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PREDICTORS OF AN INTENTION TO QUIT WATERPIPE SMOKING AMONG ARAB AMERICANS: APPLICATION OF THE THEORY OF PLANNED BEHAVIOR

by

Liqa Athamneh

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I dedicate this thesis to all of my family members.

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ABSTRACT

Predictors of Intention to Quit Waterpipe Smoking among Arab Americans:

Application of The Theory of Planned Behavior

Introduction: As the second global tobacco epidemic since the cigarette, waterpipe smoking has been rapidly spreading among youth around the world in the past decade. Middle Eastern ethnicity or having a friend of Middle Eastern ethnicity have been reported as significant predictors of waterpipe smoking among US students. To date, no studies have investigated the predictors of an intention to quit waterpipe smoking among the Arab-Americans population specifically. Our study's objective is to investigate the predictors of an intention to quit waterpipe smoking in next 12 months among a sample of Arab Americans who smoke tobacco using a waterpipe in the Houston area.

Methods: An observational, survey-based cross-sectional study with a convenience sample of Arab American adults in Houston, Texas area was conducted to address the study goals. The questionnaire consisted of six major categories with 53 questions. The first five sections of the study consisted of 41 'yes/no' and multiple-choice questions that included: socio-demographic characteristics, tobacco use history, perception of risk, and waterpipe-related practices. The last section in the survey consisted of 12 sub-questions with a seven point scale answer that cover the theory of planned behavior constructs and investigate the smoker's intention to quit smoking using waterpipes. Stepwise Logistic regression were run to determine predictors of the intention to quit waterpipe smoking in the next 12 months. All the statistical analysis were conducted using SAS 9.2 (SAS Institute Inc., Carey, North Carolina) at a significance level of 0.05.

Results: A total of 340 participants completed the survey. Overall, the percentage of participants having an intention to quit waterpipe smoking among this study sample was 27.43%. The majority of participants (96%) initiated waterpipe smoking in the company of their family members or friends. Approximately half of the participants (49%) smoked cigarettes and 31% smoked cigars, cigarillos, or little cigars in the previous 30 days. Significant predictors associated with a higher intention to quit smoking waterpipe in the next 12 months among Arab Americans were history of cigar use in the previous 30 days [OR: 4.38 CI: 1.86 – 10.31], a prior attempt to quit waterpipe smoking for more than 7 days [OR: 6.6 CI: 1.324 – 32.968], and not smoking waterpipe when seriously ill compared to those who smoke even when seriously ill [OR: 6.50 CI: 1.404 – 30.093]. Predictors associated with a lower intention to quit waterpipe smoking were increasing age [OR: 0.933 CI: 0.876 – 0.995], medium cultural acceptability of using waterpipe among family members compared to no-cultural acceptability among family [OR: 0.434 CI: 0.188 – 0.99], high cultural acceptability of using waterpipe among friends compared to no-cultural acceptability among friends [OR: 0.130 CI: 1.09 - 10.64], duration of smoking sessions between 1 hour [OR: 0.270 CI: 0.094 – 0.772] and 2 hours [OR: 0.044 CI: 0.002 - 0.933] compared to those who smoke for less than 30 minutes, and perception of waterpipe's harm as less than cigarettes [OR: 0.376 CI: 0.177 - 0.800] compared to those perceive it as more harmful than cigarettes.

After adjusting the internal constructs of TPB to age, gender, income, marital status and education the results indicated that behavioral evaluation (OR: 1.28 CI: 0.64 -0.94),

Normative beliefs (OR: 1.24 CI: 0.69 - 0.93) and motivation to comply (OR: 1.17 CI: 0.73 - 0.99) were predictors of an intention to quit waterpipe smoking in the next 12 months.

Conclusion: The study findings demonstrate low levels of intention to quit waterpipe smoking among Arab Americans in Houston, Texas area. Public health educational programs that target Arab Americans in general, and specifically older adults, those who smoke waterpipes for more than 60 minutes, those whose family and friends approve smoking waterpipe, and those with no former quit attempts may be necessary to increase the intention to quit waterpipe smoking. Interest in quitting is determined mainly by smokers' behavioral evaluation, normative beliefs and motivation to comply. Efforts are greatly needed to design interventions and strategies that include these constructs.

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Chapter 1

Tobacco smoking

Introduction

Smoking is defined as any inhaling, exhaling, burning, or using any kind of lighted pipe, cigarette, cigar, weed, herbs, waterpipe, or any other lighted smoking equipment.[1] Smoking continues to be the single most common addiction and a preventable reason of death, disease, and disability.[2-5] Smoking has been associated with the development of heart disease, malignant neoplasms, peripheral and cerebral vascular diseases, and nonmalignant chronic respiratory disease.[2-5] Almost every organ of the body can be harmed by smoking, which reduces the general health of smokers and causes many diseases.[3,6]

Around the world, there are more than 5 million deaths every year caused by tobacco use (more than the number of deaths caused by HIV/AIDS, tuberculosis and malaria combined). Current trends project that this number will increase to more than 8 million deaths per year by 2030.[7]

In the United States (US), more than 440,000 individuals annually die prematurely because of smoking or secondhand smoke exposure, approximately one in every five deaths yearly.[6,8] For every one life lost as a result of smoking-related disease, about 20 other people suffer from at least one illness caused by smoking.[9] Studies found that smokers die 10 years earlier when

compared to nonsmokers.[10] Yet, tobacco use is very common around the world due to solid and extensive marketing, low prices, lack of knowledge or ignorance about its dangers, and inconstant public policies against smoking.[11]

At any age, significant risks associated with smoking can be prevented by quitting.[12] In the US, the vast majority of smokers show an interest in quitting,[12] however, only 3% of smokers who attempt to quit on their own remain abstinent at six months while about 80% relapse within the first month.[13] This verifies the powerful effect of tobacco addiction and the chronic nature of smoking.[13]

Forms of tobacco

Tobacco comes in different shapes and forms, including cigarettes, cigar, bidis, kreteks, smokeless tobacco and waterpipe.[14] All forms of tobacco product are harmful and all levels of exposure to tobacco smoke are risky.[8] Even though the main focus for this thesis is waterpipe smoking, we will introduce all forms of tobacco before going into details regarding waterpipe smoking.

Cigarettes

The most common form of tobacco used worldwide. Cigarettes can be manufactured or hand rolled. Manufactured cigarettes are made up of shredded or reconstructed tobacco treated with hundreds of chemicals.[15] It is well documented that cigarettes contain an approximate of 600 ingredients, which create more than 4,000 chemicals when burned. At least 50 of these

chemicals are found to be poisonous and cause cancer.[16] Cigarettes accounts for ninety six percent of the whole sales of manufactured tobacco globally, with a dramatic increase in cigarette production worldwide.[17]

Cigar

Cigar is a roll of tobacco wrapped in tobacco's leaf or in a material that includes tobacco (as opposed to a cigarette which is wrapped in paper or in materials that do not include tobacco).[18,19] There are three major types of cigars sold in the US; large cigars, cigarillos, and little cigars.[18-20] Large cigar usually contain at least as much tobacco as a pack of cigarette (at least one-half ounce of aged, fermented tobacco) and usually takes one to two hours to smoke. A Cigarillo is a short and narrow cigar (three to four inches long) that usually has about three grams of tobacco and typically does not have a filter.[16,17]

A little cigar is a small cigar that has the same size as a cigarette and typically includes a filter. Cigars are not safer than cigarettes and were found to have the same carcinogenic and toxic materials.[18,19]

Bidis and kreteks

Bidis are small, thin, hand-rolled cigarettes, wrapped in a dried tendu or temburni leaf (Asian native plants) and tied with a colorful string. Some Bidis are flavored (e.g., chocolate, cherry, mango) while some are not.[21,22] Bidis came to the US mainly from India and other South-east Asian countries.[21,22]

Bidis are India's most widely used form of tobacco. In India, bidis are typically hand rolled at home by millions of workers, which are mostly women and children.[23] A bidi has 3-5 times the amount of nicotine as a regular cigarette and poses a high risk for nicotine addiction.[24]

Kreteks are clove-flavored cigarettes, imported from Indonesia and typically contain a mixture of hundreds of various additives (ammonia, flavors, etc), about 30 different types of tobacco, and cloves.[25-27] Kreteks got its name from the keretek-keretek sound of exploding and burning cloves.[27] There are higher concentrations of nicotine, tar, and carbon monoxide in bidis and kreteks compared to the usual cigarettes sold in the US.[21,25,28,29]

Waterpipe

Waterpipe smoking is known as Narghile, hookah, shisha, arghile, hubble-bubble or goza.[30] The waterpipe uses a mixture of raw tobacco with honey, pulps and molasses from fruits to create special flavors for tobacco inhalation.[31] The waterpipe device uses charcoal to heat the tobacco, a bowel of water to filter the resulting smoke and a rubber pipe for inhalation.[32] Each region has its different type of tobacco smoked, and its own shape, size and appearance of the water pipe devices.[33]

Waterpipe smokers are at the same risk of smoking diseases such as lung cancer, oral cancer, cancer of the esophagus, stomach cancer, decreased fertility, and reduced lung function as any cigarette smokers.[34,35] Waterpipe smoking is commonly practiced in

groups with the mouthpiece being shared and passed from one person to another.[32,34-36]

Smokeless tobacco

Smokeless tobacco products have existed for centuries among populations in South America and South-east Asia. These products' popularity increased throughout the world over time. Smokeless tobacco is used without burning, and can be consumed orally or nasally.[37]

Smokeless tobacco products consumed orally by chewing tobacco leaves in plugs or twists[38] or keeping a moist snuff of ground tobacco in the mouth between lip or check and gum, or under the tongue after being put in small semi-permeable packets,[27] while products consumed nasally by dry sniffing or inhaling fine tobacco powder mixtures.[37] There is enough evidence that using smokeless tobacco products causes cancer. The carcinogens in smokeless tobacco products increase the risk of oral cavity, head and neck cancers. Using smokeless tobacco products can cause a number of noncancerous oral diseases as well, and can lead to nicotine addiction.[37]

Second hand smoking

Second-hand smoke or passive smoke is the involuntary inhalation of smoke from burning cigarettes, cigar, pipe tip or waterpipe, and it includes the exhaled smoke from the person or people smoking.[39] Research has found that there are more than 7,000 chemicals in tobacco smoke with hundreds considered as toxic and about 70 can cause cancer.[40] The one and only way to protect nonsmokers from exposure to secondhand

smoke is to eliminate indoor smoking.[41]

Arab Americans and smoking

Although there is evidence that there has been an overall decrease in cigarette smoking in US adults from 52% in 1965 to approximately 19.3% in 2010, [42] there is an increase in smoking rates for many American minorities.[43-52]

Arab Americans are one of the rapidly growing minority groups in the US for which there seems to be little or no smoking behavior data. The U.S. Census Bureau categorized the Arab Americans as people with descents originating from Arab-speaking areas of the world and considered them as one of the fastest growing populations in the US.[53] There are approximately 3 to 4 million Americans who have an Arab origin.[54] They usually derive from common linguistic, cultural, and political heritages.

The majority of Arab Americans (90%) live in urban areas,[55] 57% are male, 61% are married, and 84% have high school diplomas, with 41% having a bachelor's degree or higher.[53] Less than one half of the foreign-born Arab Americans have lived in the US for ten years or less. The reported median family income for this group of population is about $52,300.[53]

There are limited studies examining the smoking patterns of Arab American adults. A study in the Detroit area found that the prevalence of tobacco use among Arab Americans was 40.6% for men and 38.2% for women.[56] Adolescents' smoking behavior among 14- to 18-year-old Arab Americans was examined by a more recent study, 17% of the

participants were current smokers (N=119), while 34% of the participants admitted to having ever smoked (even a puff).[57] Smoking is usually initiated before the age of 18 in the majority of tobacco users of any cultural background.[58] This highlights the increasing danger of cigarette smoking among this group of Americans.

