Prevalence of waterpipe tobacco smoking and associated factors among university students in the occupied Palestinian territory

مدى انتشار تدخين الأرجيلة والعوامل المرتبطة بها لدى طلاب الجامعات في أرض فلسطين المحتلة

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Birzeit University – Palestine

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BIRZEIT UNIVERSITY

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PREFACE

Tobacco smoking has always been a public health issue that frustrated me, especially seeing its frequent use (both cigarettes and waterpipe) among my family members and friends. When an opportunity to conduct a thesis project on waterpipe tobacco smoking among Palestinian university students emerged, I gladly accepted it.

The burden of tobacco smoking as a public health problem around the world surfaced with data gathering and analysis, and the many testimonies shared with me by researchers working towards tobacco control worldwide. Together, these factors magnified the importance of exploring the extent of the tobacco smoking health issue among Palestinian university students.

I was fortunate to meet tobacco experts and youth working on tobacco control, who, with the support of the Institute of Community and Public Health at Birzeit University, supported me in exploring the phenomenon of waterpipe tobacco smoking among university students in the Palestinian context.

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Lastly, I would like to thank my family and friends for their support throughout the preparation and writing of this thesis, especially my parents and siblings, Dr. Ramzi Rihan, Ranin Darkhawaja and Sawsan Imseeh. I would not have been able to successfully complete this thesis project without the support and help I received from my professors, family and friends.

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ABBREVIATIONS

AAUJ	Arab American University Jenin
AFR	African Region
AMR	Americas Region
AOR	Adjusted Odds Ratio
CAD	Coronary Artery Disease
CDC	Centers for Disease Control and Prevention
CI	Confidence Interval
COPD	Chronic Obstructive Pulmonary Disease
CPHA	Canadian Public Health Association
CS	Cigarette smoking
DHS	Demographics and Health Survey
EMHP	Ecological Model of Health Promotion
EMR	Eastern Mediterranean Region
EUR	European Region
FCTC	Framework Convention on Tobacco Control
FDA	Food and Drug Administration
FGD	Focus Group Discussion
FHS	Family Health Survey
GATS	Global Adults Tobacco Survey
GHPSS	Global Health Professional Students Survey
GPA	Grade Point Average
GTSS	Global Tobacco Surveillance System
GYTS	Global Youth Tobacco Survey
ICPH	Institute of Community and Public Health
MENA	Middle East and North Africa
MoH	Ministry of Health
NATS	National Adults Tobacco Survey
NYTS	National Youth Tobacco Survey
oPt	occupied Palestinian territory
OR	Odds Ratio
PCBS	Palestinian Central Bureau of Statistics
P-value	Probability value
SD	Standard Deviation

SEAR	South-East Asia Region
SPSS	Statistical Package for the Social Sciences
SS	Sample Size
TFI	Tobacco Free Initiative
UNRWA	United Nations Relief and Works Agency
WHO	World Health Organization
WSR	West Pacific Region
WTS	Waterpipe Tobacco Smoking

ABSTRACT

Background: Tobacco smoking is one of the leading causes of preventable death worldwide. In the occupied Palestinian territory (oPt), lung cancer ranked first in mortality-leading cancers in 2014, with smoking as a contributing factor. The Palestinian Central Bureau of Statistics reported that in 2010, 22.5% and 15.4% of adults (≥18 years old) and youth (15-29 years old), respectively, were current tobacco smokers. Recent data are capturing a change in the prevalence of waterpipe tobacco smoking (WTS), with an indication towards an increase. For instance, data among youth (13-15 years old) show that the prevalence of WTS changed from 16.6% and 7.8% in 2000 to 16.7% and 11.7% in 2005, for the West Bank and Gaza Strip, respectively, and the highest prevalence reported among health science university students was 30.9% in 2007. However, while data show a high WTS prevalence, studies among university students specifically targeting WTS prevalence, patterns and associated factors are limited in the scope of faculties of study and year at university of students, regional variation and number of universities.

Aims: To estimate the WTS prevalence among a sample of university students in the West Bank and Gaza Strip and investigate possible associated factors with current WTS status.

Methodology: A cross-sectional web-based survey was conducted among 2,146 university students in the oPt. The study took place between February-April, 2015.

Six Palestinian universities were selected, of which four were in the West Bank and two in the Gaza Strip. The participants in the selected universities were invited to participate in the study through an online link to the questionnaire posted on their student-university portal page. The study survey consisted of eight sections and questions were mainly adopted from the Arabic translated and validated Global Adults Tobacco Survey. The primary outcome of the survey was current WTS status. Univariate analysis described the means and proportions of the study variables. Chi-square tests were used to examine significant associations between our primary outcome and selected study variables (socio-demographic and university-related characteristics and social factors). Three multiple logistic regression models were computed to determine the associated factors with current WTS status, for total sample, women only and men only.

Results: The mean age of the study sample was 20.1 (SD=2.1) with an approximately equal gender distribution (50.2% women). The main findings indicated that the prevalence of current WTS among the study sample was 25.9%, with a higher prevalence among men (37.7%) compared to women (14.2%), and a higher prevalence of WTS compared to current cigarette smoking (19.5%). The WTS prevalence also showed regional variation, with the highest prevalence among the Arab American University Jenin students and lowest among Al-Islamic University Gaza students. In the logistic regression model for the total study sample, results showed that overall, being a male student, attending a university in the northern area

of the oPt, a good-excellent self-reported economic standing, having a low cumulative grade, being a current cigarette smoker, owning a waterpipe and having at least one waterpipe smoker at current residence to be associated factors with current WTS status. A gender variation was observed in some of these associated factors in their respective regression models.

Conclusions: The prevalence of WTS is high and has surpassed the prevalence of cigarette smoking in our study sample. These findings call attention for concerted efforts and interventions by health professionals, educators and policy-makers to curb the WTS prevalence from increasing. Interventions should take into account the region and context-specific nature of WTS and tailor them differently to women and men. Future research may target the social smoking environment that is conducive to WTS among university students.

ملخص

المقدمة: تدخين التبغ هو أحد الأسباب الرئيسة للوفاة التي يمكن الوقاية منها في جميع أنحاء العالم. في أرض فلسطين المحتلة، يعد سرطان الرئة المسبب الأول للوفاة للعام 2014، مع اعتبار التدخين كعامل مساعد لهذا. حسب تقرير الإحصاء الفلسطيني المركزي لعام 2010، إن 22.5% و15.4% من البالغين (18 سنة فأكثر) والشباب (15-29 سنة) على التوالي هم من المدخنين. كما أشارت الإحصائيات أن هناك تغير في نسبة تدخين الأرجيلة مع الإشارة إلى زيادة. على سبيل المثال، الاحصائيات بين الشباب (13-15 سنة) تظهر تغير في نسبة تدخين الأرجيلة من 16.6% و 7.8% في العام 2000 الى 16.7% و11.7% في العام 2005 في الضفة الغربية و قطاع غزة على التوالي. وقد بلغت أعلى نسبة لتدخين الأرجيلة بين طلاب المهن الصحية 30.9% في العام 2007. وعلى الرغم من النسبة المرتفعة في انتشار تدخين الأرجيلة، فإن هناك نقص في عدد الدراسات التي تركز على مدى انتشار تدخين الأرجيلة وأنماطها والعوامل المرتبطة بها بين طلاب الجامعات، خصوصاً في الكليات المختلفة والصفوف المتعددة والمناطق الجغرافية في فلسطين وعدد الجامعات.

الأهداف: الهدف من الدراسة الحالية هو تقدير مدى انتشار تدخين الأرجيلة بين طلاب الجامعات في الضفة الغربية و قطاع غزة ودراسة العوامل المرتبطة بها.

منهجية الدراسة: الدراسة الحالية هي دراسة مقطعية استخدمت استبيان إلكتروني وتضمنت 2146 طالب/ة جامعة من أرض فلسطين المحتلة. تم تنفيذ الدراسة بين شهر شباط - نيسان 2015. تم اختيار ست جامعات، أربع جامعات في الضفة الغربية وجامعتين في قطاع غزة. تم تعبئت الاستبيان الالكتروني من الطلاب/ات عندما تم نشره على صفحة الطالب/ة للجامعة. يتكون الاستبيان من ثمانية أجزاء وتم اختيار معظم الأسئلة من المسح العالمي لاستهلاك التبغ بين البالغين باللغة العربية. المتغير الرئيسي في الدراسة هو تدخين الأرجيلة الحالي. وقد تم حساب المعدل ونسب المتغيرات التي تم دراستها. وتم استخدام فحص "كاي" لحساب العوامل المرتبطة بتدخين الأرجيلة، وهي تتضمن الخصائص الديموغرافية وخصائص متعلقة بالجامعة وعوامل اجتماعية. وقد تم استخدام معادلة الانحدار اللوجستي لحساب العوامل المرتبطة مع تدخين الأرجيلة واحتساب ثلاثة نماذج للانحدار اللوجستي للعينة كاملة وللنساء وللرجال.

نتائج الدراسة: أظهرت نتائج الدراسة أن متوسط عمر العينة 20.1 (الانحراف المعياري=2.1) مع توزيع متساوي للجنسين تقريباً (50.2% نساء). أظهرت النتائج الأساسية للدراسة أن معدل انتشار تدخين الأرجيلة بلغ 25.9% مع ارتفاع النسبة بين الرجال (37.7%) مقارنة مع النساء (14.2%)، وكانت أعلى من نسبة تدخين السجائر الحالية (19.5%). وأظهرت النتائج أن هناك تفاوت في نسبة انتشار تدخين الأرجيلة بين الجامعات حسب التوزيع الجغرافي، حيث أن أعلى نسبة كانت بين طلاب الجامعة العربية الأمريكية جنين وأقل نسبة بين طلاب الجامعة الإسلامية غزة. وفي معادلة الانحدار اللوجستي، كون الطالب ذكر ومن المنطقة الشمالية من فلسطين وحالته\ا المادية جيدة\ممتازة ومعدله\ا الدراسي غير جيد ومدخن\ة للسجائر ووجود أرجيلة في مكان السكن ووجود شخص أو أكثر مدخن للأرجيلة في مكان السكن كانوا عوامل مرتبطين بتدخين الأرجيلة الحالي في عينة الدراسة. وقد وجد تفاوت بين النساء والرجال في نماذج اللانحدار اللوجستي الخاصة فيهم.

الخلاصة: مستوى انتشار تدخين الأرجيلة يفوق مستوى انتشار تدخين السجائر بين طلاب جامعات فلسطين من خلال النتائج التي أظهرتها الدراسة. وهذا يدعو الى ضرورة عمل تدخلات من قبل المهنين الصحيين وصناع السياسات للحد من ارتفاع ظاهرة تدخين الأرجيلة. يجب على التدخلات أن تأخذ بعين الاعتبار أن تدخين الأرجيلة هي ظاهرة محددة السياق. ويجب أن تأخذ التدخلات بعين الإعتبار الفروقات بين النساء والرجال وبين المناطق الجغرافية المختلفة في فلسطين. ويجب أن تركز الابحاث المستقبلية على البيئة الاجتماعية التي تشجع تدخين الارجيلة بين طلاب الجامعات في أرض فلسطين المحتلة.

INTRODUCTION

Waterpipe tobacco smoking: a public health epidemic

Tobacco smoking is one of the leading causes of preventable death worldwide; it annually kills 6 million people [1-6]. The World Health Organization (WHO) estimates that by the year 2030, ten million deaths annually will be attributable to tobacco smoking with many of these deaths occurring in the developing world [5, 7, 8]. Future projections by the WHO also suggest that action needs to be taken now to prevent mortality from tobacco from reaching as high as one billion deaths at the end of the 21st century [9].

While the burden of tobacco smoking has traditionally and mainly been attributed to cigarette smoking as the most common type of smoking [10], recent global data are capturing a re-emerging smoking habit (in the Middle Eastern region) and a new trend (in Western countries), which is specifically targeting youth and young adults. In the last two decades, tobacco smoking prevalence has experienced an upward trend due to a sudden rise of an old smoking tradition, waterpipe tobacco smoking (WTS) [1, 2, 11-14].

WTS is an old tradition that is believed to have its roots in ancient Persia and India. It has been practiced for approximately 400 years in different parts of the world. Its shape, form and use have changed throughout its different routes in the Middle East and neighboring countries [3, 12, 15]. Nowadays, WTS refers to the

tobacco smoking method that involves the passage of tobacco smoke through water before it reaches the end user [8, 16, 17]. The waterpipe instrument, which is composed of a head (to apply the tobacco), water bowl, hose and pipe, has come to be known by many names, depending on the region [3, 15, 16, 18-21]. The most common names are arghile, nargile, hookah and shisha [3, 5, 11, 12, 14, 15, 21].

In recent years, research has continued to provide evidence of the many health hazards that are thought to be associated with WTS. Evidence suggests that WTS increases the risk of many diseases, namely, coronary artery disease (CAD), stroke, chronic obstructive pulmonary disease (COPD), respiratory illnesses and lung cancer. It has also been suggested to contribute to low birth weight of babies born to smoking mothers, increased severity of mental disorders symptoms and overall decreased quality of life [2, 3, 9-11, 13, 14, 22]. These health effects are thought to be linked to the many toxic chemicals that are present in tobacco smoke [2, 3, 9, 11, 13, 14, 23].

In light of the rise in tobacco smoking, which includes WTS, the WHO, in collaboration with other international organizations, has pooled efforts to aid countries in monitoring and combating the rise in tobacco smoking. Some of these measures include the Global Tobacco Surveillance System (GTSS) and the Framework Convention on Tobacco Control (FCTC), with the broad aim of protecting current and future generations from the harmful effects of tobacco smoking [24-26].

Global trends in waterpipe tobacco smoking

Recent data on adults support an increase in WTS worldwide. Despite the fact that it does not cover all countries and lacks regular surveillance, available data from the Global Adults Tobacco Survey (GATS) show regional and country variations in the prevalence of WTS among adults (≥15 years old). For instance, cross-country comparisons among 13 countries from 2008-2010 revealed that the highest WTS prevalence among men was in Vietnam (13.0%) and Egypt (6.2%), and its use among women was highest in Russia (3.2%), followed by Ukraine (1.1%) [27].

As for data on youth, available national and global surveys demonstrate an alarming trend in WTS. For instance, data from the Gulf countries show a WTS prevalence ranging from 9-15% (for the years 2001-2004), surpassing the prevalence of cigarette smoking among 13-15 years old [28]. In the U.S., national data for high school students showed a statistically significant increase in WTS prevalence from 4.1% in 2011 to 9.4% in 2014 [29]. The rates are more alarming in the Eastern Mediterranean Region (EMR), where the Global Youth Tobacco Survey (GYTS) reported that the highest levels of 'other tobacco use,' mainly attributed to WTS, was among boys in the EMR, and for girls in the EMR, 'other tobacco use' ranked second when compared to other regions [28].

Data on university students worldwide also demonstrate an increased WTS use. For instance, a study among college students in the U.S. has revealed a high 'ever use' (20-40%) and current use (5-20%) of waterpipe [30]. Another study among

a sample of 937 students at Birmingham University in the U.K. found that 37.9% of students reported having ever tried WTS [31]. Among university students in the EMR, one study among medical students in Syria reported a prevalence of 23.5% for waterpipe and 7.3% for dual waterpipe and cigarette smoking [32], and another study in Jordan reported a prevalence of 30% (for use in the past month) and 56% (for 'ever use') for WTS [2]. These numbers reflect the increasing trend of WTS among youth and young adults (or university students).

Waterpipe tobacco smoking in the occupied Palestinian territory

Published national data in the occupied Palestinian territory (oPt) reflect a high overall tobacco prevalence, yet not specific to WTS. For instance, in 2010, the Family Health Survey (FHS) reported that 22.5% of individuals 18 years and older were smokers, with 27% in the West Bank and 15% in the Gaza Strip [33]. Other studies among varying population groups, which focused on WTS, revealed an indication of an increase in WTS among adolescents and young adults. For example, a comparison between GYTS data in 2000 and 2005 showed a change in the prevalence of current smoking of tobacco products 'other than cigarettes,' from 16.6% (in the West Bank) and 7.8% (in the Gaza Strip) to 16.7% and 11.7%, in the West Bank and Gaza Strip, respectively [34-38]. The 2007 Global Health Professions Student Survey (GHPSS) on young health-professionals in the West Bank and Gaza Strip showed a high smoking prevalence of tobacco products 'other than cigarettes,'

which is mainly attributed to WTS, where the highest prevalence was among dental students (3 in 10 currently smoked other types of tobacco) and lowest for medical students (12.3%) [39-42].

Moreover, a cross-sectional study among students at An-Najah National University (in 2010) in the West Bank reported a smoking prevalence, cigarette or waterpipe, of 52.7% and 16.4% among men and women, respectively (overall 34.7%) [43]. Furthermore, a cross-sectional study among seven universities in the Gaza Strip in 2013 (n=1104) found that 31.0% of the sample (18 years and older) were current cigarette smokers and 36.0% were exclusive waterpipe smokers [44]. These published studies could indicate an increasing prevalence of WTS, especially among young Palestinian adults, in a country where lung cancer ranked first in mortality-leading cancers in 2014, with smoking as a contributing factor [45, 46].

GAP IN KNOWLEDGE

While preliminary data on the prevalence of tobacco smoking in the oPt are available, there are important gaps in the current literature that hinder our ability to explore WTS behavior and patterns and to formulate appropriate tobacco interventions and policy changes, especially among university students.

First, the available studies on tobacco smoking conducted by the Palestinian Central Bureau of Statistics (PCBS) FHS lack a consistent categorization of WTS, hindering our ability to draw accurate time trends. In addition, the data from the FHS were proxy-reported estimates, which underestimate the actual WTS prevalence

among youth. Second, there are few published studies that compare the prevalence and patterns of WTS to cigarette smoking in the oPt among university students. Third, WTS has historically been a more common form of tobacco smoking in developing countries and has been viewed as a more preferable choice among women, including in the oPt. However, most research in the oPt investigated the burden of cigarette smoking only or included WTS under current tobacco smoking [5, 11, 45]. Fourth, limited studies have looked at regional variations (West Bank and Gaza Strip) in WTS among university students in the oPt. Additionally, available Palestinian studies among university students have been limited to either a certain year at university or a faculty of study of the students or to specific number of universities under investigation. Finally, and to the best of my knowledge, no studies exist on the prevalence, patterns and associated factors with WTS in the oPt (West Bank and Gaza Strip) among university students.

SIGNIFICANCE AND IMPORTANCE OF STUDY

Given the global rise in the prevalence of WTS worldwide, the recent evidence of the detrimental health effects of WTS and the observable high number of youth and college students smoking waterpipe as a leisure-time activity in restaurants and cafés, it is imperative to investigate the burden of WTS in the oPt [7, 31, 47]. With the knowledge that studies conducted in the oPt have been localized and limited to certain areas and specific age groups, it is important to determine whether waterpipe smoking is a public health risk to university students in the oPt. This will

aid in structuring policies and plans to directly address the tobacco smoking issue among an identified vulnerable sector in society by the global literature. In addition, existing tobacco control policies do not regulate all forms of tobacco and are not specific to waterpipe, especially in the oPt, and as such, without a clear picture on the current situation, the WTS prevalence will continue and may even rise over time [48]. Lastly, if appropriate interventions and WTS cessation programs are to be formulated and eventually enforced, it is imperative to gain an understanding of the underlying associated factors with WTS among university students in the oPt. Taken together, there seems to be a need to understand the factors contributing to WTS and its current patterns, hence targeting those factors at an early stage. It is hoped that this study will explore the WTS patterns among university students in the oPt – in a way that provides a baseline reflecting the current situation. Also, it is hoped that this study will allow for comparison of the WTS prevalence among university students with other countries that used standardized tobacco questionnaires.

