Original Article
http://mjiri.iums.ac.ir
Medical Journal of the Islamic Republic of Iran (MJIRI)

Med J Islam Repub Iran. 2023 (29 Mar);37.30. https://doi.org/10.47176/mjiri.37.30

The Intention of Waterpipe Tobacco Smoking by Women in the COVID-19 Pandemic and its Contributing Factors: a Nonparametric Path Analysis

Soodabeh Zare[1], Anoshirvan Kazemnejad[1]*, Amir Hamta[2], Fatemeh Raeesi Dehkordi[3]

Received: 26 Jan 2022 Published: 29 Mar 2023

Abstract

Background: People with waterpipe tobacco smoking (WTS) seem to be more at risk for the serious complications of coronavirus disease 2019 (COVID-19). This study aimed at assessing the behavioral intention (BI) of WTS by women in the COVID-19 pandemic and its contributing factors.

Methods: This cross-sectional descriptive-correlational study was conducted in 2020 (ie, during the COVID-19 pandemic). Participants were 300 women randomly selected through multistage sampling from comprehensive healthcare centers in Khorramabad, Iran. Data collection instrument was a 42-item questionnaire with 4 main subscales, namely knowledge, attitude, differential association, and BI. Data were collected through both online and phone-based methods and were analyzed using non-parametirc path analysis.

Results: The prevalence of WTS among women was 13% (95% CI, 11.06-14.94) and the mean scores of attitude, differential association, and behavioral intention among participants with WTS were significantly higher than participants without WTS ($P < 0.001$). Moreover, 46.12% (95% CI, 38.12-54.08) of participants with WTS reported intention to quit WTS due to the COVID-19 pandemic and 43.6% (95% CI, 35.66-51.54) of women with WTS and 16.5% (95% CI, 14.20-18.80) of women without WTS believed in the protective effects of WTS against COVID-19. The path analysis model showed that the BI of WTS had a significant inverse relationship with knowledge and a significant direct relationship with attitude and differential association.

Conclusion: This study suggests the need for quality educational and counseling interventions for the general public to correct popular misconceptions about the protective effects of WTS against COVID-19.

Keywords: Tobacco, Smoking, Waterpipe, COVID-19, Nonparametric Path Analysis

Conflicts of Interest: *None declared*
Funding: *None*

Cite this article as: Zare S, Kazemnejad A, Hamta A, Raeesi Dehkordi F. The Intention of Waterpipe Tobacco Smoking by Women in the COVID-19 Pandemic and its Contributing Factors: a Nonparametric Path Analysis. *Med J Islam Repub Iran.* 2023 (29 Mar);37:30. https://doi.org/10.47176/mjiri.37.30

Introduction

In December 2019, a new infectious disease was reported in Wuhan, China, which was named coronavirus disease 2019 (COVID-19) by the World Health Organization. The risk of respiratory failure among patients with COVID-19 is 17% to 29% (1). The global prevalence and mortality rates of COVID-19 were respectively 230 million and 4.7 million cases by September 19, 2021. The top COVID-19 afflicted countries are the United States, India,

Corresponding author: *Dr Anoshirvan Kazemnejad, kazem_an@modares.ac.ir*

1. Department of Biostatistics, Faculty of Medical Sciences, Tarbiat Modares University, Tehran, Iran
2. Department of Biostatistics, Faculty of Medical Sciences, Arak University of Medical Sciences, Arak, Iran
3. Social Determinants of Health Research Center, Lorestan University of Medical Sciences, Khorramabad, Iran

↑What is "already known" in this topic:
Smoking is considered as a risk factor for COVID-19 which can increase the risk of affliction and the severity of the disease. To the best of our knowledge, no study has yet evaluated waterpipe tobacco smoking (WTS) behavioral intention (BI) and its contributing factors among women in the COVID-19 pandemic.

→What this article adds:
This study suggests that significant others, level of knowledge, attitude, and beliefs have significant roles in the intention of WTS among women during the COVID-19 pandemic. Increasing knowledge about the use of smoking can have an effect on reducing the intention to use it among women.

and Brazil with prevalence rates of 42.8, 33.5, and 22.3 million cases, respectively. Iran is also the eighth country with respect to COVID-19 prevalence, with 5.5 million afflicted patients and 117000 deaths (2).

The risk of COVID-19 affliction and its associated death increases with age, particularly age of ≥ 70, and affliction by chronic illnesses such as obesity, hypertension, diabetes mellitus (3, 4), chronic obstructive pulmonary disease, and renal disorders (5). Smoking is also considered a risk factor for COVID-19 which can increase the risk of affliction and the severity of the disease (6-8). The risk of severe COVID-19 among tobacco smokers is 3.25 times more than others (9).

There are different methods for tobacco smoking, including cigarette smoking, pipe smoking, and waterpipe tobacco smoking (WTS). Waterpipe is called ghalyan in Iran and nargile, arghile, shisha, and hubbly bubbly in other countries (10). A study reported that the prevalence of WTS was 16.4% among adults in the United States and 66% of daily waterpipe tobacco smokers were young people (11). The prevalence of WTS in eastern Mediterranean countries is higher than in other countries. A systematic review showed that the prevalence of regular WTS among Lebanese young people was 37.2% and the prevalence of occasional WTS among Iranian university students was 16.3% (12).