The high rate of smoking among Arab Americans can be partly explained by the high smoking prevalence in Arab countries. The World Health Organization's 2009 report found that in some Arab countries the prevalence of tobacco use reached 58% for men and for women 31%.[59] (Table 1)

Table 1- Smoking prevalence in Arab Countries

Country	Men (%)	Women (%)
Iraq	26.5	2.9
Egypt	46	0.4
Palestine	30.8	17
Lebanon	43.2	33.8
Jordan	49.6	5.7
Syria	48	8.9
Tunisia	48.4	8.2
Yemen	27.4	10.3

Source: World Health Organization (2013)[59]

Smoking in Arab countries is generally an acceptable cultural and social behavior; it is a sign of hospitality to offer someone a cigarette, and it is a normal behavior to smoke inside the home.[60]

Chapter two

Waterpipe and waterpipe smoking

Overview

The English language scientific literature used the term waterpipe for the last two decades to refer to any type of instrument that involves passing tobacco smoke through water before inhalation.[61-65] Using a waterpipe to smoke tobacco is a centuries-old habit that has been practiced in Asian and African regions, but is usually linked with the Eastern Mediterranean area.[66-68]

There is a regional variation in waterpipe's shape, size, appearance, and names.[68,69] The terms shisha, boory, or goza are usually used in Egypt and Saudia Arabia[69-71] while narghile, or arghileh are popular in Palestine, Jordan, Lebanon and Syria,[72-74] and hookah is used in Africa and Indian subcontinent.[75,76]

Results from experiments with standard waterpipe smoking machines have been used as a base for current evidence on waterpipe smoke chemistry[77] Although experiments using smoke machines have shown that smoking using waterpipe delivers in a single session as much tar as a full pack of cigarettes,[74] smoking waterpipe tobaccos is often perceived to be safer than smoking cigarettes.[78-81]

Smoking waterpipe is currently the object of renewed attention, as its use has been lately

gaining popularity among young people in Western countries, such as the US, Europe and Brazil.[82] Whereas the number of cafes and places where people could smoke the water-pipe was limited to a few bars almost exclusively visited by immigrants about 10 years ago, there has been a continual increase in the number of such places, and customers are now mostly fifteen to twenty years old,[83] of both genders.

Apparatus, products and smoking patterns

Although waterpipe' structural details may vary by region or culture, the most often seen tobacco waterpipe in the US is composed of four parts; a fired-clay head, metallic body, acrylic or glass bowl for water, and a long plastic or leather hose ends with a mouthpiece from which the smoker inhales the tobacco.[35] (Figure 1)

In order to smoke tobacco using a waterpipe, users fill the bowl partially with water and the head with moistened tobacco upon which a perforated aluminum foil is placed to separate the tobacco from a lit piece of charcoal that is placed over it. The smoker draws air over the burning charcoal by inhaling through the hose, thus heating the tobacco, and generating smoke that moves throughout the water, the body of the waterpipe, and the hose to the smoker.[74]

Figure 1 waterpipe smoking device

Different types of tobacco products may be smoked; the most popular type of tobacco used in waterpipes is called ma'ssal. Ma'ssal is a wet mixture of tobacco, and additives including sweeteners and flavorings. Maassel usually comes in variety of flavors, such as fruits, mints

and candies, and when smoked it produces a scented smoke that is usually appealing to youth.[84]

With many charcoal products being used in waterpipe smoking, the quick-lighting charcoal products are the most commonly used type in the US.[85] Smokers can buy waterpipes, charcoal, tobacco and accessories from dedicated supply shops, including Internet vendors.[82]

Usually it takes about five minutes to smoke a single cigarette,[86] while it takes about an hour to finish a single waterpipe episode.[74,78,87] Smoking one cigarette involves 10-13 puffs of an average of 50 ml puff volume to give a total of 500-600 ml of smoke,[88,89] while a single waterpipe use episode involves about 200 puffs of about 500ml puff volume to give a total inhalation of approximately 90,000 ml of smoke.[87,90]

Waterpipe smoking is often a social event, with two or more people sharing the same waterpipe.[91] When used in cafés or restaurants, smokers usually order the waterpipe from a menu of flavors and an employee prepares it in-house.[92]
It is not uncommon for children in South-West Asia and North Africa to smoke with their parents.[93]

The unfounded assumption of safety, commercial marketing, as well as the social nature of the waterpipe use appear to be stimulants to waterpipe smoking and contribute to spreading its use across the globe.[94]

Prevalence of Waterpipe smoking in the United States

Waterpipe tobacco smoking is usually linked with southwest Asia and North Africa but, in recent years, it has spread around the world and to the US.[35]

In the US, reports show that waterpipe tobacco smoking is spreading fast and becoming more common with time, especially among adolescents and college students.[35]

Smokeshop magazine (a thirty year old journal that serves the tobacco industry) reported in April 2004 that about 200–300 new cafes for waterpipes had opened in the US since 1999 with most of those cafes being located near college campuses.[95]

Waterpipe smoking has been reported in more than 33 states, with most reports deriving from cities with a large university[96-100] thus supporting the evidence that waterpipe smoking is a growing epidemic among the young-age population in the US.[35]

It has become remarkably common among university students in the US to smoke waterpipes, In a study targeting 6,594 students of the state of Arizona (grades 6 thru 12) about 4% of the students were found to be current waterpipe smokers (7.3% of 12th grade students) and 6% of the students have ever used waterpipe.[101]

A survey of 411 Johns Hopkins University freshmen found that about 15% of the students reported waterpipe tobacco smoking in the past 30-days.[102] Another survey of 647 students from graduate and under graduate programs at a large urban university in the US found about 10% of the participants reported current, and 41% ever waterpipe smoking.[103]

Another study of 2,204 students in University of Houston reported having 12.5% of the sample participants smoking waterpipe in the last month.[104]

A survey of 744 Virginia Commonwealth University students reported that approximately 20% of the participants were past 30-day waterpipe smokers.[105]

Studies in Arab Americans smoking behaviors suggest that individuals often begin using a waterpipe to smoke tobacco at a young age. For example, a study of 1,671 Arab American adolescents reported that about 27% of the study sample reported ever use of a waterpipe. Many waterpipe users in this study reported using the waterpipe for the first time before the age of 10, and about 23% had tried waterpipe smoking by the age of 14, compared to 15% that had tried cigarettes.[106]

When waterpipe smoking habits were compared between Americans from Middle Eastern descent with those of other ethnicities, studies found 12%-15% current, 27%-36% ever, and 7%-8% regular waterpipe smoking among Arab American students (14-18 years old) while 5%- 8% current, 11%- 21% ever, and 3%-5% regular waterpipe smoking among students (14-18 years old) from other different ethnicities.[106-109]

All of these studies addressing youth waterpipe smoking are very important since earlier initiation of tobacco smoking is usually associated with longer duration, increased risk of nicotine dependence and more harmful health effects.[110]

A study in Pittsburgh found that 35.4% of university students who smoke tobacco using a waterpipe had never smoked a cigarette,[103] which is also worrisome, as waterpipe smoking

may work as an entryway to introducing tobacco and cigarette smoking to adolescents and young adults.

Toxicants in waterpipe

Preliminary studies reported that urinary cotinine levels in subjects smoking two waterpipes daily are equal to smoking one and a half pack of cigarettes per day.[111] Carbon monoxide, formaldehyde, polyaromatic hydrocarbons, nitrogen, nitric oxide, arsenic, heavy metals and other cancer-inducing chemicals are some of the toxic compounds found in waterpipe smoke.[78,112]

Many researchers found that the mainstream smoke from smoking tobacco using waterpipes contains large amounts of nicotine, CO, the carcinogenic PAH, volatile aldehydes particulate matter, and ultrafine particles.[78,112-114]

Waterpipe smoke produced by a machine was found to have significant amounts of dangerous components, including heavy metals such as arsenic, lead, cobalt, and chromium.[74,115,116]

The waterpipe's size, variety of tobacco, and charcoal type may determine the amount of CO in waterpipe smoke.[33] When compared to a single cigarette, a single waterpipe smoking session was found to release similar peak plasma nicotine concentrations, about 4-fold greater elevation in peak carboxyhemoglobin (COHb) levels, 4-fold greater elevation in the level of carcinogenic PAH, 4 fold more volatile aldehydes, 30 times the CO, and a 56-fold

greater amount of smoke inhaled.[65,117-120]

Using a single waterpipe under normal conditions can produce a smoke that contains approximately as much nicotine free, dry particulate matter (tar) as twenty cigarettes.[74]

Table 2: Machine-generated smoke content using realistic puff parameters for a single waterpipe episode and a single cigarette[35]

Toxicant (mg)	Waterpipe[78,89]	Cigarette[82]	Ratio
Nicotine	2.94	1.74	1.7
CO	145	22.3	6.5
Tar	802	17.3	46.36

Waterpipe's Health effects

Regarding the health effects of waterpipe use to its smokers, studies report that they are expected to be the same health risks experienced by cigarette smoking, including cancer, heart disease, and respiratory disease.[82] The waterpipe smoking effect on heart rate and blood pressure was analyzed and the results showed that waterpipes caused a significant increase in some risk factors of cardiovascular diseases, such as heart rate, diastolic blood pressure, systolic blood pressure and mean blood pressure as well as causing impaired baroreflex sensitivity.[121]

A case-control study conducted on Egyptian infertile women found that the husbands' waterpipe smoking behavior was associated with the couple's infertility.[122] On the other

hand, women who smoked waterpipe were shown to have low birth weight babies approximately two times more than women who did not, and almost three times more among those who began smoking waterpipes during the first trimester. In addition, there might be a serious risk for non-smokers from waterpipe second-hand smoke.[123]

A systematic review on the effect of tobacco smoking on health outcomes found that waterpipe tobacco smoking was significantly associated with lung cancer (OR=2.12), respiratory illness (OR=2.3), low birth-weight (OR=2.12) and periodontal disease (OR=3-5).[34] Moreover, in a study comparing thirty five healthy waterpipe users with thirty five healthy participants who were not exposed to smoking (controls), waterpipe smoking was significantly associated with an increase in frequency of chromosomal aberrations and sister chromatid exchanges.[124]

Waterpipe smoking was found to be associated with signs of atherosclerosis[125]coronary heart disease, [126]and elevated levels of free radicals in peripheral blood neutrophils.[127] These free radicals are known to mediate lung tissue injury.[128]

In addition to increasing the risk of cancer, cardiovascular disease, and decreased pulmonary function, waterpipe users may also be vulnerable to the risk of infectious disease transmission because of the social aspects associated with waterpipe use like sharing it.[129] Secondhand smoke from waterpipes can carry a serious risk for nonsmokers as well, mainly because it includes smoke not only from the tobacco but also from the heat source (charcoal) used while smoking the waterpipe.[32,58,130]

Attitudes and Beliefs about waterpipe

Many factors are reported to attract smokers to waterpipe smoking including the delightful social experience with cultural rituals.[131] It is typically observed as a social activity, usually in groups of people who might share the same pipe and try different flavors.[67] The use of added flavor, together with the smooth texture, promotes extended smoking periods.[132] Family acceptance also has a strong effect in choosing waterpipes over cigarettes.[133]

Smoking in Arab countries is an acceptable cultural and social behavior; it is a sign of hospitality to offer someone a cigarette, and it is a normal behavior to smoke inside the home. In a study that was conducted on Arab American adolescents, the participants described their use of narghile in the home as an acceptable social activity by their parents.[134]

A series of recent US college-based studies suggest that the majority of waterpipe users consider smoking tobacco using a waterpipe as socially acceptable.[135-137] Socializing with friends and family, taste,[85,138,139] enjoyment of the smell,[85] relaxation,[85,140] fashion, loneliness,[141] peer influence,[141], curiosity or experimentation,[142,143] the convenience of having cafes nearby[142] and relaxation[143,144] are some of the motives to smoke waterpipes reported by studies conducted in the US.

In a qualitative study among English and Canadian students, the sample consisted mainly of respondents with Arabic background who considered waterpipe smoking as a way to express their Arab heritage. The rest of the respondent (Non-Arabic) considered smoking

waterpipe to be affordable, relaxing, and more attractive than cigarettes.[132]

Several recent studies in US colleges found that the majority of waterpipe tobacco smokers perceive using the waterpipe as being less harmful and addictive compared to cigarettes.[135,145] This perception might be due to the presumed filtering effects of the water,[146] and the predominant intermittent use pattern of using the waterpipe.[77]

Theory of planned behavior and intention to quit smoking

The theory of planned behavior has been previously used to explain intentions and health related behaviors, especially the deliberative behaviors that can be planned like smoking cessation.[147-149]

Statement of the Problem

With the increased use of waterpipe tobacco smoking among youth around the world during the past decade, it has been described as the "second global tobacco epidemic since the cigarette".[150]

Middle Eastern ethnicity or having a friend of Middle Eastern ethnicity have been reported as significant predictors of waterpipe smoking among US students.[151] Consequently, addressing waterpipe smoking in this ethnic minority is essential in controlling this growing epidemic in the US population. Using the stage-based model of behavioral change, the modification of addictive behaviors includes progression through five stages: pre-

contemplation stage with no intent to quit, contemplation stage with starting an intention to quit, preparation for the behavioral change, action and change, and finally maintaining the change.[152,153]

As forming an intention to quit is the first step of quitting, identifying predictors of an intention to quit is integral in designing effective intervention strategies to aid waterpipe smokers in this subpopulation in quitting and prevent further diffusion into the US society. To date, no studies have investigated the predictors of an intention to quit waterpipe smoking specifically among the Arab-Americans population. No previous studies examined the effect of Theory of planned behavior's constructs on the intention to quit waterpipe use.