RESEARCH OBJECTIVES, QUESTIONS AND HYPOTHESES

Research objectives

The current study aimed to: first, review available data on WTS in the oPt; second, to test a web-based survey and compare it with a traditional paper-based survey in relation to characteristics of respondents; third, to estimate the WTS prevalence among a sample of university students attending six Palestinian universities in the West Bank and Gaza Strip; lastly, to investigate the factors

associated with WTS among Palestinian university students. All aim to influence policies and interventions which could inform young people and assist in cutting down on or even eliminating WTS use in the country.

Research questions

- **Research question 1**: What is the prevalence of WTS among Palestinian university students in our study sample? How does it compare with nationally published data?
- **Research question 2**: What are the main socio-demographic, socio-economic and university-related factors (gender, age, locale type, residence, year at university, economic standing …) associated WTS in our study sample?
- **Research question 3**: What are the main social factors (social acceptability, peer pressure, family smoking status, cultural identity, cigarette smoking …) associated with WTS in our study sample?

Research hypotheses

- **Research question 2 hypothesis**: Selected associated factors (male gender, older age, current-cigarette smoking status, a West Bank resident and studying in the faculties of humanities and arts) are associated with WTS status.
- **Research question 3 hypothesis**: Selected social associated factors (household parental smoking, social acceptability and smoking among friends) are positively associated with WTS.

CHAPTER 1: LITERATURE REVIEW

Tobacco smoking: a global health epidemic

By the 1990s, tobacco smoking had become a global health epidemic and a leading cause of premature mortality [24]. In the 20th century, global tobacco smoking, in its various forms, contributed to the death of 100 million people [9, 24]. To this day, tobacco smoking remains one of the most common leading causes of preventable death that annually affects 6 million people worldwide [1-6].

The projected global health impacts of tobacco smoking elicit pronounced alarm. The WHO estimates that by the year 2030, 10 million deaths will be attributable to tobacco smoking and 70% of these deaths will occur in developing countries [5, 7, 8, 24]. The WHO also estimates that 600,000 people (out of the 6 million projected deaths) are expected to die from the ill-effects of second-hand smoking [6]. It is thus suggested that if current tobacco smoking trends and patterns remain unchanged, tobacco-specific mortality will affect about 1 billion people at the end of the 21st century [9].

The impacts of tobacco smoking go beyond mortality and have been associated with many co-morbidities for smokers and non-smokers (including second-hand smokers) [9]. Specifically, tobacco smoking was found to increase the risk of many diseases, namely, coronary heart disease, cancer, ischemic heart diseases, stroke and COPD [9]. Tobacco smoking has also been found to increase the

severity of symptoms of mental disorders, such as schizophrenia, bipolar disorders and anxiety disorders [9]. Furthermore, tobacco smoking has been suggested to have significant impact on certain populations, such as those diagnosed with tuberculosis and the Human Immunodeficiency Virus Infection and Acquired Immune Deficiency Syndrome, such that these patients are at a higher risk of the dangers of tobacco use compared to those free from these diseases [9].

Recent global data have shown a decrease in the prevalence of cigarette smoking in some parts of the world, with a marked increase in alternative types of tobacco products [28, 49, 50]. For instance, data from the U.S. show that the prevalence of cigarette smoking has declined from 20.9% in 2005 to 18.1% in 2012 among middle and high school children (and about 33% drop between 2000 and 2011 among high school students) [10, 13, 50, 51]. However, as of 2012, it was estimated that about 42 million people in the U.S. were current cigarette smokers, most of whom were men [10, 13, 51]. Despite the decline in the prevalence of cigarette smoking, the tobacco industry, with its innovative direct or indirect marketing and promotion along with its misguided health messages, continue to increase the risk of many smoking-attributable health risks [9, 10, 49].

While traditionally, the burden of tobacco smoking was attributed to cigarette smoking as the most common type of smoking [10], in the last two decades, the burden of tobacco smoking has been exacerbated due to the gain in popularity of WTS. This has been manifested through a re-emergence in the EMR, while a new

trend in Western countries [1, 2, 11-14]. In many countries of the Middle East and North Africa (MENA) region as well as in Western countries, the prevalence of WTS among *youth* and *college students* is on the rise at an alarming rate [2, 3, 12, 28, 48, 49]. In several countries in the EMR, WTS is marking first among tobacco products, and in other parts of the world, it is ranking second to cigarettes [49] among youth and young adults.

Overview of waterpipe tobacco smoking

The term WTS refers to the tobacco smoking method in which the tobacco smoke passes through water before it is inhaled by the user [8, 16, 17]. Many regions and countries worldwide refer to the waterpipe instrument by different names, such as arghile, nargile (Jordan, Lebanon, Syria and other Arab Mediterranean countries), hookah (Africa and Indian subcontinent), shisha, boory, goza (Egypt and Saudi Arabia), hubbly-bubbly and oriental pipe, among others. Hence, the waterpipe term is region-dependent [3, 5, 11, 12, 14, 15, 21].

Generally, the current waterpipe instrument is composed of the following parts:

1. **The head**: it is usually an inverted funnel-shaped head where the tobacco is placed and covered with perforated aluminum foil. The charcoal is placed on the top of the inverted funnel-shaped head and is lit. At the bottom of the head, there is usually a plate, which serves as an ashtray and residues holder for the burnt charcoal. It might also serve as a tongs holder, which is used to manipulate the charcoal.

2. **The body**: it is composed of the hose and pipe. The pipe connects the water bowl to the head, while the hose runs from the water bowl to the end user. The hose is usually made of rubber, and at the user's end of the hose, a plastic mouthpiece is fixed and attached.
3. **The base**: it is commonly composed of a specially shaped varying-sized glass bowl, but the base can also be made of ceramic, metal or rock-crystal. The bowl is partially-filled with water, and occasionally the water is mixed with other liquids, such as rose-water or juice or wine, for an added flavor [3, 15, 16, 18-21] (**Figure 1**).

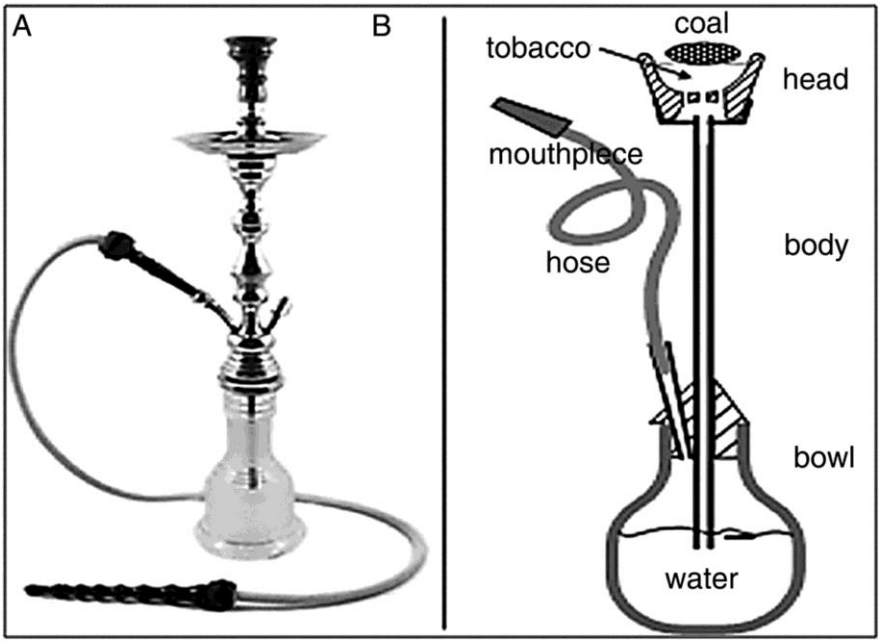


Figure 1: The current waterpipe instrument (A) with its main parts (B).

The WTS session usually starts by filling the base bowl with water (some flavored additives might be applied) and placing the tobacco inside the head of the waterpipe. The tobacco-filled head is then covered with the perforated aluminum foil. The burning charcoal is then placed on top of the tobacco-covered head. As the user inhales, the charcoal-heated air travels through the inverted funnel-shaped head and across the tobacco, which becomes smoke. The resulting tobacco smoke is filtered through the base water bowl (and bubbles through the water), which then passes through the rubber hose to the mouthpiece to be inhaled by the end user [3, 15, 16, 18-20, 28].

The most common type of tobacco used in the waterpipe instrument is mu'assel, which is flavored and sweetened. Historically, mu'assel was developed by mixing shredded tobacco leaves with honey, molasses or dried fruit. Currently, the mu'assel comes in a variety of flavors, such as apple, mint, lemon, grape, orange, pineapple and watermelon, to name a few. The use of mu'assel produces a very appealing aroma to users. Other types of tobacco used in the waterpipe instrument include the unflavored and unsweetened 'Ajami' or 'Tumbak' or 'Jurak' [3, 8, 21]. Many companies nowadays produce, manufacture and distribute pre-packaged flavored tobacco throughout the MENA region and other countries [3].

To put into historical context, WTS is a centuries-old tradition that has been practiced for approximately 400 years. It is believed that WTS originated in ancient Persia and India [3, 12, 15]. The original waterpipe bowl was presumably made from

a coconut shell (known as Narjil in India) with milk, instead of water, as a filtering agent, and was considered the most primitive form of the waterpipe [3, 16]. In the East (especially India), different leaves' paste was used as tobacco and smoked using the Narjil as the base. Evidence suggests that the rudimentary use of the waterpipe was for smoking opium or 'hashish,' as the construction of the waterpipe instrument precedes its current use for tobacco smoking in the MENA region and other regions [3, 16]. It is not yet clear, nevertheless, whether the waterpipe or tobacco reached the Middle East region first, as some suggest that the Ottomans introduced WTS after the introduction of tobacco to the region [16].

The form, shape and spread patterns of the primitive waterpipe instrument changed during its routes to different parts of the world. For instance, in 1492 in the Americas region (AMR), WTS was practiced through a Y-shaped wooden bowl, called 'tobago,' with the burning leaves on one end. In Egypt, the coconut bowl was replaced with the gourd plant [16]. During the 15th century, waterpipe use spread throughout the MENA region and Asia, and was widely used in Turkey, Iran, Lebanon, Syria, Palestine, India, Pakistan, Egypt and Saudi Arabia [3, 5]. In the 19th century, the practice of WTS was common among both men and women, as a symbol of social class. However, by 1980, WTS decreased considerably and its habit became confined to older men, especially in the Middle Eastern region [3, 8, 12, 16, 28]. Unfortunately, the current century witnessed a resurgence of WTS that has spread to

different age groups, especially youth and college students, and among women across many parts of the world, where it is seen as a fashionable behavior [8, 12, 21, 49].

Health effects of waterpipe tobacco smoking

The first indicator of the harmful effects of WTS appeared in 1962, during a study on lung cancer mortality among ethnic groups in Jerusalem, attributed to the habit of WTS. After that date, research on WTS, especially its health effects, started to appear again in the 1990s [49]. The harmful effects of WTS arise from burning the tobacco and the resulting tobacco smoke. It is worth mentioning that, in one waterpipe smoking session, the mu'assel head requires continued additional charcoal, which implies the production of more tobacco smoke. Smoke from the waterpipe consists of more than 700 harmful and toxic chemicals, gases and particles that are released from the burnt charcoal and the heated tobacco. Studies have demonstrated that smoke from waterpipe tobacco contains many harmful chemicals, similar to those found in cigarettes, such as carcinogenic polycyclic aromatic hydrocarbons, carbon monoxide, nicotine, tar and traces of heavy metals, which negatively affect almost every organ in the human body [2, 3, 9, 11, 13, 14, 23]. The WHO estimates that, in a single WTS session, the amount of smoke inhaled is as much as100 times the smoke volume involved in smoking one cigarette [2, 13]. In addition, evidence explains that waterpipe tobacco smokers are at a higher risk of absorbing these toxic chemicals because of the longer duration of smoking (usually 45 minutes) and inhaling the moisturized smoke more deeply [15]. Other studies have also found that,

in comparison to one cigarette, smoke from a single WTS session has 40 times the tar, 30 times the carcinogenic polycyclic aromatic hydrocarbons, 10 times the carbon monoxide and 2 times the nicotine delivered by a cigarette [13]. Thus, WTS exposes smokers to similar toxicants as cigarettes, with a special short-term impact of higher risk of carbon monoxide poisoning in WTS [49]. Published biological literature support the evidence that WTS smoke is indeed 'a substantial inhalation hazard [49].'

In comparison to cigarettes, some studies reported that white blood cells of waterpipe tobacco smokers contain higher levels of chromatin exchange, an indicator of carcinogenic activity, than those found in the while blood cells of cigarette smokers [2]. In addition, further studies found that plasma nicotine concentrations in daily waterpipe tobacco smokers are equivalent in those who smoke 10 cigarettes daily [2, 13, 14]. Other studies reported that the nicotine content of waterpipe tobacco smoke is 2%-4%, as opposed to 1%-3% for cigarettes, and a carbon monoxide concentration of 0.34%-1.40% and 0.41% for waterpipe smoke and cigarette smoke, respectively [15], possibly resulting in dependency for waterpipe users [49].

Many published studies also provide supportive evidence for acute short-term and long-term health effects associated with WTS. Most of the health effects of WTS, for active and second-hand smokers, target the cardiovascular and respiratory systems, which eventually lead to CAD and COPD. Over the years, studies have suggested evidence supporting a significant association between WTS and various health issues, including lung cancer, respiratory illness, low birth weight, decreased

pulmonary function and periodontal disease [2, 3, 10, 11, 13, 14, 22]. In addition, it was found that children who were born to mothers who smoked during pregnancy were at a higher risk of having congenital disorders, sudden death as well as diseases of the lungs and cancer [9]. With the variation in the use and patterns in WTS among different groups of people, as well as the intermittent nature of WTS, the severity of these health impacts on users will differ.

Global trends: the epidemiology of waterpipe tobacco smoking

The WHO reports that for the year 2010, the overall global tobacco smoking prevalence was 21.9%, distributed as 12.8%, 18.7%, 19.6%, 29.2%, 18.2%, 26.6% in the six WHO regions, the African (AFR), the AMR, the EMR, the European (EUR), the South East Asia (SEAR) and Western Pacific (WPR), respectively [25]. It is also estimated that the worldwide prevalence of WTS (use on a daily basis) is about 100 million, with higher rates among youth [22]. Unfortunately, regular surveillance specifically for WTS is lacking, but select countries have monitored waterpipe tobacco use through a few standardized surveillance surveys, namely, the GATS and the GYTS, among adults and youth respectively, and other national surveys. For these countries, data indicate a relatively high use of WTS among youth and adults of both genders [52].

GATS data on the prevalence of WTS among men and women adults (≥15 years old) of the WHO six regions show regional and gender variations, only for those countries where GATS data are available. For instance, the 2012 GATS in

Nigeria found a very low prevalence of ‘other tobacco types’ (0.8% overall, 1.6% men and 0.1% women), with lacking data for other countries in the AFR. As for the AMR, similar prevalence data were reported in Brazil (2008), Mexico (2009), Uruguay (2010) and Argentina (2012), with an overall WTS prevalence of less than 0.2%. The GATS for the EMR was conducted in Egypt (2009) and Qatar (2013), which found comparable overall WTS prevalence between the two countries (3.4% in Qatar and 3.3% in Egypt), nevertheless, WTS was higher among men in Egypt compared to Qatar (6.2% versus 4.9%, respectively) and lower among women in Egypt compared to Qatar (0.3% in Egypt and 1.6% in Qatar) [53, 54]. The data for the EUR showed a decreasing WTS prevalence among men from the Russian Federation (2009), Turkey (2008) and Ukraine (2010) to Romania (2011) ranging from 4.4% to 0.3%. Comparing these data to those for men in the SEAR, GATS showed lower prevalence. For instance, the WTS prevalence among men was highest in Bangladesh (1.3%, 2009) and lowest in Thailand (0.03%, 2009). As for women, the highest prevalence was reported in India (0.6%, 2010). Lastly, the GATS data for the WSR revealed low prevalence, for instance, 0.65% for men and 0.08% for women in China (2010) and 1.0% for men and 0.1% for women in Malaysia (2011) [52]. While these results indicate that the highest WTS prevalence rates are in the EMR and EUR, and higher among men compared to women, these data provide evidence for a lack of a comprehensive surveillance system of WTS prevalence among adults worldwide.

Available data among youth suggest an alarming increase in WTS among this age group, with regional variations. For instance, in the Gulf countries (Bahrain, Kuwait, Oman, Qatar, United Arab Emirates and Yemen), a multi-country study (2001-2004) among 13-15 years old reported a high WTS prevalence, from 9% to 15%, with a clear indication that it surpassed the prevalence of cigarette smoking [28]. In the U.S., the National Youth Tobacco Survey (NYTS) for the years 2011-2014, reported that there was a statistically significant increase in WTS from 4.1% in 2011 to 9.4% in 2014, among high school students [29]. The Canadian Youth Smoking Survey for the years 2006-2010 among students (9-12 grade) revealed a 6.3% increase in the prevalence of WTS [28].

The high prevalence of WTS among adolescents and university students has also been documented in a number of studies targeting specific age groups, educational backgrounds and sectors of society. For instance, a cross-sectional study on 1,652 Saudi children and young adults between the ages of 15-19 years found that 53.9% of the sample smoked tobacco using a waterpipe, and those who smoked waterpipe, 20.7% smoked on a daily basis and 23.8% on a weekly basis [5]. Another cross-sectional study among school children aged 11-18 years in Jordan revealed that 36%, 34% and 30% of participants smoked waterpipe at least once in the past year, in the past month and in the past week, respectively, with a higher prevalence among girls compared to boys [14]. A study among school children (13-15 years old) in Oman in the year 2003 found a 9.6% prevalence of current WTS and 26.6% of ever

waterpipe use [55].

In addition, a sample of college students (n=105,012) from 152 institutions in the U.S. for the academic year 2008-2009 found that 30.5% of the sample reported ever waterpipe use, while for current tobacco users, 16.8% smoked cigarettes and 8.4% were waterpipe smokers [13]. In another study in the U.S. for the academic year 2010-2011 has indicated an increasing ever use (20-40%) and current use (5-20%) of WTS among college students [30]. In a sample of 937 students at Birmingham University in the U.K., 37.9% of students reported having ever tried WTS, with this habit becoming an important part of the student university culture [31]. In a study among medical students in a university in Syria (2006-2007), a prevalence of 23.5% for waterpipe and 7.3% for dual waterpipe and cigarette smoking were reported [32], and a study among university students in Jordan (2010) reported a prevalence of 30% (in the past month) and 56% (ever use) for WTS [2]. These studies, among many others, emphasize and provide support for the emerging trend of increased WTS among youth and university students.

The observed change in the epidemiological trends of WTS started to be noticeable in the early 1990s, where the habit of WTS transitioned from old Middle Eastern men to young female and male youth, initially in the Middle East region and eventually reaching other parts of the world [28]. This epidemiological change in WTS trends has been attributed to a combination of influences and factors that ultimately resulted in the rise of WTS popularity among youth. These drivers include

the introduction of flavored tobacco, ‘mu’assel,’ which is believed to have attracted young adults through its smell, taste and the smooth smoke it produced [28]. Not only that, but the innovative presentation and designs, the easy access and availability at cafes made WTS an enjoyable choice for many young people [5, 15]. Moreover, in contrast to cigarette smoking, the social nature of WTS, especially in family gatherings and in the café culture, the long smoking sessions and the sharing of the waterpipe instrument, attracted many young adults [3, 28]. The low harm perception of WTS, as compared to cigarette smoking, among many young people is also believed to have driven the observable high rates of WTS [3, 11, 15]. The tobacco industry has propagated misleading information regarding WTS, with messages such as ‘low tar and nicotine,’ ‘the water in the waterpipe filters the tobacco smoke,’ and the absence of any health warnings and labels, is also believed to have contributed to low harm perception and knowledge, hence the rise in popularity of WTS [49].