WTS is a group behavior and hence, puts group members at risk for different infectious diseases such as influenza, oral herpes simplex, and tuberculosis (13). The use of a single hose by several waterpipe smokers can also increase the risk of COVID-19 transmission because coughing by smokers may contaminate the internal surface of the hose and lead to the transmission of infection to other smokers. Cold water in the waterpipe bowl and humidity in the hose also improve the survival of viruses and bacteria (14, 15).

Recent social changes such as feminism movements, changes in traditional norms, and greater freedom for women have lead women towards engagement in men's behaviors and increased their tobacco smoking, particularly WTS (16, 17). In Iran and Arab countries, WTS prevalence among women is much higher than cigarette smoking because WTS by women is associated with less severe social stigmatization (18). WTS prevalence among women may surpass WTS prevalence among men in a few years [16]. WTS can increase the risks of cervical cancer, premature menopause, osteoporosis, infertility, spontaneous abortions, premature birth, and low birth weight among women (19).

According to the Behavioral Intention Model, behavioral intention (BI) is a combination of attitude towards behavior and subjective norms (20). Attitude refers to individuals' negative or positive evaluation of engagement or non-engagement in a given behavior (21) and is affected by beliefs and knowledge. Evidence shows that tobacco smoking depends on complex social-structural processes (22) and hence, behavior modification theories are needed for effective WTS prevention (23). Previous studies into cigarette smoking reported that most smokers were unaware of smoking-associated risks such as mouth cancer, lung diseases, and myocardial infarction (24, 25). However, there are limited studies into knowledge, attitude, and BI among waterpipe tobacco smokers. Most studies in this area were conducted on certain populations such as students or physicians (26, 27).

The learning of high-risk behaviors through companionship and attachment to others is called differential association (28). A study in Turkey showed that cigarette smoking and WTS by family members and friends were among the most important contributing factors to a tendency towards WTS (29). Another study in Lebanon showed earning the respect of others as a significant factor behind WTS (30).

To the best of our knowledge, no study had yet evaluated WTS BI and its contributing factors among women in the COVID-19 pandemic. Therefore, the present study sought to narrow this gap. The study aimed to assess the BI of WTS by women in the COVID-19 pandemic and its contributing factors.

Methods

This cross-sectional descriptive-correlational study was conducted in 2020, that is, during the COVID-19 pandemic. The target population of the study consisted of all women with health records in comprehensive healthcare centers in Khorramabad, a large city in the west of Iran. Sampling was performed through multistage sampling. Accordingly, the city of Khorramabad was divided into 3 hypothetical regions, namely north, center, and south, 3 centers were randomly selected from each region, and eligible women were randomly selected from these 9 centers. Eligibility criteria were Iranian nationality, basic literacy skills, and agreement for participation. The sample size was calculated to be 240 based on the results of a previous study (31), a WTS prevalence of 11.3, a d of 0.06, and a confidence level of 0.05. Considering a probable attrition rate of 25%, the sample size was increased to 300.

A researcher-made questionnaire was used for data collection. The demographic checklist had 12 items such as age, educational level, and occupation. The questionnaire on factors with potential effects on WTS was developed based on relevant studies (32-34) and had 41 items in 4 subscales, namely knowledge(number of questions (NQ): 14; score:0-14), attitude (NQ: 20; score: 0-40), differential association(NQ: 3; score: 0-12), and BI(NQ: 4; score: 0-11).

Ten experts in health education, psychology, and sociology from Lorestan and Isfahan Universities of Medical Sciences, Khorramabad and Isfahan, Iran, assessed the qualitative face validity of this questionnaire and the questionnaire was revised according to their comments. Then, quantitative face validity was assessed through calculating the item impact score

The content validity of the questionnaire was assessed through calculating the content validity ratio (CVR) and content validity index (CVI). Then, CVR values of all items were calculated and items with CVR values > 0.62 were considered acceptable. All items had acceptable CVR values and none of them were omitted. The CVR of

the whole questionnaire was also 0.87. Greater CVI values are indicative of better content validity. The CVI values of all items was 0.79, the total CVI of the questionnaire was 0.91, and no item was omitted.

The reliability of the questionnaire was calculated using the test-retest method. Accordingly, 20 eligible women were invited to complete the questionnaire twice at a 2-week interval. The test-retest intraclass correlation coefficients of the knowledge, attitude, behavioral intention, and differential association were respectively 0.8, 0.84, 0.78, and 0.79, confirming the acceptable reliability of the questionnaire.

Data Collection

Data collection was performed online due to COVID-19s related restrictions and limited physical access to eligible participants. The phone number of eligible women was obtained from their health records in the study setting and they were invited to the study through personal phone contacts. The study instruments were uploaded on a website and its link was sent to participants via Telegram or WhatsApp and they were asked to complete them online. For participants with no access to the internet or smartphone, instruments were completed through telephone interviews.