Significance

Our study's objectives are to investigate the predictors of an intention to quit waterpipe smoking in next 12 months and to examine the TPB's constructs effect on the intention to quit smoking waterpipe in the next 12 months among a sample of Arab Americans who smoke tobacco using a waterpipe in the Houston area. These findings are essential to develop strategies and effective intervention programs to target smokers with an intention to quit and promote quitting.

Chapter three

Past Literature and Research

Objective 1: Predictors of Intention to Quit Waterpipe Smoking

Studies found that 70% of smokers around the globe are interested in quitting smoking, but addiction to nicotine and lack of motivation were attributed as factors for their smoking persistence.[154,155] When compared to cigarette smoking, waterpipe smokers have less intention to quit smoking.[156]

 To motivate waterpipe smokers to quit we need to address and investigate the factors that prompt their intention to quit. Past literature in waterpipe quitting intentions reported predictors such as being married, length of waterpipe use, perception of harm, perceived ability to quit, and social pressure.

Demographics

Being married was found in one study as one of the variables that were independently related to the intention to quit smoking waterpipe.[156]

Having Indian Asian or Pakistani Asian race was significantly associated with higher intention to quit waterpipe smoking when compared to having white, non-middle eastern

decent.[104]

Length and frequency of waterpipe use

Past studies reported a strong association between the length and frequency of smoking waterpipe and the intention to quit waterpipe smoking. A study conducted on 276 students who smoke waterpipe in one US university reported that smokers who used the waterpipe for more than 60 minutes per session were less likely to have an intention to quit compared to those who smoke for thirty minutes or less.[104]

Another study on 268 waterpipe users reported that individuals who had smoked for a lesser number of years and whose frequency of use had not increased over time were more likely to want to quit.[156]

Perception of harm

Waterpipe smokers who perceived waterpipes as harmful were found in one study to have a higher intention to quit, actually they were found to be 2.3 times more likely to have an intention to quit compared with those who did not perceive waterpipe smoking as harmful.[104]

The vast majority of respondents to a study conducted in Syria (89.5%, n=268) reported that the primary reason to their intention to quit waterpipe smoking is the desire to protect their health.[156] In addition, 14.5% of the sample reported considering quitting waterpipe to protect their family's health.[156]

Perceived ability to quit

Waterpipe smoking is believed to be less addictive and easier to quit compared to cigarette smoking,[157] which might work against motivating an intention to quit waterpipe smoking.[156] A previous study in Syria reported that about 86.5% of the study sample (n=268) were confident in their ability to quit using the waterpipe anytime they want and 59% had made a quit attempt in the last year that lasted an average of 10.3 weeks. About 76% of those who tried to quit smoking waterpipes reported easy, and successful quit attempts.[156] Another study conducted in the US reported no significant effect for perceived addictiveness on the intention to quit smoking tobacco using the waterpipe.[104]

Social norms

There is a positive association between an intention to quit waterpipe smoking and having advice from a physician to quit waterpipes,[157] having members in the family who have a hostile attitude regarding smoking waterpipes[156,157] and not having family members who smoke waterpipes.[156] Studies reported that social norms that support smoking waterpipe negatively affect the intention to quit waterpipe smoking.[156]

Objective 2: Theory of planned behavior and intention to quit smoking waterpipe

The Theory of Planned Behavior

To improve the predictive power of the Theory of Reasoned Action, The Theory of Planned

Behavior (TPB) was proposed by Icek Ajzen. TPB predicts one's intention to involve in a

behavior at certain time and place. The theory affirms that an individual's behavioral

intentions are shaped by individual's attitude toward behavior, the subjective norms

surrounding the individual, and the perceived control of the behavior.

Figure 2: Diagrammatic representation of the theory of planned behavior
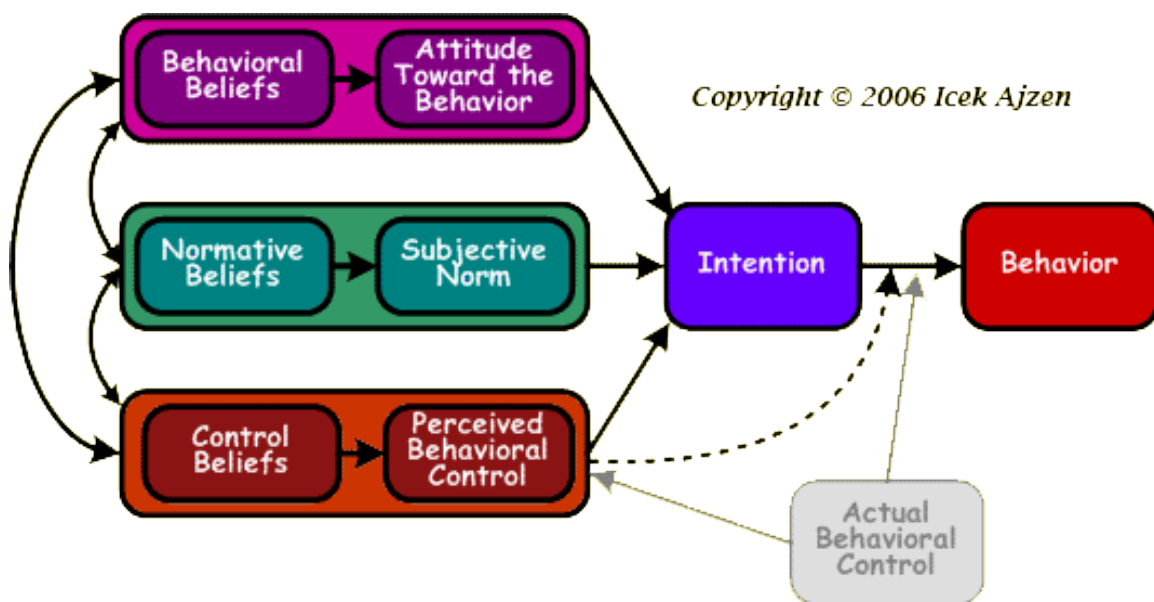
Attitude toward the behavior is defined as the individual's positive or negative evaluation

of the particular behavior. It is established through an appraisal of one's beliefs regarding

the consequences resulting from a behavior and an evaluation of the desirability of these

consequences. Overall attitude can be measured by summing (the individual behavioral

beliefs x desirability and evaluation of the outcome) for all expected outcomes of the

behavior.

Subjective norm is an individual's perception of whether people important to the individual approve or disapprove the behavior, and the motivation that an individual has to comply with their wishes. Overall subjective norm can be measured by summing (the normative beliefs x motivation to comply) for all sources of social pressure.

Perceived behavioral control is one's perception of the ease or difficulty of performing a specific behavior and an individual's beliefs about the presence of factors that may facilitate or hinder performance of the behavior. Overall behavioral control can be measured by summing (control beliefs x perceived likelihood of occurrence) for all obstacles encountered by the individual.

The TPB was selected as a theoretical setting for the current study to predict intention to quit smoking waterpipe in the next 12 months, since it is one of the widely applied models for predicting and understanding health and social behaviors,[158] including smoking.[159-161]

Research Hypothesis

To determine the predictors of intention to quit waterpipe smoking among Arab Americans:

Objective 1:

H_{1a}**:** There is an association between the intention to quit waterpipe use and the perception of harm

H_{1b}**:** There is an association between the intention to quit waterpipe use and the participants' different demographics, waterpipe beliefs and use patterns.

Objective 2:

H_{2a}**:** There is an association between the intention to quit waterpipe use and the attitude toward the behavior

H_{2b}**:** There is an association between the intention to quit waterpipe use and the subjective norm

H_{2c}**:** There is an association between the intention to quit waterpipe use and the perceived behavioral control

Chapter Four

Methodology

Study design and area

An observational, survey-based cross-sectional study with a convenience sample of Arab American adults was conducted to address the study goals.

The study was conducted in the Houston area with a population of more than 1,950,000 in 2000.[162] Houston was chosen as it is one of the ten places in the united states that have the largest Arab population with more than 11,000 people from Arab origins living in Houston in 2000[162] and because of the convenience of the investigator who is living in this area.

Study setting

Data was collected by distributing surveys to willing adult participants from Arab origins in the Houston area. Adults, visiting public areas, Arab congregations or hookah bars, were asked if they are from Arab origins, if they answered yes they were asked if they were willing to participate in filling out an anonymous survey regarding their waterpipe smoking habits. The basic information about the study such as the purpose, procedures, confidentiality issues, risks and benefits to participation both verbally and in written form were explained by the investigators before filling the questionnaire. Filling and returning the questionnaire implied study participants' consent.

Inclusion criteria for the study were: adult with age of 18 years or above, from Arab

American descent, smoked a waterpipe in the last 30 days. There was a locked box in the

data collection sites to drop the survey upon completion.

Sample size

A multiple logistic regression statistical tests were considered in this study for sample size

assumptions.

The minimum effective sample size that is required for the study was determined using

G*POWER 3.1 statistical software package.[163]

By conducting a z-test with 5% margin of error at 95% confidence interval, 80% power and

1.5 odds ratio by two tails, the final required sample size for this study was estimated to be

307. (Table 3)

Table 3: Table depicting sample size calculations for different values of odds ratio and power

Sample size			
Odds ratio	**.80 power**	**0.85 power**	**0.95 power**
1.4	442	504	725
1.5	307	350	502
1.6	231	263	306

Below is a plot of the sample sizes computes with respect to the power of 0.8 with odds

ratio between 1.4 and 1.6.

Figure 3: plot to compute sample size based on odds ratios with 80% power
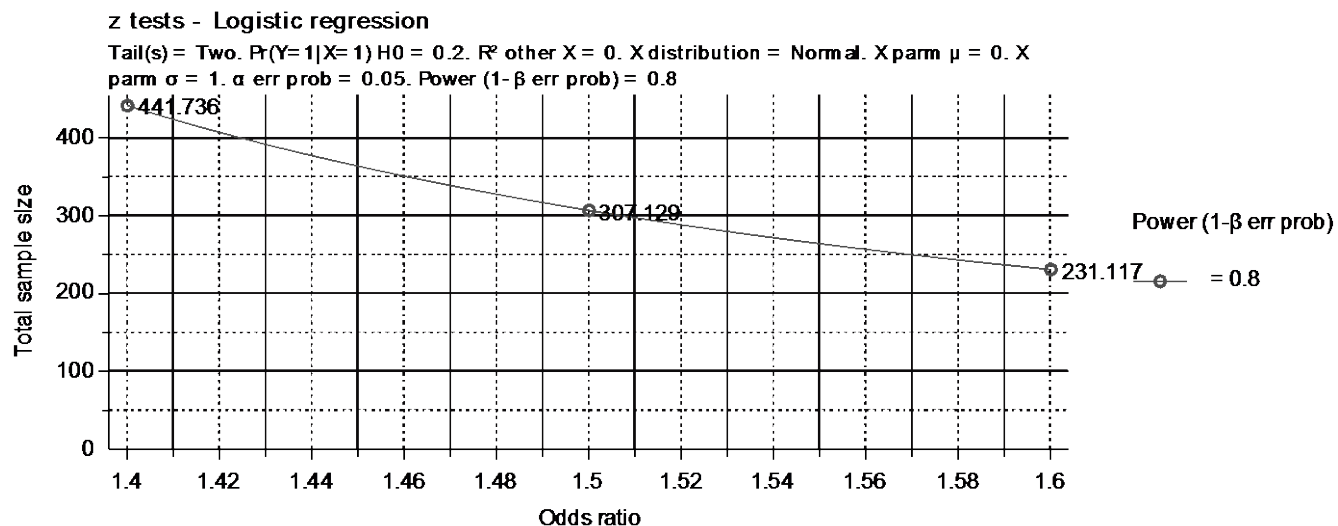
Data collection instrument

The study used a self-report survey. The questionnaire consisted of six major categories with 53 questions. The first five sections of the survey were adopted from previously used and validated questionnaires[85,102,104,105] which consisted of 41 'yes/no' and multiple-choice questions.