In addition, the role of the internet, mass and social media, has also been suggested to have contributed to the global emergence of WTS, through the tobacco industry utilizing these electronic communication venues to advertise their products [28]. The promotion and marketing of WTS has been made easy in waterpipe cafes and restaurants by propagating the image of the ‘fashionable,’ ‘socially acceptable’ and ‘harmless’ entertainment activity of WTS [3, 49]. Lastly, the lack of WTS-specific legislation and regulations has unintentionally encouraged the flourishing of WTS, especially that tobacco polices were tailored to cigarettes [28]. Some have also

suggested that the rapid rise of globalization, coupled with high rates of migration, might have contributed to the emerging trend of WTS in other parts of the world [5].

The social and cultural aspect of WTS has been of particular interest, especially given the high rates of WTS among youth and young adults in the EMR. Many studies have addressed the long cultural tradition usually associated with WTS such that it is considered a behavioral norm for many [3, 5, 11, 15]. Usually, people smoke waterpipe in social settings as groups, either at home or in restaurants and cafes [12, 14]. It is a common behavior for individuals to pass the waterpipe hose around from person to person, using the same mouthpiece or changing it at each turn and trying different flavors; it is viewed as an inexpensive method of spending time with friends [3, 12]. The smoking session usually takes from 45 to 60 minutes, but some might smoke for multiple sessions [12]. It is also common to observe both men and women engage in the smoking sessions [3, 11]. WTS among women goes back to the 19th century where WTS started gaining popularity among women, who found it a more socially and culturally acceptable alternative to cigarette smoking [3, 11]. Nowadays, WTS has become less stigmatized and more socially acceptable compared to cigarette smoking, especially for women [3, 5, 15]. For instance, a study in Kuwait found that 79.9% of waterpipe tobacco smokers were women, and another study in Jordan found a higher WTS preference among women (53%) compared to men; similar results were reported in Iran [11].

Factors associated with waterpipe tobacco smoking

With the recent rise in WTS among youth and young adults, many studies have attempted to explore the motives and associated factors behind this popularity and use. One framework to explore these factors is the Ecological Model of Health Promotion (EMHP), which addresses proximal and distal factors that could influence WTS behavior. This framework offers a valuable insight into factors associated with WTS, at various levels.

The level of intrapersonal factors includes the reasons for smoking, perception of health-related hazards, addictiveness and ability to quit, and attitudes towards WTS. In many studies, the most common reasons for WTS included, boredom, curiosity, relaxation, peer pressure, a positive experience that engages all senses, proving manhood, emancipation as well as culture [7, 19, 47, 48, 56-66]. Many studies have also found that there was a low harm perception of WTS, with some who believed that it was more harmful than cigarette smoking, while others believed the opposite [5, 7, 19, 31, 47, 48, 58, 59, 65, 66]. Some of the reasons for the low harm perception included the water and extended hose serving as filters for harmful chemicals and that the nicotine content in WTS is less than that found in cigarettes [3, 5, 11, 12, 15]. Moreover, some attributed the fruit content of tobacco to suggest that WTS was a healthy choice [5, 12]. Many young adults also revealed that WTS addictiveness was not a concern and were confident that they can quit if they wanted to [64]. Additionally, some studies reported that youth associate WTS with

expressions of a ‘fun activity,’ an opportunity for social gatherings with family and friends, ‘fashionable’ and ‘cool.’ Others also suggested that WTS behavior was influenced by the attractive waterpipe instrument and its easy access and affordability, especially in comparison to cigarette smoking. In many studies, these perceptions and attitudes towards WTS were found to be positive predictors of WTS [5, 7, 19, 31, 47, 48, 58, 59, 65, 66].

Another level is the interpersonal influences, which include such factors as peer pressure and the family smoking environment. Having family members and friends who are smokers can either create an environment conducive to or discouraging to WTS [64]. Some studies found that having one or more parent who smoked waterpipe to be associated with youth WTS [5, 7, 19, 47, 48, 65, 66]. Having no family discussions about the dangers of WTS was also found to be associated with WTS, especially among school children [14]. Also, having friends who support WTS and encourage it was found to correlate with higher waterpipe smoking, for both initiation and continuation [64]. The organizational/institutional and the community factors are another level, which consider the formal and informal structures in place, including community, schools, neighborhoods and mass media. Having low knowledge of the harmful effects of WTS was found to be associated with current WTS use, especially among youth and university students [7, 19, 47, 48, 65, 66]. Misunderstandings and lack of proper knowledge of the dangers and negative health consequences of WTS were found to be common among waterpipe tobacco smokers

[11]. Studies have shown that many waterpipe smokers are unaware of the health risks associated with WTS and perceive WTS as “less harmful” than cigarette smoking [3, 5, 11, 13-15]. The lack of adequate knowledge of the harmful effects of WTS indicates the scant role of organizations and institutions in directing attention towards the health hazards of WTS. Lastly, the level on policies influences revealed that the lack of policies-specific to WTS encourages waterpipe smoking [7, 19, 47, 48, 65, 66].

Other socio-demographic factors and university-related characteristics, not included in the EMHP framework, have also been found to be associated with current WTS status. For instance, being a male was found to be positively associated with WTS [2, 5, 13, 43]. Some studies found older age to be associated with current WTS status [2, 5, 14, 31, 43, 58, 67]. Having a university education, being in a higher academic year in university and having a low grade point average were found to be positively associated with WTS [2, 5, 11, 14, 31, 43, 58, 67].

Tobacco smoking as a public health challenge: where do we currently stand?

Since the start of the tobacco epidemic, many attempts have been made to curb the rising prevalence of smoking. However, many of these efforts proved to be ineffective as a result of a number of interacting factors. The multinational tobacco industry, with its luring presentation of tobacco products, active promotion and the high benefit from this profit-generating manufacturing and trade, has crippled tobacco control efforts. In addition, the rise in globalization has paved the way for the

spread of the tobacco epidemic from developed to developing countries. Individual country tobacco control measures were faced with a halt [24].

Hereafter, discussions about a new approach to tobacco control continued, and in 1998, the WHO established the Tobacco Free Initiative (TFI) to support the transition to a legal tobacco control approach. In the same year, the WHO, Centers for Disease Control and Prevention (CDC) and the Canadian Public Health Association (CPHA) started working on the GTSS [26]. The GYTS for youth tobacco smoking was the first surveillance system to be created and is considered the foundation of the GTSS [24]. Other surveillance measures included the GATS for adults smoking and the GHPSS for health professionals, collectively aimed at monitoring the tobacco prevalence and helping countries adopt comprehensive tobacco action plans [26].

In 2003, the WHO negotiated the first evidence-based treaty, the FCTC, with the goal of protecting present and future generations from the harmful effects of tobacco use and exposure [24, 25]. The WHO FCTC reaffirmed, “the right of all people to the highest standard of health” with all people deserving a healthy, tobacco-free world. The FCTC was the first regulatory measure to tackle addictive substances and came into force in February 2005 [24]. The WHO further devised a 6-package tobacco control measures that were proven to lessen tobacco use, and were termed the MPOWER (Monitoring tobacco use, protecting people, offering cessation help, warning about dangers of tobacco, enforcing bans on tobacco and raising taxes) [25].

Despite the growing efforts of the WHO FCTC, the framework was predominantly based on evidence derived from cigarette smoking use and patterns [68]. The global waterpipe tobacco growth and regulation differ from those of cigarette smoking. The WTS growth is painted by an increase in the number of producers, manufacturers and importers of the waterpipe instrument and its various accessories, in contrast to the control of the cigarette industry by a couple of multinational companies. These differential features of WTS necessitate a complimentary regulatory mechanism to the WHO FCTC and WTS-specific legislation [68].

Unfortunately, as of 2008, the WHO revealed that less than 5% of the world is covered by tobacco policies that intend to enhance its fight against the tobacco industry [69]. Currently, many countries lack defined laws for WTS and instead adopt ‘generic’ tobacco control laws for waterpipe [68]. Moreover, the situation is complicated by the lack of current smoking legislation enforcement, painted by violations and non-compliance, as seen in the United Arab Emirates, India, Pakistan, U.S. and U.K. Other countries provide further challenges to the current WTS legislation. For instance, in the U.S., smoke-free laws are only applicable to cigarettes and the U.S. Food and Drug Administration (FDA) Family Smoking Prevention and Tobacco Control Act exempts a ban on WTS and solely focuses on the banning of flavored cigarettes. In the European Union, the situation is not very different, where its recent ban (to be implemented by mid-2016) on flavored tobacco exempts WTS.

In the EMR, Lebanon, Turkey and Israel described health warnings on tobacco products, but only Lebanon described the need to use WTS-specific health warnings [68]. Together these cases highlight existing gaps in laws and policies to regulate global WTS and the consequent impact on undermining existing tobacco control measures. “Tobacco control … [remains] a marathon effort in public health [24].”

Waterpipe tobacco smoking in the occupied Palestinian territory

The burden of tobacco smoking in the oPt is not very different than that reported in other countries in the EMR. Tobacco smoking prevalence has been mainly monitored through the PCBS as well as the WHO GYTS and GHPSS. Data from PCBS on adults (≥18 years old) on the overall smoking prevalence in the oPt show a decreasing trend of tobacco smoking over time. The overall smoking prevalence in the oPt decreased from 27.5%, 25.3% to 22.5% in 2000, 2006 and 2010, respectively. The point-time changes for tobacco smoking prevalence in the West Bank and Gaza Strip showed a higher smoking prevalence in the West Bank compared to the Gaza Strip from 2000 to 2010. For instance, in the West Bank, 29.9% of the population was smokers in 2000 to reach 26.9% in 2010. As for the Gaza Strip, 24.1% were smokers in 2000 and the smoking prevalence reached 14.6% in 2010 [70]. A cross-sectional study in 2006-2007 among Palestinian women living in East Jerusalem (18 years and older; n=306) found that 16.1% of the study sample were current smokers, of which 2.6% smoked waterpipe regularly and 11.6% smoked cigarettes regularly [71], comparable to the PCBS data.

The GYTS data (13-15 years old) in the oPt show an increased current cigarette smoking prevalence among Palestinian students in the West Bank. For 2000, the current cigarette smoking prevalence was 14.1%, 14.7% and 13.9% for north, central and south West Bank, respectively (14.2% overall, 24.7% boys and 4.7% girls). Later data showed an increase in current cigarette smoking among the same age group to 18.0% (27.6% boys and 8.6% girls) and 21.0% (36.1% boys and 7.5% girls), for 2005 and 2009, respectively. As for the Gaza Strip, the prevalence of current cigarette smoking revealed a decrease from 9.0% (15.1% boys and 3.4% girls) in 2000 to 6.6% (9.7% boys and 3.0% girls) in 2005 [72]. Moreover, for the years 2000 and 2005, the prevalence of current smoking of tobacco products 'other than cigarettes' among the same age group showed an increase for both regions of the oPt. In 2000, the prevalence of current smoking (other than cigarettes) was 16.6% and 7.8%, for the West Bank and Gaza Strip, respectively. In 2005, the prevalence changed to 16.7% and 11.7%, for the West Bank and Gaza Strip, respectively [34-38].

In addition to the research conducted by GYTS, four studies and PCBS data on Palestinian adolescents also shed some light on the tobacco smoking burden. For instance, a cross-sectional study during the academic year 2003-2004 was conducted on Palestinian school children and adolescents (13-15 years old) in the West Bank and Gaza Strip (n=17715 students; 9444 from the West Bank and 8271 in the Gaza Strip). The study found that the overall prevalence of current smoking was 12.0%

[73]. In 2008, another study among 13-15 years old Palestinian United Nations Relief and Works Agency (UNRWA) refugee school children in the West Bank (n=1305) and Gaza Strip (n=1395) found that the prevalence of cigarette smoking among UNRWA students who live inside UNRWA refugee camps to be 24.4% and 6.4% in the West Bank and Gaza Strip, respectively. As for WTS, the prevalence of smoking for UNRWA students who live inside UNRWA refugee camps was 31.2% and 12.6% in the West Bank and Gaza Strip, respectively. When compared to current cigarette smoking, current WTS was found to be higher for girls in the West Bank [74]. Another cross-sectional study in the same year (2008) reported on the smoking prevalence among 13-15 year old Palestinian students in two governorates in the West Bank, Ramallah in central West Bank and Jenin in the north (n=3,107). The study revealed an overall smoking prevalence of 25.0% (with 9.0% who smoked cigarettes, 6.0% who smoked through a waterpipe and up to 10.0% who smoked both cigarettes and waterpipe) [75]. In 2011, another cross-sectional study was conducted among the age group 13-17 years in a sample of 720 Palestinian students who were attending public schools in Tarqumia village in the oPt. The study found that 32.2% of the sample (47.4% of boys and 16.8% of girls) had smoked cigarettes on one or more days in the past month. Among smokers, cigarette smoking was higher than WTS (32.2% and 25.6% respectively) [4]. Among youth (15-29 years old), the PCBS reported that in 2010, 15.4% were smokers, with 0.9% among women and 29.3% among men. The percentage of youth smokers was higher in the West Bank (20.1%)

than in the Gaza Strip (7.7%), mirroring the smoking variation between the West Bank and Gaza Strip in previous years [70]. These studies reflect a high prevalence in overall smoking among adolescents, whether they live in the West Bank, Gaza Strip or in UNRWA refugee camps.

The tobacco smoking patterns and profile among Palestinian university students and adults are not very different from the smoking profile among Palestinian adolescents. Data from the GHPSS on health professionals found, that for the year 2007, the prevalence of current cigarette smoking was about a third (33.4%) for dental students, 22.7% for medical students, less than a third (25.0%) for nursing students and 11.0% for pharmacy students. The prevalence of current cigarette smoking among the different male health professions was highest for male dental students (48.8%) and lowest for male nursing students (33.9%). Similarly, for women, the highest prevalence was seen among female dental and nursing students (19.9%) and lowest among female pharmacy students (3.2%). Aside from cigarette smoking, the prevalence of current tobacco smoking, other than cigarettes, was highest among dental students (3 in 10 currently smoked other types of tobacco) and lowest for medical students (12.3%) [39-42]. In another cross-sectional study among university students in 2010 in An-Najah National University in the Nablus governorate (n=954, age ≥20) reported a smoking prevalence, cigarette or waterpipe, of 52.7% and 16.4% among men and women, respectively (overall 34.7%) [43]. Furthermore, a cross-sectional study among seven universities in the Gaza Strip in

2013 (n=1104) on smoking behaviors found that 55.0% of the study sample (18 years and older) reported ever smoking, 31.0% were current cigarette smokers and 36.0% were exclusive waterpipe smokers [44]. These data provide invaluable evidence for the spread of tobacco smoking, whether cigarettes or waterpipe, across different regions, age groups and educational background in the oPt.

With the presence of international efforts and global policies for WTS, in the oPt, the No Smoking Law was passed in 2005, and it entailed bans on smoking in public places and forbade the sale of cigarettes to those under the age of 18. However, the law was never enforced. The situation was further complicated by the lack of a system that enforces compliance to the law and imposes penalties for violation and non-compliance [76]. Nevertheless, the Palestinian Ministry of Health (MoH) still theoretically reaffirms its commitment to ensuring the implementation of the No Smoking Law, as stated in its 2014-2016 National Health Strategy, including the ban on smoking in public places and the sale of cigarettes to minors and the modification of cigarette packaging [77]. Unfortunately, even with the rise in WTS among young Palestinians and adults and its projected detrimental health effects, there are yet no specific laws pertaining to prohibiting WTS in the oPt.

CHAPTER 2: METHODOLOGY

Study design overview

The current study was a cross-sectional exploratory study among a sample of 2,146 university students, from six selected universities in the oPt. Participants were invited to partake in the study through completing a web-based survey during the second semester of the 2014-2015 academic year.

Study area and population

The oPt consists of two regions, the West Bank and Gaza Strip. The West Bank is divided into 11 governorates: Jenin, Tubas, Tulkarm, Nablus, Qalqiliya, Salfit (North), Ramallah and al-Bireh, Jericho and al-Aghwar, Jerusalem (Central), Bethlehem and Hebron (South), whereas the Gaza Strip is divided into five governorates: North Gaza (North), Gaza, Dir Al-Balah (Central), Khan Yunis and Rafah (South) [78]. For the year 2014, the total population of the oPt was 4.55 million (2.79 million in the West Bank and 1.76 million in the Gaza Strip). By mid-2014, the total population of youth aged 17-25 years old reached 860,580 (529,887 in the West Bank and 330,693 in the Gaza Strip) [79].

In the current study, the population under investigation included all Palestinian students who were enrolled at Palestinian higher education ‘traditional universities’ in the West Bank and Gaza Strip. According to the Palestinian Ministry

of Education and Higher Education, ‘traditional universities’ are those which have a university campus, lecture halls and laboratories, face-to-face teaching, a pre-set academic calendar, a clear curriculum and mandatory attendance, to name a few [80]. Overall, for the academic year 2014-2015, the oPt had a total of 14 ‘traditional universities,’ with 132,449 enrolled students, of which 121,008 were Bachelor’s degree students (undergraduate students) (47,722 men and 73,286 women) [81].

Sampling frame and study sample

The study’s sampling frame included the selection of six universities out of the 14 ‘traditional universities’ in the oPt. The selection criterion was based on region (West Bank and Gaza Strip), geographic area (north, central and south) and size of the student body in each university (in terms of the number of enrolled undergraduate students as reflected in the Higher Education Institutions Statistical Yearbook for the academic year 2014-2015). In each region, the universities were stratified by geographic area and the largest university, in terms of the number of students, was selected [81]. It is worth noting that Al-Aqsa University in the Gaza Strip had the largest number of enrolled undergraduate students. However, Al-Aqsa University was not selected because it did not compare well with the other selected universities in terms of faculties of study, especially its lack of the faculties of health sciences (faculty of study was one of our independent variables).

The list of selected universities comprised: the Arab American University Jenin (AAUJ; north), Birzeit University (central), Al-Quds University (central) and Hebron University (south) in the West Bank, and Al-Azhar University and the Islamic University, both of which are in Gaza city in central Gaza Strip. The total sample population according to the selected universities registries was 66,646 undergraduate student for the academic year 2014-2015. It is worth mentioning that An-Najah National University was initially selected for the northern geographic area of the West Bank, but the university's administration refused to provide us access to students because of university polices. As a result, it was replaced with the AAUJ because it was located in the northern geographic area of the West Bank and the next university in terms of the size of the student body. The selected universities covered the following governorates: Jenin, Ramallah, Al-Quds, Hebron and Gaza city – students from the selected universities might come from different governorates of residence. Selected characteristics of enrolled undergraduate students at the selected universities for the fall semester of the academic year 2014-2015 are presented in **Annex 1**.

Sampling method, sample size and eligibility criteria

In the current study, the initial sampling method and subsequent calculations were based on a 2-stage cluster sample design. The first stage included the selection of the largest universities that represented the different geographical area distribution of each region of the oPt. The second stage involved the selection of students, where

the number of students would be proportional to the size of the university (proportionate sampling). The sample size (SS) calculation was thus based on the following multi-stage cluster sample equation:

$SS = (t^2 * p*(1-p) * \text{design effect}) / E^2$;

where t^2 is the α risk expressed in the t-score,

p is the predicted value of the prevalence,

design effect to account for cluster sampling,

E^2 is the error.

For this method, a confidence interval of 95% (α=0.05), hence a t-score of 1.96, a predicted prevalence of WTS of p=0.15, a design effect of 1.5 and an error of E=0.04 were used. It was estimated that a total SS of approximately 460 students would be required for the study from all the universities. However, communication with the universities revealed that granting access to detailed information on students would conflict with universities' policies, which deterred us from using the proposed sampling method. In addition, the use of proportionate sampling and the SS of 460 yielded small numbers from each university, which hindered our ability to meet our research objectives.