The Ethics Committee of Tarbiat Modares University, Tehran, Iran, approved this study (code: IR.MODARES.REC.1399.155). Permissions for entering the study setting and sampling were also obtained from Lorestan University of Medical Sciences, Khorramabad, Iran. Participants were informed over the phone about the study aim and were ensured of the confidentiality of their data and online written informed consent was obtained from all of them.

Statistical Analysis

Data were analyzed using the R software (V. 4.0.5). Numerical variables were described using the mean and standard deviation and categorical variables were described using absolute and relative frequencies. Data analysis was performed through the chi-square, independent-sample t, Pearson correlation analysis, and non-parametric path analysis. Figure 1 shows the path analysis model drawn based on the findings of previous studies (35-38).

This figure depicts the direct and indirect effects of independent and mediating variables on BI. It was predicted that the history of WTS, age at WST onset, and the differential association had effects on attitude and BI. The relationship between attitude and BI was also determined in the model. Accordingly, all variables, except for attitude, had direct and indirect effects on BI. Before path analysis, the normality of the attitude and the BI variables was assessed through the Kolmogorov-Smirnov test which showed that the distribution of these variables was not normal ($P < 0.05$). Therefore, non-parametric path analysis was used. Path analysis is a flexible and robust method for testing relationships among variables (39). Parametric path analysis needs a large sample and normally distributed data, while non-parametric path analysis can be performed on the data obtained from smaller samples and the data with the non-normal distribution. Moreover, the assumptions of non-parametric methods are practically closer to the characteristics of the data, while a predetermined distribution is imposed on the data in parametric path analysis. Besides, a certain model of relationships is imposed on the data in parametric methods, while a rational model of relationships can be drawn when the exact type of relationships among variables is unclear (40).

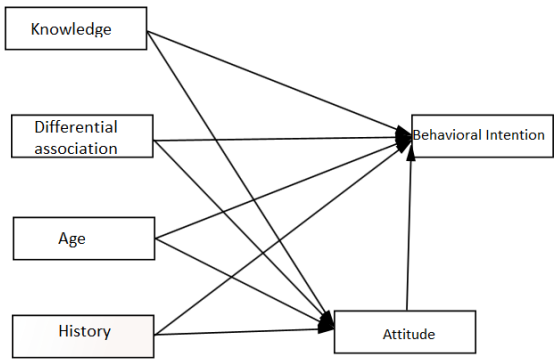

Figure 1. The hypothetical path analysis model for behavioral intention

Results

A total of 300 women participated in the study. The mean of their age was 29.6±10.52 years. A total of 79 participants (26.33%) reported a history of WTS and 39 (13% (95% CI, 11.06-14.94)) reported current WTS. The mean age of participants with and without WTS was respectively 29.396±10.31 and 31.05±10.51, with no significant between-group difference ($P = 0.361$). Moreover, 142 (47.33%) had university education, 17 (5.7%) were illiterate, 144 (48%) were married, 144 (48%) were single, and 12 (4%) were divorced or widowed. Also, 43 participants (14.3%) were employed, 130 (43.3%) were housewives, and 127 (42.3%) were student. Among the 79 participants with a history of WTS, 38 (48.1%) had started WTS at an age of 20 to 30 years and 24 (30.4%) had started WTS before the age of 20 years. The age at regular WTS onset was 17.1±12.11 years, on average. Among the 39 participants with current WTS, the duration of WTS was < 6 months in twelve participants (30.8%), 6 to 12 months in four participants (10.3%), 1 to 2 years in 7 participants (17.9%), and >2 years in 16 participants (41%). Eighteen participants with WTS reported the intention to quit WTS due to the COVID-19 pandemic, while 17 participants with WTS (43.58% (95% CI, 35.66-51.54)) and 43 participants without WTS (16.47% (95% CI, 14.20-18.80)) believed in the protective effects of WTS against COVID-19.

The results of Table 1 showed that WTS had significant relationship with occupation and history of WTS among family members, relatives, or friends ($P < 0.05$).

The total mean scores of differential association, knowledge, attitude, and BI were 1.76±1.99, 9.69±1.95, 29.52±4.82, and 9.02±2.80, respectively (Table 2). There was no significant difference between participants with

Table 1. Participants' demographic characteristics and their relationships with WTS

Characteristics		WTS, N (%)		P-value
		Yes	No	
Educational level	Illiterate	2 (11.8)	15 (88.2)	0.812
	High school	5 (11.6)	38 (88.4)	
	Diploma	16 (16.3)	82 (83.7)	
	Bachelor's	14 (10.9)	114 (89.1)	
	Master's or higher	2 (14.3)	12 (85.7)	
Occupation	Employee	3 (7.0)	40 (93.0)	0.041
	Housewife	24 (18.5)	106 (81.5)	
	Student	12 (9.4)	115 (90.6)	
WTS by family members	No	19 (8.6)	202 (91.4)	< 0.001
	Daily	5 (38.5)	8 (61.5)	
	Weekly	2 (33.3)	4 (66.7)	
	Sometimes	13 (22.4)	46 (77.6)	
WTS by relatives	No	8 (5.7)	133 (94.3)	< 0.001
	Daily	8 (44.4)	10 (55.6)	
	Weekly	5 (35.7)	9 (64.3)	
	Sometimes	18 (14.2)	109 (85.8)	
WTS by friends	No	7 (5.0)	134 (95.0)	< 0.001
	Daily	10 (52.6)	9 (47.4)	
	Weekly	5 (33.3)	10 (66.7)	
	Sometimes	17 (13.6	108 (86.4)	

