

# Determinants of Waterpipe Smoking Among Women: A Systematic Review

## Abstract

**Background:** The present study aimed to assess the determinants of waterpipe smoking among women based on a systematic review regarding the increasing prevalence of waterpipe smoking in women and the tendency of them to this type of tobacco. **Methods:** The present study was a systematic review. The search strategies were based on using a combination of MeSH and free-text terms. Searches were performed in Iranian databases and PubMed, ScienceDirect, Web of Science, EMBASE, Scopus and Medline. Databases inclusion criteria included articles and gray literature in English or Persian, published between January 2000 and December 2018. The keywords were related to women and waterpipe and related terms. The quality of the articles was assessed using the EPHP tool. **Results:** In the initial search, out of 1027 articles, 15 articles were studied. Inclusion criteria in this study were the target population of women and girl and descriptive and qualitative studies on waterpipe use among women. The mean prevalence of waterpipe smoking in quantitative studies was 13.980/0. Studies have shown that waterpipe smoking in women is influenced by several individual (awareness, favorable attitudes, and positive prototype), interpersonal (role of family and friends), and socio-political factors. **Conclusions:** Due to the influence of various determinants on women's inclination to waterpipe smoking, there is a necessity to act and impose interventions such as lessening women's favorable attitude toward waterpipe, increasing women's awareness, encouraging negative prototype about waterpipe smoking, and restricting access to tobacco products that can be useful. Interpersonal factors such as the role of family and friends are one of the major determinants in waterpipe smoking. It seems that developing the skill of saying "no" to the pressure of friends can help prevent waterpipe use. Furthermore, educating the family about the risks of waterpipe use is an effective strategy in this respect.

**Keywords:** *Determinants, waterpipe smoking, women*

## Introduction

Nowadays, smoking is recognized as an epidemic concern worldwide.<sup>[1]</sup> According to the World Health Organization (WHO), in 2019, 8 million people die each year due to smoking, 7 million of which are due to direct use and 1.2 million are not smokers and lose their life due to second-hand smoke exposure.<sup>[2]</sup> In the last two decades, waterpipe smoking has been increased in most countries, and this trend is increasingly significant in women and girls.<sup>[3]</sup> About 8.7% of Jordanian women are waterpipe users.<sup>[4]</sup> However, the results of a recent national survey of noncommunicable disease risk factors (SuRFNCD-2007) in Iran showed that more than half of female smokers use waterpipe.<sup>[5]</sup>

In a 2014 global study on using tobacco and waterpipe derivatives, the prevalence of waterpipe smoking was highest among girls

aged 13–15 years in Lebanon, the United Arab Emirates, and Iran.<sup>[6]</sup> In many Middle East countries, waterpipe smoking is close to the global rate due to social acceptance, easy access to various tobacco flavors, and low cost of tobacco.<sup>[7]</sup> The position of girls and women has been changed due to social changes, employment, and education, which have made their behavior similar to that of men. One of these developments is the changing pattern of drug use from mono-gender to bi-gender, as well as the increasing trend of smoking, especially waterpipe in women. Today, waterpipe smoking has become a social phenomenon or behavior<sup>[8]</sup>. The prevalence of using waterpipe in women is higher than cigarette smoking. Negative views toward cigarette use and its unpleasant social image have made waterpipe smoking more acceptable and convenient than cigarette smoking.<sup>[9]</sup>

Nowadays, waterpipe smoking has no negative image for women and it is

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considered as a way of having fun. In Labib *et al.*'s study, women perceived waterpipe smoking as a way to be attractive and feel free.<sup>[10]</sup> However, the use of waterpipe in women leads to a higher prevalence of respiratory diseases than in men.<sup>[11]</sup> use waterpipe increase increases problems such as menstrual function changes, decreased bone density, estrogen deficiency disorders, pregnancy problems, and the importance of waterpipe smoking in women.<sup>[12]</sup> Waterpipe smoking during pregnancy increases the risk of preterm birth and is associated with a high incidence of anemia in women.<sup>[13]</sup>