The first 6 questions cover the demographics including age, gender, annual income, marital status and education level. Questions 6-30 were taken from a survey that was originally developed by smith et al[85,102] and include questions about tobacco use history, perception of risk, perceived social acceptability of smoking tobacco using a waterpipe and waterpipe-

related practices such as the ownership of waterpipe, frequency and length of smoking sessions, and age and place of first waterpipe use. Items 31-41 were taken from the Lebanon waterpipe dependent scale-11 (LWDS-11)[164] with its four subscales: the nicotine dependence, negative reinforcement, psychological craving, and positive reinforcement properties of waterpipe smoking.

Question 42 consisted of 12 sub questions with a seven point scale answer that was developed using Ajzen's sample of TPB questionnaire[147,148] and past smoking studies[165,166] to fit the theory used in this study to investigate smoker's intention to quit smoking using waterpipes (appendix D).

Section 1: socio-demographic information

This section of the survey intended to gather the demographic and socioeconomic information from the participants. Variables such as age, gender (male, female), annual income (<$20,000 , $20,000-$35,000 , $35,000-$50,000 , 50,000-100,000) marital status (single, married, divorced, widowed), and education level (less than high school degree, high school degree, college or university degree, graduate degree) were examined.

Section 2: Tobacco use history

This section contained several questions about the participant's tobacco use history. Questions about current and past tobacco use such as "During the past 30 days, have you tried cigarette smoking, even one or two puffs?", "During the past 30 days, have you tried

smoking cigars, cigarillos, or little cigars, even one or two puffs?" were included in this section. Also, history of waterpipe use of the subjects were evaluated, for example "During the past 30 days, have you tried smoking tobacco in a waterpipe (hookah, shisha, narghile, argila) even one or two puffs?"

Section 3: Perception of risk

This section assessed the waterpipe smoker's perception of health and addiction risk. The questions included in this section was, "Do you believe smoking a waterpipe (hookah, shisha, narghile, and argila) is harmful to your health? ", "Compared to a regular cigarette, how harmful do you think waterpipe smoking is?", "Do you believe that a governmental agency should be required to evaluate the safety of the waterpipe (hookah, shisha, narghile, and argila) before they are sold to consumers?".

Section 4: perceived social acceptability

Beliefs about the social and cultural acceptability of smoking tobacco using waterpipe were assessed in this section. Questions such as "What is the social acceptability of using a waterpipe among your peers?", "What is the cultural acceptability of using a waterpipe among your family members?", "What is the cultural acceptability of using a waterpipe among friends of your ethnicity?", "How often do you attend Middle Eastern gatherings where waterpipe are served?", "How *cool* do your peers look when they use the waterpipe?" were included.

Section 5: Waterpipe-related practices and beliefs

In this section we included questions about the first use of waterpipe such as "How old were you when you first used a waterpipe to smoke tobacco?", "Where were you when you first used a waterpipe to smoke tobacco?", "Who were you with when you first used a waterpipe to smoke tobacco?", questions about the habitual use of waterpipe such as "how often you smoke tobacco using a waterpipe?", "When you used a waterpipe to smoke tobacco in the past 30 days, how long did a typical "waterpipe session" last?", "When you use a waterpipe to smoke tobacco, do you usually share it with others?", "What is the likelihood of getting addicted when using a waterpipe socially?", "What is the likelihood of getting addicted when using a waterpipe by oneself?", "Number of waterpipes you usually smoke per week?", "When you use a waterpipe to smoke tobacco, is the tobacco flavored?", general questions about waterpipe use such as "Do you own a waterpipe?", " Where did you buy your waterpipe(s)?", "Do you consider yourself "hooked" on a waterpipe?", "Do you intend to quit using a waterpipe to smoke tobacco?", "Number of times you could stop waterpipe for more than 7 days?", "What percentage of income would you spend for waterpipe smoking?", "Number of days you could spend without waterpipe?", "Do you smoke waterpipe alone?", "Are you ready not to eat in exchange for a waterpipe?", and questions about possible reasons for smoking tobacco using waterpipe such as "Do you smoke waterpipe to relax your nerves?", "Do you smoke waterpipe to improve your morale?", "Do you smoke waterpipe when you are seriously ill?", "Do you smoke waterpipe for pleasure?", "Do you smoke waterpipe to please others?"

Section 6: Theory of planned behavior measures

This section assessed the association and predicting power of each of the TPB's construct in waterpipe smoker's intention to quit. This section comprised of 12 questions with 7 points scale answers that assess each and every construct in the theory used.

Waterpipe smoker's attitude toward quitting waterpipe smoking was assessed by evaluating the smoker's behavioral beliefs using questions with a 7 point scale answer range such as "My attempt to quit waterpipe smoking would be: (wise- foolish), (beneficial-harmful), (pleasant-unpleasant), (safe-unsafe), (like-dislike), (good-bad)", and the smokers evaluation of quitting using questions such as "Quitting waterpipe smoking will benefit my health: (likely-unlikely)", "Smoking waterpipe is harmful: (agree-disagree)", "To quit smoking waterpipe is very important to me: (agree-disagree)".

The subjective norms surrounding the waterpipe smoker was assessed by evaluating the normative beliefs using questions such as "My doctor thinks I should quit smoking waterpipe: (agree-disagree)", "My family and friends think I should quit waterpipe smoking: (agree-disagree)", and the motivation to comply using "When it comes to matters of health I want to do what my doctor thinks I should do: (agree-disagree)", "For matters of health, I want to do what my family and friends want me to do: (agree-disagree)".

The perceived control of the behavior was assessed by evaluating the control beliefs using "I am confident that I can quit waterpipe smoking: (agree-disagree)", "My decision to quit smoking waterpipe is completely up to me: (agree-disagree)", and assessing the perceived

likelihood of quitting using "I expect that I will have enough determination in the future to quit smoking: (likely-unlikely)", and "Having strong determination will enable me to quit waterpipe smoking: (true-false)".

The intention to quit smoking waterpipe was decided using "Do you intend to quit using a waterpipe to smoke tobacco in the next 12 months? (yes,No)" question. (See Appendix D for survey).

Ethical considerations

The study involved human subjects, so the protocol of the study was submitted to the Institutional Review Boards (IRBs) at the University of Houston, the Committee for the Protection of Human Subjects before collecting any data.

Data processing

All data was coded for all the variables and entered into excel 2010 worksheet.

As the surveys were anonymous, there were no confidentiality issues. Data will be stored in a locked file cabinet in the academic advisor's office, and would be destroyed after 3 years.

Statistical analysis

Descriptive statistics and chi-square analyses were used to determine the frequencies and associations of sample characteristics with the intention to quit waterpipe smoking (Do you intend to quit using a waterpipe to smoke tobacco in the next 12 months? Yes or No). For the TPB model part, each internal construct was scored by taking the average score of all the questions answering that construct.

Bivariate analyses of sample characteristic were carried out with the outcome variables (intention to quit waterpipe smoking in the next 12 months), and results were presented as unadjusted odds ratios (OR) with 95% confidence intervals (CI). After assessing co-linearity between the independent variables (IVs), all IVs with p<0.2 in the unadjusted analysis was included in the stepwise multivariate logistic regression model to determine predictors of intention to quit smoking waterpipe.

 All the statistical analysis was conducted using SAS 9.2 (SAS Institute Inc., Carey, North Carolina) at a significance level of 0.05.

Chapter five

Results

Validity analysis

Validity is the accuracy of an assessment or an instrument and its ability to measure the underlying concept it is supposed to measure.[167] The questionnaire used in this study for measuring predictors of the intention to quit smoking tobacco using waterpipes was adopted from previously validated questionnaires. The theory of planned behavior section was modified to test the objective of this study. Thus it was assumed that all the sections of the survey used had high construct and content validity.

Reliability Analysis

Reliability is the level to which the assessments of item sets are consistent. In this study the Cronbach's Alpha was used to measure the internal consistency of each of the TPB constructs. An overall value of 0.7 was considered as an acceptable benchmark value for internal consistency. The results of the reliability analysis are displayed below in table 4.

Table 4: Reliability Coefficient Test

Domain	Cronbach Coefficient Alpha	
	Raw	**Standardized**
Attitude Behavioral beliefs	0.909	0.913

Behavioral evaluation	0.762	0.767
Subjective Norms		
Normative beliefs	0.735	0.735
Motivation to comply	0.731	0.733
Perceived Control		
Control beliefs	0.766	0.778
Perceived power	0.819	0.821

Descriptive Analysis

We carried out descriptive analyses to determine the total frequencies of the participants and their different demographics and the frequencies of those with an intention to quit waterpipe smoking and all the independent variables included in the study.

Sample Characteristics

Response Rate

Collecting the data started officially on the 10th of January, 2014 and ended on the 10th of March, 2014. Data was collected from adults, visiting hookah bars, public areas, Arab congregations or mosques in Houston. The total responses collected at the end of the data collection were 340 out of 510 surveys distributed. Thus the overall response rate was 67%. The only reason reported for not participating in the study was lack of time.

Demographic data

A total of 340 participants completed questionnaires. The distribution of the socio-demographic characteristics of the waterpipe smokers that participated is shown in tables (4-7). The study sample consisted mainly of males (67%), Married (50%), with a mean age (±SD) of 30± 8.5 years.

Objective 1: predictors of intention to quit smoking waterpipe in the next 12 months

Smoking Patterns

The mean age (±SD) of starting smoking tobacco using waterpipe was 20 (±6.5) (range 3–55 years old). Ninety-six percent of participants initiated waterpipe smoking in the company of their family members or friends. Two third of participants own a waterpipe and 66% share it with others. Ninety-one percent reported smoking flavored tobacco in the waterpipe. Sixty percent of participants smoke waterpipe tobacco at least once a week (38% smoke it at least once a day). Eighty-four percent of smokers tried at least once in the past to stop smoking the waterpipe for more than 7 days.

Overall, the prevalence of having an intention to quit waterpipe smoking among this study sample was 27.43% (table 4). The chi square test results showed no significant association between the intention to quit waterpipe smoking in the next 12 months and gender, income level, marital status or education. (Table 5)

Table 5: Frequency of intention to quit waterpipe smoking and demographics

		Has Intention to quit in the next 12 months	
Characteristics	Total Frequency (%)	Frequency (%)	P value
Total	N= 339	93 (27.43%)	
Gender			0.2482
Male	228 (67.26)	67 (29.39)	
Female	111 (32.74)	26 (23.42)	
Income level			0.2685
< $20,000	94 (29.01)	30 (31.91)	
$20,000 - $35,000	55 (16.98)	17 (30.91)	
$35,000 - $50,000	63 (19.44)	17 (26.98)	
$50,000 - $100,000	68 (20.99)	15 (22.06)	
> $100,000	44 (13.58)	7 (15.91)	
Marital status			0.6512
Single	157 (46.45)	45 (28.66)	
Married	168 (49.70)	44 (26.19)	
Divorced	10 (2.96)	2 (20.00)	
Widowed	3 (0.89)	0 (0.00)	
Education level			0.7195
< High school degree	11 (3.26)	4 (36.36)	
High school degree	34 (10.09)	11 (32.35)	

| College or university degree | 201 (59.64) | 55 (27.36) | |
| Graduate degree (MS or PhD) | 91 (27.00) | 22 (24.18) | |

Tobacco use history

About forty nine percent of the participants had smoked cigarettes and 31% had smoked cigars, cigarillos, or little cigars in the last 30 days. The chi-square results listed in table 5 showed no significant association between the intention to quit waterpipe smoking in the next 12 months and cigarette or cigars use history. (Table 6)

Table 6: Frequency of intention to quit waterpipe smoking with tobacco use history

		Has Intention to quit in the next 12 months	
Characteristics	Total Frequency (%)	Frequency (%)	P value
Smoked Cigarettes in the last 30 days			0.2993
Yes	163 (48.66)	48 (29.45)	
No	172 (51.34)	42 (24.42)	
Smoked Cigars, cigarillos, or little cigars in the last 30 days			0.2065

Yes	103 (30.75)	46 (44.66)	
No	232 (69.25)	87 (37.50)	

Perception of risk

Thirty-two percent of participants perceived waterpipe as less harmful to one's health compared to cigarette smoking. The chi square test results indicate that the intention to quit waterpipe smoking in the next 12 months is significantly associated with perception of waterpipe smoking risk compared to cigarettes (P=0.0022). (Table 7)

Table 7: Frequency intention to quit waterpipe smoking with perception of risk

		Has Intention to quit in the next 12 months	
Characteristics	Total Frequency (%)	Frequency (%)	P value
Do you believe smoking a waterpipe is harmful to your health? Yes No	279 (86.65) 43 (13.35)	77 (27.60) 9 (20.93)	0.3576
Compared to a regular cigarette, how harmful do you think			0.0022*

waterpipe smoking is?			
More harmful than cigarettes	119 (35.63)	41 (34.45)	
As harmful as cigarettes	109 (32.63)	35 (32.11)	
Less harmful than cigarettes	106 (31.74)	16 (15.09)	

Perceived social acceptability

Few participants reported that their families (14.8%), friends (9.6%) and peers (10.9%) did not approve or accept their use of waterpipe tobacco. Almost two thirds of participants believe smoking waterpipes looks cool or very cool.

