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Original Article

"Waterpipe Is Like a Wife": Qualitative Assessment of Perspectives on Waterpipe Smoking Dependence

Satish Kedia[1], Nikhil Ahuja[2], Fadi Hammal[3,4], Taghrid Asfar[4,5,6], Thomas Eissenberg[4,7], Wasim Maziak[4,8], Kenneth D. Ward[1,4*]

[1]Division of Social and Behavioral Sciences, School of Public Health, University of Memphis, Memphis, TN, USA
[2]Department of Public Health and Social Work, Slippery Rock University, PA, USA
[3]School of Public Health, University of Alberta, Edmonton, Canada
[4]Syrian Center for Tobacco Studies, Aleppo, Syria
[5]Department of Public Health Sciences, University of Miami, Leonard M. Miller School of Medicine, Miami, FL, USA
[6]Sylvester Comprehensive Cancer Center, University of Miami, Miller School of Medicine, Miami, FL, USA
[7]Center for the Study of Tobacco Products and Department of Psychology, Virginia Commonwealth University, Richmond, VA, USA
[8]Department of Epidemiology, Robert Stempel College of Public Health and Social Work, Florida International University, Miami, Florida, USA

Abstract

Background: Waterpipe (WP) smoking has become a global public health problem in recent decades and growing evidence indicates that it can cause nicotine dependence. Most evidence on WP dependence to date has been derived from survey- or laboratory-based studies. This study employed qualitative methods to explore WP users' perceptions of dependence in Aleppo, Syria.

Methods: A total of 15 focus groups were conducted with 64 adult WP smokers (51 males and 13 females) using a semi-structured interview. All focus group discussions were audiotaped, transcribed, and coded using directed content analysis.

Findings: Several WP dependence features were consistent with those commonly reported by cigarette smokers. These included positively reinforced features, such as smoking's association with social gatherings and cultural connectedness, and negatively reinforced features including relief of withdrawal symptoms, stress, and boredom. Although interest in quitting was low, many users perceived quitting WP to be difficult and an indicator of loss of control over smoking, a common marker of dependence. Several observed dependence features were specific to WP, including transitioning from social smoking to smoking alone, and adapting one's behavior to the considerable effort normally required to engage in WP smoking despite inconvenience or cost, and often at the expense of other reinforcers such as social interaction.

Conclusion: The general and specific features of WP dependence need to be considered in developing instruments to measure WP dependence, in clinical assessment of WP dependence, and in developing cessation programs.

Keywords: Waterpipe smoking, Hookah, Nicotine dependence, Focus groups, Syria

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Introduction

Waterpipe (WP), also known as hookah, shisha, arghile, narghile, hubble-bubble, and qalyan, is a traditional method of tobacco use in which heated tobacco smoke passes through water prior to inhalation.[1] In the past two decades, WP use has spread beyond its cultural roots in the Middle East and Southeast Asia to become a global epidemic.[2] Now, it is being widely used in Europe and North America, and is most prevalent in the Eastern Mediterranean region, where regular or occasional use among adults ranges from 3.3% in Egypt to 16.3% in Iran.[3] Among 13-15-year-old individuals in 22 Arab countries surveyed in 2005-2011, 10.6% used WP in the past month, indicating WP smoking was more prevalent than cigarette smoking (6.4%).[4] Many factors such as the introduction of flavored WP tobacco, the social nature of WP smoking, the thriving café culture, the rise of the internet and social media, and the lack of WP specific policies and regulations have created optimal conditions for the rise of WP smoking.[5] WP smokers inhale greater puff volumes than cigarette smokers, leading to larger intake of toxicants, including polycyclic hydrocarbons and other carcinogens, lung-damaging volatile aldehydes, and nicotine.[6,7] Growing epidemiological and laboratory evidence links WP to health risks such as lung cancer, cardiovascular and pulmonary diseases, oral dysplasia, infertility, and low birth weight.[8,9] In addition, WP users are at risk of developing nicotine dependence

*Corresponding Author: Kenneth D. Ward, Email: kdward@memphis.edu

and experience dependence symptoms including urges to smoke, irritability during abstinence, and difficulty quitting.[10]