As a result of these issues, the alternative sampling method employed was equal sampling. The use of this sampling method allowed us to explore WTS patterns

in terms of the geographical area distribution of students and ensured appropriate numbers of students from each university. Consequently, individualized analysis of each university and comparison between universities could be conducted. Thus, it was estimated that a SS of 2,304 students would be appropriate for the purpose of this study. The total SS was calculated using the following equation (infinite population SS equation):

$$SS = (z^2 * p * q) / d^2;$$

where z is the α risk expressed in the z-score,

p is the predicted prevalence, q is (1-p)

and d is the absolute precision.

In this study, a confidence interval of 95% (α=0.05), hence a z-score of 1.96, a predicted prevalence of WTS of p=0.5 and an absolute precision of d=0.05 were used. Thus, a sample of 384 students was required from each selected university. To account for non-response (estimated at 25%), a SS of 480 was requested from each selected university.

Eligible participants for this study included full-time students, men and women, who, at the of the time of the survey, were registered as undergraduate students in any academic faculty of study at one of the selected universities, were ≥17 years old and consented to participate in the study. Students who were registered as

pursuing a degree other than a bachelor (that is, Masters or higher diploma) and were not studying full-time were excluded from the study, such that our sample could reflect homogeneity of the undergraduate student body. Each student at the selected university who had access to internet services and utilized the university-student portal page was part of the random study sample. Student participation was based on their self-selection in agreeing to partake in the study (voluntary sample).

Data collection tools

The data collection tool of the study included a questionnaire designed to explore the prevalence of WTS and associated factors among university students in the oPt. More than two thirds of the questions were taken from the following surveys: the GATS/National Adult Tobacco Survey (NATS), the GYTS/National Youth Tobacco Survey (NYTS), the GHPSS and the FHS [70, 82, 83]. The first two surveys are nationally standardized questionnaires, supported by the TFI and CDC, and the third survey is a standardized school-based survey conducted in all WHO states. The last survey is a nationally representative survey conducted by the PCBS. Questions from the Arabic-translated and validated Qatar GATS were used in our study because of its use of formal Arabic. The remaining questions were either developed by researcher or adopted from relevant studies in the literature, and were evaluated for language, accuracy, relevancy and cultural appropriateness by the Institute of Community and Public Health (ICPH) council.

The final questionnaire consisted of eight sections, which were: **socio-demographic characteristics** (gender, date of birth, marital status, governorate of residence and locale type, current residence (with parents or not), ownership of a private car/bicycle/motorcycle, employment status, final score on the tawjihi (or high school equivalent exam), parental highest educational attainment, self-reported comparative economic standing; 15%); **university-related characteristics** (name of university, undergraduate student status, full-time student status, current year at university, faculty of study, cumulative university grade point average (GPA), financial assistance with schooling; 9%); **tobacco smoking practices and behavior for waterpipe and cigarette** (current smoking status, past smoking status for ex-smokers, average number of WTS sessions and average number of cigarettes per day/week/month, age at initiation of WTS and cigarette smoking, curiosity about WTS, ever-trying WTS, quitting, duration of WTS session, sharing the waterpipe with others, number of heads smoked during a waterpipe session; 24%); **the smoking environment** (smokers at current residence for waterpipe and cigarette, monthly expenditure on leisure activities, the presence of waterpipe at current residence, agreeing to a smoking offer by a friend, smoking on university premises, reasons for smoking and the social smoking environment, such as: smoking place, smoking with others, use of flavored tobacco and mixing other substances with the water in the waterpipe bowl; 17%); **knowledge, perceptions and attitudes towards WTS** (main source of information on WTS, who discourages WTS, health-related knowledge,

perception of addiction, perception of harm, second-hand smoking, health warnings on WTS products; 13%); **health indicators** (quality of life and overall health, doctors' visits and exercise; 12%); **opinions on WTS** (ban of WTS in public and private places, social connotations associated with WTS; 5%) and **the use of electronic cigarettes** (5%). The percentages indicate the proportion of each section from the whole tool. **Annex 2** presents the Arabic web-based survey.

The web-based questionnaire was built using Google forms and consisted of 27 pages (with a varying number of questions in each page, ranging from one-fourteen questions). A skip pattern was added for the questions on university-related characteristics to apply the exclusion criteria. In addition, some questions requested detailed sub-questions, which only applied to specific participants (based on their previous responses). Thus, a skip pattern was built to help participants navigate between questions and save time. The average time to complete the questionnaire was estimated at 10-15 minutes. The questionnaire link was placed on the student-university portal page or student-specific electronic page (in compliance with the universities policies) to ensure that the students' responses reflected those at the selected universities.

One qualitative focus group discussion (FGD) with undergraduate students (n=7) at Birzeit University was conducted in order to offer some insight on some of the study's results which needed clarification. The FGD took place during the first week of July, 2015.

The fieldwork process

The fieldwork began with a pilot study prior to the actual study. In the pilot study, the clarity and flow of questions and the whole process of contacting and communicating with the university, posting the questionnaire link on the student-university portal page, recording the time needed to complete the questionnaire and the time needed to reach the required sample size, were tested. The pilot study was conducted on Bethlehem University students in Bethlehem governorate (this university was not part of the selected study universities). The university was contacted through email and visits and approval to conduct the study was granted by the university's administration (**Annex 3**). The pilot questionnaire was completed through two approaches: paper-based and web-based. In the paper-based survey, 100 random students were approached (on January 21st 2015) and for the web-based survey, the data of the first eligible 100-students to respond to the questionnaire were used (January 26th – January 31st 2015). A completion rate was calculated for the web-based survey, which is a measure of the number of *completed* surveys by eligible participants divided by the total number of respondents who *entered* the survey whether they *agreed* to participate or not [84]. According to the number of returned questionnaires, the completion rate for the pilot web-based survey was 90%. Overall, there were no major problems with the questions as reflected through the paper and web-based pilot results.

The actual fieldwork took place between February 11th and April 11th 2015. For each university, a series of visits, emails and phone calls were carried out. In some universities, flyers were distributed around campus to facilitate announcing the questionnaire as some students were not frequent users of their university-student portal/electronic page. The link of the final and modified Arabic version of the questionnaire was placed on the universities electronic systems, where data collection took place. Periodic reminders were sent once a week to the selected universities, through email or phone, to track the progress of data collection. The time-range for collecting the required SS from each university differed among universities (one week – 2 months). It is worth mentioning that Hebron University and Al-Quds University did not reach the required SS during the allocated time for data collection. The final SS was 2,146 students and completion rates were calculated for the study sample. After the conclusion of the data collection period, universities were thanked for their participation and cooperation (**Annex 3**).

Ethical considerations

A letter was submitted to the Research Ethics Committee at the ICPH at Birzeit University to request approval on conducting the study, followed by a presentation to the Institute's council. The committee and council reviewed and approved the thesis project request. An official letter was sent (through fax or email) to the contact person(s) at the selected universities to request approval on conducting the study (**Annex 3**). An overview of the study and its objectives were presented to

the students prior to obtaining their consent online. A question on agreeing to participate was provided at the end of the introductory message. Participants were ensured complete confidentiality on their names and personal information, as questionnaires were anonymous. It was explained to participants that their participation was voluntary and that they can withhold from answering any question, and that they could choose to withdraw from the study at any point (**Annex 2**). Funding for this study was provided by the Scientific Research Committee at Birzeit University.

Study measures and variables

Dependent variable: The primary outcome variable in this study was current WTS status. In the GATS, current waterpipe smokers are those who smoke waterpipe, on a daily or less than daily basis, regardless of other types of tobacco smoked. According to the GATS, daily means smoking at least one tobacco product every day or nearly every day over a period of a month or more. The primary outcome question was: '*Do you currently smoke waterpipe on a daily, less than daily, or not at all?*' Response options included: daily, less than daily and not at all. In the analysis, current WTS status was recoded into a current (daily and less than daily) and not a current smoker.

Independent variables: These included questions on selected socio-demographic and university-related characteristics and social factors (**Annex 2**). Some of the variables were changed and/or recoded and were not used in their original form, for

descriptive and analytical purposes. For instance, age of participants was recoded from a continuous to a categorical variable with five categories (which corresponded to the year at university) and used for the analysis. However, to account for missing cases, especially for the purposes of the logistic regression, missing cases were replaced with the mean age of the study sample (~20 years old). Locale type was recoded into urban/camp and rural because the numbers for camp were too small. For current residence, the variable was recoded into the different geographic areas of the West Bank and Gaza Strip, as well as West Bank and Gaza Strip regions. Employment status was recoded into currently employed and not currently employed because of small numbers. Living arrangement was recoded into 'living with family' and other. Current cumulative GPA at university was recoded from a continuous into a categorical variable (three categories). Faculty of study was recoded into three categories (health sciences, sciences and arts/humanities/social sciences), which were found to be associated with current WTS status in the literature [43]. The smoking environment was analyzed using two variables, having at least one waterpipe smoker and having at least one cigarette smoker at current residence.

Other variables: Smoking patterns according to the criteria set by the WHO for cigarette smoking and by Maziak et al. specifically for WTS [32], were regular WTS, defined as $\geq$ 1 waterpipe session/week, and occasional WTS, defined as $<$ 1 waterpipe session/week. As for cigarette smoking, regular cigarette smoking was defined as $\geq$ 1 cigarette/day and occasional cigarette smoking as <1 cigarette/day

[32]. Age of initiation and duration of the last WTS session were used in their continuous form. Number of waterpipe heads smoked during the last session was recoded into two categories.

Statistical data analysis

Descriptive statistics: Descriptive summaries were computed to determine the sample smoking prevalence and to describe the sample baseline characteristics and the smoking profile. For continuous variables, data were represented in terms of means or medians and standard deviation (SD), and for categorical variables, data were presented as percentages (%).

Bivariate analysis: Bivariate analyses were conducted to test for associations between the dependent variable (current WTS status) and the independent study variables, stratified by gender and university attended. For the categorical variables, Chi-square (χ^2) analysis was used to test for statistical significance between our dependent variable and selected independent study variables. Statistical significance was defined at $p<0.05$. Confidence intervals (95% CI) were used to examine differences among universities by their students' current smoking status.

Multivariate analysis: Logistic regression analysis was conducted to identify factors associated with the dependent variable (current WTS status). Bivariate analysis revealed that there were statistically significant differences in the prevalence of WTS between women and men and also in the sample baseline characteristics, hence, three

regression models were computed, with one model for the total sample, one for women only and another for men only. Selected study variables that were found to be statistically significant in the bivariate analysis were included in the regression models, which included: gender, age, university attended, self-reported economic standing, university cumulative GPA, current cigarette smoking status, ownership of a waterpipe at current residence, having at least one waterpipe smoker and having at least one cigarette smoker at current residence. It is worth noting that region of residence (and geographic area of residence) and university attended provided the same information, as students from the West Bank universities were from the various West Bank governorates (the same was reflected for students from the Gaza Strip where almost all of the students' residence was in the Gaza Strip). Thus, university attended was selected and included in the regression models. The results of the regression models were presented by the adjusted odds ratio (AOR), confidence intervals (95% CIs) and probability values (p-values). Data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 22.0.

CHAPTER 3: RESULTS

Baseline sample characteristics

Table 1 and **Table 2** show the socio-demographic and university-related characteristics of the study sample, respectively, stratified by gender. A total of 2,146 women and men Palestinian university students participated in this study, with a mean age of 20.1 (SD=2.1) (age ranged from 17-26 years old). However, there were 28 participants (undergraduate students) older than 26 years old, of which 16 were from Al-Islamic and Al-Azhar Universities in the Gaza Strip. The sample was 49.8% men and 50.2% women (N=1,069 and N=1,077, respectively). More than half of participants were from the West Bank (64.1%) and 35.9% were from the Gaza Strip (geographic region of residence). West Bank participants were almost equally distributed among the northern (18.2%), central (24.3%) and southern (21.5%) geographic areas of the West Bank, whereas those from the Gaza Strip predominantly came from Central Gaza Strip (24.0%), which includes Gaza City. More than half of the participants (56.2%) were urban dwellers, followed by 34.0% who were from rural areas and 9.7% who resided in camps. At the time of the survey, 86.1% of participants resided with their families, where the majority (91.1%) was single and only 15.3% were employed. Among participants, 62.3% and 55.8% reported that their fathers and mothers, respectively, had attained an education level of tawjihi and

above. Over a third (36.3%) of students self-rated their economic standing as good compared to their classmates (**Table 1**).

For university-related characteristics, less than a third of participants were in each class year and more than half (55.1%) were studying in the faculties of arts, humanities and social sciences, followed by 26.5% and 18.4% studying in the faculties of sciences and health sciences, respectively. The majority (89.0%) had a current cumulative grade point average (GPA) of 70 and above (**Table 2**).

Some of the baseline sample characteristics showed statistically significant variation between women and men. For instance, there were more men (22.7%) in the age group 22 years and older than there were women in the same age group (12.3%). In addition, a higher employment rate was reported among men (25.1%) compared to women (5.7%), more women (89.2%) lived with their family compared to men (83.1%) and men were generally less satisfied with their economic standing compared to women (34.0% versus 25.7%). For current faculty of study, a higher proportion of men (31.7%) studied in the faculties of sciences than women (21.3%), and the opposite trend was true for the faculties of health sciences (22.1% among women and 14.7% among men studied in the health sciences faculties), and women generally had higher cumulative GPA than men (44.1% versus 30.3%; **Table 1** and **Table 2**).

Table 1: Baseline sample socio-demographic characteristics, stratified by gender.

Variable/ Category	Total (N=2,146)		Women (N=1,077)	Men (N=1,069)
	n	%	%	%
Age (in years)				
≤ 18 years old	428	20.7	23.6***	17.9***
19 years old	462	22.4	23.1	21.7
20 years old	446	21.6	22.5	20.8
21 years old	366	17.7	18.6	16.9
≥ 22 years old	361	17.5	12.3	22.7
Marital status				
Single	1956	91.1	86.7***	95.6***
Other [a]	190	8.9	13.3	4.4
Locale type of residence				
Urban	1207	56.2	59.7**	52.8**
Rural	730	34.0	31.9	36.1
Camp	209	9.7	8.4	11.1
Geographic area of residence				
North West Bank	391	18.2	12.5***	23.9***
Central West Bank	522	24.3	25.8	22.8
South West Bank	462	21.5	29.2	13.8
North Gaza Strip	121	5.6	4.1	7.2
Central Gaza Strip	514	24.0	22.0	25.9
South Gaza Strip	136	6.3	6.4	6.3
Current residence				
With family	1847	86.1	89.2***	83.1***
Other	297	13.9	10.8	16.9
Current employment status				
Yes, employed	329	15.3	5.7***	25.1***
Not employed, but looking for a job	605	28.2	22.0	34.4
Not employed	1212	56.5	72.3	40.5

High school tawjihi or equivalent grade				
≤ 69.9	258	12.2	7.8***	16.6***
70.0-79.9	531	25.1	20.1	30.2
80.0-89.9	707	33.4	34.3	32.6
≥ 90.0	619	29.3	37.9	20.6
Father's highest educational status				
BA and higher	839	39.1	37.4	40.8
Tawjihi	499	23.3	24.1	22.4
Diploma	314	14.6	14.9	14.3
Less than tawjihi	469	21.9	22.1	21.6
I don’t know	25	1.2	1.4	0.9
Mother's highest educational status				
BA and higher	520	24.2	22.8*	25.6*
Tawjihi	677	31.5	32.5	30.6
Diploma	288	13.4	15.4	11.4
Less than tawjihi	635	29.6	28.2	31.0
I don’t know	26	1.2	1.0	1.4
Self-reported economic standing				
Poor-satisfactory	640	29.8	25.7***	34.0***
Good	779	36.3	37.1	35.5
Very good-excellent	650	30.3	33.8	26.8
I refuse to answer	77	3.6	3.3	3.8

*Significant at the <0.05 level; **Significant at the <0.01 level; ***Significant at the <0.001 level; [a] Other includes: engaged, married, separated, divorced, widowed

Table 2: Baseline sample university-related characteristics, stratified by gender.

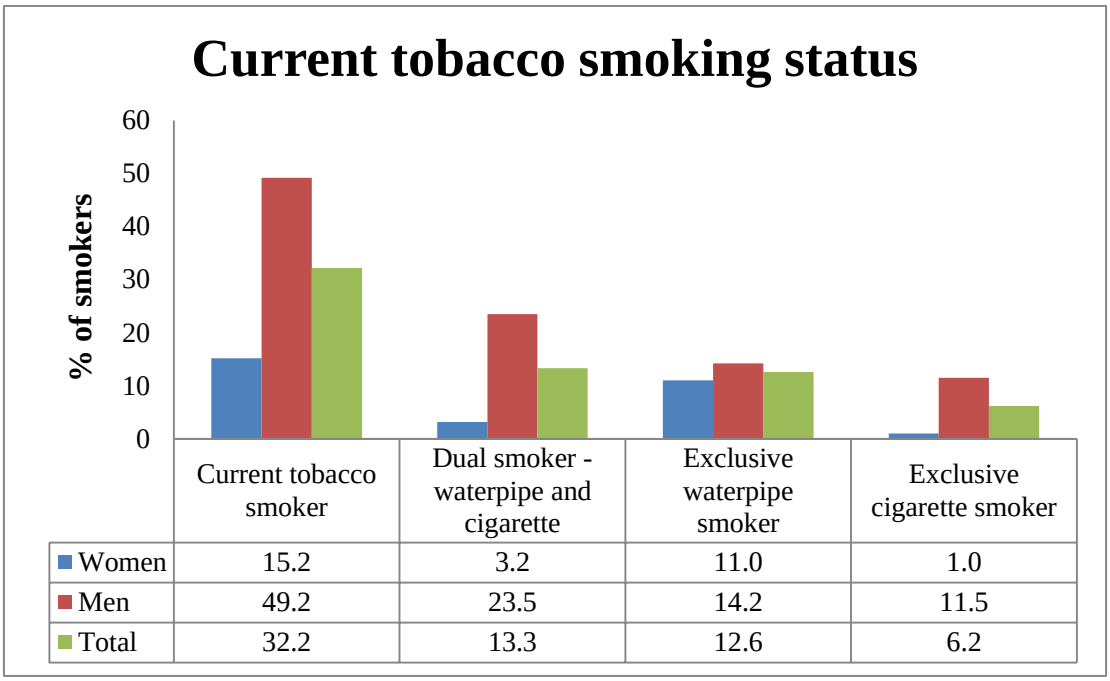
Variable/ Category	Total (n=2,146)		Women (n=1,077)	Men (n=1,069)
	n	%	%	%
University attended				
AAUJ [a]	384	17.9	12.4***	23.4***
Birzeit University	384	17.9	18.8	17.0
Al-Quds University	255	11.9	10.7	13.1
Hebron University	355	16.5	25.8	7.2
Al-Azhar University	384	17.9	13.7	22.1
Al-Islamic University	384	17.9	18.6	17.2
Current year in university				
First year	616	28.9	30.8***	27.0***
Second year	491	23.0	22.7	23.4
Third year	488	22.9	23.9	21.9
Fourth year	396	18.6	18.6	18.6
Fifth year and above	140	6.6	4.0	9.2
Current faculty of study				
Arts & Humanities	1158	55.1	56.5***	53.6***
Sciences	558	26.5	21.3	31.7
Health Sciences	387	18.4	22.1	14.7
Current cumulative university grade point average (GPA)				
≤ 69.9	231	10.9	7.4***	14.5***
70.0-79.9	1094	51.8	48.4	55.2
≥ 80.0	786	37.2	44.1	30.3
Financial assistance for current schooling				
Yes, financial aid	720	3.2	3.2**	3.1**
Yes, loan	390	18.2	20.3	16.0
Yes, scholarship	262	12.2	13.6	10.8
No	1305	60.8	56.8	64.8
I refuse to answer	121	5.6	5.9	5.3

*Significant at the <0.05 level; **Significant at the <0.01 level; ***Significant at the <0.001 level; [a] AAUJ: Arab American University Jenin

Some socio-demographic and university-related characteristics of participants also varied by university attended between women and men (**Annex 4**). Overall, men had a higher employment rate than women. The highest employment rate for men was for students at Al-Quds University (40.7%) and lowest for students at Al-Azhar University (13.1%). As for women, the highest employment rate was for students attending Al-Quds University (8.7%), and lowest for students at Hebron University (2.5%). As for faculty of study, most participants (women and men) were studying at the faculties of arts, humanities and social sciences with very few women studying in the faculties of science. The highest percentage of women studying in the faculties of arts, humanities and social sciences was at Al-Islamic University Gaza (66.5%) and the highest percentage for men was at Al-Azhar University (67.2%). AAUJ had the highest percentage of women studying at the faculties of health sciences (55.3%) and Birzeit University had the highest percentage of men studying in the various faculties of science (57.7%). Among the six universities, women scored higher than men in their cumulative university GPA. Students at AAUJ had the highest academic performance of 80 and above (29.6% among men and 59.8% among women) compared to the other universities. In addition, compared to the other universities, Al-Azhar male students had the lowest cumulative GPA of 80 and above (24.0%) and Birzeit female students had the lowest cumulative GPA of 80 and above (35.9%).