Evidence and studies confirm that women are more vulnerable to the health risks of smoking compared to men.<sup>[14]</sup> Women's health is one of the fundamental pivots and indicators of any country's development.<sup>[15]</sup> Given the significant and prolific role of women in the family and their impact as a behavioral model for adolescents, the need to understand the determinants of waterpipe use in women to maintain the society and future generations' health is paramount.<sup>[10]</sup>

Also, there are scattered studies concerning the determinants of waterpipe use in women. Cooper *et al.* examined determinants of waterpipe use among the American youth population in a systematic study. The results revealed that peer use, social norms, and harm perceptions are valid factors in the inclination to use waterpipe; this study was limited to American youth and it has only examined several determinants without categorization and has not considered political, social determinants.<sup>[16]</sup>

It appears that a systematic study is required for classifying the determinants and achieving coherence. Such studies can be of value in developing strategies to deter waterpipe use, given the increasing trend of waterpipe use among women.

Therefore, this systematic review was conducted to determine the effective factors on waterpipe smoking.

## Methods

### Type of study

The present research was a systematic study.

### Research question

What are the factors that increase the smoke of waterpipe in women and girls?

### Information sources and search strategy

The present study was designed using the PRISMA checklist. The search strategy was conducted using a combination of the terms "MeSH" and "free-text" in the English databases including PubMed, Science Direct, Web of Science, EMBASE, Scopus, and Medline and Iranian databases including SID, Magiran, Iran medex [APP1].

According to the objective of the study, keywords related to waterpipe smoking and women were selected [APP2].

Then, search terms were constructed by using conjunctions to connect the keywords. Studies were limited to English and Persian studies conducted between January 2000 and December 2018.

### Study selection process

Databases are at first searched by one of the researchers using the considered research strategy. Then, all the recognized articles were collected from different databases using Thomson Reuters EndNote X9.3.3 software and repeated items were removed in the Endnote folder. Afterward, two researchers assessed independently all articles and eliminated those not related to inclusion criteria.

In the next step, the remained research abstracts were assessed independently by two researchers. The whole texts were reviewed by two researchers to identify articles with full correspondents, inclusion, and exclusion criteria.

The PICO index (study population, type of study, types of determinants and outcome) was used to evaluate study inclusion and exclusion criteria.<sup>[17]</sup> After choosing the final articles, all references were assessed and disputes were resolved through discussion and finally with the opinion of the third party as well at all stages from reading to final approval of the articles.

### Inclusion criteria

- Descriptive and qualitative studies on waterpipe use among women
- Women and girls with any appropriate demographic and background characteristics.

### Exclusion criteria

- Studies examining the determinants of waterpipe consumption in women with other tobacco products
- Studies conducted in other at-risk groups other than women and girls.

### Data extraction

The method of data extraction included investigating the abstract of articles and importing the following data to the Excel software:

- Authors name and the year of publishing
- Sample population: girls and women
- Studies' determinants
- Type of study: cross-sectional studies for determinants (i.e., attitude, knowledge, social norms, prototype, and intension) of behavior prevalence.

### Quality assessment

Two researchers specialist in health education and health promotion assessed articles based on the EPHPP checklist<sup>[18]</sup> to determine the quality of quantitative articles.

## Ethics approval and consent to participate

The Ethical Committee of Hamadan University of Medical Sciences approved this study [reference number: IR.UMSHA.REC.1397.696].

## Results

The initial search included 1027 studies, of which 1003 were from database searches and 24 were from conference and gray literature searches. After eliminating duplicate cases, 730 studies remained. Further, after reviewing the titles and abstracts, 97 studies were selected for full-text review. After assessing the full text of these studies, 15 studies were selected for final analysis according to the entry criteria [based on Figure 1].

The selected studies examined the determinants of waterpipe use in women. Among the studies, seven were quantitative while seven were qualitative and one was a mixed-method case.

Qualitative studies using the 6-item EPHPP tool with poor, average, and good scores showed that only one study<sup>[31]</sup> achieved an average score, and the other studies were poor in quality [Table 1].