WP smokers may also exhibit other dependence symptoms related to highly rewarding features including shared social experience as well as aroma and taste from sweetened and flavored tobacco.[11] Among a cohort of adolescent WP smokers in Lebanon, 82% reported that "Just the sight or smell of WP is enough to make me want to smoke," and 78% admitted that "It would be very difficult for me to be in a restaurant and not smoke WP."[12] Survey studies from Syria have reported that some WP users, particularly heavy users, engage in behavioral adaptation to ensure WP access including selecting restaurants or cafes based on WP availability, carrying one's own WP apparatus, and smoking alone at home.[13,14] Nearly one-third of WP users report wanting to quit and more than half make an unsuccessful quit attempt in any given year.[15-17]

To date, most studies about factors associated with WP dependence have been survey- or laboratory-based. While valuable, quantitative studies do not provide users' perspectives on the nature and distinctiveness of WP dependence that can be gained from qualitative research. Although a few qualitative studies have explored patterns of and reasons for smoking WP,[18-24] none of these have focused specifically on WP smokers' perceptions about their experiences of WP dependence. Furthermore, given that WP is smoked at higher rates among people in Middle Eastern countries than Western countries, and is considered an expression of cultural identity,[3,11,25] it is important to understand WP-specific dependence features among users in these countries. The current study contributes greatly to the existing literature on WP by employing qualitative methods to explore adult users' perceptions of WP dependence. Findings will improve our understanding of WP dependence, and inform assessment and intervention efforts, to address this evolving WP epidemic.

Methods

Design and participants

This study was part of a larger project to develop a WP-specific dependence scale.[26] Consistent with previous research that used qualitative methods as formative work to develop dependence measurement instruments for cigarette smokers,[27] focus groups were used to explore perspectives on dependence among adult WP smokers in Aleppo, Syria. Those who identified themselves as currently smoking WP at least once a month and not having smoked cigarettes in the past 30 days were included in this study. Dual WP/cigarette smokers were excluded to ensure that perceptions of WP dependence were not adulterated by cigarette smoking. Participants were recruited using newspaper advertisements, flyers, and word-of-mouth.

As the first step in developing an interview guide for the focus groups, we reviewed theories and frameworks of dependence among cigarette smokers, including positive reinforcement,[28,29] negative reinforcement,[30,31] social learning and cognitive models,[32-36] the Health Belief Model,[37,38] Transtheoretical Model,[39-41] The ICD-10,[42] and DSM-IV-TR dependence criteria.[43,44] We also evaluated survey data collected by our research team and others about attitudes, beliefs, and behaviors of WP users that were potentially relevant to dependence.[10,11,45] In addition, data from our previous surveys and in-depth interviews with WP smokers in Aleppo, Syria were used to highlight WP specific themes that are not captured adequately in existing dependence theories.[13,19] After finalizing the initial list of questions to be covered in the focus groups, the research team members discussed each of the items to develop a consensus on the final list (see Supplementary file 1). Two bilingual investigators independently translated questions in Arabic and then, for validation purpose, questions were back-translated into English by an external professional translator.

Procedure

The Institutional Review Boards of the University of Memphis and the Syrian Society Against Cancer approved the study protocol. Informed consent was obtained from all participants. Prior to the start of each focus group session, participants completed a self-administered survey of sociodemographic and tobacco use characteristics for descriptive purposes. The number of focus groups was determined using the criteria of data saturation in qualitative methods and additional focus groups were conducted until no new themes emerged. In total, 15 focus groups involving 64 participants were conducted using a semi-structured interview. Following the social and cultural norms in Syria, focus groups were conducted separately for men and women. Each focus group lasted 45-60 minutes and was audiotaped.

Data analysis

Audiotaped interviews were transcribed first in Arabic and then were translated into English. The transcripts were encoded using the ATLAS.ti 5.2 software for qualitative analysis. Directed content analysis was utilized in this study.[46] In this approach, an initial coding scheme is developed based on an existing theoretical or conceptual model and novel emergent codes are used to revise the framework to inform the findings.[46,47] In the present study, the initial coding scheme was guided by constructs of nicotine or tobacco dependence.[32-36] One of the co-authors (FH) analyzed the data line by line to develop the initial codes. These initial codes were then compared and contrasted for their similarities and differences and were categorized based on dependence domains. Those initial

codes that could not be categorized under the existing dependence domains were classified under a new domain. At this stage, the codes and categories were discussed and reviewed by three other co-authors (NA, SK, and KDW) to ensure rigor. During the entire analytical process, the transcripts were read several times in order to capture a deeper understanding of WP smokers' perceptions about their experience of dependence. This manuscript is guided by the Consolidated Criteria for Reporting Qualitative Research (COREQ) statements.[48]