Table 2. The Mean scores ofknowledge, attitude, differential association, and behavioral intention and their relationships with WTS

Variable	Total Mean±SD	WTS, Mean ± SD		*P*-value
		No	Yes	
Differential association	1.76±1.99	1.49±1.75	3.62±2.50	< 0.001
Knowledge	9.69±1.95	9.75±1.85	9.49±2.20	0.314
Attitude	29.52±4.82	30.15±4.32	27.77±5.69	0.001
Behavioral intention	9.02±2.80	6.22±3.25	10.03±1.75	< 0.001

Table 3. The Correlations of the mean scores of knowledge, attitude, differential association, and behavioral intention

Variable	Knowledge	Differential association	Attitude	Behavioral intention
Knowledge	1.000	—	—	—
Differential association	–0.025	1.000	—	—
Attitude	–0.372*	0.179*	1.000	—
Behavioral intention	–0.158*	0.415*	0.260*	1.000

* Correlation is significant at a level of 0.01 (2-tailed).

and without WTS respecting their knowledge mean score ($P = 0.314$), while the mean scores of differential association, attitude, and BI among participants without WTS were significantly greater than participants with WTS ($P < 0.05$)

According to Table 3, Pearson correlation analysis revealed that the mean score of participants' knowledge had a significant inverse correlation with the mean score of their attitude (r = –0.37; $P < 0.001$) and BI (r = –0.16; $P = 0.008$). Moreover, the mean score of differential association had significant positive relationship with attitude (r = 0.18; $P = 0.002$) and BI (r = 0.4; $P < 0.001$) and the mean score of attitude had significant positive relationship with BI (r = 0.26; $P < 0.001$).

In path analysis, the Ramsey test was used to determine the linearity or nonlinearity of relationships among dependent and independent variables. Its results showed that the relationship of age at WST onset with attitude and the relationship of age at WST onset and history of WTS with BI was not linear ($P < 0.05$), while other relationships were linear (Table 4).

Based on Figure 1, The final non-parametric path analysis model was as follows:

$$Expected\ attitude = -0.40 * knowledge + 0.30 * differential\ association + 2.09 * age - 0.50 * age^2 + 0.10 * history$$

$$Expected\ bihavioral\ intention = -0.98 * knowledge + 0.18 * differential\ association + 1.47 * age - 0.41 * age^2 + 1.46 * history - 0.11\ history^2 + 0.12\ attitude$$

Based on these models, the variables of knowledge, differential association, age at WTS onset, and history of WTS had a linear relationship with attitude with coefficients of –0.41, 0.3, 2.09, and 0.1, respectively. Age also had a quadratic relationship with attitude, with a coefficient of –0.5. Moreover, knowledge, differential association, age at WTS onset, and history of WTS had a linear relationship with BI, with coefficients of –0.98, 0.18, 1.47; and 1.46, and age and history of WTS had quadratic relationship with BI with coefficients of –0.41 and –0.11, respectively.

Direct, indirect, and total path coefficients are listed in Table 5. Based on direct path analysis coefficients, each 1-point increase in the mean score of knowledge will be associated with 0.4-point decrease in the mean score of attitude, while each 1-point increase in the mean score of the differential association will be associated with 0.3-point increase in the mean score of attitude. Moreover, each 1-point increase in the mean of age at WTS onset will be associated with 1.59-point increase in the mean

Table 4. The Results of the ramsey reset test for nonlinearity

Effect	*P*-value	Correlation
Knowledge on attitude	0.072	Linear
Attitude on differential association	0.414	Linear
Age at WTS onset on attitude	0.011	Nonlinear
WTS history on attitude	0.113	Linear
Knowledge of behavioral intention	0.067	Linear
Differential association on behavioral intention	0.208	Linear
Attitude on behavioral intention	0.412	Linear
Age at WTS onset on behavioral intention	<0.001	Nonlinear
WTS hisstory on behavioral intention	0.010	Nonlinear

Table 5. The Path analysis coefficients for the direct, indirect, and total effects of the study variables on behavioral intention

Variable	Direct	Indirect	Total
Knowledge	–0.98	–0.048	–1.028
Differential association	0.18	0.036	0.216
Age at WTS onset	1.06	0.191	1.251
History	1.35	0.012	1.362
Attitude	0.12	No	0.12

score of attitude and each one point increase in the history of WTS will be associated with 0.1-point increase in the mean score of attitude.