After using chi-square analysis, the cultural acceptability of using a waterpipe among family members (P=0.0028) and the social acceptability of using a waterpipe among friends (P=0.0158) were found to be significantly associated with an intention to quit waterpipe smoking in the next 12 months. (Table 8)

Table 8: Frequency of intention to quit waterpipe smoking with perceived social acceptability

		Has Intention to quit in the next 12 months	
Characteristics	Total Frequency	Frequency (%)	P value

	(%)		
The social acceptability of using a waterpipe among your peers?			0.2031
None	36 (10.88)	11 (30.56)	
Low	75 (22.66)	20 (26.67)	
Medium	117 (35.35)	38 (32.48)	
High	103 (31.12)	21 (20.39)	
The cultural acceptability of using a waterpipe among your family members?			0.0028*
None	49 (14.76)	21 (42.86)	
Low	99 (29.82)	34 (34.34)	
Medium	122 (36.75)	23 (18.85)	
High	62 (18.67)	13 (20.97)	
The cultural acceptability of using a waterpipe among friends of your ethnicity?			0.0158*
None	32 (9.61)	12 (37.50)	
Low	41 (12.31)	17 (41.46)	
Medium	125 (37.54)	36 (28.80)	
High	135 (40.54)	26 (19.26)	
How often do you attend Middle			0.2615

Eastern gatherings where waterpipe are served?			
Daily	54 (16.36)	20 (37.04)	
Weekly	155 (46.97)	36 (23.23)	
Monthly	83 (25.15)	24 (28.92)	
Yearly	38 (11.51)	11 (28.95)	
How cool do your peers look when they use the waterpipe?			0.1377
Not at all	113 (34.35)	32 (28.32)	
Cool	171 (51.98)	52 (30.41)	
Very cool	45 (13.68)	7 (15.56)	

Waterpipe-related practices and beliefs

Length of smoking session (P=0.0004), number of times the participants stopped smoking waterpipes for more than 7 days (P=0.0137), pleasure as a reason to smoke (P=0.0189), pleasing others as a reason to smoke (P=0.0264) were significantly associated with an intention to quit waterpipe smoking in the next 12 months. (Table 8)

Table 9: Frequency of intention to quit waterpipe smoking with different waterpipe-related practices and beliefs

		Has Intention to quit	
Characteristics	Total	Frequency	P value

	Frequency (%)	(%)	
The likelihood of getting addicted when using a waterpipe socially			0.6314
None	65 (19.52)	16 (24.62)	
Low	120 (36.04)	30 (25.00)	
Medium	98 (29.43)	31 (31.63)	
High	50 (15.02)	12 (24.00)	
The likelihood of getting addicted when using a waterpipe by oneself			0.2538
None	75 (22.66)	18 (24.00)	
Low	120 (36.25)	26 (21.67)	
Medium	92 (27.79)	30 (32.61)	
High	44 (13.29)	14 (31.82)	
A governmental agency should evaluate the safety of the waterpipe before selling it.			0.3104
Yes	213 (63.77)	29 (23.97)	
No	121 (36.23)	62 (29.11)	
How often you smoke tobacco using a waterpipe?			0.0912
At least once a year but not monthly	53 (15.82)	21 (39.62)	

At least once a month but not weekly	80 (23.88)	25 (31.25)	
At least once a week but not daily	127 (37.91)	31 (24.41)	
At least once a day, or most days each month	75 (22.39)	16 (21.33)	
How long did a typical "waterpipe session" last?			0.0004*
0-30 minutes	80 (23.95)	34 (42.50)	
31-60 minutes	119 (35.63)	35 (29.41)	
61-90 minutes	85 (25.45)	12 (14.12)	
91-120 minutes	29 (8.68)	5 (17.24)	
120+ minutes	21 (6.29)	3 (14.29)	
Do you own a waterpipe?			0.2426
Yes	225 (66.18)	57 (25.33)	
No	115 (33.82)	36 (31.30)	
Where did you buy your waterpipe(s)?			0.1556
I do not own a waterpipe	110 (32.35)	36 (32.7)	
Internet	22 (6.47)	10 (45.45)	
Convenience store	25 (7.35)	7 (28.00)	
Tobacco shop	107 (31.47)	22 (20.56)	
It was a gift	46 (13.53)	11 (23.91)	
Street vendor	8 (2.35)	3 (37.50)	

Other	21 (6.18)	4 (18.18)	
Do you consider yourself "hooked" on a waterpipe?			0.7737
Yes	107 (33.02)	27 (25.23)	
No	217 (66.98)	58 (26.73)	
Do you usually share the waterpipe with others?			0.0675
Yes	215 (66.36)	66(30.70)	
No	109 (33.64)	23 (21.10)	
Is the tobacco used in waterpipe flavored?			0.1312
Yes	285 (85.84)	75 (26.32)	
No	31 (9.34)	13 (41.94)	
Sometimes	16 (4.82)	3 (18.75)	
Number of times you could stop waterpipe for more than 7 days			0.0137*
None	54 (16.31)	10 (18.52)	
Once	29 (8.76)	15 (51.72)	
Several times	114 (34.44)	31 (27.19)	

It always happens	134 (40.48)	36 (26.87)	
Percentage of income would you spend for waterpipe smoking			0.4706
1% or less of your monthly income	187 (56.50)	56 (29.95)	
2%–10% of your monthly income	101 (30.51)	22 (21.78)	
11%–50% of your monthly income	28 (8.46)	9 (32.14)	
More than 50% of your monthly income	15 (4.53)	4 (26.67)	
Number of days you could spend without waterpipe?			0.7587
One day or less	38 (11.38)	9 (23.68)	
2–3 days	59 (17.66)	19 (32.20)	
4–7 days	40 (11.98)	12 (30.00)	
More than 7 days	197 (58.98)	52 (26.40)	
Number of waterpipes you usually smoke per week			0.4480
<1 waterpipe/week	132 (40.37)	40 (30.30)	
1–2 waterpipes/week	83 (25.38)	24 (28.92)	
3–6 waterpipes/week	75 (22.94)	16 (21.33)	
7 or more waterpipes/week	37 (11.31)	8 (21.62)	

Do you smoke waterpipe to relax your nerves?			0.1978
Yes, absolutely	51 (15.18)	8 (15.69)	
Yes, probably	103 (30.65)	32 (31.07)	
Yes, maybe	85 (25.30)	26 (30.59)	
No	97 (28.87)	26 (26.80)	
Do you smoke waterpipe to improve your morale?			0.2342
Yes, absolutely	16 (4.80)	4 (25.00)	
Yes, probably	50 (15.02)	16 (32.00)	
Yes, maybe	62 (18.62)	22 (35.48)	
No	205 (61.56)	48 (23.41)	
Do you smoke waterpipe when you are seriously ill?			0.9232
Yes, absolutely	14 (4.18)	4 (28.57)	
Yes, probably	34 (10.15)	11 (32.35)	
Yes, maybe	38 (11.34)	10 (26.32)	
No	249 (74.33)	67 (26.91)	
Do you smoke waterpipe alone?			0.3140
Yes, absolutely	33 (10.09)	5 (15.15)	
Yes, probably	44 (13.46)	15 (34.09)	
Yes, maybe	107 (32.72)	30 (28.04)	

No	143 (43.73)	41 (28.67)	
Are you ready not to eat in exchange for a waterpipe?			0.3187
Yes, absolutely	27 (8.39)	10 (37.04)	
Yes, probably	39 (12.11)	14 (35.90)	
Yes, maybe	35 (10.87)	8 (22.86)	
No	221 (68.63)	56 (25.34)	
Do you smoke waterpipe for pleasure?			0.0189*
Yes, absolutely	130 (39.51)	26 (20.00)	
Yes, probably	78 (23.71)	24 (30.77)	
Yes, maybe	72 (21.88)	19 (26.39)	
No	49 (14.89)	21 (42.86)	
Do you smoke waterpipe to please others?			0.0264*
Yes, absolutely	17 (5.11)	6 (35.29)	
Yes, probably	21 (6.31)	11 (52.38)	
Yes, maybe	26 (7.81)	9 (34.62)	
No	269 (80.78)	65 (24.16)	

Logistic Regression Results

A stepwise multiple logistic regressions were performed including independent variables with p<0.2 in the bivariate analyses with intention to quit waterpipe smoking as the outcome. After controlling for the covariates, the final results for the multiple logistic regression indicated that the significant predictors associated with a higher intention to quit waterpipe smoking in the next 12 months among Arab Americans are history of cigar use in the last 30 days compared to those who did not use cigar in the last month [OR: 4.38 CI: 1.86 – 10.31], a prior attempt to quit waterpipe smoking for more than 7 days compared to those with no previous attempt [OR: 6.6 CI: 1.324 – 32.968], and not smoking waterpipe when seriously ill compared to those who smoke even when seriously ill [OR: 6.50 CI: 1.404 – 30.093]. Predictors associated with a lower intention to quit waterpipe smoking are increasing age [OR: 0.933 CI: 0.876 – 0.995], medium cultural acceptability of using waterpipe among family members compared to no-cultural acceptability among family [OR: 0.434 CI: 0.188 – 0.99], high cultural acceptability of using waterpipe among friends compared to no-cultural acceptability among friends [OR: 0.130 CI: 1.09 - 10.64], duration of smoking sessions between 1 hour [OR: 0.270 CI: 0.094 – 0.772] and 2 hours [OR: 0.044 CI: 0.002 - 0.933] compared to those who smoke for less than 30 minutes, and perception of waterpipe's harm as less than cigarettes [OR: 0.376 CI: 0.177 - 0.800] compared to those who perceive it as more harmful than cigarettes. (Table 10)

Table 10: Results of bivariate and multiple logistic regressions to predict intention to quit waterpipe smoking.

Characteristics	Unadjusted OR (CI 95%)	Adjusted OR**

Age	0.966 (0.936 - 0.997)*	0.933 (0.876 – 0.995)*
Income level < $20,000 $20,000 - $35,000 $35,000 - $50,000 $50,000 - $100,000 > $100,000	Reference 0.404 (0.161 - 1.010)	
Education level < High school degree High school degree College or university degree Graduate degree (MS or PhD)	Reference 0.659 (0.186 - 2.340)	
Smoked Cigars, cigarillos, **or little cigars in the last** **30 days** Yes No	 2.311 (1.395 -3.829)* Reference	 4.38 (1.86 – 10.31)* Reference
The social acceptability of **using a waterpipe among** **your peers?** None	 Reference	

Low	------------------	
Medium	------------------	
High	0.582 (0.247 - 1.370)	
The cultural acceptability of using a waterpipe among your family members?		
None	Reference	Reference
Low	0.697 (0.346 - 1.407)	---------------
Medium	0.310 (0.150 - 0.640)*	0.434 (0.188 – 0.99)*
High	0.354 (0.154 - 0.814)*	----------------
The cultural acceptability of using a waterpipe among friends of your ethnicity?		
None	Reference	Reference
Low	1.181 (0.458 - 3.046)	-------------------
Medium	-----------------------	-------------------
High	0.398 (0.173 - 0.915)*	0.130 (1.09 - 10.64)*
How often do you attend Middle Eastern gatherings where waterpipe are		

served?		
Daily	Reference	
Weekly	0.514 (0.264 - 1.001)	
Monthly	-----------------	
Yearly	-----------------	
How cool do your peers look when they use the waterpipe?		
Not at all	Reference	
Cool	1.106 (0.656 - 1.866)	
Very cool	0.466 (0.189 - 1.152)	
How often you smoke tobacco using a waterpipe?		
At least once a year but not monthly	Reference	
At least once a month but not weekly	--------------------	
At least once a week but not daily	0.492 (0.248 - 0.974)*	
At least once a day, or most days each month	0.413 (0.189 - 0.901)*	