According to Table 1, in terms of sample size, Al-Otaibi *et al.*'s study<sup>[19]</sup> assessed a sample size of 5150 adolescent females aged 12 to 19, Baheiraei *et al.*'s study<sup>[20]</sup> assessed a sample size of 1359 women aged 15 to 49 years, Chaaya *et al.*'s study<sup>[21]</sup> assessed a sample size of 864 pregnant women, Azab *et al.*'s study<sup>[4]</sup> assessed a sample population size of 500 pregnant women aged 20 to 40 years and, Saeed Firoozabadi *et al.*'s study<sup>[22]</sup> assessed 430 women who use waterpipe smoking. The rest of the selected studies had a sample size consisting of populations fewer than 400 individuals, which are reported in Table 1.

The prevalence of waterpipe smoking was investigated in the analysis of quantitative studies. In the study of Saeed Firoozabadi *et al.*,<sup>[22]</sup> 31.6% of women had more than 10 years of history in waterpipe smoking. Similarly, 39.8% in Abdulrashid *et al.*'s study,<sup>[23]</sup> 37% in Labib *et al.*'s study,<sup>[10]</sup> 8.7% in Azab *et al.*'s study,<sup>[4]</sup> 6.3% in Baheiraei *et al.*'s study,<sup>[20]</sup> 4% in Chaaya *et al.*'s study,<sup>[21]</sup> and finally, 25% in Dar-Odeh *et al.*'s study<sup>[24]</sup> were reported as the waterpipe smoking prevalence.

The mean prevalence of waterpipe use among women within quantitative studies was 13.98%.

The analysis of the extracted studies led to the recognizing of several determinants in the inclination to use waterpipe