Results

Participant characteristics

Sociodemographic and WP smoking characteristics of the 64 study participants are presented in Table 1. Age ranged from 18 to 65 years, with most participants being under 40 years. Besides, 80% of the participants were male. Most participants could read and write (32.8%) or had completed secondary education (35.9%) and were either an employee (34.9%) or had a private business (39.7%). Most participants had begun smoking WP during their late teens or early 20s and had smoked for at least two years, with two-thirds smoking daily and one-third less than daily but at least once per month. Average time spent smoking per week was fairly evenly divided as less than three hours, 3-7 hours, and more than 7 hours, with about two-thirds of the participants smoking primarily at home and one-third mostly in restaurants. More than half of the participants wanted to quit and believed they could quit WP anytime, with only 19% perceiving quitting to

Table 1. Sociodemographic and tobacco use characteristics of participants (n=64)

Characteristics	%
Sociodemographic	
Age	
18-25	35.9
26-40	43.8
41-65	20.3
Gender	
Male	79.7
Female	20.3
Marital status	
Never married	54.7
Married	45.3
Education	
Illiterate	1.6
Read and write	32.8
Secondary school	35.9
University	29.7
Occupation	
Student	17.5
Employee	34.9
Private business	39.7
Homemaker	7.9
Tobacco use	
Age of WP initiation (years)	
<15	4.7
15-19	39.1
20-24	23.4
25-45	31.3
>45	1.6
Duration of smoking (years)	
≤2 years	6.3
2-5	32.8
5-10	37.5
10-20	15.6
>20	7.8
Frequency of smoking	
Daily	67.2
Weekly	32.8
Frequency of use has increased over time	
Yes	79.7
No	20.3
Time spent smoking/week	
<3 h	28.1
3-7 h	32.8
>7 h	39.1
Usual place of smoking	
Home	64.1
Restaurant	35.9
WP is important in restaurant selection	
Yes	67.2
No	32.8
Smoke in company	
Usually alone	42.2
Usually with company	57.8
Usually share WP with others	
Yes	40.6
No	59.4
Want to quit smoking WP	
Yes	56.3
No	43.7
Believe they can quit WP anytime	56.3
Yes	
No	43.7
Perceived difficulty of quitting	
Very difficult	18.8
Somewhat difficult	46.9
Not difficult	34.4

be "very difficult." Study participants shared the unique features of WP dependence in the context of their own individual and social realities.

Themes and coding

Data analysis revealed seven dominant dependence-related themes branching from the various frameworks of dependence and addiction that were referenced in the development of the interview guide. Thematic categories included (1) smoking larger amounts of tobacco, (2) spending excessive amounts of time smoking or gathering WP supplies, (3) sensory and socially induced cravings for WP, (4) the tendency to maintain a WP habit at any cost, (5) an increased tolerance to nicotine, (6) the denial of the risks associated with smoking, even in the face of physical or psychological issues, and (7) difficulty controlling or quitting WP use. The thematic categories, as well as the extrapolation of sub-categories and codes that were developed during the data analysis are displayed in Table 2. Table 3 summarizes and describes the seven themes along with a relevant example quote from the data.

1. Smoking larger amounts of tobacco or over a longer period of time

Dependence on WP was considered multi-faceted, as the intensity, dosage, and timing of smoking were viewed by many participants as indices of dependence. Intense WP smoking in larger amounts, multiple heads (*nafas)* during a single session, and frequent smoking