How long did a typical "waterpipe session" last?		
0-30 minutes	Reference	Reference
31-60 minutes	-------------------	-----------
61-90 minutes	0.222 (0.105 - 0.473)*	0.270 (0.094 – 0.772)*
91-120 minutes	0.282 (0.098 - 0.814)*	0.044 (0.002 - 0.933)*
120+ minutes	0.225 (0.061 - 0.828)*	-----------
Do you usually share the waterpipe with others?		
Yes	1.656 (0.961 - 2.852)	
No	Reference	
Number of times you could stop waterpipe for more than 7 days		
None	Reference	Reference
Once	4.714 (1.733 - 12.827)	6.6 (1.324 – 32.968)*
Several times	-------------------	-----------
It always happens	-------------------	-----------
Do you smoke waterpipe when you are seriously ill?		
Yes, absolutely	Reference	Reference
Yes, probably		

Yes, maybe		
No	0.511 (0.172 - 1.520)	6.50 (1.404 – 30.093)*
Do you smoke waterpipe for pleasure?		
Yes, absolutely	Reference	
Yes, probably	-------------	
Yes, maybe	--------------	
No	3.000 (1.474 - 6.105)*	
Do you smoke waterpipe to please others?		
Yes, absolutely	Reference	
Yes, probably	-----------------	
Yes, maybe	-----------------	
No	0.584 (0.208 - 1.641)	
The likelihood of getting addicted when using a waterpipe socially		
None	Reference	
Low	----------------	
Medium	1.417 (0.699 - 2.873)	
High	----------------	
The likelihood of getting		

addicted when using a waterpipe by oneself		
None	Reference	
Low	0.876 (0.442 - 1.738)	
Medium	---------------	
High	---------------	
Do you believe smoking a waterpipe is harmful to your health?		
Yes	1.440 (0.660 - 3.141)	
No	Reference	
Compared to a regular cigarette, how harmful do you think waterpipe smoking is?		
More harmful than cigarettes	Reference	Reference
As harmful as cigarettes	---------------------	-------------------
Less harmful than cigarettes	0.338 (0.176 - 0.649)*	0.376 (0.177 - 0.800)*

**Adjusted to all variables with unadjusted odds ratio with p<0.2

Objective 2: Theory of Planned Behavior and intention to quit smoking waterpipe in the next 12 months

Before conducting any analysis on each construct of TPB as a whole, we calculated the

mean responses and ran a bivariate regression analysis on each single question with

intention to quit smoking. Results are shown in table 11.

Table 11: Results of bivariate logistic regressions of TPB's questions with intention to quit waterpipe smoking.

Question	Mean (±SD)	Unadjusted OR (CI 95%)
My attempt to quit waterpipe smoking would be		
Wise-Foolish	2.41 (±1.76)	0.908 (0.781-1.056)
Beneficial-Harmful	2.45 (±1.79)	1.012 (0.875-1.169)
Pleasant-Unpleasant	2.85 (±1.84)	0.910 (0.785-1.056)
Safe-Unsafe	2.45 (±1.86)	0.980 (0.851-1.129)
Like-Dislike	2.89 (±1.91)	0.860 (0.742-0.997)*
Good-Bad	2.55 (±1.90)	1.007 (0.880-1.152)
Quitting waterpipe smoking cessation will benefit my health Likely-Unlikely	2.46 (±2.07)	0.929 (0.821-1.051)
Smoking waterpipe is harmful Agree-Disagree	2.39 (±1.92)	0.890 (0.776-1.021)
To quit smoking waterpipe is very important to me: Agree-Disagree	3.30 (±2,13)	0.781 (0.688-0.886)*

My doctor thinks I should quit smoking waterpipe Agree-Disagree	3.25 (±2.31)	0.781 (0.688-0.886)
When it comes to matters of health I want to do what my doctor thinks I should do: Agree-Disagree	2.77 (±1.97)	0.913 (0.802-0.995)*
My family and friends think I should quit waterpipe smoking: Agree-Disagree	3.39 (±2.18)	0.827 (0.733-0.933)*
For matters of health, I want to do what my family and friends want me to do: Agree-Disagree	3.49 (±2.15)	0.907 (0.807-0.919)*
I am confident that I can quit waterpipe smoking Agree-Disagree	2.40 (±1.90)	0.962 (0.842-1.098)
My decision to quit smoking waterpipe is completely up to me Agree-Disagree	2.05 (±1.84)	1.099 (0.970-1.245)
I expect that I will have enough determination in the future to quit smoking Likely-Unlikely	2.31 (±1.77)	0.926 (0.803-1.069)
Having strong determination will enable me to quit waterpipe smoking True-False	2.35 (±1.87)	1.057 (0.932-1.199)

* significant at p<0.05

Results of unadjusted and adjusted (to age, gender, education, income, and marital status) logistic regression of each of TPB constructs and intention to quit smoking waterpipe are shown in table 12-14.

After adjusting each of the internal constructs of TPB for age, gender, income, marital status and education the results indicated that the behavioral evaluation (OR: 1.28 CI: 0.64 - 0.94), Normative beliefs (OR: 1.24 CI: 0.69 - 0.93) and motivation to comply (OR: 1.17 CI: 0.73 - 0.99) were predictors of an intention to quit waterpipe smoking in the next 12 months.

Table 12: Results of bivariate and multiple logistic regressions of Attitude to predict intention to quit waterpipe smoking.

Attitude		
Characteristics	**Unadjusted OR**	**Adjusted OR***
Behavioral beliefs	0.94 (0.802- 1.097)	0.95 (0.80 - 1.14)
Behavioral evaluation	0.78 (0.66 – 0.92)*	0.78 (0.64 -0.94)*

** Adjusted to age, gender, income, marital status and education.

Table 13: Results of bivariate and multiple logistic regressions of subjective norms to predict intention to quit waterpipe smoking.

Subjective Norms		
Characteristics	**Unadjusted OR**	**Adjusted OR**
Normative beliefs	0.83 (0.73 – 0.95)*	0.80 (0.69 – 0.93)*
Motivation to comply	0.889 (0.772 – 0.997)*	0.86 (0.73 - 0.99)*

** Adjusted to age, gender, income, marital status and education.

Table 14: Results of bivariate and multiple logistic regressions of perceived behavioral control to predict intention to quit waterpipe smoking.

Perceived Control		
Characteristics	**Unadjusted OR**	**Adjusted OR****
Control beliefs	1.06 (0.93 - 1.22)	1.04 (0.88 - 1.22)
Perceived power	0.99 (0.86 - 1.15)	0.98 (0.83 1.15)

** Adjusted to age, gender, income, marital status and education.

CHAPTER SIX

Discussion, Implication, Limitations and conclusion

Discussion

As the first step in quitting waterpipe smoking, the intention to quit is an important precursor to the behavioral change for successful tobacco cessation.[152,153,168] Previous studies on cigarette smoking report that about 70% of smokers around the world are interested in quitting.[154,155,169] Literature examining the intention to quit among waterpipe smokers is scarce with one study in a US university with a multicultural sample and another in Syria, a Middle Eastern country. In both studies, the majority of waterpipe smokers reported no intention to quit (83% (N=227) in the US university sample and 72% (N=268) in the Syrian sample).[104,156] This study explored the intention to quit waterpipe smoking among Arab Americans, an ethnic group known to have high waterpipe smoking rates.[64,170-174] In our study sample of 340 Arab American waterpipe smokers, only 27.43% (n=93) reported having an intention to quit, a percentage similar to that reported in the previously mentioned Syrian study.[156] These numbers highlight the importance of addressing waterpipe smoking among Middle-Easterners regardless of their country of residence. Controlling the habit in this subpopulation in the US can prevent further infiltration into the US society, especially that studies have reported that having a Middle-

eastern friend increases the likelihood of waterpipe smoking in the US.[151]

Findings of this study enriched current knowledge about intention to quit smoking waterpipes with 3 important additions. First, age of smokers, perception of harm, history of cigars use, having a previous attempt to quit, and smoking when seriously ill were found to significantly predict the intention to quit smoking waterpipe.

Second, this study reported a non-significant effect of gender, marital status, education levels, and history of cigarette use on smokers' intention to quit waterpipe smoking.

Finally, even though perceived behavioral control was recognized in previous studies as the most important construct in TPB to predict the intention to quit smoking,[175,176] perceived behavioral control on quitting waterpipe smoking was not determined in this study as a predictor to quit waterpipe smoking.

Objective 1: predictors of intention to quit smoking waterpipe in the next 12 months

Demographics and smoking patterns

Age

The intention to quit waterpipe smoking in this study sample was significantly lower with increasing age. The finding contrasts previous studies on waterpipe smoking that reported no significant association between age and intention to quit.[104,156,157] A potential

explanation to our finding could be that older participants in our sample could have spent a longer number of years smoking waterpipes and thus may have a higher addiction level. To confirm this potential assumption we ran a bivariate regression between age and duration of smoking waterpipe (in years) and found a significantly higher duration of smoking waterpipes in older participants in this study sample. Another explanation could be related to the education level and health literacy[177,178] at different ages that we did not control for. Targeting older adults with educational programs to build their knowledge about the health effects of waterpipe smoking may be beneficial in promoting an intention to quit as the first step in quitting.[152,153]

History of cigar use

Surprisingly, the study results indicated a positive association between smoking cigars, cigarillos, or little cigars' in the last 30 days and an intention to quit waterpipe smoking. A potential reason could be that smokers who use many kinds of tobacco may be worried about the combined effects of what they smoke and may want to quit. Highlighting the long-term tobacco use effects through educational programs may be beneficial. Future research is needed to confirm and study this association and explore possible causes.

Previous quit attempt

A previous quit attempt has been reported as a significant predictor of an intention to quit tobacco smoking.[168,179,180] This study also documents a higher intention to quit among those who had a previous attempt to stop waterpipe smoking for more than 7 days. A

previous quit attempt indicates that the participant had the intention prior to the first quit attempt and has moved to the next stage of quitting. Encouraging waterpipe smokers to try stopping using waterpipes even once could improve their chance of actual quitting in the future.

Smoking when ill

Our study showed that waterpipe smokers who continue to smoke while ill were less likely to have an intention to quit. Continuing to smoke waterpipes even when seriously ill might indicate higher addiction level and nicotine dependence. With cigarette smoking, a high addiction level has been reported to significantly decrease the desire to quit as well as the attempts to quit smoking.[168,180-182]

Length of smoking session

Findings of this research are also consistent with previous studies on waterpipe smoking that reported a lower intention to quit among smokers who used the waterpipe for more than 60 minutes per session.[104] This is potentially related to the association between longer duration of smoking and higher nicotine exposure and dependence,[104,117] which has been shown to lower quit attempts among cigarette smokers.[168,180]

Perceived harm

This study showed a higher intention to quit waterpipe smoking among those who perceived waterpipe use as more harmful than cigarettes compared to those who did not.

This finding is consistent with previous research of a higher intention to quit among smokers who perceived waterpipe as harmful.[104] Lesser harm perception compared to cigarettes has also been identified as a predictor of use for waterpipe smokers in a number of studies both in the US and abroad.[135,145,151,183,184]

As a factor influential in both initiation and continuation of waterpipe smoking, educating and informing users of potential harms and negative health consequences should be part of any intervention aiming at increasing the intention to quit smoking waterpipes as an initial step to quitting.

Social norms

In addition, the results of this study demonstrated the significant effect of the social norms on the smoker's intention to quit waterpipe smoking as previously described in literature.[156,157] Arab Americans whose friends and family members have a medium or high social acceptability of smoking waterpipe had a lesser intention to quit. Waterpipe smoking has been shown to be part of a social phenomenon as it is frequently carried out in groups and gatherings thus making the habit more appealing.[85,131,138,139] This social aspect has to be taken into consideration when designing any intervention to promote quitting. Including friends and family members in the programs and interventions that aim to increase the smokers' awareness about the negative aspects of smoking could be beneficial.

Perceived addictiveness and popularity

Perceived addictiveness and perceived popularity were not found in this study or the

previous ones[104] to have a significant effect on the intention to quit waterpipe smoking. The predominant intermittent use pattern of waterpipe smoking,[77] and the beliefs that waterpipe smoking is less addictive and easier to quit compared to cigarette smoking,[157] might contribute to the non-significant effect of perceived addictiveness of waterpipe use and smokers' intention to quit.