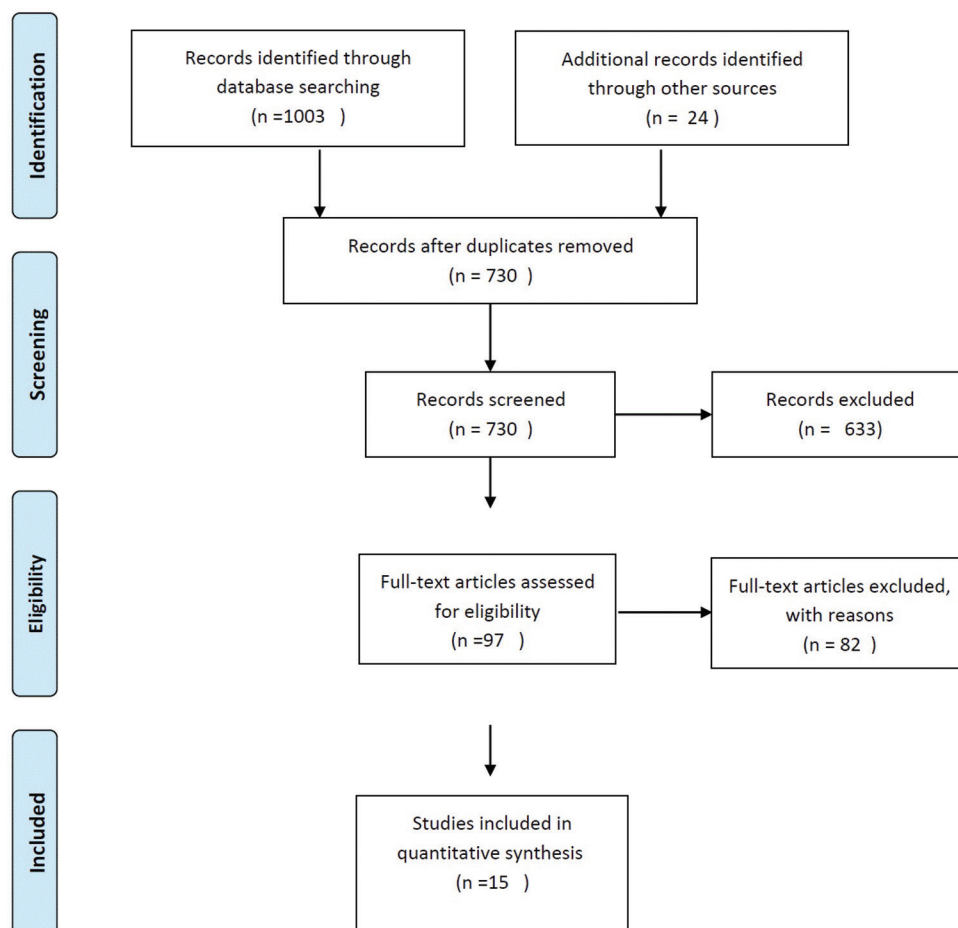


Figure 1: Flow chart describing literature extraction process

**Table 1: Study characteristics of 15 studies**

Row	Author name, year and location	Type study	Data collecting method	Sample size	Study determinants	Score quality assessment
1	Al-Otaibi/2012-2013/ Saudi Arabia <sup>[19]</sup>	quantitative	5150 female teenagers 12-19 years old from 40 schools	Random	Personal: entertainment, flavor Interpersonal: role of friends and family	Weak
2	Baheiraei /2015/ Iran <sup>[25]</sup>	qualitative	Content analysis Deep interview	36 female users 4 experienced users 32 beginners 15-51 years old	Personal: positive attitude toward WP Interpersonal: role of friends and family, being not aware of addictive feature of WP, common use of WP in restaurants and public places, late marriage	Weak
3	Sohrabzadeh/2015/ Iran <sup>[26]</sup>	qualitative	Semistructured interview	37 women	Personal: Hedonism, fashion, equality seeking, friendliness, willingness to take risks, Interpersonal: Friends Community: Extensive access Politics: Lack of WP prevention laws	Weak
4	Khalil/2012/ western Mediterranean <sup>[27]</sup>	qualitative	Focus group In depth interview Snowball sampling technique	38 women 81 Focus group	Personal: attractiveness, sense of freedom, seduction of the opposite sex, sense of superiority, marriage	Weak
5	Baheiraei/2015/ Iran <sup>[28]</sup>	qualitative	Content analysis Deep interview	36 women	Personal: A sense of curiosity, a desire to do men's work. Show off, get noticed, get others satisfied, get married late, need for fun Interpersonal: Accompanying friends	Weak
6	Hammal/2013/ Canada. <sup>[31]</sup>	qualitative	Group dispute Ask and reply	18-30 years old	Personal: awareness of WP Interpersonal: Friends' comments Community: culture, religion, easy access, and the prohibition of alcohol in Muslims and tendency to use WP	Moderate
7	Baheiraei/2010/ Iran. <sup>[20]</sup>	quantitative	Multistage random/ questionnaire	1359 Iranian 15-49 years old women	Interpersonal: the role of friends and family	Weak
8	Labib/2007/ Lebanon. <sup>[10]</sup>	quantitative	Regression Logistic questionnaire	196 female students, public university 96 private university	Personal: Positive perceptions, high desire to use WP with friends, believe in less harms, curiosity Interpersonal: Encourage of friends	Weak
9	Dar-Odeh/2013/ Jordan. <sup>[24]</sup>	quantitative	Chi-squared test	196 women with high education	Interpersonal: using WP by relatives and friends	Weak
10	Chaaya/2003/ Lebanon. <sup>[21]</sup>	quantitative	Stratified sample Chi-squared test, Mann-Whitney test	864 pregnant women from 23 Lebanon health center	Personal: Misunderstandings about WP and its harms, lack of awareness, and positive attitude about WP	Weak
11	Baheiraei/2015/ Iran. <sup>[29]</sup>	qualitative	Deep interview Content analysis	36 women	Interpersonal: Role of family and friends Community: easy access to WP	Weak
12	Azab/2013/ Lebanon. <sup>[4]</sup>	quantitative	Random selection	500 pregnant women 20-40 years old	Personal: positive view Interpersonal: user family or friend	Weak
13	Dar-Odeh/2011/ Arab. <sup>[30]</sup>	Quantitative			Personal: friends, family Politics: lack of laws for WPS	Weak

Contd...

Table 1: Contd...

Row	Author name, year and location	Type study	Data collecting method	Sample size	Study determinants	Score quality assessment
14	Abdulrashid/2015/ ArabiSaudi. <sup>[23]</sup>	Qualitative/ quantitative	5 group discussion and 3 deep interview, regression analysis	232 female over 15 years old who use WP	Personal: Believe in low harm of WP, entertainment, causing a better mood  Interpersonal: Leisure with friends, friends accompany, imitating celebrities  Community: availability in restaurants, cafe	Weak
15	Saeed Firoozabadi/2015/ Iran. <sup>[22]</sup>	qualitative	Snowball sampling	430 user women	Personal: Intention to continue using WP, Emotional attitude, Instrumental attitude, Interpersonal: Subjective norms	

in women. These determinants include awareness, favorable attitude, positive prototype, and interpersonal, socio-cultural, and political factors.