Prevalence and patterns of WTS among the study sample

Figure 2 shows the proportion of smokers by their current (daily or less than daily) smoking status in our study sample. Overall, 32.2% of students were current tobacco smokers of either waterpipe or cigarettes, with a substantial difference between men (49.2%) and women (15.2%; p-value <0.001). Among the current tobacco smokers, the exclusive WTS prevalence was slightly higher among men compared to women (12.6% overall, 14.2% men and 11.0% women; p-value <0.05). In contrast to exclusive WTS, the prevalence of exclusive cigarette smoking was considerably higher among men than women (6.2% overall, 11.5% men and 1.0% women; p-value<0.001). Regardless, the overall prevalence of exclusive WTS was higher than exclusive cigarette smoking, for both men and women. As for dual cigarette and waterpipe smoking, we see the same trend of considerably higher prevalence among men compared to women (13.3% overall, 23.5% men and 3.2% women; p-value<0.001).



	Current tobacco smoker	Dual smoker - waterpipe and cigarette	Exclusive waterpipe smoker	Exclusive cigarette smoker
Women	15.2	3.2	11.0	1.0
Men	49.2	23.5	14.2	11.5
Total	32.2	13.3	12.6	6.2

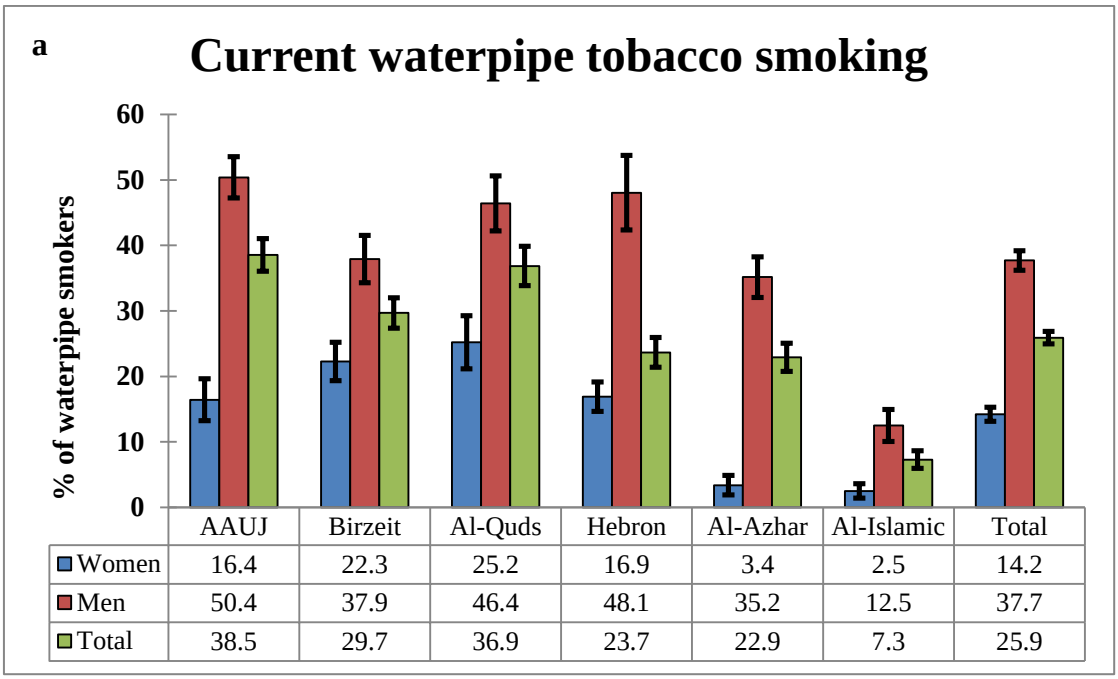
Figure 2: Proportion of participants by their current (daily and less than daily) smoking status (either cigarette, waterpipe or both), stratified by gender.

As for the prevalence of our dependent variable, current (daily and less than daily) WTS, it was 25.9%, with a considerably higher prevalence among men (37.7%) compared to women (14.2%; χ^2=154.25 and p-value<0.001). In addition, the prevalence of current cigarette smoking was 19.5%, which was lower than the prevalence of WTS. Current cigarette smoking also showed gender variation, with a higher smoking prevalence among men (35.0%) compared to women (4.2%; χ^2=324.07 and p-value<0.001). Noteworthy was the higher prevalence of WTS compared to cigarette smoking among women and the smaller gender gap for WTS compared to the gender gap for cigarette smoking.

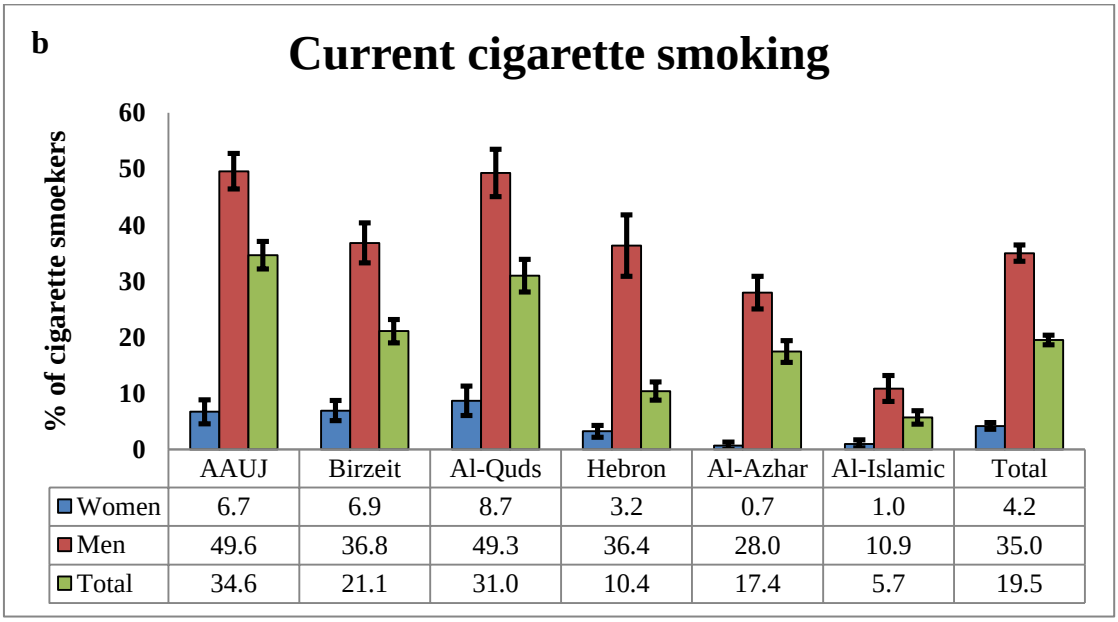
Figure 3 shows current WTS and cigarette smoking prevalence by university attended. The prevalence of current WTS varied by university attended and it ranged from 7.3% (in Al-Islamic University Gaza) to 38.5% (in AAUJ in the West Bank). Hebron University students had the lowest WTS prevalence (23.7%) among the West Bank universities and Al-Islamic University students had the lowest WTS prevalence (7.3%) among the universities in the Gaza Strip. As for cigarette smoking, the prevalence among the study sample also varied by university attended and it ranged from 5.7% (Al-Islamic University Gaza) to 34.6% (in AAUJ in the West Bank). The highest cigarette smoking prevalence was among students at AAUJ (34.6%), and lowest among students at Hebron University (10.4%) in the West Bank. As for Gaza Strip, the prevalence of cigarette smoking was lower in Al-Islamic University (5.7%) compared to Al-Azhar University (17.4%). The reflected trend is that the prevalence of WTS was higher than cigarette smoking across universities. Some statistically significant variation existed between universities as reflected in **Figure 3**.

In addition, the men-to-women gender gap varied across universities and oPT regions. It is worth highlighting that the men-to-women gender gap for WTS was smaller than the gap for CS across universities. The largest gender gap for WTS was observed among students at Al-Azhar University (~10:1) and lowest among students at Birzeit University (1.7: 1). For cigarette smoking, the gender gap differences were more pronounced and ranged from about 5:1 at Birzeit University to 40:1 at Al-Azhar

University Gaza. Overall, the smoking gender gap was more noticeable for universities in the Gaza Strip, compared to the West Bank.



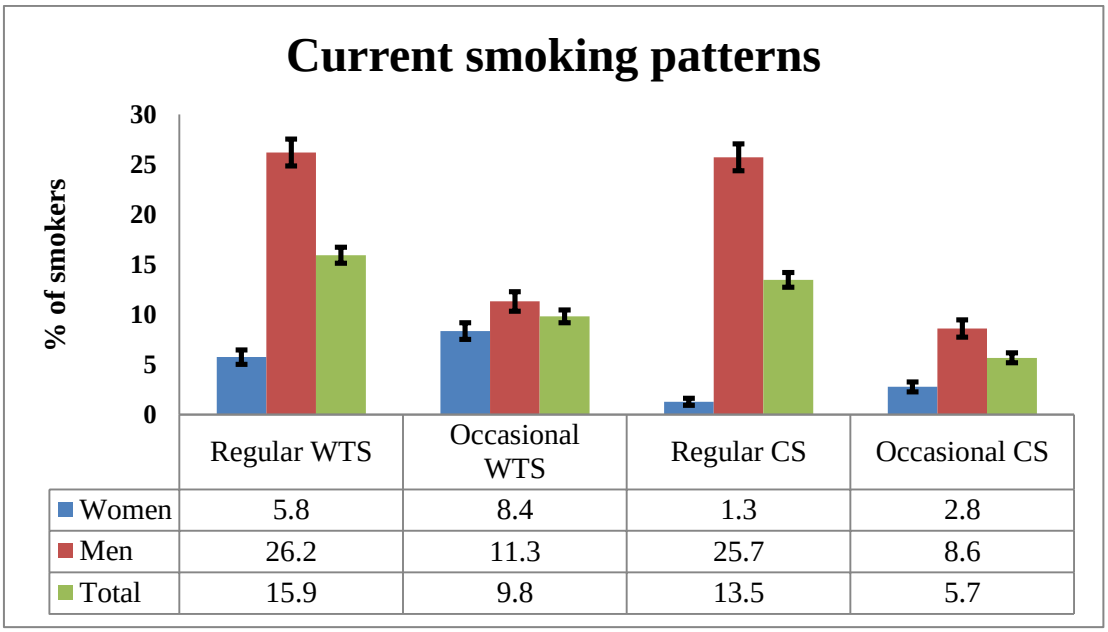
	AAUJ	Birzeit	Al-Quds	Hebron	Al-Azhar	Al-Islamic	Total
Women	16.4	22.3	25.2	16.9	3.4	2.5	14.2
Men	50.4	37.9	46.4	48.1	35.2	12.5	37.7
Total	38.5	29.7	36.9	23.7	22.9	7.3	25.9



	AAUJ	Birzeit	Al-Quds	Hebron	Al-Azhar	Al-Islamic	Total
Women	6.7	6.9	8.7	3.2	0.7	1.0	4.2
Men	49.6	36.8	49.3	36.4	28.0	10.9	35.0
Total	34.6	21.1	31.0	10.4	17.4	5.7	19.5

Figure 3: Proportion of respondents who are current (daily or less than daily) tobacco smokers for waterpipe (a) and cigarettes (b) by university attended, stratified by gender.

Figure 4 presents the smoking patterns of both, waterpipe and cigarette smoking, stratified by gender. The figure shows a higher prevalence of regular WTS (15.9%) compared to occasional WTS (9.8%) among the study sample. Both patterns of WTS use showed a considerably higher prevalence among men compared to women (regular WTS, χ^2=167.24 and p-value<0.001, and occasional WTS, χ^2=5.31 and p-value=0.021). As for the prevalence of cigarette smoking, both patterns (regular, 13.5% and occasional, 5.7%) were lower compared to the prevalence of WTS. The same gender variation was reflected for cigarette smoking patterns as well. Overall, regular and occasional WTS patterns surpassed cigarette smoking. Also, regular use patterns for both waterpipe and cigarettes predominated among men, while occasional use patterns of waterpipe and cigarettes predominated among women.

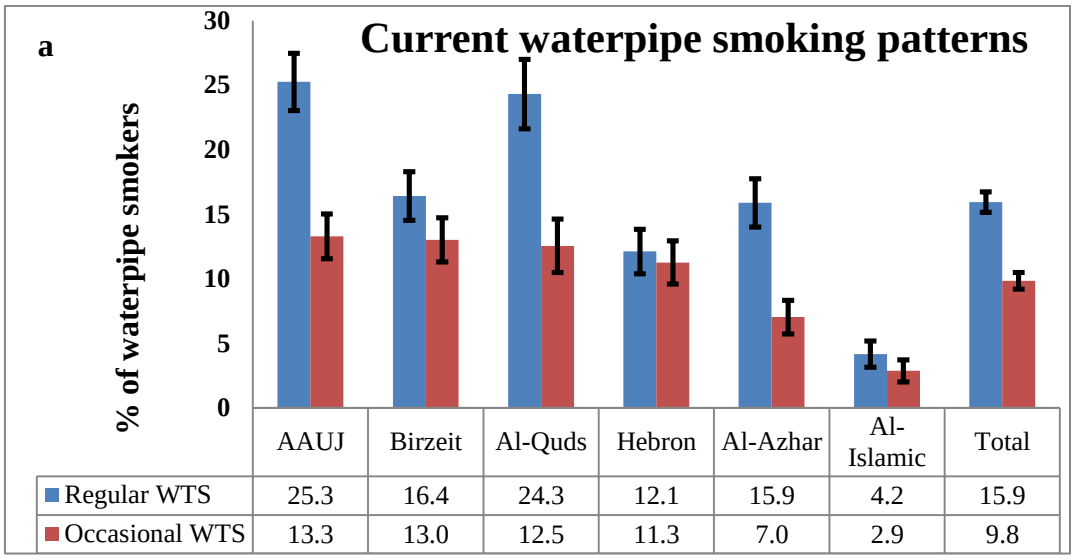


	Regular WTS	Occasional WTS	Regular CS	Occasional CS
Women	5.8	8.4	1.3	2.8
Men	26.2	11.3	25.7	8.6
Total	15.9	9.8	13.5	5.7

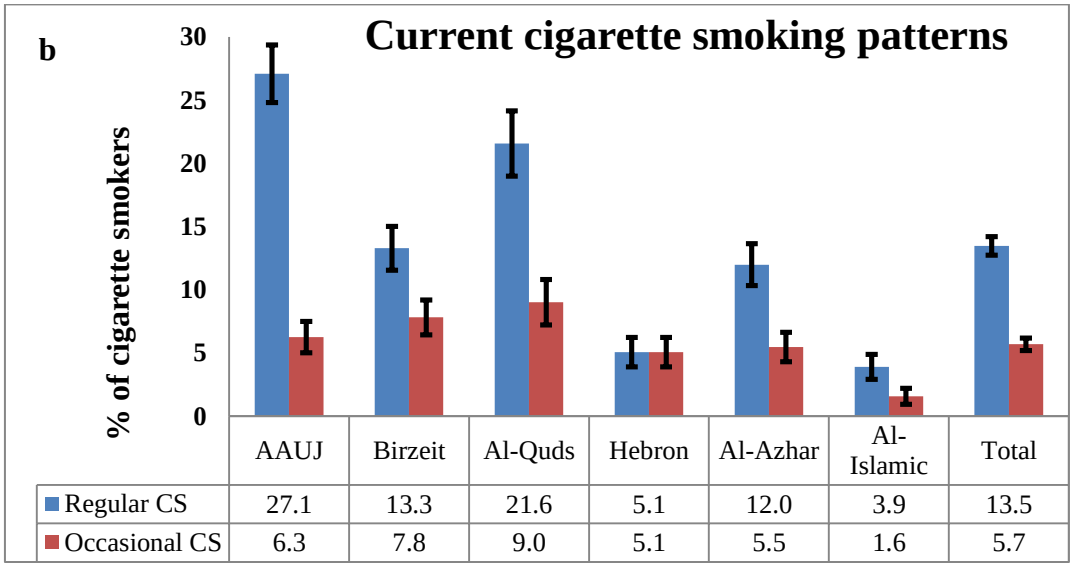
Figure 4: Proportion of respondents who are current tobacco smokers (daily or less than daily) for waterpipe and cigarettes, stratified by gender.

*The totals for regular and occasional smoking patterns, for both cigarette and waterpipe, might not add up to the totals reflected for current WTS and cigarette smoking because of the presence of mandatory questions in the questionnaire.

Regular and occasional waterpipe and cigarette smoking patterns, by university attended, are presented in **Figure 5**. The prevalence of regular WTS (15.9%) was higher than the prevalence of occasional WTS (9.8%) and the same trend was seen for cigarette smoking (13.5% for regular and 5.7% for occasional), across all universities. The prevalence of regular WTS by universities ranged from 27.1% in AAUJ to 3.9% in Al-Islamic University Gaza. As for occasional WTS, the prevalence ranged from 6.3% in AAUJ to 1.6% in Al-Islamic University Gaza. In comparison, the prevalence of regular cigarette smoking also had its highest prevalence in AAUJ (27.1%) and had its lowest in Al-Islamic University Gaza (3.9%). The trend for occasional cigarette smoking varied from regular cigarette smoking, with the highest prevalence present in Al-Quds University (9.0%) and lowest in Al-Islamic University Gaza (1.6%). Some statistically significant variation existed between universities as reflected in **Figure 5**.