Gender

Even though females were known for their negative longstanding stigma towards cigarettes use, previous studies reported less disapproval attitudes towards waterpipe smoking among women compared to men,[84] and found that waterpipe smoking was perceived to be more positive and familiar compared to cigarette, mainly among women.[185]

Compared to men, literature shows that women are less confident about their ability to quit cigarette smoking, and usually seek more help to change their health behavior,[186,187] which could explain the higher intention to quit cigarette smoking in men compared to women.[188-190] Since waterpipe smoking is perceived to be less addictive and easy to quit,[156] it is not surprising that gender was not found in this study or previous ones as a significant predictor of intention to quit waterpipe smoking.

Marital status

Previous studies on cigarette smoking reported higher rates of quitting among married individuals who live with a non-smoker or disapprover of smoking partner compared to

singles.[191] Marital status employs a form of protective impact for smoking in married couples.[192]

Since the vast majority of waterpipe smokers in this study (85%, N=340) reported cultural acceptability of using a waterpipe among their family members, it is not surprising that being married did not have an impact on the intention to quit waterpipe smoking.

Education levels

Higher education level has been associated with a higher intention to quit among cigarette smokers worldwide,[193-197] as higher education levels expose individuals to more resources about the negative effect of smoking and positive effect of quitting.

In this study and previous studies on waterpipe smoking,[104,156,157] education level was not a significant predictor of intention to quit smoking. Which might be due to the largely under-researched and under-communicated health and addictive profile of waterpipe smoking compared to the huge number of research and negative campaigns against cigarettes[80] with health related information reported by the government and provided on cigarette packs.

History of cigarette use

History of smoking cigarettes in the last 30 days was not significantly associated with the intention to quit smoking waterpipes while previous use of other forms of tobacco was significantly associated (like cigars). This finding might indicate an underestimated risk of adding another form of tobacco with cigarettes on one's health, and shows the great need

to design programs that increase the awareness about the risk of tobacco smoking in any form.

Objective 2: Theory of Planned Behavior and intention to quit smoking waterpipe in the next 12 months

Theory of planned behavior

According to the TPB, to determine predictors of intention we need to identify the specific behavioral beliefs, subjective norms, and control beliefs related to the specific population and behavior in question.

In this study only half the constructs of the TPB were significantly associated with the intention to quit waterpipe smoking, i.e. behavioral evaluation and subjective norms. Generally, a more positive attitude towards quitting smoking is associated with a greater intention to quit.[149,198-200] The study results indicated that the correct behavioral evaluation towards quitting waterpipe smoking is significantly associated with higher odds of intentions to quit waterpipe smoking. By correct behavioral evaluation we mean the study participants' evaluating waterpipe smoking as harmful and quitting as beneficial and important to ones health.

In general, the least contributing construct of the TPB to intention to change one's behavior is subjective norms.[149] In tobacco smoking cessation, some studies reported a significant effect of subjective norms on intention to quit[201] while others failed to prove any association.[149,199,202] Our results reported that positive normative beliefs from family, friends and doctors towards quitting smoking waterpipes and high motivation to comply

with these beliefs were significantly associated with higher odds of having an intention to quit. Consequently, awareness and educational programs about the negative health effects of smoking waterpipe and the benefits and importance of quitting can prove beneficial for waterpipe smokers through their physicians, families and friends.

Previous research reported that perceived behavioral control is the strongest predictor of an intention to quit smoking.[149,176,198,200,202] Unexpectedly our study did not find a significant association between any control beliefs or self-efficacy on the intention to quit waterpipe smoking. Since perceived behavioral control has been proven influential in changing non-volitional behaviors,[176,203] waterpipe smokers' beliefs about the ease and volitionally of quitting waterpipe[156] may explain the non-significant association between perceived behavioral control and intention to quit waterpipe smoking.

Limitations and Future Research

The study suffers the limitations of the cross sectional design as we are unable to draw causal associations with such a design. As the study was conducted using a convenience sample of Arab Americans in Houston, Texas area only, the generalizability of the finding maybe limited to this geographic area. The replication of this study in different settings and geographic locations would provide better generalizability of the results.

Our study did not address some important factors related to waterpipe smoking such as reasons for starting smoking, history of any health complications due to waterpipe smoking, motivations to quit waterpipe smoking. Future research projects that include

assessing these factors among Arab American waterpipe smokers are needed.

In addition, we relied on each subject's self-reported data, which might contain some potential sources of bias, such as selective memory (to remember or not remember experiences or events that occurred at some point in the past) or social desirability bias as a result of the tendency of smokers to base their answers on what they think is theoretically right not what they usually do.

Implications of the findings

This is the first study to examine intention to quit waterpipe smoking in a sample of Arab Americans and the first to use the theory of planned behavior to examine waterpipe smokers' intention to quit.

Based on the findings of this study, educational programs and interventions that aim to increase intentions to quit smoking waterpipes should focus special attention on educating waterpipe smokers about the potential harm and health effects associated with waterpipe use in order to increase their awareness toward this behavior and help them evaluate it accurately.

Targeting older smokers, those who smoke for sessions that last more than one hour, those with no previous quit attempts, and smokers' subjective norms (physicians, friends and family) could be beneficial in helping these smokers form intention to quit waterpipe

smoking and eventually quit.

Behavioral evaluation, normative beliefs, and motivation to comply are effective features to include when designing interventions and strategies that aim at helping those who smoke waterpipes with quitting the habit.

Conclusion

This study's findings demonstrate low levels of an intention to quit smoking waterpipe among Arab Americans in Houston, Texas area. Public health educational programs that target Arab Americans in general, and specifically older adults, those who smoke waterpipe for more than 60 minutes, those whose family and friends approve of waterpipe smoking and those with no former quit attempts may be necessary to increase the intention to quit waterpipe smoking.

Interest in quitting is determined mainly by smokers' behavioral evaluation, normative beliefs and motivation to comply. Efforts are greatly needed to design interventions and strategies that include these constructs.

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APPENDIX

Appendix A: Communiqué Recited to Participants

Hello! My name is Liqa Athamneh. I am a graduate student at University of Houston, College of Pharmacy pursuing a MS degree in the Department of Clinical Sciences and Administration. The purpose of this study is to gain insight into waterpipe smoking habits among Arab Americans living in the United States and to identify strategies to prevent waterpipe smoking and help smokers quit.

Your participation is voluntary and you may refuse to participate or answer any question or withdraw at any time. The time required for your participation in this research is around 10 minutes. If you are from Arab origins,18 years or older and smoke waterpipe even if once during the last 30 days you can participate in this study.

You are not required to write or give your name, address or telephone number in any form. You are assured of confidentiality and your opinion will be kept in strictest confidence. Your participation in this study is very important to me. I hope that you choose to participate.

Appendix B: COODBOOK

The Question	Code	Answer	The answer's code
1. Age	Age	18-99	18-99
2. Gender	Gender	Male Female	0 1
3. Annual income	Income	< $20,000 $20,000 - $35,000 $35,000 - $50,000 $50,000 - $100,000 > $100,000	0 1 2 3 4
4. Please indicate your current marital status	Marital	Single Married Divorce Widowed	0 1 2 3
5. What is your education level?	Educa	< High school degree High school degree College or University Degree Graduate degree (MS or PhD)	0 1 2 3
6. During the past 30 days,	cigarett	No	0

have you tried cigarette smoking, even one or two puffs?		Yes	1
7. During the past 30 days, have you tried smoking cigars, cigarillos, or little cigars, even 1 or 2 puffs?	cigar	No Yes	0 1
8. During the past 30 days, have you tried smoking tobacco in a waterpipe (hookah, shisha, narghile, argila) even one or two puffs?	wtrpipe	No Yes	0 1
9. Do you believe that a governmental agency should be required to evaluate the safety of the waterpipe (hookah, shisha, narghile, and argila) before they are sold to consumers?	governmt	No Yes	0 1
10. Do you believe smoking a waterpipe (hookah, shisha, narghile, and argila) is harmful to your health?	Harmful	No Yes	0 1

11. Compared to a regular cigarette, how harmful do you think waterpipe smoking is?	comprcig	More harmful than cigarettes	0
		As harmful as cigarettes	1
		Less harmful than cigarettes	2
12. What is the likelihood of getting addicted when using a waterpipe socially?	Addctsoc	None	0
		Low	1
		Medium	2
		High	3
13. What is the likelihood of getting addicted when using a waterpipe by oneself?	addctone	None	0
		Low	1
		Medium	2
		High	3
14. What is the social acceptability of using a waterpipe among your peers?	w_peers	None	0
		Low	1
		Medium	2
		High	3
15. What is the cultural acceptability of using a waterpipe among your family members?	w_family	None	0
		Low	1
		Medium	2
		High	3
16. What is the cultural acceptability of using a waterpipe among friends of your ethnicity?	w_friend	None	0
		Low	1
		Medium	2
		High	3

17. How often do you attend Middle Eastern gatherings where waterpipe are served?	gathring	Daily Weekly Monthly Yearly	0 1 2 3
18. How <u>cool</u> do your peers look when they use the waterpipe?	Cool	Not at all Cool Very cool	0 1 2
19. How old were you when you first used a waterpipe to smoke tobacco?	how_old	0 - 99	0 - 99
20. Where were you when you first used a waterpipe to smoke tobacco	where_1	In a Café In my house At a family member's house At a fraternity house At a friend's house Dorm room Other	0 1 2 3 4 5 6
21. Who were you with when you first used a waterpipe to smoke tobacco?	with_who	No one, I was alone With one friend With more than one friend With a family member With more than one family member Other	0 1 2 3 4 5

22. **Which of the following choices best describes how often you smoke tobacco using a waterpipe?**	howoften	At least once a year but not monthly	0
		At least once a month but not weekly	1
		At least once a week but not daily	2
		At least once a day, or most days each month	3
23. **When you used a waterpipe to smoke tobacco in the past 30 days, how long did a typical "waterpipe session" last?**	how_long	0-30 minutes	0
		31-60 minutes	1
		61-90 minutes	2
		91-120 minutes	3
		120+ minutes	4
24. **Do you own a waterpipe?**	own	No	0
		Yes	1
25. **Where did you buy your waterpipe(s)?**	wherebuy	I do not own a waterpipe	0
		Internet	1
		Convenience store	2
		Tobacco shop	3
		It was a gift	4
		Street vendor	5
		Other	6
26. **Do you consider yourself "hooked" on a waterpipe?**	hooked	No	0
		Yes	1
27. **When you use a**	share	No	0

waterpipe to smoke tobacco, do you usually share it with others?		Yes	1
28. When you use a waterpipe to smoke tobacco, is the tobacco flavored?	flavored	No Yes sometimes	0 1 2
29. Do you intend to quit using a waterpipe to smoke tobacco?	intend	No Yes	0 1
30. If yes, when are you planning to quit?	when_q	In the next month In next 6 months In next 12 months In the future but not in the next 12 months	0 1 2 3
31. Number of times you could stop waterpipe for more than 7 days?	Number_q	None Once Several times It always happens	0 1 2 3
32. What percentage of income would you spend for waterpipe smoking?	W_income	1% or less of your monthly income 2%–10% of your monthly income 11%–50% of your monthly income More than 50% of your monthly income	0 1 2

			3
33. Number of days you could spend without waterpipe?	without	One day or less	0
		2–3 days	1
		4–7 days	2
		More than 7 days	3
34. Number of waterpipes you usually smoke per week?	No_week	<1 waterpipe/week	0
		1–2 waterpipes/week	1
		3–6 waterpipes/week	2
		7 or more waterpipes/week	3
35. Do you smoke waterpipe to relax your nerves?	nerves	Yes, absolutely	0
		Yes, probably	1
		Yes, maybe	2
		No	3
36. Do you smoke waterpipe to improve your morale?	morale	Yes, absolutely	0
		Yes, probably	1
		Yes, maybe	2
		No	3
37. Do you smoke waterpipe when you are seriously ill?	ill	Yes, absolutely	0
		Yes, probably	1
		Yes, maybe	2
		No	3
38. Do you smoke waterpipe alone?	smokalone	Yes, always	0
		Yes, most of the times	1
		Yes, sometimes	2