Table 2. Relevant themes, sub-categories, and codes for waterpipe dependence

Themes	Subcategories	Primary codes
Smoking larger amounts of tobacco or over a longer period of time	Increased dosage	How many WPs used
		How many smoking sessions per day
	Increased intensity	How deep is the puff
		Frequency of puffs per smoking session
A great deal of time is spent in activities necessary to obtain or use WP	Time spent smoking WP with friends and family	Friends also smoke WP
		Family smokes WP
	Smoking WP at home	Substituting cigarettes for WP
		Substituting WP components
		Accepting inconvenience to be able to smoke WP
	Smoking while doing routine activities	Keeping WP available in all locations
		Allotting specials time(s) in daily activities for smoking
Craving and a strong desire to use WP elicited by social and sensory cues	WP cravings induced by social cues	Always smoking in restaurants or cafés
		Developing craving by seeing others smoke
	WP cravings induced by sensory cues	Wanting to smoke after meals
		Dedicated time of day for smoking
Maintaining WP smoking at any cost	Giving up activities to be able to smoke	Disregarding personal needs
		Ignoring needs of others
		Only spending time with people who also smoke
	Transition to solitary smoking behavior	Smoking at home
		Smoking first thing in the morning
Tolerance to nicotine and need to increase WP smoking	Increased use to achieve desired effects over time	Changing puff patterns
		Purchasing extra supplies
	Diminishing effect with continued smoking	Reduced pleasure from smoking
		Less satisfaction from each smoking session
Risk denial and continued WP use despite adverse physical health or psychological issues	Experiencing negative health effects of WP	Loss of control
		Smoking while medically vulnerable
	Denying or minimizing the health-damaging effects of WP	Not wanting to quit
		Fatalistic attitude
Difficulty controlling or quitting WP smoking	Psychological barriers to quitting WP	Feeling addicted to WP
		Not wanting to quit because of stress
	Social and physical barriers to quitting	Wider availability of WP
		Friends and family's continual WP use
		Withdrawal symptoms from WP

Table 3. Themes and descriptions relevant to waterpipe dependence among study participants

Themes	Description of themes	Example quotes
1. Smoking larger amounts of tobacco or over a longer period of time	Dependence due to increased dosage, intensity, and frequency of smoking WP	*"I am sure that the smoker who smokes two or three WPs daily, or two or three heads in one session, is an addict."*
2. A great deal of time is spent in activities necessary to obtain or use waterpipe	Considerable amount of time spent smoking WP with friends, within households, or while doing routine activities	*"I have WP at home, at work, at my parents' home, at my parents-in-law's home, and at all my friends' homes, and when I go somewhere else, I have my own WP in the car."*
3. Craving and a strong desire to use waterpipe elicited by social and sensory cues	Increased urge to smoke WP while at restaurants or cafés, seeing others smoke, after meals, and doing leisure activities	*"After eight o'clock, I need to smoke WP, at home or in the restaurant, it doesn't matter."*
4. Maintaining WP smoking at any cost	Accommodating WP smoking in daily routine activities and transitioning from social to solitary smoking behavior	*"At first, the WP was connected with special atmosphere; with time this connection is lost and what remains is the habit. I think that changing from smoking in the restaurants only to smoking in the restaurant and home is an important indicator of dependence."*
5. Tolerance to nicotine and need to increase waterpipe smoking	Increased WP smoking to achieve desired effects or diminishing effect with continued smoking over time.	*"At first, the smoker enjoys smoking WP, but with time, this feeling fades and disappears."*
6. Risk denial and continued waterpipe use despite adverse physical health or psychological issues	Experiencing, denying, or minimizing the health-damaging effects of WP	*"I was suffering from serious lung disease, and I was coughing up blood, I could not stop smoking, I believe I am an addict."*
7. Difficulty controlling or quitting waterpipe smoking	Certain barriers such as feeling addicted, habit, life stressors, wide availability of the WP, and withdrawal symptoms made WP quitting difficult	*"For me it is impossible to quit; the availability of the WP everywhere is a serious obstacle for me, I may quit but as soon as I see someone smoking WP in the restaurant or at home, I will immediately ask for one."*

sessions were perceived as important indicators of WP dependence. The idea that "*When you smoke more, you're more dependent*" was widely held by many respondents. In general, increased dosage and regular smoking of more than one WP daily was a certain sign of dependence. Frequent and heavier smokers indicated their dependence on WP with comments such as, *"My body is dependent on WP, as long as I smoke daily, that means I'm an addict."* However, smoking for shorter amounts of time but more aggressively could also reflect greater dependence, as one participant said,

"It is possible that the WP addict has no time, so he smokes for 15-20 minutes with long and deep puffs, to finish the nafas in a short time. However, this is true for certain limits where spending longer time smoking daily could be a good indicator for dependence."