	AAUJ	Birzeit	Al-Quds	Hebron	Al-Azhar	Al-Islamic	Total
Regular WTS	25.3	16.4	24.3	12.1	15.9	4.2	15.9
Occasional WTS	13.3	13.0	12.5	11.3	7.0	2.9	9.8

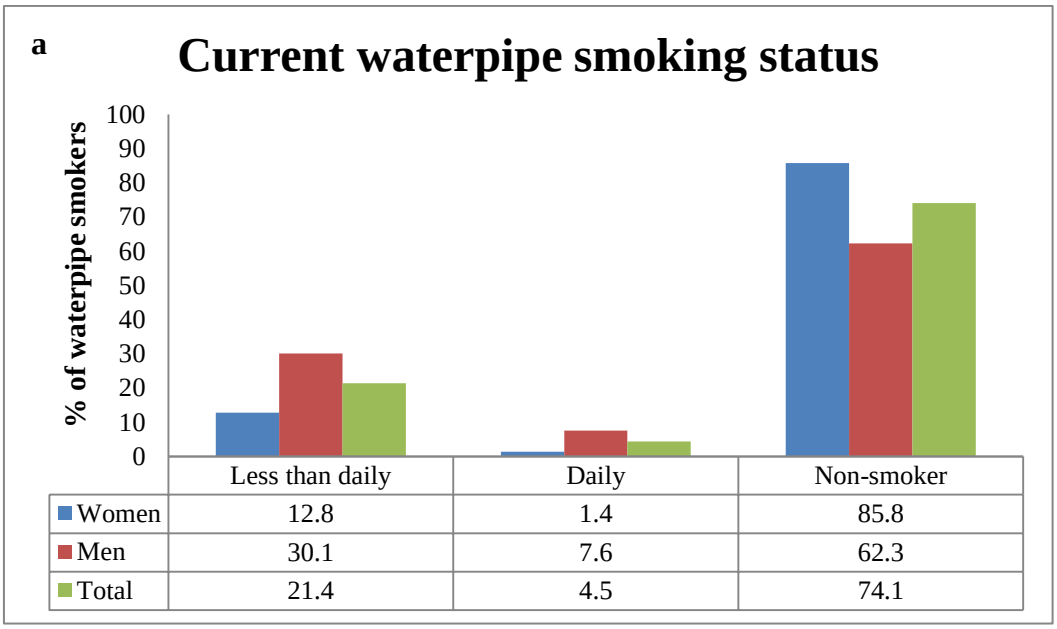


	AAUJ	Birzeit	Al-Quds	Hebron	Al-Azhar	Al-Islamic	Total
Regular CS	27.1	13.3	21.6	5.1	12.0	3.9	13.5
Occasional CS	6.3	7.8	9.0	5.1	5.5	1.6	5.7

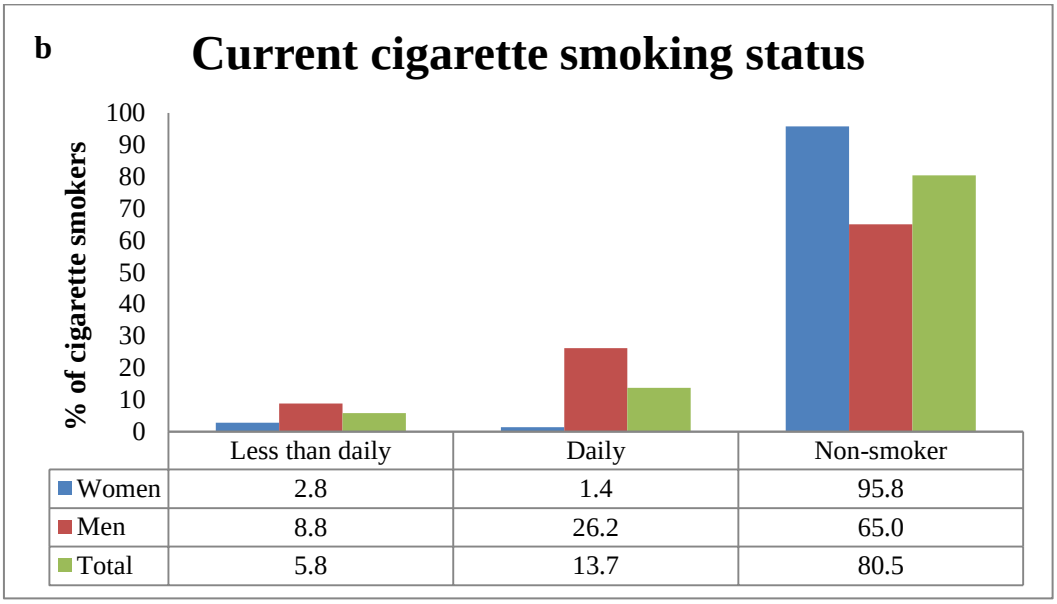
Figure 5: Proportion of respondents who are current regular and occasional smokers for waterpipe (a) and cigarettes (b) by university attended.

*The totals for regular and occasional smoking patterns, for both cigarette and waterpipe, might not add up to the totals reflected for current WTS and cigarette smoking because of the presence of mandatory questions in the questionnaire.

Other smoking patterns include smoking on a daily or less than daily basis. Results showed that the prevalence of less than daily smoking was higher for waterpipe (21.4%) than for cigarettes (5.8%), while the opposite was true for daily smoking, where the prevalence was higher for cigarette smoking (13.7%) than for WTS (4.5%; **Figure 6**). Additionally, among those who do not currently smoke waterpipe, the prevalence of ever waterpipe smoking was 45.7% (among women, 39.3% ever tried WTS, and among men, 54.7% ever tried WTS; χ^2=125.63 and p-value <0.001). Moreover, the median age of initiation for current waterpipe tobacco smokers was 17.0 years (SD=2.5), compared to a lower median age of initiation among current cigarette smokers of 16.0 years (SD=2.9). About two thirds (69.5%) of participants reported that during their last WTS session, they smoked ≤1 waterpipe heads and 30.5% smoked 2 waterpipe heads and above. No statistically significant gender variation was observed. On average, participants reported that the duration of their last WTS session was 63.6 minutes (SD=47.2 minutes).



	Less than daily	Daily	Non-smoker
Women	12.8	1.4	85.8
Men	30.1	7.6	62.3
Total	21.4	4.5	74.1



	Less than daily	Daily	Non-smoker
Women	2.8	1.4	95.8
Men	8.8	26.2	65.0
Total	5.8	13.7	80.5

Figure 6: Proportion of respondents by their current tobacco smoking status for waterpipe (a) and cigarette smoking (b), stratified by gender.

Some of the social patterns of current waterpipe tobacco smokers are worth highlighting (**Annex 5**). Participants identified the following primary motives for WTS: to enjoy the taste (66.7%), to accommodate social settings and gatherings (63.0%), to relive boredom (61.8%), to relive stress (58.9%), to fit with friends or peer pressure (58.2%), to relax (48.3%), to fulfill curiosity (26.3%) and to conform with the traditional tie of WTS to the Eastern culture (21.3%). Other social smoking patterns included: the smoking place, the smoking partners and the sharing of the waterpipe. The results of these patterns showed that during the last WTS session, about half of respondents (54.8%) smoked at a restaurant or coffee shop, followed by 37.3% who smoked at their home or current residence. In addition, the majority (91.9%) of current WTS smoked with others during their last WTS session and 82.9% smoked flavored tobacco ‘mu’assel.’ As for sharing the waterpipe, the majority (83.5%) of respondents had shared their waterpipe with others, with a higher proportion using the same waterpipe mouthpiece (47.7%) compared to those who changed the mouthpiece between each turn (35.8%). Moreover, the majority of participants (80.1%) indicated that they did not mix the water in the waterpipe bowl with other substances. Lastly, among current waterpipe smokers, some indicated that their waterpipe smoking increased during summer vacations (86.5%) and more than a half (57.8%) increased their WTS use during exams and periods of high stress.

WTS and its associated factors among the study sample

Bivariate and multiple logistic regression analyses for the total study sample

Bivariate analysis of current WTS status (dependent variable) and selected socio-demographic, university-related and social factors (independent variables) revealed several associations between current WTS status and selected independent variables. The prevalence of current WTS was found to be significantly higher among men (37.7%) compared to women (14.2%; p-value<0.001), students who were current cigarette smokers (68.0%) compared to those who did not smoke cigarettes (15.7%; p-value<0.001), those who owned at waterpipe at current residence (42.5%) compared to those who did not own a waterpipe (18.2%; p-value<0.001), students who had at least one waterpipe smoker at current residence (35.9%) compared who did not have smokers (17.4%; p-value<0.001) and students who had at least one cigarette smoker at current residence compared to those who did not have smokers (31.3% versus 18.4%; p-value<0.001). By age, the highest WTS prevalence was among students who were ≥22 years old (33.5%; p-value=0.004). Students who self-reported a good-excellent economic standing had the highest rates of WTS (29.7%; p-value=0.016). By university attended, students at AAUJ had the highest WTS prevalence (38.5%) and students at Al-Islamic University Gaza had the lowest WTS prevalence (7.3%; p-value<0.001). Additionally, students who had a cumulative GPA of ≤69.9 had the highest rates of WTS (39.8%; p-value<0.001; **Table 3**).

Table 3: Bivariate analysis between current waterpipe tobacco smoking status and selected variables among the study sample.

Variable/ Category	Total	Current waterpipe tobacco smoking		Test statistics	
	n	n	%	χ^2	p-value
Gender					
Women	1077	153	14.21	154.25	<0.001
Men	1069	403	37.70		
Age (in years)					
≤ 18 years old	428	100	23.36	15.64	0.004
19 years old	462	105	22.73		
20 years old	529	130	24.60		
21 years old	366	100	27.32		
≥ 22 years old	361	121	33.52		
Self-reported economic standing					
Poor-satisfactory	640	145	22.66	8.30	0.016
Good	779	202	25.93		
Very good-excellent	650	193	29.69		
University attended					
AAUJ [a]	384	148	38.54	122.78	<0.001
Birzeit University	384	114	29.69		
Al-Quds University	255	94	36.86		
Hebron University	355	84	23.66		
Al-Azhar University	384	88	22.92		
Al-Islamic University	384	28	7.29		
Current cumulative university grade point average (GPA)					
≤ 69.9	231	92	39.83	67.91	<0.001
70.0-79.9	1094	323	29.52		
≥ 80.0	786	129	16.41		
Current cigarette smoking status					
A current smoker	419	285	68.02	480.97	<0.001
Not a current smoker	1727	271	15.69		

Do you own a waterpipe at your current residence?					
No	1463	266	18.18	142.28	<0.001
Yes	670	285	42.54		
At least one person smokes waterpipe at current residence					
No	1158	201	17.36	95.81	<0.001
Yes	988	355	35.93		
At least one person smokes cigarette at current residence					
No	898	165	18.37	45.67	<0.001
Yes	1248	391	31.33		
[a] AAUJ: Arab American University Jenin					

Multiple logistic regression results revealed that men were almost 2 times as likely to be current waterpipe smokers compared to women (OR=2.202, 95% CI=1.669-2.906). Students who reported a very good-excellent economic standing were more likely to be current waterpipe smokers compared to those who self-reported a poor-satisfactory economic standing (OR=1.685, 95% CI=1.235-2.300). There was no variation in students' WTS behavior among universities except between students at AAUJ and Al-Islamic University Gaza, where Al-Islamic University Gaza students were less likely to be current waterpipe smokers compared to AAUJ students (OR=0.289, 95% CI=0.175-0.479). Students who had a cumulative GPA of 70.0-79.9 were more likely to be current waterpipe smokers compared to students who had a cumulative GPA of ≥80.0 (OR=1.353, 95% CI=1.029-1.777). Students who were current cigarette smokers were more likely to be current waterpipe smokers compared to those who were not cigarette smokers (OR=6.617, 95% CI=4.933-8.875). Students who owned a waterpipe at current residence had a

higher likelihood of being current waterpipe smokers compared to those who did not own a waterpipe (OR=2.159, 95% CI=1.655-2.815). Those who had at least one person at current residence who smoked waterpipe had higher odds to be current waterpipe smokers, compared to those who did not have waterpipe smokers (OR= 1.729, 95% CI=1.311-2.281). **Table 4** shows the univariate logistic regression (unadjusted OR) and multivariate logistic regression (adjusted OR) for current WTS status and selected variables in our study sample (the 'not a current waterpipe smoker' is the reference category).

Table 4: Univariate (unadjusted odds ratio) and multivariate (adjusted odds ratio) logistic regression model for current waterpipe smoking status among the total study sample.

Variable/ Category	**Unadjusted OR**	**95% CI**	**Adjusted OR**	**95% CI**
Gender				
Women [R]	1		1	
Men	3.65	2.96-4.51 ***	2.20	1.67-2.91 ***
Age (in years)				
≤ 18 years old [R]	1		1	
19 years old	0.97	0.71-1.32	0.92	0.63-1.35
20 years old	1.13	0.83-1.53	0.97	0.67-1.41
21 years old	1.23	0.90-1.70	0.89	0.60-1.32
≥ 22 years old	1.65	1.21-2.26 **	1.00	0.67-1.50
Self-reported economic standing				
Poor-satisfactory [R]	1		1	
Good	1.20	0.94-1.53	1.27	0.95-1.72
Very good-excellent	1.44	1.12-1.85 **	1.69	1.24-2.30 **

University attended				
AAUJ [a, R]	1		1	
Birzeit University	0.67	0.50-0.91 *	0.97	0.67-1.41
Al-Quds University	0.93	0.67-1.29	1.00	0.67-1.51
Hebron University	0.49	0.36-0.68 ***	1.03	0.69-1.53
Al-Azhar University	0.47	0.35-0.65 ***	0.69	0.47-1.02
Al-Islamic University	0.13	0.08-0.19 ***	0.29	0.18-0.48 ***
Current cumulative university grade point average (GPA)				
≥ 80.0 [R]	1		1	
70.0-79.9	3.37	2.44-4.66 ***	1.35	1.03-1.78 *
≤ 69.9	2.13	1.70-2.68 ***	1.48	0.98-2.22
Current cigarette smoking status				
Not a smoker [R]	1		1	
A smoker	0.09	0.07-0.11 ***	6.62	4.93-8.88 ***
Do you own a waterpipe at your current residence?				
No [R]	1		1	
Yes	3.33	2.72-4.08 ***	2.16	1.66-2.82 ***
At least one person smokes waterpipe at current residence				
No [R]	1		1	
Yes	2.67	2.19-3.26 ***	1.73	1.31-2.28 ***
At least one person smokes cigarettes at current residence				
No [R]	1		1	
Yes	2.03	1.65-2.49 ***	0.92	0.70-1.20

Odds ratio (OR) and Confidence Intervals (CIs) for associated factors with current WTS status; [R] reference category; WTS status reference category: not a current waterpipe smoker; Columns 2 & 3 represent results from the unadjusted model; Columns 4 & 5 represent results from the adjusted model; *Significant at the <0.05 level; **Significant at the <0.01 level; ***Significant at the <0.001 level; [a] AAUJ: Arab American University Jenin.

Bivariate and multiple logistic regression analyses for women only

Bivariate analysis of current WTS status (dependent variable) and selected independent variables showed statistically significant associations between current WTS status and several of these variables for women in the study sample. The prevalence of current WTS was statistically higher among female students who were current cigarette smokers (75.6%) compared to those who did not smoke cigarettes (11.5%; p-value<0.001), those who owned a waterpipe at current residence (28.0%) compared to those who did not own a waterpipe (8.4%; p-value<0.001), students who had at least one waterpipe smoker at current residence (24.3%) compared who did not have smokers (5.8%; p-value<0.001) and students who had at least one cigarette smoker at current residence compared to those who did not have smokers (17.2% versus 10.5%; p-value=0.002). By university attended, female students at Al-Quds University had the highest WTS prevalence (25.2%; p-value<0.001) and students at Al-Islamic University Gaza had the lowest WTS prevalence (2.5%). Additionally, students who had a cumulative GPA of ≤69.9 had the highest rates of WTS (26.6%; p-value<0.001; **Table 5**).

Table 5: Bivariate analysis between current waterpipe tobacco smoking status and selected variables among women in the study sample.

Variable/ Category	Total	Current waterpipe tobacco smoking		Test statistics	
	n	n	%	χ^2	p-value
Age (in years)					
≤ 18 years old	243	42	17.28	5.88	0.208
19 years old	237	28	11.81		
20 years old	231	29	12.55		
21 years old	191	33	17.28		
≥ 22 years old	126	17	13.49		
Self-reported economic standing					
Poor-satisfactory	277	30	10.83	4.91	0.086
Good	400	59	14.75		
Very good-excellent	364	62	17.03		
University attended					
AAUJ [a]	134	22	16.42	61.16	<0.001
Birzeit University	202	45	22.28		
Al-Quds University	115	29	25.22		
Hebron University	278	47	16.91		
Al-Azhar University	148	5	3.38		
Al-Islamic University	200	5	2.50		
Current cumulative university grade point average (GPA)					
<= 69.9	79	21	26.58	22.08	<0.001
70.0-79.9	514	85	16.54		
>=80.0	468	43	9.19		
Current cigarette smoking status					
A current smoker	45	34	75.56	145.02	<0.001
Not a current smoker	1032	119	11.53		
Do you own a waterpipe at your current residence?					
No	748	63	8.42	70.47	<0.001
Yes	321	90	28.04		

At least one person smokes waterpipe at current residence					
No	587	34	5.79	74.94	<0.001
Yes	490	119	24.29		
At least one person smokes cigarette at current residence					
No	478	50	10.46	9.89	0.002
Yes	599	103	17.20		
[a] AAUJ: Arab American University Jenin					

Multiple logistic regression results revealed that female students attending Al-Islamic University Gaza and Al-Azhar University were less likely to be current waterpipe smokers compared to students attending AAUJ (OR=0.251, 95% CI=0.086-0.728 and OR=0.233, 95% CI=0.080-0.676, respectively). Students who had a cumulative GPA of ≤69.9 were more likely to be current waterpipe smokers compared to those students who had a cumulative GPA of ≥80.0 (OR=3.262, 95% CI=1.604-6.635). Those who were current cigarette smokers had higher odds of being current waterpipe smokers compared to those who were not cigarette smokers (OR=19.673, 95% CI=8.659-44.698). Students who owned a waterpipe at current residence had a higher likelihood of being current waterpipe smokers compared to those who did not own a waterpipe (OR=2.420, 95% CI=1.545-3.792). Those who reported at least one person at current residence who smoked waterpipe had higher odds to be current waterpipe smokers, compared to those who did not have waterpipe smokers (OR=2.925, 95% CI=1.754-4.879)**. Table 6** shows the univariate logistic regression (unadjusted OR) and multivariate logistic regression (adjusted OR) for

current WTS status and for selected variables for women in our study sample (the 'not a current waterpipe smoker' is the reference category).

Table 6: Univariate (unadjusted odds ratio) and multivariate (adjusted odds ratio) logistic regression model for current waterpipe smoking status among women in the study sample.

Variable/ Category	Unadjusted OR	95% CI	Adjusted OR	95% CI
Age (in years)				
≤ 18 years old [R]	1		1	
19 years old	0.64	0.38-1.07	0.69	0.37-1.28
20 years old	0.64	0.39-1.05	0.78	0.43-1.40
21 years old	1.00	0.61-1.65	0.95	0.52-1.74
≥ 22 years old	0.75	0.41-1.37	0.79	0.38-1.64
University attended				
AAUJ [a, R]	1		1	
Birzeit University	1.46	0.83-2.57	1.51	0.77-2.95
Al-Quds University	1.72	0.92-3.20	1.63	0.78-3.44
Hebron University	1.04	0.60-1.80	1.07	0.56-2.03
Al-Azhar University	0.18	0.07-0.49 **	0.23	0.08-0.68 **
Al-Islamic University	0.13	0.05-0.35 ***	0.25	0.09-0.73 *
Current cumulative university grade point average (GPA)				
≥ 80.0 [R]	1		1	
70.0-79.9	1.96	1.33-2.89 **	1.48	0.95-2.33
≤ 69.9	3.58	1.99-6.45 ***	3.26	1.60-6.64 **
Current cigarette smoking status				
Not a smoker [R]	1		1	
A smoker	23.71	11.70-48.05 ***	19.67	8.66-44.70 ***
Do you own a waterpipe at your current residence?				
No [R]	1		1	
Yes	4.24	2.97-6.04 ***	2.42	1.55-3.79 ***

At least one person smokes waterpipe at current residence				
No [R]	1		1	
Yes	5.22	3.49-7.81 ***	2.93	1.75-4.88 ***
At least one person smokes cigarettes at current residence				
No [R]	1		1	
Yes	1.78	1.24-2.55 **	0.76	0.49-1.19

Odds ratio (OR) and Confidence Intervals (CIs) for associated factors with current WTS status; [R] reference category; WTS status reference category: not a current waterpipe smoker; Columns 2 & 3 represent results from the unadjusted model; Columns 4 & 5 represent results from the adjusted model; *Significant at the <0.05 level; **Significant at the <0.01 level; ***Significant at the <0.001 level; [a] AAUJ: Arab American University Jenin.