Based on total path analysis coefficients, each 1-point increase in the mean score of knowledge will be associated with a 1.028-point decrease in the mean score of BI. Moreover, a differential association has a significant positive relationship with BI so that each 1-point increase in its mean score will be associated with a 0.218-point change in the mean score of BI. Besides, each 1-point increase in the mean of age at WTS onset and history of WTS will be associated with a change of respectively 1.251 and 1.362 points in the mean score of BI. The coefficient of determination of the path analysis model was 0.79, denoting that the path analysis model in this study explained 79% of the variance of BI.

Discussion

This study evaluated WTS among women in the COVID-19 pandemic and its contributing factors. The prevalence of WTS among women was 12.6%. Two earlier studies in Lorestan, Iran, reported that the prevalence of WTS was 3.7% among women (41) and 17.7% among female students (41). Moreover, our findings showed that 57% of the 39 women with current WTS had started WTS in the past 1 year. A systematic review of 13 studies also showed that the prevalence of tobacco use among 5960 patients with COVID-19 in China was 1.4% to 12.6% (42) and another review study on hospitalized patients with COVID-19 reported that the prevalence of tobacco use was 7.6% (43). Tobacco use increases the risk of affliction by severe COVID-19 by 1.4 times and the risk of hospitalization an intensive care unit, the need for mechanical ventilation, and the risk of death due to COVID-19 by 2.4 times (44).

Most participants had good knowledge about WTS. Moreover, there was no significant difference between participants with and without WTS respecting the mean score of knowledge. However, a study on pregnant women in Lebanon reported that women without WTS had better knowledge about WTS than those with WTS (45).

Study findings revealed no significant relationship between WTS and educational level. This is in agreement with the findings of some previous studies (37, 46) and contradicts the findings of some other studies (47, 48). Moreover, we found that participants with WTS obtained significantly higher attitude and BI scores compared with participants without WTS. Some participants had positive attitude towards WTS and considered WTS as an indicator of women's power due to their limited knowledge about the consequences of WTS and their beliefs in the pleasurably of waterpipe smell and taste, lower risk of WTS compared with cigarette smoking, calming effects of WTS, positive effects of WTS on forgetfulness towards the problems of the COVID-19 crisis, and the protective and disinfectant effects of WTS on COVID-19. A previous study also reported the same finding (49). We also found that participants with WTS had firmer beliefs in the protective effects of WTS against COVID-19, which is in agreement with the findings of 2 previous studiesa (37, 50). Such misconceptions may originate from prevalent misconceptions about WTS in Iran and the Middle East (51, 52). Culture exerts its effects on different phenomena through different mechanisms such as the social stigmatization phenomenon. Social stigma is a state of spoiled identity, in which a certain characteristic is attributed to a person or group and thereby, that person or the members of that group are devalued. Therefore, WTS will become prevalent in societies that do not stigmatize it (53).

The findings of the present study showed that better knowledge about WTS was associated a with more negative attitude about WTS and lower BI of WTS. A previous study showed that knowledge improvement was associated with the lower intention of WTS among women (54). Moreover, our findings showed that knowledge about the consequences of WTS had a significant inverse relationship with attitude toward WTS. Therefore, educational interventions can be used to improve people's knowledge about the risks of WTS (54, 55). We also found that attitude and BI had a direct relationship with each other which is in agreement with the findings of several previous studies (35, 56).

In the present study, 46.1% of participants with current WTS reported intention to quit WTS due to the COVID-19 pandemic. Similarly, 17.8% of participants in a study in the United States reported a reduction of WTS due to the COVID-19 pandemic and 46.5% of them reported that they intended to quit WTS due to obtaining more knowledge about the negative effects of WTS on the complications and severity of COVID-19 (57). Another study in Jordan also showed that people had quitted WTS due to COVID-19 (44). According to the results, in addition to the government's decisions to prevent the use of waterpipe in its serving places, it is recommended to seek help from social media and mass media to educate people about the relationship between the progress of COVID 19 and waterpipe use.

The differential association also had a significant direct relationship with attitude and BI in the present study, denoting that WTS among family members or friends can

significantly contribute to WTS. Moreover, our findings showed that 38% of participants with WTS had started WTS in the past 6 months. This finding may be due to the fact that mandatory quarantine and closure of centers for recreational activities and parks during the COVID-19 pandemic have required people to spend more time with family members, relatives, and friends and might have increased their exposure to waterpipe tobacco smokers. Some previous studies also reported WTS among family members, relatives, or friends as a contributing factor WTS (4, 14, 58). As most women engage in WTS in home settings, daughters may inevitably be involved in the preparation of waterpipe and thereby, they may be at high risk for WTS. A previous study reported that husbands have a significant role in WTS onset by women, particularly during the engagement period or the first years of marital life, because a man with WTS is very likely to encourage his wife for WTS (14).

We also found that BI had significant direct relationship with duration of WTS so that BI was lower among those with shorter WTS duration. This finding may indicate that most participants with WTS had started WTS due to the COVID-19 pandemic and its associated mandatory quarantine. Longer tobacco smoking is associated with more dependence on tobacco and more difficult quitting (59).

Health policy makers and tobacco use control authorities can use the findings of the present study to minimize tobacco use. Education for individuals with no WTS is necessary to help them protect themselves against the smoke of tobacco smokers. Imposing higher taxes on tobacco products, prohibiting WTS in public places, and conducting knowledge improvement campaigns which integrate multidisciplinary interventions are also recommended for WTS minimization.