2. A great deal of time is spent in activities necessary to obtain or use WP

Dependence on WP was also reflected in many participants spending a lot of time smoking WP with friends or within their households. Some allotted a certain amount of time in a day to accommodate this habit. A few pursued social activities only if the opportunity to use WP was available. Even routine activities such as dining revolved around preferences for restaurants where WP services were provided. Such restaurant preferences were apparent among more frequent smokers. A daily smoker mentioned,

"I do not go to a restaurant that does not offer the WP, even, if [WP] is available but not tasty and good I will not go, and if I go to a restaurant and the WP is not good or the service is not satisfactory, I will leave."

Some participants went out after midnight to obtain a missing WP ingredient or component, invented alternates for the WP components, paid more to smoke WP, ignored social norms, smoked cigarettes as a substitute, sacrificed their personal comfort, and sometimes neglected their work to smoke WP. A participant who once ran out of supplies in the middle of the night shared, *"I once went out at 3 am and walked about 3 kilometers to get charcoal to smoke WP. It came to my mind, and I had to smoke."* For some participants, WP smoking was a priority even though it caused them inconvenience or discomfort. One participant stated,

"*When I travel to Damascus, I use the old uncomfortable means of transportation that allow smoking, and keep smoking cigarettes all the time as a substitute for the WP, and as soon as I arrive, I go to a café to smoke [WP]."*

Ingenuity was sometimes required when WP supplies were unavailable. A young daily smoker said, *"One day, the WP glass broke after midnight, we wanted to smoke, we invented an alternative using a family size bottle of Pepsi. My mother was astonished, she said to that extent you could not stand staying without WP."* Many WP smokers also tried to maintain their smoking habits by ensuring availability of WP in all locations where they spend considerable time.

3. Craving and a strong desire to use WP elicited by social and sensory cues

Most smokers reported cravings or strong desire or urge to smoke WP. For some smokers, craving was associated with certain cues in their surroundings, such as being in a restaurant, while for others no stimuli was needed to provoke craving; for them knowing that they had missed their usual time for smoking was sufficient to

elicit craving. A young daily smoker said, *"When I need to smoke WP, nothing can stop me, it is like you are thirsty and you need to drink water."* A strong and crucial cue to use WP was being in a restaurant or café where WP was available. This was true for most smokers regardless of the smoking frequency or the number of WPs smoked in the session. Another young participant, who smoked more than four WPs daily, said,

"I was sick and the doctor ordered 'no smoking'; we went to a restaurant, my companions tried to help me and no one asked for WP, but a lot of people were smoking around me, I got nervous and told my mother that she has two options, take me home or bring me a WP."

Likewise, several participants reported how unexpectedly seeing others smoke WP could induce an urge. One participant mentioned,

"One day I was going to my work, I saw an old man smoking WP in front of his shop. When I saw him, I craved the WP and I could not stand going without smoking. I approached him and asked him for few puffs, so that I would not feel sick and have a headache. He looked at me, then he smiled and let me take few puffs, and everything was fine."

Other triggers to smoking WP were meal time, being on a recreational trip, and gathering with friends in a garden or other enjoyable settings. One respondent said, *"After each meal I want WP; if pleased I need WP. I'm addicted to WP. I always light the charcoal while I'm eating to make sure that when I finish my meal the WP will be ready."* For most smokers, however, there were special times allocated for smoking WP when smokers usually felt a strong desire to smoke such as after meals, in the evening, at night when out for leisure, or back home after work. Many smokers reported that they smoke only at night or in the afternoon, others smoked in the morning, and most smokers agreed that smoking in the morning, especially first thing in the morning is a clear indication of stronger dependence on WP. One participant said, *"I believe that the smoker who smokes in the morning is 100% an addict."*

4. Maintaining WP smoking at any cost

Similar to how time commitments are made by those dependent on WP to accommodate smoking into their routines, others may give up activities if it means they cannot smoke. They may even put the needs of others aside to smoke. One man detailed his daily smoking routine,

"Every day, I spend one or two hours with the WP, in the morning or in the evening, alone or with my friends; it depends on my work; nevertheless, the WP time for me is somehow sanctified. WP, exactly like work, has its own time. I push back any other thing to do if it comes during my smoking, and I may not answer the phone, as it may disturb me while I'm engaged in something important to me."