### Personal factor Awareness

This study confirmed that five out of 15 reviewed studies indicate that women are less aware of the hazardous side effects of waterpipe use. 74.1% of women who participated in the Labib *et al.*'s study,<sup>[10]</sup> 69.8% in Abdulrashid *et al.*'s study,<sup>[23]</sup> and 74.3% in Azab *et al.*'s study<sup>[4]</sup> considered waterpipe to be less harmful compared to cigarettes and did not regard it as addictive. A qualitative study of women between the ages of 18 and 30 also observed that some women were unaware of the type of tobacco used in waterpipe and did not know what they were consuming. Moreover, qualitative studies<sup>[21,25]</sup> raised the issue of women's lack of awareness concerning the consequences of waterpipe use in a similar manner.

### Favorable attitude

Analysis of Table 1 results confirms that several studies have signified the influence of a favorable attitude on the inclination to use waterpipe.<sup>[4,10,22,25-27]</sup>

For instance, in Saeed Firoozabadi *et al.*'s study,<sup>[22]</sup> participating women suggested the attitude as a strong predictor for the intention to use waterpipe ( $B = 0.407$ ). 48.5% of the participants in Labib *et al.*'s study<sup>[10]</sup> had a pleasant experience, and a positive attitude toward waterpipe use ( $P < 0.05$ ).

### Positive prototype

The results of seven out of 15 reviewed studies confirmed that women had a positive prototype of waterpipe.<sup>[10,21,23,25-28]</sup> For instance, 49.3% of participants in Abdulrashid *et al.*'s study<sup>[23]</sup> used waterpipe to have fun and a more agreeable mood, OR: 1.57 (0.49–0.87).

In a qualitative study,<sup>[27]</sup> women thought they were perceived as more attractive with waterpipe use and received more attention from the opposite sex. The review of Sohrabzadeh and Parnian<sup>[26]</sup> indicated that women considered waterpipe use to be a sign of maturity and sophistication, women who used waterpipe were like men (in terms of equality), and that waterpipe use being a means to allure the opposite sex.

### Interpersonal factors

#### Friends and Family

Table 1 shows that 13 out of 15 reviewed studies signify the role of interpersonal factors and confirm the influence of friends and family on women's willingness or unwillingness to use waterpipe. In Dar-Odeh *et al.*'s study,<sup>[24]</sup> for example, 73.7% of participants regarded the role of their friends and relatives to be valid in their inclination to use waterpipe. In Abdulrashid *et al.*'s study,<sup>[23]</sup> 66.7% of women regarded waterpipe use to be a means of sharing companionship with friends. In Labib *et al.*'s study,<sup>[10]</sup> 56.6% of women were encouraged to use waterpipe by their peers and friends. Saeed Firoozabadi *et al.*'s study<sup>[22]</sup> observed that 62.1% of waterpipe using women's family members were similarly waterpipe users themselves.

Al-Otaibi *et al.*'s study<sup>[19]</sup> emphasizes the influence of peers on the inclination to use a waterpipe. Labib *et al.*'s study<sup>[10]</sup> indicates a significant association between the role of family and friends and waterpipe use.

A qualitative study<sup>[29]</sup> showed that the role of the young women's husband, family, and friends was significant in their inclination to use waterpipe.

#### Socio-cultural factors

The results of the studies showed that participants<sup>[23,26,28-31]</sup> remarked easy access to waterpipe and the presence of various flavors as major factors in their waterpipe use. Women participating in Hammal *et al.*'s study<sup>[31]</sup> and Abdulrashid *et al.*'s study<sup>[23]</sup> signified the role of cultural factors in the inclination to use waterpipe.