Strengths and Limitations

To the best of our knowledge, this is the first study in its kind into WTS and its contributing factors in Iran during the COVID-19 pandemic. Moreover, participants were from different age groups, different levels of education, and different occupations. Data collection was also performed through both online and phone-based methods and data analysis was performed using advanced statistical methods. On the other hand, assessment of causal relationships was impossible due to the cross-sectional design of the study. Moreover, we could not find any valid and reliable instrument for the assessment of the study variables in the COVID-19 pandemic.

Conclusion

This study suggests that significant others, level of knowledge, attitude, and beliefs have significant roles in the intention of WTS among women during the COVID-19 pandemic. Univariate analysis may lead to misleading results due to the non-simultaneous consideration of some important variables, thus the use of more complex statistical methods is inevitable. Instead of using univariate methods, path analysis produces more realistic correlations. Unlike the parametric methods, nonparametric path analysis explains the relationship function between different paths without needing specific assumptions about data distribution and the type of relationship between variables.

Acknowledgments

The present study was financially supported by Tarbiat Modares University. The authors would like to express their gratitude to the members of the health centers of Khoramabad and the women who participated in the study.

Authors Contributions

AK conceived the study, supervised all phases of evaluation, and critically revised the manuscript; he is the guarantor. F.R.D. has cooperated in collecting primary data. SZ and A.H. analyzed and interpret of the data. SZ, AH and FRD drafted the manuscript.

Ethics Declarations

This study was approved by The Ethics Committee of Tarbiat Modares University, Tehran, Iran, approved this study (code: IR.MODARES.REC.1399.155).

Conflict of Interests

The authors declare that they have no competing interests.

References

1. Control CfD and Prevention. Interim clinical guidance for management of patients with confirmed coronavirus disease (COVID-19). 2020.
2. https://www.worldometers.info/coronavirus/. 2021.
3. Mahase E. COVID-19: death rate is 0.66% and increases with age, study estimates. BMJ-BRIT MED J (Online). 2020;369.
4. Grant WB, Lahore L, McDonnell SL, Baggerly CA, French CB, Aliano JL, et al. Evidence that vitamin D supplementation could reduce risk of influenza and COVID-19 infections and deaths. Nutrients. 2020;12(4):988.
5. Wu C, Chen X, Cai Y, Xia J, Zhou X, Xu Sh, et al. Risk factors associated with acute respiratory distress syndrome and death in patients with coronavirus disease 2019 pneumonia in Wuhan, China. JAMA Intern Med. 2020;180(7):934-943.
6. Karanasos A, Aznaouridis K, Latsios G, Synetos A, Plitaria S, Tousoulis D, et al. Impact of Smoking Status on Disease Severity and Mortality of Hospitalized Patients With COVID-19 Infection: A Systematic Review and Meta-analysis. Nicotine Tob Res. 2020;22(9):1657-1659.
7. Vardavas CI, Nikitara K. COVID-19 and smoking: A systematic review of the evidence. Tob Induc Dis. 2020;18:20.
8. Zhao Q, Meng M, Kumar R, Wu Y, Huang J, Lian N, et al. The impact of COPD and smoking history on the severity of COVID-19: A systemic review and meta-analysis. J Med Virol. 2020;92(10):1915-1921.
9. Guan WJ, Ni ZhYI, Hu Y, Lian WH, Ou ChQ, He JX, et al. Clinical characteristics of coronavirus disease 2019 in China. N Eng J Med. 2020;382(18):1708-1720.
10. Maziak W, Taleb ZB, Bahelah R, IslamF, Jaber R, Auf R, et al. The global epidemiology of waterpipe smoking. Tob Control. 2015;24Suppl 1(Suppl 1):i3-i12.
11. Robinson JN, Wang B, Jackson K, Donaldson E, Ryant Ch. Characteristics of Hookah tobacco smoking sessions and correlates of use frequency among us adults: findings from wave 1 of the Population Assessment of Tobacco and Health (PATH) study. Nicotine Tob Res. 2018;20(6):731-740.
12. Jawad M, Charide R, Waziry R, Darzi A, Ballout RA, Aki EA. The prevalence and trends of waterpipe tobacco smoking: A systematic review. PLoS One. 2018;13(2):e0192191.
13. Ministério da Saúde. Instituto Nacional de Câncer José Alencar Gomes da Silva. Nomenclatura Brasileira para Laudos Citopatológicos