Another WP-specific dependence feature to emerge in the data was solitary smoking as an indicator of dependence. There was a common perception that *"The more you smoke alone, the more you are dependent"* and that transitioning from social to solitary smoking indicates that the person is dependent. One participant commented, *"The smoker who smokes alone at home is more dependent; however, I believe that he doesn't enjoy like we who smoke with company."*

More dependent smokers tend to refuse sharing their WP because it may affect their smoking rhythm, burn the head too quickly, make them feel nervous, interrupt their enjoyment, and reduce satisfaction. One daily smoker said, *"I do not like anyone to share the WP with me, I feel uncomfortable, and I prefer to prepare another WP for him, even if he wants to take only a few puffs."* Another smoker passionately shared, *"In the past, they said the WP is like a wife and you cannot lend your wife to someone! The same is for the WP."*

5. Tolerance to nicotine and need to increase WP smoking

Many participants reported increasing WP smoking to achieve desired effects. Relatively clear signs of tolerance were expressed by many smokers, including increased smoking frequency, increased time spent smoking, increased number of heads smoked during a single session, and changing puff patterns to increase the amount of smoke inhaled. As the frequency of WP use increased, some smokers purchased extra apparatuses to keep at different locations to ensure access. A daily smoker stated,

"I started smoking in restaurants then I got WP at home, then I brought one to my sister's home, and one to my parents-in-law's home, to make sure that the WP is available everywhere around me."

Some smokers reported diminished effect with continued WP smoking and shared that the pleasure and satisfaction associated with smoking WP disappeared over time. For some, even though the pleasure of smoking WP disappeared with time, their habit remained. Some respondents were convinced that only dependent smokers enjoy smoking the WP, and the others are just imitating "real" smokers. A young adult male participant said,

"With time, the pleasure reduces, and the habit remains. In the beginning, the WP is associated with the ambiance and gathering with friends, but then when the smoker starts smoking alone at home in the sitting room while watching TV, this makes me say, I cannot understand where is the ambiance and where is the gathering?"

6. Risk denial and continued WP use despite adverse physical health or psychological issues

Participants continued to use WP despite experiencing

health issues caused or exacerbated by tobacco. When participants did describe themselves as an addict, it often was based on perceived loss of control over their behavior. A young woman reported,

"During my pregnancy, I tried my best not to smoke daily at home; however, at least once a week and maybe more I used to go to a restaurant to smoke WP. I was smoking during my pregnancy; this means I'm an addict."

Denying or minimizing the health-damaging effects of WP was common among those who did not want to quit. One participant justified the habit by saying,

"You drink coffee and tea, and eat vegetables full of hormones and pesticides, and the air you breathe is polluted and it is worse than the WP, so why should we not smoke? You live only once, and when it is your time to die, you will die regardless of the reason."

7. Difficulty controlling or quitting WP smoking

While a few smokers reported wanting to quit, interest in quitting WP was not common. *"I have never thought about quitting,"* and *"I'm happy with the WP and I do not want to quit"* were common responses. Experiences with quitting or controlling WP use varied; although some smokers believed that quitting WP is not difficult, many perceived it to be challenging. One participant relayed his experience as such,

"I quit the WP. One day I went with my friends to a restaurant, they convinced me that a few puffs will not be a big deal. I took a few puffs, then I ordered a WP, and when I went home, I got my old one out, now I'm a daily smoker again."

Another commented, *"I told you I adore the WP and based on my feelings and nervousness when I could not smoke the WP, I'm telling you, it is impossible for me to quit."*

Most daily smokers who tried to quit reported experiencing withdrawal symptoms such as headache, nervousness, irritation, anxiety, anger, trouble concentrating, and feeling that "something is missing." These symptoms made quitting WP seem formidable. One WP smoker said, *"You feel like you're lost, that something is missing, you cannot work, and you lose concentration. I cannot quit, ask me to stop breathing but not to stop smoking WP."* However, not all face these challenges. One respondent commented, *"Despite being a daily smoker, I quit for one month, and I did not feel anything, I relapsed because I have a lot of free time."* Some of the barriers to quitting mentioned were feeling addicted, habit, life stressors, wide availability of the WP, having friends who smoke, lack of willpower, too much free time, and fear of withdrawal symptoms. Some smokers perceived resisting a temptation or refusing an offer to smoke WP to be difficult. This temptation took different forms, including visiting a friend who is smoking WP, going to a restaurant, or being invited by a friend to go out to smoke WP. *"For me, the WP is not enjoyable when you smoke alone, it requires the gathering or at least a friend."*