In Dar-Odeh *et al.*'s study,<sup>[24]</sup> 63% of women stated that they were previously interested in quitting waterpipe use, but it was challenging for them because of the variety and abundance of flavors. In Abdulrashid *et al.*'s study,<sup>[23]</sup> 77.7% of waterpipe consuming women chose to spend time in cafes that granted easy access to waterpipe.

#### Political factors

In the present review, the studies of Baheiraei *et al.*, Sohrabzadeh and Parnian, and Dar-Odeh and



Abu-Hammad<sup>[25,26,30]</sup> confirmed that there were no regulations for the prevention and control of waterpipe use. The findings of these three studies showed that the regulation instability and lack of authority over waterpipe use had led to an increase among women users.

Kappa coefficient was used to evaluate the agreement between the two researchers during the quality assessment of the studies. In the case of disagreement among the researchers, good agreement (0.705) was obtained based on EPHPP and 6 tool components [Table 2].

## Discussion

This study was conducted systematically to determine the effective factors of waterpipe smoking in women. After studying the studies and categorizing the factors affecting the tendency of women to waterpipe, the results showed that social norms (interpersonal factor) are one of the important predictors of waterpipe smoking in women.

### Personal factor

#### Positive prototype

In this study, one of the determinants of women's tendency to use waterpipe is their positive perceptions toward it.<sup>[10]</sup> Individuals have positive perceptions of those who engage in risky behaviors.<sup>[32]</sup> Conducting educational interventions aimed at negating perceptions will lead people to worry about risky behaviors and to avoid risky behaviors.

#### Favorable attitude

Favorable attitude is one of the effective factors in increasing the use of waterpipe. One of the signs of a tendency to use waterpipe is a positive attitude.<sup>[33]</sup>

Maziak *et al.* showed that flavored tobacco has an important role in increasing the use of waterpipe in youth and is one of the reasons for continued smoking in youth.<sup>[34]</sup> Also, meeting friends who have a positive attitude toward waterpipe is one of the factors to continue waterpipe.<sup>[35]</sup>

The results also showed that those who have a positive attitude toward smoking it are more likely to be curious about the tobacco test and its negative and socially ugly attitude reduces waterpipe.<sup>[36]</sup>

Regarding the effect of attitude, changing attitudes and creating a negative attitude toward waterpipe are needed;

some suggestions are showing the negative effects waterpipe, especially its effect on skin and beauty, and the use of celebrities in highlighting the dangers of the waterpipe.

### Awareness

The results of the present study showed that women think that waterpipe is less dangerous than cigarettes and this shows that their awareness of the dangers of waterpipe is low. The results of the Ramji *et al.* showed that 80% of those who had used waterpipe believed that it was less harmful than cigarettes and considered it safe to use waterpipe for 1 h a day<sup>[37]</sup>.

AKL *et al.* found that waterpipe is more acceptable to women than cigarettes in the Middle East. Most of the participants believe that waterpipe is less addictive than cigarettes and consumers believe in their willpower to quit it at any time<sup>[38]</sup>.

The WHO considered having inaccurate information about waterpipe as one of the main reasons for young people's tendency to use waterpipe.<sup>[39]</sup> Providing information on waterpipe and its harms through the media and educational brochures can be helpful in this regard.

### Interpersonal factors

#### Friends and Family

Another reason for the widespread use of waterpipe is that using it is a social norm. Barikani found that 47% of adolescents first experienced waterpipe with their friends.<sup>[40]</sup> Studies have shown that waterpipe use is 10 times higher in people who have user friends than the others.<sup>[35,41]</sup> Studies have shown that 51.4% of waterpipe users are adolescents who use waterpipe with their families and 58.5% of them are adolescents who use waterpipe with friends, and 71.8% of families are aware of adolescent waterpipe consumption.<sup>[42]</sup> Bandura's theory of social learning emphasizes interpersonal factors in explaining drug consumption. According to this theory, adolescents gain their beliefs about high-risk behaviors from role models, especially of close friends and parents.<sup>[43]</sup> Watching waterpipe consumption by family members and close friends makes them consider waterpipe as a normal and routine activity.<sup>[44,45]</sup> In the study of Baheiraei *et al.*,<sup>[29]</sup> it was shown that family and family members play an