Bivariate and multiple logistic regression analyses for men only

Bivariate analysis of current WTS status (dependent variable) and selected independent variables showed significant associations between current waterpipe smoking status and several of these variables for men in the study sample. The prevalence of current WTS was statistically higher among male students who were current cigarette smokers (67.1%) compared to those who did not smoke cigarettes (21.9%; p-value<0.001), those who owned at waterpipe at current residence (55.9%) compared to those who did not own a waterpipe (128.4%; p-value<0.001), students who had at least one waterpipe smoker at current residence (47.4%) compared who did not have smokers (29.3%; p-value<0.001) and students who had at least one cigarette smoker at current residence compared to those who did not have smokers (44.4% versus 27.4%; p-value<0.001). Male students who self-reported a good-excellent economic standing had higher rates of WTS (45.8%; p-value=0.001). By

university attended, male students at AAUJ had the highest WTS prevalence (50.4%) and students at Al-Islamic University Gaza had the lowest WTS prevalence (12.5%; p-value<0.001). Additionally, students who had a cumulative GPA of ≤69.9 had the highest rates of WTS (46.7%; p-value<0.001; **Table 7**).

Table 7: Bivariate analysis between current waterpipe tobacco smoking status and selected variables among men in the study sample.

Variable/ Category	**Total**	**Current waterpipe tobacco smoking**		**Test statistics**	
	n	n	%	χ^2	p-value
Age (in years)					
≤ 18 years old	185	58	31.35	8.83	0.066
19 years old	225	77	34.22		
20 years old	215	85	39.53		
21 years old	175	67	38.29		
≥ 22 years old	235	104	44.26		
Self-reported economic standing					
Poor-satisfactory	363	115	31.68	13.57	0.001
Good	379	143	37.73		
Very good-excellent	286	131	45.80		
University attended					
AAUJ [a]	250	126	50.40	75.62	<0.001
Birzeit University	182	69	37.91		
Al-Quds University	140	65	46.43		
Hebron University	77	37	48.05		
Al-Azhar University	236	83	35.17		
Al-Islamic University	184	23	12.50		

Current cumulative university grade point average (GPA)					
≤ 69.9	152	71	46.71	23.39	<0.001
70.0-79.9	580	238	41.03		
≥ 80.0	318	86	27.04		
Current cigarette smoking status					
A current smoker	374	251	67.11	211.9	<0.001
Not a current smoker	695	152	21.87		
Do you own a waterpipe at your current residence?					
No	715	203	28.39	75.65	<0.001
Yes	349	195	55.87		
At least one person smokes waterpipe at current residence					
No	571	167	29.25	37.28	<0.001
Yes	498	236	47.39		
At least one person smokes cigarette at current residence					
No	420	115	27.38	31.36	<0.001
Yes	649	288	44.38		
[a] AAUJ: Arab American University Jenin					

Multiple logistic regression results revealed that male students who self-reported a very good-excellent economic standing had higher odds of being current waterpipe smokers compared to those who self-reported a poor-satisfactory economic standing (OR=1.919, 95% CI=1.303-2.826). In addition, male students attending Al-Islamic University Gaza were less likely to be current waterpipe smokers compared to AAUJ students (OR=0.300, 95% CI=0.168-0.536). Those who were current cigarette smokers had higher odds of being current waterpipe smokers compared to those who were not cigarette smokers (OR=5.858, 95% CI=4.233-8.105). Students who owned a waterpipe at current residence had a higher likelihood of being current

waterpipe smokers compared to those who did not own a waterpipe (OR=2.049, 95% CI=1.463-2.869). **Table 8** shows the univariate logistic regression (unadjusted OR) and multivariate logistic regression (adjusted OR) for current WTS status for selected variables among men in our study sample (the 'not a current waterpipe smoker' is the reference category).

Table 8: Univariate (unadjusted odds ratio) and multivariate (adjusted odds ratio) logistic regression model for current waterpipe smoking status among men in the study sample.

Variable/ Category	Unadjusted OR	95% CI	Adjusted OR	95% CI
Age (in years)				
≤ 18 years old [R]	1		1	
19 years old	1.14	0.75-1.73	1.25	0.75-2.09
20 years old	1.40	0.94-2.09	1.38	0.84-2.28
21 years old	1.36	0.88-2.10	1.02	0.59-1.73
≥ 22 years old	1.74	1.16-2.60 **	1.35	0.81-2.23
Self-reported economic standing				
Poor-satisfactory [R]	1		1	
Good	1.31	0.97-1.77	1.26	0.88-1.80
Very good-excellent	1.82	1.32-2.51 ***	1.92	1.30-2.83 **
University attended				
AAUJ [a, R]	1		1	
Birzeit University	0.60	0.41-0.89 *	0.67	0.42-1.07
Al-Quds University	0.85	0.56-1.29	0.79	0.48-1.29
Hebron University	0.91	0.55-1.52	1.19	0.65-2.16
Al-Azhar University	0.53	0.37-0.77 **	0.85	0.55-1.31
Al-Islamic University	0.14	0.09-0.23 ***	0.30	0.17-0.54 ***

Current cumulative university grade point average (GPA)				
≥ 80.0 [R]	1		1	
70.0-79.9	1.88	1.39-2.53 ***	1.17	0.82-1.68
≤ 69.9	2.37	1.58-3.54 ***	1.01	0.61-1.66
Current cigarette smoking status				
Not a smoker [R]	1		1	
A smoker	7.29	5.51-9.65 ***	5.86	4.23-8.11 ***
Do you own a waterpipe at current residence?				
No [R]	1		1	
Yes	3.19	2.45-4.17 ***	2.05	1.46-2.87 ***
At least one person smokes waterpipe at current residence				
No [R]	1		1	
Yes	2.18	1.69-2.80 ***	1.32	0.94-1.86
At least one person smokes cigarettes at current residence				
No [R]	1		1	
Yes	2.12	1.62-2.76 ***	1.05	0.75-1.48

Odds ratio (OR) and Confidence Intervals (CIs) for associated factors with current WTS status; [R] reference category; WTS status reference category: not a current waterpipe smoker; Columns 2 & 3 represent results from the unadjusted model; Columns 4 & 5 represent results from the adjusted model; *Significant at the <0.05 level; **Significant at the <0.01 level; ***Significant at the <0.001 level; [a] AAUJ: Arab American University Jenin.

Testing of the pilot web-based survey versus the paper-based survey

The results of the web-based and traditional paper-based surveys of the pilot study were compared to evaluate the web-based survey method (in terms of gaining insight on what it measures) and assess its comparability with the paper-based survey. Results revealed that the web-based survey had significantly more women participants compared to the paper-based survey (82.0% women in the web-based compared to 57.0% women in the paper-based; χ^2=14.74; p-value<0.001). The prevalence of current WTS in the paper-based survey was 44.8%, about twice as the prevalence of current WTS reported in the web-based survey (23.0%; χ^2=10.41; p-value<0.01). The same variation was found for the prevalence of current cigarette smoking (21.0% in the paper-based versus 10.0% in the web-based; χ^2=4.62; p-value<0.05; **Table 9**). There were no statistically significant differences between the web-based and paper-based surveys on the basis of faculty of study, year at university and geographic area of the participants' residence.

Table 9: Comparison between the web-based and paper-based surveys for the pilot study in Bethlehem University.

Variable/ Category	Web-based (n=100), %	Paper-based (n=100), %	χ^2	p-value
Gender				
Women	82.0	57.0	14.74	<0.001
Men	18.0	43.0		
Current waterpipe tobacco smoking status				
A current smoker	23.0	44.8	10.41	0.001
Not a current smoker	77.0	55.2		
Current cigarette smoking status				
A current smoker	10.0	21.0	4.62	0.032
Not a current smoker	90.0	79.0		

When the characteristics of the participants in the web-based survey and the paper-based survey were compared, each separately, to the overall student characteristics provided by the university, the results reflected variation in some of the selected variables. **Table 10** presents the main differences between the two survey methods in relation to the students characteristics provided by the university.

Table 10: Selected students characteristics provided by Bethlehem University and by the pilot web-based and paper-based surveys.

Variable/ Category	Bethlehem University (N=3,254), %	Web-based (n=100), % (95% CI)*	Paper-based (n=100), % (95% CI)*
Gender			
Women	77.1	82.0 (73.3-88.3)**	57.0 (47.2-66.3)
Men	22.9	18.0 (11.7-26.7)**	43.0 (33.7-52.8)
Faculty of study			
Arts and humanities	73.3	67.0 (57.3-75.4)**	79.0 (70.0-85.5)**
Sciences and health sciences	26.7	33.0 (24.6-42.7)**	21.0 (14.2-30.0)**
Year at university			
First	35.2	34.0 (25.5-43.7)**	21.0 (14.2-30.0)
Second	20.3	29.0 (21.0-38.5)	25.0 (17.6-34.3)**
Third	17.6	16.0 (10.1-24.4)**	29.0 (21.0-38.5)
Fourth and above	27.0	21.0 (14.2-30.0)**	25.0 (17.6-34.3)**
Geographic area of residence			
Central & other - West Bank	43.3	35.0 (26.4-44.8)**	44.0 (34.7-53.8)**
South - West Bank	56.7	65.0 (55.3-73.6)**	56.0 (46.2-65.3)**

*95% CI: 95% Confidence Interval for a proportion
**Actual percentage falls within the 95% CI of the two survey methods

Completion rate of the web-based survey

The completion rates of the six selected universities were as follows: AAUJ 86% (656/761*100), Birzeit University 98% (883/901*100), Al-Quds University 94% (255/270*100), Hebron University 99% (355/358*100), Al-Azhar University 93% (613/658*100) and Al-Islamic University 60% (1231/2040*100). The highest dropout rate (those who clicked the survey link and decided not to participate in the study) was for students at Al-Islamic University Gaza and the lowest dropout rate was for students attending Hebron University in the West Bank. The overall completion rate for the whole sample was 80% (3,993/4,988*100).

CHAPTER 4: DISCUSSION

Main study findings discussion

In the current study, we aimed to estimate the prevalence of WTS and explore associated factors among a sample of university students attending six selected universities in the West Bank and Gaza Strip. Exploring the WTS patterns and associated factors is imperative in informing future interventions and policies for university students, who are the target of the tobacco industry; hence they are at an increased risk of continuation of smoking into adulthood. The main study findings indicated that the prevalence of current WTS among the study sample was 25.9%, with a higher prevalence among men compared to women, and a higher prevalence compared to cigarette smoking (19.5%). The WTS prevalence also showed variation across universities, with the highest prevalence among students in the northern geographic area of the oPt and lowest in the southern geographic area of the oPt.

In relation to the first study objective, the self-reported prevalence of WTS among university students in our sample was higher than the prevalence analysis from the PCBS surveys (2000-2010). In the 2003 youth survey (N=1,788) among Palestinians in the age group (17-24 years old), the prevalence of current WTS, directly reported by this group, was 11.7%, with a higher prevalence among men (24.2%) compared to women (4.2%). In addition, proxy-reported data from the FHS and the Demographics and Health Survey (DHS) showed that the prevalence of

current WTS among the age group 17-25 years old changed from 0.7% in 2000 to 1.5% in 2010. When the sample was limited to those enrolled at university at the time of the survey, the prevalence of current WTS among the same age group indicated a change from 0.5% in 2000 to 2.0% in 2010 (Annex **6**).

Given the point prevalence data of PCBS, it is difficult to draw clear time trends for WTS prevalence, especially in light of our study results. When considering only the results of the comparison between our self-reported prevalence with that reported by the 2003 youth survey, the data could indicate an increase in the WTS prevalence, considering that both survey methods relied on self-reporting. However, comparison among all surveys, we see that the results from the 2003 youth survey were self-reported, while those from the FHS and DHS (2000, 2004, 2006 and 2010) were proxy-reported (as the mother, as one of the main household members, probably reported smoking habits of her children). In addition, the 2003 youth survey specifically inquired about smoking for, cigarettes, pipes and waterpipe, in three separate questions. In contrast, the FHS and DHS question on smoking allowed respondents to pick the most applicable tobacco type smoked, and in 2010, the survey added another category for dual cigarette and waterpipe smoking. Therefore, the proxy-reporting and the inconclusive smoking categories could suggest an under-estimation of WTS prevalence in the FHS and DHS among Palestinian youth. Consequently, these results raise questions about the actual size of the WTS problem expressed in nationally representative data in the oPt.

Compared to the WTS prevalence reported among university students in published studies in the oPt, especially the higher prevalence among men compared to women, the WTS prevalence among our sample was comparable to other studies. For instance, our result fell within the range reported by the 2007 GHPSS, which showed that the prevalence of 'other tobacco products,' mainly waterpipe, among health professional students ranged from 30.9% (among dental students) to 12.3% (among medical students), with a higher prevalence among men compared to women [39-42]. The results of the study on An-Najah National University students found a current smoking prevalence of 34.7% (52.7% for men and 16.5% for women), nevertheless, it was not specific for waterpipe, but can give an indication that our results are lower, but comparable to An-Najah National University study, especially the high WTS prevalence at AAUJ of 38.5% (also in the northern geographic area of the West Bank) [43]. When compared to the results of the study on WTS among seven universities in the Gaza Strip, the prevalence of exclusive WTS (36.0%) was considerably higher than our result for exclusive WTS (12.6%). This is important given that the prevalence of WTS in our study had the lowest rates in the Gaza Strip, reaching 22.9% and 7.3% for Al-Azhar and Al-Islamic universities, respectively [44]. There are no other published studies on current WTS specifically among university students in the oPt.

The data on the WTS prevalence in the Gaza Strip obligate further discussion. Our results on WTS among students in the Gaza Strip universities were lower than

those reported in the most recent study on WTS among university students in the Gaza Strip, which found a current exclusive WTS prevalence of 36% in 2013. The Gaza Strip has witnessed many changes in the last two years, highlighted in the 2014 war. While many studies have linked exposure to trauma and conflict to an increased risk of tobacco smoking [85, 86], the smoking prevalence in our study reflected a decrease in WTS in the Gaza Strip region after the 2014 war. This could be tied to changes in the poverty levels in the Gaza Strip after the war, and the subsequent need to redefine priorities to meet immediate needs of the people (given the amount of destruction that the region has undergone). The most recent study on WTS in Gaza universities were conducted before the 2014 war, thus, we are lacking information on how the war might have affected the smoking behavior. We are also not aware if we were able to capture the results of these changes on WTS behavior among our sample. Given our lack of knowledge and documentation on the changes and consequences of the 2014 war on the Gaza Strip, future qualitative research might be able to provide us with a more comprehensive explanation to understand the spectrum of changes and consequences of the war on the WTS behavior among university students.

Compared to the prevalence of WTS among university students in Arab countries, the prevalence of current WTS among our study sample (25.9%) was higher than the prevalence among university students in Lebanon (23.0% current waterpipe smoking), among medical students in Syria (23.5% current waterpipe

smoking), among students in three public universities in Jordan (25.0% current, on a daily or weekly basis, waterpipe smoking) and among students of University of Sharjah in the United Arab Emirates (5.6% for current WTS prevalence). However, our current WTS prevalence was lower than the prevalence reported among students at King Saud University (N=7,550) in Saudi Arabia (36.3% current WTS prevalence) [32, 47, 65, 87, 88]. These data reflect differential WTS prevalence among university students in Arab countries, and could suggest that the current WTS prevalence in the oPt is comparable to the WTS prevalence in the EMR and that the prevalence in the oPt might be following the upward trajectory of the WTS epidemic.

In comparison to the prevalence of WTS among non-Arab countries, our current WTS prevalence was lower than the prevalence reported among university students in Turkey (32.7% current waterpipe smoking), students at one university in Malaysia (30.0% current WTS prevalence), university students in Pakistan (61.8%), university students in South Africa (40% for current waterpipe smoking) and university students in the U.S. (40.5% current waterpipe smokers) [13, 30, 32, 56, 59, 89-92]. Collectively, these studies provide insight into the WTS problem among university students, yet measures and definitions are not standardized, thus caution is taken into account with interpretations of results. Regardless, our results were more in line with countries of the EMR than in other regions. These differences can be traced back to the cultural origin of WTS and the degree of its social and cultural acceptability in different parts of the world.

The smoking profile and patterns of our study sample were overall consistent with the published literature. For instance, the age of initiation of WTS among our study sample (17.0 years old, SD=2.5) was higher than the age of initiation of cigarette smoking (16.0 years old, SD=2.9), with a small gap, for which other studies grant support [28, 43, 91]. Indeed, the age of initiation of WTS among our study sample coincides with a transitional period for students where they move from high school to university. Some studies have alluded to the idea that this transitional period is critical for changes in behavior, including smoking, especially with the decreased control from parents [44, 93]. These findings should be taken into account when considering interventions, with the aim of preventing smoking initiation and promoting cessation [93]. In addition, the age of initiation of WTS has also been linked to an expression of personal freedom and emancipation, such that growing up coincides with voicing the need for social freedom [43, 64, 94, 95], corroborating the changes in smoking behavior in the transitional period to university. Moreover, the social acceptability of WTS makes young adults more open to sharing their WTS habits with their parents [94], giving WTS an early onset. Despite these findings, WTS is still evolving and attracting a wide range of people of different ages, thus the picture on age of initiation is not yet clear [28].

The average WTS duration among our study sample was about 60 minutes, which falls within the range of WTS duration reported in other studies [28]. This is one of the main differences between cigarette and waterpipe smoking, owing perhaps

to the generally individualistic nature of cigarette smoking versus the social nature of WTS [28]. Some studies have also described the intermittent nature of WTS compared to cigarette smoking [28], which has been supported by studies in the EMR and elsewhere. This finding was consistent with our study where less than daily smoking for waterpipe predominated over daily habits, while the opposite was true of cigarette smoking. This could tie back into the social nature of WTS, where WTS is common in social settings and gatherings with family and friends [28, 64].

In addition, more than 80% of our study sample smoked flavored tobacco, which has a sweet aroma and pleasant flavor, and which corresponds to what has been reported about the role of mu'assel specifically in the WTS sharp rise among the youth [28]. This calls for attention in targeting the tobacco industry and its various marketing and promotion techniques. Moreover, smoking with others and sharing of the same waterpipe (same or different mouthpieces) were also characteristic features of our study sample smoking habits. These findings as well correspond to the social nature of WTS presented in the literature, and highlight the need to raise awareness on the health hazards of sharing the same waterpipe in conjunction with targeting the social smoking environment for prevention. At the same time, this suggests a need to differentiate between beginners and established smokers (which are thought to exhibit different behaviors, and require different types of interventions) [28].

Reasons given for WTS among university students in our study sample resemble those that were reported in the literature [7, 19, 47, 48, 56-66]. The top five

motives that university students in our sample shared for their smoking were: to enjoy the taste or flavor, to accommodate social settings and gatherings (to socialize), to relive boredom or to fill free time, to relive stress and to fit in with friends. The sweet aroma, the waterpipe attractive design and the fruity flavor have been cited by many studies as reasons for the popularity of WTS among young adults [28]. Other studies have also explained that WTS is a symbol of cultural hospitality in the Middle Eastern culture, thus encouraging youth WTS in social gatherings [5]. In addition, a multi-country study among four Arab countries has explored the gendered motives for WTS, especially among women. Mainly, participants viewed WTS as a sign of power and strength and a gateway for women to take control of their lives and prove themselves. In other words, WTS was seen as one step towards, "gender equalization and women's rights" [94]. In contrast to other published studies, 'culture' was rated lowest as a motive for WTS, nevertheless, culture was expressed as a factor that encourages smoking rather than a reason, due to its social acceptance [2, 5, 28, 64, 65]. These reasons for smoking, while not confined to our study sample, raise the issue of the lack of recreational activities for youth and young adults in the oPt, perhaps prompting them into adopting a behavioral risk.