Many participants found WP to be a habit, which they distinguished from an addiction, which was due to its widespread availability. One participant commented, *"I'm telling myself it is not a habit, but practically, I cannot quit, and it became a habit, no other explanation, I don't prefer using (the word) addiction, it is not a good word."* WP became part of their routine, as expressed by one participant, *"For me smoking WP is a habit, like other habits in your life, you used to dress, to wash your face, to brush your teeth, and to drink water, it is like your body is pushing you."*

Discussion

Survey and laboratory studies indicated that WP smoking can cause dependence.[10] The purpose of this study was to extend this growing body of literature using qualitative methodology to assess, in greater depth, WP smokers' perceptions of dependence features. In particular, we were interested in exploring whether perceived symptoms are similar to known dependence features derived from cigarette smoking and whether any WP-specific features were identified. Some distinct dependence features were expected due to WP's unique use characteristics, including its time-consuming preparation and consumption, intermittent use patterns, and unique sensory and social cues. Several themes emerged that were similar to cigarette smoking, including positive reinforcement features, social and sensory cues, intensity and timing of smoking, negative reinforcement features, urges/cravings, and difficulty quitting. In addition, two themes emerged that described distinct features of WP dependence, including behavioral priority/adaptation and solitary smoking.

WP's growing popularity is primarily due to several positively reinforcing features, which help to maintain its use and are linked to the development of dependence.[10] These features include its association with socializing and cultural identity, and mood-enhancing effects. Participants reported how WP smoking became a regular, sometimes daily, habit that was a part of social rituals, to the point where smokers perceived that smoking "must" accompany spending time with family and friends. These results among WP smokers confirm survey findings from several populations and age groups.[11,49] Moreover, similar features of dependence have also been reported among cigarette smokers who expect smoking to be extremely pleasurable and to help them deal with negative affect and stress.[50-52]

The results of the present study provided a nuanced view about how intensity of WP smoking is related to dependence. Participants consistently viewed smoking more frequently, as well as smoking multiple heads per

session, as signs of dependence, but important exceptions were noted. Those who smoked every day were not thought to necessarily be dependent, as long as smoking was limited to one session or head per day. Smoking every day was thought to sometimes reflect having free time rather than "needing" to smoke. Indeed, some participants reported smoking every day without increasing their smoking over time or experiencing other dependence symptoms such as craving or withdrawal. Likewise, participants did not believe length of the smoking session was a reliable indicator of dependence because it may reflect availability of free time. These findings are consistent with a survey study that compared WP smoking among young adult university students (mean age 22 years, age range 18-30) to adult café customers (mean age 30 years, age range 18-68), and found that university students who smoked daily were more likely to perceive themselves to be "not hooked" than café customers who smoke daily (40% vs. 17%).[53] In contrast, some studies have also reported length of smoking session (averaging an hour compared to 5 minutes for cigarettes) as a novel indicator of dependence among WP smokers.[5,54] The results of the current study indicated the importance of carefully assessing smoking patterns in survey studies and clinical cessation encounters. A consensus statement about WP use assessment recommends several items to assess intensity of smoking.[55] It would be helpful to include items that explicitly capture the usual number of heads smoked per session, and how frequently multiple smoking sessions occur in the same day. Additionally, it would be helpful to capture whether smoking occurs in the morning. WP smoking in the morning appears to be rare,[56,57] but viewed as a reliable indicator of dependence.

Participants distinguished between "habit" and "addiction." This difference reflected perceptions of psychological vs. physical dependence and was related to intensity of smoking. Those who smoked less frequently (e.g., less than daily) were more likely to report that their smoking was a "habit" or behavioral routine which they enjoyed and did not want to quit. In contrast, participants who smoked more frequently were often willing to refer to themselves as "addicted" and believed that they were unable to quit. Understanding oneself to be "addicted" often resulted from the realization that one had lost control of the decision to smoke or not. Such participants could point to specific situations where they smoked despite doing so not being in their long-term best interests, such as when suffering from a lung infection, during pregnancy, or having to go out in the middle of the night to obtain WP supplies. Regardless of whether participants perceived themselves to be addicted or to merely have a habit, interest in quitting was low and quit attempts mostly unsuccessful, as has been reported in survey studies.[11,17,58] Difficulty quitting among occasional smokers most often was attributed to external cues, such as seeing others smoke, whereas daily smokers often cited internal cues, such as withdrawal symptoms, as making it difficult to quit.