**Table 2: Calculation of the kappa between two researchers for the components of the quality assessment tool**

EPHPP tool	Kappa value	[SE]	P	Interpretation
Selection bias	0.812	79/0	*001/0>	Very good agreement
Design	00/0	000/1	*001/0>	Very good agreement
Blinding	0.818	81/0	*001/0>	Very good agreement
Confounders	00/0	000/1	*001/0>	Very good agreement
Data collection methods	00/0	000/1	*001/0>	Very good agreement
Withdrawals and dropouts	91/0	705 /0	*001/0>	good agreement

\*P<001/0

important role in the tendency to smoke waterpipe. For example, a spouse plays an important role in starting waterpipe smoking, especially when they are in their first years of marriage. A man who smokes waterpipe may encourage his wife to smoke waterpipe as well or may encourage her to smoke waterpipe in a family gathering. In this situation, women often accept their husband's offer because they do not want to leave their husband alone and do not want to be separated.

Some women are still embarrassed about smoking waterpipe in the presence of others, but their husbands seem to be trying to help women relieve their shame. In Baheirai *et al.*'s study,<sup>[25]</sup> male friends were identified as a strong factor in waterpipe consumption. It is common among today's youth to meet their friends in traditional restaurants and boys order waterpipe for women.

Kin and Lim showed that some girls began to smoke waterpipe under the influence of their boyfriends. Girls smoke waterpipe with their boyfriends to show they can do all the things boys can do. Therefore, they start smoking waterpipe for gaining more credit and acceptance.<sup>[46]</sup>

Waterpipe accessibility in the home means that family members consume it and this availability motivates adolescents to use waterpipe.<sup>[47]</sup> It seems useful to increase the skill of saying "no" to friends and to increase the skills to deal with temptations. Furthermore, educating parents about the adverse effects of waterpipe may be an effective strategy in this regard.

### Socio-cultural factors

The findings of this study showed that cultural norms, social acceptance of waterpipe, and easy access to waterpipe in the community are factors contributing to the increasing use of waterpipe. Elsewhere,<sup>[48-51]</sup> it has been reported that having easy access to waterpipe in cafes and cultural habits have changed an unacceptable phenomenon to an acceptable norm among women and young people.

The results of some studies have shown that a high percentage of waterpipe users find it acceptable in the community and believe that others have a positive view of using waterpipe.<sup>[52,53]</sup> Increasing the number of cafes and restaurants offering waterpipe is one of the causes of the increasing incidence of waterpipe use.<sup>[8]</sup>

Primack *et al.* showed a relationship between easy access to waterpipe and its prevalence among adolescents<sup>[54]</sup>.

Contrary to the results of the study by Hammel *et al.*,<sup>[31]</sup> some researchers have shown that religion has a positive role in reducing the rate of waterpipe and religious beliefs can affect the use of waterpipe.<sup>[55]</sup>

In a national study in Lebanon, a significant relationship was reported between waterpipe users and the decrease in religious prejudice<sup>[56]</sup>.

### Political factors

In studying the laws of 62 countries, only the United States, Britain, India, the United Arab Emirates, and Pakistan had adopted effective laws on the control of waterpipe.<sup>[56]</sup>

Government regulation (e.g., the impact of prices on the demand for tobacco products) plays a controlling role in the use of tobacco products.<sup>[14]</sup> The presence of waterpipe in cafes and restaurants and access to it for people under the age of 18 years have made the cafe an attractive and motivating place and a cheap way for young people to spend time.<sup>[57,58]</sup> This may be due to the focus on marketing strategies and the lack of waterpipe law in public places.<sup>[59]</sup> Banning waterpipe use in cafes and restaurants, increasing its price, and banning its use for people younger than 18 years are some effective measures for reducing the widespread use of waterpipe.

Moreover, providing alternative incentives in cafes, such as games and entertainment, and alternative policies for waterpipe in cafes can prevent its use.