		No, never	3
39. Are you ready not to eat in exchange for a waterpipe?	no_eat	Yes, absolutely	0
		Yes, probably	1
		Yes, maybe	2
		No	3
40. Do you smoke waterpipe for pleasure?	pleasure	Yes, absolutely	0
		Yes, probably	1
		Yes, maybe	2
		No	3
41. Do you smoke waterpipe to please others?	for_oth	Yes, absolutely	0
		Yes, probably	1
		Yes, maybe	2
		No	3
42.a. My attempt to quit waterpipe smoking would be:	ATT_Wise	Wise/ Foolish	1 to 7
	ATT_BENf	Beneficial/ Harmful	1 to 7
	ATT_PLSNT	Pleasant/ Unpleasant	1 to 7
		Safe/ Unsafe	1 to 7
	ATT_SAFE	Like/ Dislike	1 to 7
	ATT_LIKE	good/ Bad	1 to 7
	ATT_good		
42.b. Quitting waterpipe smoking cessation will benefit my health	ATT_quit	Likely/Unlikely	1 to 7
42.c. Smoking waterpipe is	ATT_harm	Agree/Disagree	1 to 7

harmful			
42.d. To quit smoking waterpipe is very important to me	ATT_imprt	Agree/Disagree	1 to 7
42. e. My doctor thinks I should quit smoking waterpipe	SN_DOC	Agree/Disagree	1 to 7
42.f. When it comes to matters of health I want to do what my doctor thinks I should do	SN_IDOC	Agree/Disagree	1 to 7
42.g. My family and friends think I should quit waterpipe smoking	SN_FRND	Agree/Disagree	1 to 7
42. h. For matters of health, I want to do what my family and friends want me to do	SN_IFRND	Agree/Disagree	1 to 7
42. i. I am confident that I can quit waterpipe smoking	PC_CAN	Agree/Disagree	1 to 7
42.j. My decision to quit smoking waterpipe is completely up to me	PC_UPTOME	Agree/Disagree	1 to 7
42.k. I expect that I will have enough determination in	PC_DETRMN	Likely/Unlikely	1 to 7

the future to quit smoking			
42. l. Having strong determination will enable me to quit waterpipe smoking	PC_ENABLE	True/False	1 to 7

Appendix C: Consent of Participate in Research

<div align="center">

UNIVERSITY OF HOUSTON
CONSENT TO PARTICIPATE IN RESEARCH

</div>

PROJECT TITLE: Predictors of Intention to Quit Waterpipe Smoking Among Arab Americans

You are being invited to participate in a research project conducted by Liqa Athamneh from Department of Clinical Sciences and Administration, College of Pharmacy at the University of Houston.

<div align="center">

NON-PARTICIPANT STATEMENT

</div>

Your participation is voluntary and you may refuse to participate or withdraw at any time without penalty or lost of benefit to which you are otherwise entitled. You may refuse to answer any question.

<div align="center">

PURPOSE OF THE STUDY

</div>

The purpose of the study is to gain insight into waterpipe smoking habits among Arab Americans living in the United States and to identify strategies to prevent waterpipe smoking and strategies to help smokers quit. Questionnaires will be collected over a 4 months and the study will be carried out over a 6 months period.

<div align="center">

PROCEDURES

</div>

You will be among 350-450 participants at Houston Area. You will be asked to complete a one-time questionnaire of 53 questions about your waterpipe smoking status, previous smoking, and attitudes about waterpipe smoking. The questionnaire should take 5-10 minutes. No follow-up is required. The completed questionnaire should be placed in the drop-box provided.

<div align="center">

CONFIDENTIALITY

</div>

Your participation is anonymous so please do not write your name on the research material you will return to the investigator.

<div align="center">

RISKS/DISCOMFORT

</div>

There are no foreseeable risks, discomforts, or inconveniences to participating in this study.

<div align="center">

BENEFITS

</div>

While you will not directly benefit from participating in this study, your responses will help the investigators better identify ways to prevent waterpipe smoking and to help smokers quit.

<div align="center">

ALTERNATIVES

</div>

Your participation is voluntary and you may choose not to participate in this study.

<div align="center">

PUBLICATION STATEMENT

</div>

The results of this study may be published in professional and scientific journals. It may also be used for education purposes or for professional presentations. However, we will not identify anyone who answers the questionnaire.

> If you have any questions, you may contact Liqa Athamneh at lathamneh@uh.edu or at 713-795-8395. ANY QUESTIONS REGARDING YOUR RIGHTS AS A RESEARCH SUBJECT MAY BE ADDRESSED TO THE UNIVERSITY OF HOUSTON COMMITTEE FOR THE PROTECTION OF HUMAN SUBJECTS (713-743-9204).

Thank you.

Principal Investigator's Name: Liqa Athamneh

Signature of Principal Investigator: _____

Appendix D: Questionnaire used in the study

WATERPIPE SMOKING QUESTIONNAIRE
We appreciate your help in this survey and hope you enjoy taking part in it.

Please indicate your socio-demographic information below:

1. Age: _____

2. Gender: ☐ Male ☐ Female

3. Annual Income:
   ☐ < $20,000 ☐ $20,000 - $35,000 ☐ $35,000 - $50,000 ☐ $50,000 - $100,000 ☐ > $100,000

4. Please indicate your current marital status. (Select one)
   ☐ Single ☐ Married ☐ Divorce ☐ Widowed

5. What is your education level? (Choose one)
   ☐ < High school degree ☐ High school degree ☐ College or University Degree ☐ Graduate degree (MS or PhD)

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6. During the past 30 days, have you tried cigarette smoking, even one or two puffs? ☐ Yes ☐ No

7. During the past 30 days, have you tried smoking cigars, cigarillos, or little cigars, even 1 or 2 puffs? ☐ Yes ☐ No

8. During the past 30 days, have you tried smoking tobacco in a waterpipe (hookah, shisha, narghile, argila) even one or two puffs? ☐ Yes ☐ No

9. Do you believe that a governmental agency should be required to evaluate the safety of the waterpipe (hookah, shisha, narghile, and argila) before they are sold to consumers? ☐ Yes ☐ No

10. Do you believe smoking a waterpipe (hookah, shisha, narghile, and argila) is harmful to your health? ☐ Yes ☐ No

11. Compared to a regular cigarette, how harmful do you think waterpipe smoking is?
    ☐ More harmful than cigarettes ☐ As harmful as cigarettes ☐ Less harmful than cigarettes

12. What is the <u>likelihood</u> of getting addicted when using a waterpipe socially? ☐ None ☐ Low ☐ Medium ☐ High

13. What is the <u>likelihood</u> of getting addicted when using a waterpipe by oneself? ☐ None ☐ Low ☐ Medium ☐ High

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14. What is the social acceptability of using a waterpipe among your peers? ☐ None ☐ Low ☐ Medium ☐ High

15. What is the cultural acceptability of using a waterpipe among your family members?
    ☐ None ☐ Low ☐ Medium ☐ High

16. What is the cultural acceptability of using a waterpipe among friends of your ethnicity? ☐ None ☐ Low ☐ Medium ☐ High

17. How often do you attend Middle Eastern gatherings where waterpipe are served? ☐ Daily ☐ Weekly ☐ Monthly ☐ Yearly

18. How <u>cool</u> do your peers look when they use the waterpipe? ☐ Not at all ☐ Cool ☐ Very cool

19. How old were you when you first used a waterpipe to smoke tobacco? _____ years old

20. Where were you when you first used a waterpipe to smoke tobacco?
    ☐ In a Café ☐ In my house ☐ At a family member's house ☐ At a fraternity house
    ☐ At a friend's house ☐ Dorm room ☐ Other, _____

21. Who were you with when you first used a waterpipe to smoke tobacco? (check all that apply)
    ☐ No one, I was alone ☐ With one friend ☐ With more than one friend
    ☐ With a family member ☐ With more than one family member ☐ Other, _____

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22. Which of the following choices best describes how often you smoke tobacco using a waterpipe?
    ☐ At least once a year but not monthly ☐ At least once a month but not weekly
    ☐ At least once a week but not daily ☐ At least once a day, or most days each month

23. When you used a waterpipe to smoke tobacco in the past 30 days, how long did a typical "waterpipe session" last? ☐ 0-30 minutes ☐ 31-60 minutes ☐ 61-90 minutes ☐ 91-120 minutes ☐ 120+ minutes

24. Do you own a waterpipe? ☐ Yes ☐ No

25. Where did you buy your waterpipe(s)? (Check all that apply)
    ☐ I do not own a waterpipe ☐ Internet ☐ Convenience store
    ☐ Tobacco shop ☐ It was a gift ☐ Street vendor ☐ Other, _____

26. Do you consider yourself "hooked" on a waterpipe? ☐ Yes ☐ No

27. When you use a waterpipe to smoke tobacco, do you usually share it with others? ☐ Yes ☐ No

28. When you use a waterpipe to smoke tobacco, is the tobacco flavored? ☐ Yes ☐ No ☐ Sometimes

29. Do you intend to quit using a waterpipe to smoke tobacco?
    ☐ Yes ☐ No

30. If yes, when are you planning to quit?
    ☐ In the next month ☐ In next 6 months ☐ In next 12 months ☐ In the future but not in the next 12 months

31. Number of times you could stop waterpipe for more than 7 days?
☐ None ☐ Once ☐ Several times ☐ It always happens

32. What percentage of income would you spend for waterpipe smoking?
☐ 1% or less of your monthly income ☐ 2%–10% of your monthly income
☐ 11%–50% of your monthly income ☐ More than 50% of your monthly income

33. Number of days you could spend without waterpipe?
☐ One day or less ☐ 2–3 days ☐ 4–7 days ☐ More than 7 days

34. Number of waterpipes you usually smoke per week?
☐ <1 waterpipe/week ☐ 1–2 waterpipes/week ☐ 3–6 waterpipes/week ☐ 7 or more waterpipes/week

35. Do you smoke waterpipe to relax your nerves?
☐ Yes, absolutely ☐ Yes, probably ☐ Yes, maybe ☐ No

36. Do you smoke waterpipe to improve your morale?
☐ Yes, absolutely ☐ Yes, probably ☐ Yes, maybe ☐ No

37. Do you smoke waterpipe when you are seriously ill?
☐ Yes, absolutely ☐ Yes, probably ☐ Yes, maybe ☐ No

38. Do you smoke waterpipe alone? ☐ Yes, always ☐ Yes, most of the times ☐ Yes, sometimes ☐ No, never

49. Are you ready not to eat in exchange for a waterpipe? ☐ Yes, absolutely ☐ Yes, probably ☐ Yes, maybe ☐ No

40. Do you smoke waterpipe for pleasure? ☐ Yes, absolutely ☐ Yes, probably ☐ Yes, maybe ☐ No

41. Do you smoke waterpipe to please others? ☐ Yes, absolutely ☐ Yes, probably ☐ Yes, maybe ☐ No

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42. Please check your answers to the following questions by circling the appropriate number on the given scale:

1) My attempt to quit waterpipe smoking would be:

(Wise)	1	2	3	4	5	6	7 (Foolish)
(Beneficial)	1	2	3	4	5	6	7 (Harmful)
(Pleasant)	1	2	3	4	5	6	7 (Unpleasant)
(Safe)	1	2	3	4	5	6	7 (Unsafe)
(Like)	1	2	3	4	5	6	7 (Dislike)
(Good)	1	2	3	4	5	6	7 (Bad)

2) Quitting waterpipe smoking cessation will benefit my health.   (Likely) 1 2 3 4 5 6 7 (Unlikely)

3) Smoking waterpipe is harmful   (Agree) 1 2 3 4 5 6 7 (Disagree)

4) To quit smoking waterpipe is very important to me   (Agree) 1 2 3 4 5 6 7 (Disagree)

5) My doctor thinks I should quit smoking waterpipe   . (Agree) 1 2 3 4 5 6 7 (Disagree)

6) When it comes to matters of health I want to do what my doctor thinks I should do.   (Agree) 1 2 3 4 5 6 7 (Disagree)

7) My family and friends think I should quit waterpipe smoking   (Agree) 1 2 3 4 5 6 7 (Disagree)

8) For matters of health, I want to do what my family and friends want me to do   (Agree) 1 2 3 4 5 6 7 (Disagree)

9) I am confident that I can quit waterpipe smoking (Agree) 1 2 3 4 5 6 7 (Disagree)

10) My decision to quit smoking waterpipe is completely up to me .   (Agree) 1 2 3 4 5 6 7 (Disagree)

11) I expect that I will have enough determination in the future to quit smoking . .   (Likely) 1 2 3 4 5 6 7 (Unlikely)

12) Having strong determination will enable me to quit waterpipe smoking ..   (True) 1 2 3 4 5 6 7 (False)

Thank you for your co-operation in the study. Your help is greatly appreciated.