Cervicais. 2012.
14. Alagaili AN, Briese T, Amor MSN, Mohammed OB, Lipkin WI. Waterpipe smoking as a public health risk: Potential risk for transmission of MERS-CoV. Saudi J Biol Sci. 2019;26(5):938-941.
15. Shekhar S, Hannah-Shmouni F. Hookah smoking and COVID-19: call for action. Can Med Assoc J. 2020;192(17):E462-E462.
16. Arévalo S, Prado G, Amaro H. Spirituality, sense of coherence, and coping responses in women receiving treatment for alcohol and drug addiction. Eval Program Plann. 2008;31(1):113-123.
17. Saidi AA, Dibaji Foroushani S, Firouzabadi SA. Sociological factors influencing smoking among women and girls in Tehran. Soc Probl Iran. 2011;1(4).
18. Koul PA, Hajni MR, Sheikh MA, Khan UH, Shah A, Khan Y, et al. Hookah smoking and lung cancer in the Kashmir valley of the Indian subcontinent. Asian Pac J Cancer Prev. 2011;12(2):P519-P524.
19. Dadipoor S, Kok G, Aghamolaei T, Ghaffari M, Ghanbarnezhad A. An intervention development for cessation of hookah smoking among Iranian women: study protocol for a systematic and theory-based approach to intervention design. Addict sci clin pract. 2020;15(1):1-10.
20. Ewald BM, Roberts CS. Contraceptive behavior in college-age males related to Fishbein model. Adv Nurs Sci. 1985.
21. Alami A, Tavakoly sany SB, Tehrani H, Monfared EL, Hosseini Z, Jafari A. The effect of educational intervention on iron and vitamin D consumption based on the theory of planned behaviour in Iranian adolescent girls: a quasi-experimental study. Int J Health Prom Educ. 2019;57(6):316-331.
22. Greaves L, Hemsing N. Women and tobacco control policies: social-structural and psychosocial contributions to vulnerability to tobacco use and exposure. Drug Alcohol Depend. 2009;104:S121-S130.
23. Zarei F, Shojayizade D. The effect of educational intervention based on BASNEF model to improve interpersonal communication skills of nurses. Alborz Univ Med J. 2012;1(3):173-178.
24. Bou Khalil R, Aoun-Bacha Z, Hlais S, Richa S. Smokers' knowledge about smoking-related health problems in Lebanon. Subst Use Misuse. 2014;49(3):270-276.
25. Trofor AC, Papadakis S, M.Lotrean L, Radu-Lghin C, Eremia M, Mihaltan F, et al. Knowledge of the health risks of smoking and impact of cigarette warning labels among tobacco users in six European countries: Findings from the EUREST-PLUS ITC Europe Surveys. Tob Induc Dis. 2018;16.
26. Kumar A, Mahmud M, Hussai N, Bdoulnabi Z, Shah B, Rizvi N. Knowledge and behaviour of physicians and surgeons regarding shisha smoking. J Adv Med Med Res. 2016;1-12.
27. Nasser AM, Salah BA, Regassa LT, Alhakimy AA, Zhang X. Smoking prevalence, attitudes and associated factors among students in health-related Departments of Community College in rural Yemen. Tob Induc Dis. 2018;16.
28. Momtaz F. Social deviations. Theories and perspectives. Tehran: Public Joint Stock Company. 2003.
29. Poyrazoğlu S, Şarlis Ş, Gencer Z, Günay O. Waterpipe (narghile) smoking among medical and non-medical university students in Turkey. Upsala J Med Sci. 2010;115(3):210-216.
30. Salameh P, M Waked, and Z Aoun. Waterpipe smoking: construction and validation of the Lebanon Waterpipe Dependence Scale (LWDS-11). Nicotine Tob Res. 2008;10(1):149-158.
31. Hessami Z, Masjedi MR, Ghahremani R,Kazempour M, Emami H. Evaluation of the prevalence of waterpipe tobacco smoking and its related factors in Tehran, Islamic Republic of Iran. East Mediterr Health J. 2017;23(2):94-99.
32. Ho LLK, Li WHCh, Cheung AT, Xia W, Wang MP, Cheung DYT, et al. Impact of COVID-19 on the Hong Kong Youth Quitline Service and quitting behaviors of its users. Int J Environ Res Public Health. 2020;17(22):8397.
33. Kaveh MH, Jafari A, Keshavarzi S, Momenabadi V, Taheri M, Dehbozorgi F, et al. Evaluation of explanation of the BASNEF model on smoking waterpipe among the students one of the medical universities located in the south of Iran. Iran J Health Educ Health Prom. 2019;7(4):312-322.
34. Tetik BK, Tekinemre IG, Taş S. The effect of the COVID-19 pandemic on smoking cessation success. J Community Health. 2021;46(3):471-475.
35. Athamneh L, Essien EJ, Sansgsiri S, Abughosh S. Intention to quit water pipe smoking among Arab Americans: Application of the theory of planned behavior. J Ethn Subst Abuse. 2017;16(1):80-90.
36. Baheiraei A, Hamzehgardeshi Z, Mohammadi MR, Nedjat S, Mohammadi R. Lifetime and current waterpipe use among adolescents in Tehran, Islamic Republic of Iran. East Mediterr Health J. 2013;19(12):1003-13.