### Conclusions

According to the influence of various determinants on women's inclination to waterpipe smoking, there is a necessity to act and impose interventions such as lessening women's positive attitude toward waterpipe, increasing women's awareness regarding the health risks of waterpipe smoking, encouraging negative prototype about waterpipe smoking, and restricting access to tobacco products such as waterpipe that can be useful in limiting and diminishing prevalence. According to the outcomes of this study, interpersonal factors such as the role of family and friends is one of the major determinants in women's inclination to use waterpipe. It seems that developing the skill of saying "no" to the pressure of friends and adequately dealing with temptations can help prevent waterpipe use. Furthermore, educating the family about the risks of waterpipe use is an effective strategy in this respect.

### Consent to publish

The manuscript has been read and approved by all authors.

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### Conflicts of interest

There are no conflicts of interest.

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## App1. Sample Search in the Study

Search History:

Set	Results		Edit Sets	Combine Sets <input type="radio"/> AND <input type="radio"/> OR	Delete Sets <input type="button" value="Select All"/> <input type="button" value="Delete"/>
# 5	95	#4 AND #3 AND #2 AND #1 <small>Indexes=SCI-EXPANDED, SSCI, ABHCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, CCR-EXPANDED, IC Timespan=2000-2018</small>	Edit	<input type="checkbox"/>	<input type="checkbox"/>
# 4	1,743,689	TOPIC: (Woman) OR TOPIC: (Women) OR TOPIC: (Female) OR TOPIC: (girl) OR TOPIC: (girls) <small>Indexes=SCI-EXPANDED, SSCI, ABHCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, CCR-EXPANDED, IC Timespan=2000-2018</small>	Edit	<input type="checkbox"/>	<input type="checkbox"/>
# 3	298,836	TS=("Cross – sectional") OR TS=("descriptive-analytical") <small>Indexes=SCI-EXPANDED, SSCI, ABHCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, CCR-EXPANDED, IC Timespan=2000-2018</small>	Edit	<input type="checkbox"/>	<input type="checkbox"/>
# 2	4,568,909	TOPIC: (Determinant*) OR TOPIC: (Determinants) OR TOPIC: (forecast) OR TOPIC: (anticipation*) OR TOPIC: (factors*) OR TOPIC: (factor) OR TOPIC: (predictive*) OR TOPIC: (Forecasting) <small>Indexes=SCI-EXPANDED, SSCI, ABHCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, CCR-EXPANDED, IC Timespan=2000-2018</small>	Edit	<input type="checkbox"/>	<input type="checkbox"/>
# 1	35,792	TOPIC: (waterpipe*) OR TOPIC: ("water pipe") OR TOPIC: (narghile*) OR TOPIC: (arghile*) OR TOPIC: (shisha*) OR TOPIC: (goza*) OR TOPIC: (narkeela*) OR TOPIC: (water pipe*) OR TOPIC: (Dokha*) OR TOPIC: ("Smoking Water Pipes") OR TOPIC: ("Tobacco, Waterpipe") OR TOPIC: ("water-pipe") OR TOPIC: ("Narghile Smoking") OR TOPIC: ("smoking narghile") OR TOPIC: ("waterpipe smoking") OR TOPIC: ("water pipes") OR TOPIC: ("Water pipe Smoking") OR TOPIC: ("hubble-bubble") OR TOPIC: ("Hubble, bubble") OR TOPIC: (Gaza) OR TOPIC: (Narkeela) <small>Indexes=SCI-EXPANDED, SSCI, ABHCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, CCR-EXPANDED, IC Timespan=2000-2018</small>	Edit	<input type="checkbox"/>	<input type="checkbox"/>

AND  OR

Clarivate Analytics

## App2. Search Terms Used in the Study

1. waterpipe\* OR "water pipe" OR narghile\* OR arghile\* OR shisha\* OR goza\* OR narkeela\* OR water pipe\* OR Dokha\* OR "Smoking Water Pipes" OR "Tobacco, Waterpipe" OR "water-pipe" OR "Narghile Smoking" OR "smoking narghile" OR "waterpipe smoking" OR "water pipes" OR "Water pipe Smoking" OR "hubble-bubble" OR "Hubble, bubble" OR Gaza OR Narkeela
2. Determinant\* OR Determinants OR forecast OR anticipation\* OR factors\* OR factor OR predictive\* OR forecasting
3. "Cross – sectional" OR "descriptive-analytical" OR "descriptive qualitative"
4. Woman OR Women OR Female OR girl OR girls.