Certain shared features of tobacco dependence such as cravings and socio-cognitive cues can be different for WP due to its specific makeup like time-consuming preparation and consumption, greater size of apparatus that limits mobility during use, and use in social contexts.[13] Consistent with these features, WP users in this study often went to great lengths to procure and smoke WP. Cafés/restaurants were selected based on quality of WP served rather than quality of food or drink. Smokers spent more money than they could afford on WP and if WP was not available, would inconvenience themselves to obtain it. Some smokers carry their own WP with them or keep a WP at work or at friends' homes to ensure easy access. WP use also produces unique specific stimuli (e.g. smell and taste, feel of mouthpiece, visual stimuli of WP itself) which are different from cigarette smoking, and interact with more general smoking-related cues (e.g. hand to mouth motion, restaurant or café setting).[14] Furthermore, consistent with previous studies,[13,14] extensively prioritizing or adapting one's behavior was more common among individuals who smoked more often and felt more addicted.

Another unique feature of WP smoking is that users transition from social to individual smoking as they become more dependent. Participants who perceived themselves to be dependent reported having transitioned from smoking with family and friends to smoking mainly alone – at home, by themselves, and without sharing the WP with others. This phenomenon was first observed in a survey study of Syrian WP smokers, in which the likelihood of smoking alone increased, and the likelihood of sharing the same WP with others decreased, across frequency of use (monthly, weekly, daily).[13]

One of the limitations of this study was using a qualitative, focus group-based method, which is construed as relatively unstructured and subjective, and represents interpretations of themes by the researchers. Another limitation was that the participants were selected using purposive convenience sampling from one city in Syria; thus, these perspectives may not be representative of the rest of the country or other geographical areas.

Conclusion

This qualitative study confirms and extends findings from survey studies about WP dependence. Several dependence features are consistent with those commonly reported by cigarette smokers. These include positively reinforced features (e.g., relief from stress and boredom) and negatively reinforced features including relief of withdrawal symptoms. Likewise, quitting is difficult for many users and inability to quit is interpreted as having lost control of one's smoking, a common marker of

dependence.[10,59] Several observed dependence features were specific to WP, including transitioning from social smoking to smoking alone, and adapting one's behavior to the considerable effort normally required to engage in WP smoking despite inconvenience or cost, and often at the expense of other reinforcers such as social interaction.

These general and specific features of WP dependence obtained from this study will be useful in developing instruments to measure WP dependence, in clinical assessment of WP dependence (e.g., by physicians and substance use counselors),[26] and in developing cessation programs.[60] Specifically, there is a need to modify existing cessation interventions to suit local WP users and local health systems.[13] Moreover, given that dependence is an important barrier to quitting WP, investigating the effectiveness of behavioral or pharmacological interventions aimed at reducing WP dependence requires more research and warrants consideration in primary care and other clinical settings.

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Author Contributions

Conceptualization: Satish Kedia, Thomas Eissenberg, Wasim Maziak, Kenneth D. Ward.
Data curation: Fadi Hammal, Satish Kedia, Nikhil Ahuja.
Formal Analysis: Fadi Hammal, Satish Kedia, Nikhil Ahuja.
Funding acquisition: Kenneth D. Ward, Wasim Maziak, Thomas Eissenberg.
Investigation: Fadi Hammal, Taghrid Asfar.
Methodology: Satish Kedia, Thomas Eissenberg, Wasim Maziak, Kenneth D. Ward.
Project administration: Fadi Hammal.
Supervision: Wasim Maziak, Kenneth D. Ward.
Validation: Satish Kedia, Nikhil Ahuja.
Writing – original draft: Satish Kedia, Nikhil Ahuja, Kenneth D. Ward.
Writing – review & editing: Satish Kedia, Nikhil Ahuja, Fadi Hammal, Taghrid Asfar,, Thomas Eissenberg,, Wasim Maziak, Kenneth D. Ward.

Conflict of Interests

Thomas Eissenberg is a paid consultant in litigation against the tobacco industry and also the electronic cigarette industry. He is named on one patent for a device that measures the puffing behavior of electronic cigarette users and on another patent for a smartphone app that determines electronic cigarette device and liquid characteristics. Other co-authors have declared no conflict of interest.

Ethics Approval

The Institutional Review Boards of The University of Memphis and Syrian Society Against Cancer approved the study protocol.

Supplementary Files

Supplementary file 1. Topic guide for focus groups with current WP smokers.

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