37. Kalan ME, Ghobadi H, Taleb ZB, Adham D, Cobb CO, Ward KD, et al. COVID-19 and beliefs about tobacco use: an online cross-sectional study in Iran. Environ Sci Pollut Res. 2020;1-9.
38. Danaei M, Kermani AJ, Mohebbi E, Momeni M. Waterpipe Tobacco Smoking Prevalence and Associated Factors in the Southeast of Iran. Addict Health. 2017;9(2):72-80.
39. Suhr D. Step your way through path analysis. in Western users of SAS software conference proceedings. 2008.
40. Ringle CM, Wende S, Will A. Finite mixture partial least squares analysis: Methodology and numerical examples, in Handbook of partial least squares. 2010;195-218.
41. Mirzaei N, Dehdari T, Taghsidi MH, Zare N. Development of an instrument based on the theory of planned behavior variables to measure factors influencing Iranian adults' intention to quit waterpipe tobacco smoking. Psychol Res Behav Manag. 2019;12:901-912.
42. Tarrahi MJ, Mohammadpoorasl A, Ansari H, Mohammadi Y. Substance Abuse and its predictors in freshmen students of Lorestan universities: subgrouping of college students in West of Iran. Health Scope. 2017;6(4).
43. Farsalinos K, Barbouni A, Niaura R. Systematic review of the prevalence of current smoking among hospitalized COVID-19 patients in China: could nicotine be a therapeutic option? Int Emerg Med. 2020;15(5):845-852.
44. Emami A, Javanmardi F, Pirbonyeh N, Akbari A. Prevalence of underlying diseases in hospitalized patients with COVID-19: a systematic review and meta-analysis. Arch Acad Emerg Med. 2020;8(1).
45. Al-Tammemi BA, Barakat M, Tamimi D, Alhallaq SA, AlHassan DM, Khasawneh GM, et al. Beliefs Toward Smoking and COVID-19, and The Pandemic Impact on Smoking Behavior and Quit Intention: Findings from a Community-Based Cross-Sectional Study in Jordan. Tob Use Insights. 2021 Nov 23;14:1179173X211053022.
46. Chaaya M, Jabbour S, El-Roueiheb Z, Chemaitelly H. Knowledge, attitudes, and practices of argileh (water pipe or hubble-bubble) and cigarette smoking among pregnant women in Lebanon. Addict Behav. 2004;29(9):1821-1831.
47. Ebrahimi Kalan M, Alborzi M, Ben-Taleb Z, Adham D, Abasi A, Bursac Z, et al. Characteristics of flavored and non-flavored waterpipe tobacco users: a real-world setting study. Environ Sci Pollut Res. 2021;1-11.
48. Hallit S, Haddad Ch, Malhab SB, Khabbaz LR, Salameh P. Construction and validation of the water pipe harm perception scale (WHPS-6) among the Lebanese population. Environ Sci Pollut Res. 2020;27(3):3440-3448.
49. Baheiraei A, Sighaldeh ShS, Ebadi A, Kelishadi R, Majdzadeh SR. Psycho-social needs impact on hookah smoking initiation among women: a qualitative study from Iran. Int J Prev Med. 2015;6.
50. Altindis M, Koroglu M, Demiry T, Yilmaz K, Inci MB, Olmez M, et al. Microbial contamination and infection risks of narghile besides hazards of tobacco. Cent Eur J Public Health. 2020;28(1):74-78.
51. Davaji RBO, Shahamat YD, Davaji DH, Mirkarimi K, Chakazi A, Pahlavanzadeh B, et al. Patterns, beliefs, norms and perceived harms of hookah smoking in north Iran. Asian Pac J Cancer Prev. 2017;18(3):823.
52. Akl EA, Jawad M, LamWY, Co ChN, Obeid R, Irani J. Motives, beliefs and attitudes towards waterpipe tobacco smoking: a systematic review. Harm Reduct J. 2013;10(1):1-10.
53. Yang LH, Kleinman A, Link BG, Phelan JC, Lee S, Good B. Culture and stigma: Adding moral experience to stigma theory. Soc Sci Med. 2007;64(7):1524-1535.
54. Hassani L, Aghamolaei T, Ezatirad R, Ahmadzadeh Kh, Ghanbarnejad A. Effect of Educational Intervention Based on Theory of Planned Behavior on the Reduction of Water Pipe Smoking in Women. Health Educ Health Prom. 2019;7(4):191-195.
55. Mohlman MK, Boulos DN, Setouhy ME, Radwan Gh, Makambi K, Jillson I, et al. A randomized, controlled community-wide intervention to reduce environmental tobacco smoke exposure. Nicotine Tob Res. 2013;15(8):1372-1381.
56. Girma E, Assefa T, Deribew A. Cigarette smokers' intention to quit smoking in Dire Dawa town Ethiopia: an assessment using the Transtheoretical Model. BMC Public Health. 2010;10:320.
57. Kowitt SD, Ross JC, Jarman K, Kistler C, Lazard A, Ranney LM, et

al. Tobacco quit intentions and behaviors among cigar smokers in the United States in response to COVID-19. Int J Environ Res Public Health. 2020;17(15):5368.
58. Bommelé J, Hopman P, Walters BH, Geboers C, Croes E, Fong GT, et al. The double-edged relationship between COVID-19 stress and smoking: implications for smoking cessation. Tob Induc Dis. 2020;18.
59. Caponnetto P, Polosa R. Common predictors of smoking cessation in clinical practice. Respir Med. 2008;102(8):1182-92.