparison was made between participants from the two different tobacco smoking methods. MNWS mean score was 1.6 (SD=0.97) for cigarette smokers and 1.5 (SD=0.86) for waterpipe smokers. Regarding each symptom, significant differences between cigarettes vs. waterpipe smokers were found when comparing mean scores for each of the following items: (i) urge to smoke, (ii) craving nicotine, (iii) hunger, (iv) desire for sweets, and (v) depression/feeling blue (P-values < 0.05). Even waterpipe smokers reported a higher mean score on the item of feeling hunger, as compared to cigarette smokers, they have scored less on the item of desire for sweets. Adding to that, in comparison to cigarette smokers, waterpipe smokers have indicated lower scores on items of the urge to smoke and nicotine cravings, however, higher scores were achieved on the item of depression and feeling blue (Table 2).

As related to their dependence on WPS (Table 3), the majority reported ≥ 3 sessions per week, monthly expenditure on WPS of $\geq 2\%$, and denied any previous trial to quit WPS. Different motives for waterpipe smoking were documented by waterpipe smokers. The highest rank was for using waterpipes to feel happy, followed by smoking while being alone and using waterpipes to relax (Table 4). On the other hand, the least ranking was for smoking waterpipe instead of food intake and smoking waterpipe to look good.

4. DISCUSSION

The goal of this investigation was to characterize withdrawal symptoms among cigarette versus waterpipe smokers during a short period of tobacco abstinence among study participants. The month of "Ramadan," (the fasting month of Muslims) was selected as a period for data collection. Because most of the adult population in Jordan is Muslims, they are supposed to abstain from smoking, drinking, and any food intake from sunrise to sunset during "Ramadan.". Overall, this study showed that WPS is associated with abstinence-induced smoking urge and withdrawal symptoms that are comparable to cigarette smoking. Our results indicated that abstinence-related symptoms, such as restlessness, irritability, anxiety, difficulty concentrating, impatience, and drowsiness were similarly experienced by waterpipe and cigarette smokers.

Even though the urge to smoke and nicotine craving were slightly expressed more among cigarette smokers, waterpipe smokers in this study reported more symptoms of hunger and depression. These findings support the previously highlighted replacement potential between cigarettes and waterpipes during attempts of cigarette cessation [21]. The WPS was associated with dominant features of tobacco dependence and was considered an interchangeable method of tobacco smoking with cigarette smoking in its effects on tobacco withdrawal symptoms [21]. The reported motives of smoking waterpipes,

such as “to feel happy” or “to relax” support the notion that abstaining from WPS for hours might induce craving in anticipation of WPS to alleviate the negative mood. In concordance to the Diagnostic and Statistical Manual of Mental Disorders-5 (DSM-5), this would also indicate its strong relation to the reported psychological withdrawal symptoms of restlessness, irritability, anxiety, difficulty concentrating, impatience, and drowsiness. The present findings provide support to previous literature and can be utilized in cessation interventions that target WPS.

Table 3. Dependence on waterpipe smoking.

	Percent (n)
-	
Number of waterpipe sessions/day ⁵	2.1 (1.1) Min = 1 Max = 7
Percentage of monthly expenditure on WPS:	
≤ 1% of income	31.7% (51)
2 – 10% of income	50.9% (82)
11 – 50% of income	13.7% (22)
>50% of income	3.7% (6)
Previous trials to quite WPS:	
Yes	30.4% (49)
No	69.6(112)
Weekly waterpipe sessions:	
<1	18% (29)
1 – 2	24.8% (40)
3 – 6	31.1% (50)
≥ 7	26.1% (42)
Number of times when you could stay away from WPS for more than a week:	
None	33.5% (54)
Once	24.8% (40)
Many times	23.6% (38)
Every time	18% (29)
Number of days that you can stay without WPS:	
≤ 1 day	21.7% (35)
2 – 3 days	23% (37)
4 – 7 days	13.7% (22)
> 7 days	41.6% (67)

⁵: variables represented by mean (standard deviation)

Abbreviations: WPS: Water Pipe Smoking; Min: Minimum; Max: Maximum

Table 4. Motives for waterpipe smoking.

	4 Yes, always (n)	3 Yes, mostly (n)	2 Yes, sometimes (n)	1 No, never (n)	Score
Do you use a waterpipe when you are sick?	8.7% (14)	14.9% (24)	25.5% (41)	50.9% (82)	1.814
Do you use a waterpipe when you are alone?	26.1% (42)	17.4% (28)	18.6% (30)	37.9% (61)	2.317
Do you use waterpipe to feel happy?	19.3% (31)	21.7% (35)	33.5% (54)	25.5% (41)	2.348
Do you use waterpipe to look good?	8.1% (13)	5.6% (9)	13% (21)	73.3% (118)	1.485
Do you use a waterpipe to relax?	17.4% (28)	19.3% (31)	24.2% (39)	39.1% (63)	2.15
Do you use waterpipe to satisfy others?	21.1% (34)	13% (21)	6.2% (10)	59.6% (96)	1.954
Do you use waterpipe instead of food intake?	4.3% (7)	8.1% (13)	12.4% (20)	75.2% (121)	1.415

It is widely accepted that nicotine, the main component in cigarettes, causes dependence and associated withdrawal symptoms [22 - 24]. The WPS has also been shown to deliver nicotine to users with a magnitude comparable to that of cigarette smoking [3, 25]. However, in contrast to cigarette smoking, WPS is considered a complex behavior because of the significant variation of the key parameters related to frequency, duration, and intensity of WPS sessions [26, 27]. Therefore, the contribution of nicotine to the observed abstinence symptoms needs further investigation.

There were some limitations to the current study. For example, the variation in the abstinence period might contribute to current findings. As WPS needs long preparation and settings when compared to cigarette smoking, smokers can consume cigarettes immediately before sunrise. Researchers might control such effects by asking about the last smoking session for both methods. This study was also self-reported, so there is a chance of Hawthorne effect and recall bias. In future studies, an objective measure of abstinence would be considered. This study used a convenience sampling approach, which could in some cases limit the overall generalizability of the results. Moreover, the current study did not include clinical sub-set, such as mental illness or patients on general medicine. Including such clinical subsets of patients is warranted in future studies.

CONCLUSION

In conclusion, this study provided evidence from the month of Ramadan that WPS is associated with abstinence-induced smoking urge and withdrawal symptoms that are comparable to cigarette smoking. WPS use is spreading worldwide and is characterized by exclusive patterns of intermittent use and age trends, with younger ages being the most affected. Thus, more interdisciplinary research must be focused on developing interventions that deal with the striking rates of WPS in society.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The protocol of this study was approved by the Institutional Review Board (IRB) of Jordan University of Science and Technology.

HUMAN AND ANIMAL RIGHTS

No Animals were used in this research. All human research procedures followed were in accordance with the ethical standards of the committee responsible for human experimentation (institutional and national), and with the Helsinki Declaration of 1975, as revised in 2013.

CONSENT FOR PUBLICATION

Informed consent was obtained from the participants.

AVAILABILITY OF DATA AND MATERIALS

Not applicable.

FUNDING

None.

CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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Not applicable

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