As for our second and third research questions, findings on factors associated with WTS among university students in our study sample, with gender variations, were overall consistent with the published literature. For socio-demographic factors, the finding that men have higher odds of being waterpipe smokers compared to

women was shared among many studies [2, 13, 19, 31, 65, 92], with a lower gender gap compared to cigarette smoking. This could be explained by the socio-cultural normative beliefs about WTS that still distinguish smoking among men and women, which could explain the higher prevalence among men. Also, it could be due to the cultural perception that WTS is more tolerated for women compared to cigarette smoking, promoting women to adopt WTS [2, 32, 92]. The tolerant role of society for WTS use among young women can be explained in terms of the common knowledge of acceptable use by women, especially in the northern geographic area of the West Bank, where WTS has historically and continues to currently be an acceptable mode of entertainment for both men and women.

However, other studies in the EMR indicated that the gap in WTS prevalence between men and women is decreasing and there is an absence of such variation in WTS prevalence in some countries [32, 96, 97]. For instance, one study among female students at two universities in Egypt (N=196) found a WTS prevalence of 37.8% [98]. Another study in 2006-2007 among male university students in Saudi Arabia (N=1,382) found a WTS prevalence of 14.6%, while a study in 2008-2009 among male and female students also at King Faisal University in Saudi Arabia found less of a gender-specific gradient, with WTS of 37.0% among men and 33.3% among women [88, 99]. In our study sample, there were differences in baseline sample characteristics, which would reflect that smoking prevalence and behaviors would probably be different. The different attitudes towards women smoking, “vulgarity”

versus “expression of eagerness for more liberal choices,” does reflect the role of the social attitudes in the gender gap in smoking [94]. Indeed, the gender gap for WTS still existed, but was lower than that for cigarette smoking, which calls for tailored WTS-interventions for women and men and a re-assessment of the social attitudes surrounding women and men smoking behaviors.

Different studies have addressed socio-economic status using different scales, with conflicting results among the EMR [2, 47] and the western countries [28]. In our study, male students who reported a good-excellent economic standing had higher odds of being current waterpipe smokers compared to those who reported a poor-satisfactory economic standing. This finding was consistent with studies in the EMR [2, 28, 47]. Some studies have linked WTS to social class and prestige, while results from qualitative studies have downplayed the role of cost to WTS behavior [2, 28, 48, 95]. The latter can be viewed in light of the social nature of WTS, its availability and accessibility in the café culture and its affordability in the sense that the price can be shared among many users, thus reducing the financial burden on smokers [2, 28, 48, 95]. In the same manner, the accessories of the waterpipe instrument can last for a long duration, distressing the price factor of being a waterpipe smoker.

These findings offer conflicting results on the role of price and socio-economic status in WTS behavior. They could also highlight the role of cafes and restaurants in encouraging use among youth, especially the presence of waterpipe smoking venues that are relatively cheaper than the high end cafes and restaurants, in

different areas of the oPt. These results obligate further research, with studying a wider range of socio-economic indicators with regional variations. While self-reported economic standing was found to be an associated factor with current WTS for men, the association was lacking for women in our study sample. Our results also showed that there was statistical significance difference between men and women in self-rated economic status, with more men reporting poor-satisfactory economic status compared to women. This can be explained by the observation and anecdotal evidence that men attending local universities are usually poorer than the women, as wealthier families will be more willing to have their sons travel abroad, but not their daughters. The generally higher self-reported economic standing among women, compared to men, added to the observation of women staying in local universities, could explain the lack of association with current WTS status for women, with the need for further research into these gendered differences. Future research on the role of income, especially in the Gaza Strip can be explored, in light of the 2014 war.

Students from the southern geographic area of the oPt were less likely to be current waterpipe smokers among our study sample. These results were somehow similar to other studies in terms of regional variations in smoking behavior [13, 100]. One study in the U.S. found that regional variation in university location (the Western region as opposed to the Midwestern) independently increased the odds of being a current waterpipe smoker [13]. In our study sample, the high WTS prevalence among our study sample could indicate that WTS has become a popular habit among

university students and is part of the student culture, considering that its prevalence surpassed cigarette smoking. The variation of WTS prevalence across universities may be due to differential access to WTS venues and cafes around the universities, ownership of a waterpipe at current residence, and/or the degree to which the culture and traditions accept the habit of WTS. As explained above, the northern region of the West Bank is generally known to be tolerant of the use of WTS by men and women and is a common form of entertainment not only among young people, but among families [43, 95, 101]. In addition, the study results showed that 55% of participants had smoked at a restaurant or coffee-shop, followed by 37% who smoked at home. These support our understanding that social and cultural norms in the different geographic areas of the oPt could account for the variation of the WTS prevalence among students across universities in the oPt.

Having a high cumulative GPA (≤80) was found to be protective against being a waterpipe smoker for women but not men. Our results indicated that women had higher grades for high school and university overall, compared to men. This can be explained by the cultural practices that keep women in local universities, while sending their sons to study abroad. The finding on academic grade association with WTS status has been supported by other studies. For instance, a study among Jordanian middle and high school students found that students with a low GPA had higher odds of being current waterpipe smokers [14]; results from another study among university students in the U.S. support this finding [13]. It could be due to the

social network of friends that is created through WTS, which encourages smoking, indirectly shifting attention from studies. Another reason for this finding could be explained by inferring that students with a lower academic achievement are less likely to know of the harmful effects of WTS on health; this finding requires further research.

The smoking environment was found to be associated with current WTS among our study sample. Overall, being a current cigarette smoker strongly predicted being a current waterpipe smoker. The discussion on whether cigarette smoking could act as a gateway for waterpipe smoking has been addressed by many studies [13, 19, 47, 92]. In our study sample, being a current cigarette smoker had about twice the odds of being a current waterpipe smoker, 13.3% of our sample were dual smokers for waterpipe and cigarette and only 6.2% was exclusive cigarette smokers (with 19.5% being current cigarette smokers). Also, of the current waterpipe smokers (25.9%), 12.6% were not current cigarette smokers. These numbers suggest that there is not a very strong overlap between waterpipe and cigarette smoking in our study sample.

Some studies alluded to the idea that results on the association between waterpipe and cigarette smoking could indicate that tobacco users view waterpipe and cigarette smoking differently, even though both involve tobacco consumption and evidence suggested similar health effects [13]. The results could also suggest that WTS could appeal to people who would not have been attracted to tobacco smoking

in first place, possibly because of its aroma and social acceptability [2, 5], these findings were corroborated by our lack of strong overlap between cigarette and waterpipe smoking. A biological perspective on nicotine suggested that waterpipe smoking and cigarette smoking, together, might reduce nicotine craving symptoms, thus supporting the increased odds of being a current waterpipe smoker with being a current cigarette smoker [47, 102], hence biological and biochemical validation is needed. Future longitudinal studies are needed to assess the temporality sequence of waterpipe and cigarette smoking and raise awareness on how the use of one form of tobacco could lead to the use of another.

The smoking environment, described by having at least one waterpipe smoker at current residence and owning a waterpipe, was also found to be associated with current WTS among women in our study sample. Smoking among family and peers has been repeatedly discussed in the literature to either provide an environment that is conducive or discouraging to WTS among youth and young adults, where most studies agreed that parental, siblings and/or friends smoking encourages WTS, either initiation or continuation [2, 14, 19, 47, 59, 65, 88, 99]. Having a family member who smokes waterpipe could give the perception of acceptability of smoking. Indeed, many Arab families view the offering of a waterpipe as a sign of hospitability (permissibility of WTS), further creating an environment tolerant to social WTS [65]. As for owning a waterpipe at current residence, it could emphasize the traditional and cultural ties of WTS to the region and improve access to and increase familiarity with

the waterpipe tobacco instrument [2], factors thought to increase the likelihood of adopting the WTS behavior. The association of current WTS with the smoking environment at current residence for women only, but not men, could likely be due to the socio-cultural characteristics among some families of accepting and being more tolerant to WTS among women, as is the case of what we know of the north of the West Bank. This finding could also suggest that men are less influenced by the smoking environment, whereas women are more likely to be influenced, possibly due to the need to seek approval on behaviors previously attributed to men [94, 95].

Methodological discussion

To the best of my knowledge, this was the first study to employ a *web-based* approach in exploring the prevalence of WTS and investigate the associated-factors with WTS among university students in the oPt. In an attempt to analyze the appropriateness and effectiveness of the use of a web-based survey as a tool in exploring the topic of WTS among university students in the oPt, numerous perspectives were considered [13, 92]. First, the use of a web-based survey has allowed us to conduct the current study in the Gaza Strip universities, which are not accessible for West Bankers. This has resulted in increased access to university students in the two regions of the oPt. Second, the choice of the web-based survey was less labor-intensive and saved time in comparison to using a paper-based survey, a finding cited by researchers [13, 103]. Third, the high completion rate of the web-based survey (low dropout rate) reflected an increased access to this type of survey

method. The high completion rate (overall 80%) could indicate that the web-based link was easily accessible to students, reaching many, and could indicate that the web-based survey is advantageous to use among university students. Indeed, with increasing access to the web and internet in the country at large, and especially among young people, this method of investigation may provide researchers with a low cost and quick way to conduct research. The low dropout rate could also indicate that the participants found the topic of the research interesting and/or that the presentation of the survey online was appealing.

Moreover, the comparison between the pilot paper-based and web-based survey at Bethlehem University revealed that participation, based on the selected variables, differed between the two survey methods. Nevertheless, the gender distribution in the web-based survey was a better representation of the actual gender distribution at Bethlehem University. In addition, comparison between the web-based survey and selected university student characteristics revealed that participation in the web-based survey gave a reasonable representation of the study population of Bethlehem University students on the basis of faculty of study, year at university and geographic area of residence, along with gender distribution.

Strengths and contributions of the study

This was the first study to assess the prevalence of and factors associated with WTS among Palestinian university students in both, the West Bank and Gaza Strip in

the oPt. Therefore, this study can function as a baseline study for the estimating the current prevalence of WTS among Palestinian university students and for the main associated factors surrounding the WTS behavior. This is particularly important given the lack of published studies in the oPt that targeted the same population as this study with geographic areas variations. It is worth keeping in mind that the current study design did not aim for a representative sample, but rather an explorative study into WTS behavior and patterns among university students in the oPt.

In addition, this is the first study to use the core tobacco smoking questions of the standardized GATS to study the WTS habit among university students, as the GATS has never been conducted in the oPt. Thus, the results of this study can be compared to other countries in the EMR that used the GATS and other international countries, within the same age group that our study targeted. Eventually, this will help in estimating the current WTS problem among university students in the oPt, such that future interventions can be oriented towards geographic areas/regions, gender considerations and other vulnerabilities which can prompt young people in the oPt to smoke waterpipe.

Lastly, as alluded to earlier, this is the first study in the oPt to use a web-based study design to explore WTS prevalence and patterns among university students. The results of the web-based survey have given us insight into the utility of a web-based survey for future research endeavors in the oPt. Additionally, it has allowed us to explore the use of a web-based survey in our Palestinian context and reflected that

this survey method could be useful for researchers studying a similar age group. The results of the web-based survey have also suggested that this method can be validated and refined for future studies on WTS.

Limitations of the study

The current study was a cross-sectional exploratory study not intended for generalizations, and as such, has only provided a glimpse into the factors which contribute to WTS among different university students in the oPt. In addition, the use of a cross-sectional design hampers the ability to make any causal links between current WTS status and the various associated factors. Lastly, participation in the study was based on self-selection, which has an inherent bias in the characteristics of the non-respondents.

Despite the presence of these limitations, as an explorative research, the current study focused on an important public health issue pertaining to WTS prevalence among university students in the oPt. The findings of this study have implications that should be considered by health professionals, policy-makers and educators and that could guide future intervention programs.

CHAPTER 5: CONCLUSIONS AND IMPLICATIONS

The main findings of the current study on WTS among university students in the oPt have revealed that the prevalence of current WTS was 25.9% and surpassed the prevalence of cigarette smoking (19.5%) among the study sample. The prevalence of WTS and cigarette smoking remained higher among men compared to women. In addition, the WTS prevalence, whether current (daily/less than daily), regular or occasional, showed variation across universities in the oPt, with the highest WTS prevalence found among university students in the northern geographic areas of the oPt. Moreover, a number of socio-demographic, university-related characteristics and social factors were found to be associated with current WTS prevalence in our study sample, with a gender variation in some of these associated factors.

The current study has shed light on an important public health issue in our Palestinian context, reflected as the high prevalence of WTS among our study sample in both, the West Bank and Gaza Strip regions of the oPt, which may continue to increase in the absence of concrete action plans. The results clearly indicate that WTS is a context and region-specific phenomenon among university students in the oPt. Therefore, conducting in-depth qualitative studies will offer well-grounded explanations for WTS habits and patterns in the Palestinian context. Moreover, the study has shown that the trends in WTS in the oPt are catching up with the trends reflected by university students in the EMR, to varying degrees, warranting

immediate action to prevent the rising trend from propagating. Furthermore, a worrisome finding was the smaller gender gap of WTS compared to the gender gap for cigarette smoking, highlighting the increased popularity of WTS among women. Interventions to curb the WTS trend among university students should be gender-sensitive and specific. This is especially important for women, who are quickly catching up to men smoking trends with their specific motives.

The results also indicated that WTS seems to cluster among men, university students who reside in the northern geographic areas of the oPt, those with a high socioeconomic status and low academic grade. Thus, the study suggests that different measures are needed to capture the full range of waterpipe smokers, in terms of their ages, region of residence, gender and educational backgrounds to guide awareness campaigns. Not only that, but the social environment seems to play an integral role in the trends for WTS, where the results indicated that WTS clusters among those students who own a waterpipe at current residence, are current cigarette smokers and have one or more family (or resident) members who also engage in WTS and/or cigarette smoking. These findings call attention for a better understanding of the social culture of WTS, especially the rising role of social media in changing behaviors, opinions and perceptions of youth and young adults, as well as the restaurant and café influence. This is particularly important as the social smoking environment in the current study revealed that more than half of participants smoke waterpipe at a venue, other than home, namely cafes and restaurants, which have

been found to influence initiation and propagation of the WTS behavior through direct and indirect ways. This also calls for enforcing anti-WTS laws in the oPt to curb the high prevalence of WTS and to increase awareness among university students smoking behavior who are in the critical transitional period of their lives.

These findings also suggest a re-orientating of tobacco interventions towards the outer smoking environment, rather than the internal environment or the individual him/herself. In other words, regulations for WTS should target cafes and restaurants. The easy access to WTS, whether its accessories (and their durability) or in the café culture, could be an entry point into targeted interventions. Future WTS interventions must target the role of social media and the use of health warning labels and messages presented in a visual and interactive fashion on the behaviors of youth and young adults; in other words, to explore the effective use of social media for tobacco control advantages. Future research should also look into the role of the tobacco industry in marketing a favorable picture of WTS among youth and young adults, especially with the lack of WTS-specific laws in the oPt.

Furthermore, the current study entailed the collection of a large amount of data on WTS among university students in the oPt. For the purposes of this study, not all the data were used, leaving room for using the available data for future research. For instance, the questions on cigarette smoking in the survey were not utilized to their fullest potential, leaving room for answering questions, such as cigarette

smoking serving as a gate-way for WTS. A retrospective study can be utilized to assess the temporality of the two types of tobacco

Lastly, in the current study, the testing of the web-based survey versus the paper-based survey in the pilot study served to illuminate the advantages and disadvantages of using a web-based method in public health research. Results from the comparison between the two survey methods gave us an insight so as to what it could be measuring. Future research should plan to validate the web-based survey as a data collection method, to assess its appropriateness in reflecting the real phenomena.

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ANNEXES

Annex 1: Selected characteristics of enrolled Bachelor-degree seeking students at the six selected universities during the first semester of the 2014-2015 academic year (data provided by the universities).

Variable/ Category	AAUJ		Birzeit University		Al-Quds University		Hebron University		Al-Azhar University		Al-Islamic University	
	(N=7,319)		(N=9,764)		(N=10,687)		(N=7,669)		(N=13,652)		(N=17,555)	
	n	%	n	%	n	%	n	%	n	%	n	%
Gender												
Women	3945	53.9	6276	64.3	5563	52.1	5796	75.6	7460	54.6	10994	62.7
Men	3374	46.1	3488	35.7	5124	47.9	1873	24.4	6192	45.4	6551	37.3
Faculty of study												
Arts & sciences	4024	55.0	N/A	N/A	8167	76.4	N/A	N/A	N/A	N/A	N/A	N/A
Health sciences	3295	45.0	642	6.6	2520	23.6	372	4.9	2582	18.9	2102	12.0
Arts & humanities	N/A	N/A	6243	63.9	N/A	N/A	6259	81.6	9188	67.3	12329	70.2
Sciences	N/A	N/A	2897	29.5	N/A	N/A	1038	13.5	1882	13.8	3124	17.8
Year in university												
First	2743	37.5	4145	42.5	1986	18.6	2454	32.0	4405	32.3	6672	38.0
Second	1801	24.6	1922	19.7	1908	17.9	2067	27.0	3327	24.4	3750	21.4
Third	1218	16.6	1674	17.1	2296	21.5	1427	18.6	2299	16.8	3432	19.6
Fourth and above	1557	21.3	2023	20.7	4497	42.1	1721	22.4	3621	36.5	3691	21.0

Annex 2: The Arabic version of the web-based survey used in the current study.

دراسة حول استهلاك التبغ بين طلاب جامعات فلسطين
الزملاء الطلبة الأعزاء، تقوم الباحثة بدراسة حول استهلاك التبغ بين طلاب الجامعات الفلسطينية، تشمل المدخنين وغير المدخنين. الهدف من هذا البحث هو معرفة مدى انتشار ظاهرة التدخين بين طلاب الجامعات الفلسطينية، ومحدّداتها، ومدى المعرفة والتوجهات والآراء اتجاه ظاهرة التدخين. وسوف تستخدم معلومات هذه الدراسة لأغراض البحث العلمي فقط. يتم اختيار المشاركين بطريقة عشوائية من ست جامعات فلسطينية من بينها جامعتك. تعد مشاركتك في هذه الدراسة طوعية تماماً. لك كامل الحرية في المشاركة أو الانسحاب أو الامتناع عن إجابة أي سؤال، مع العلم أنه سيتم التعامل مع المعلومات التي ستقدمها بسرية تامة ولن يتم الكشف عن هويتك. مدة الاستبيان عشرة دقائق تقريباً. نتطلع لتشاركنا بآرائك! اسم الباحثة: مارينا طقطق اسم المشرفة: د. نفين ابو رميلة هل أنت موافق/موافقة على المشاركة في هذا البحث؟ نعم لا
معلومات شخصية ***مطلوب**
A00. هل أنت ذكر أم أنثى؟* 1. ذكر 2. أنثى
A01. تاريخ ميلادك:* __ __ / __ __ / __ __ __ __
A02. حالتك الاجتماعية:* 1. أعزب (عزباء) 2. متزوج(ة) 3.مخطوب(ة) 4. مطلق(ة) 5. منفصل(ة) 6. أرمل(ة)
A04. مكان إقامتك:* 1. مدينة 2. قرية 3. مخيم
A03. المحافظة:* 1. جنين 2. طوباس 3. طولكرم 4. نابلس 5. قلقيلية 6. سلفيت 7. رام الله والبيرة 8. أريحا 9. القدس 10. بيت لحم 11. الخليل 12. شمال غزة 13. غزة 14. دير البلح 15. خان يونس 16. رفح

A05. مكان سكنك خلال دراستك الجامعية:* 1. بيت العائلة 2. سكن (تابع أو غير تابع للجامعة)
3. غير ذلك، حدد: _____

A06. حالياً، هل تمتلك أي من التالي (سيارتك الخاصة أو هوائية أو دراجة نارية):*
1. نعم 2. لا

A07. في الفصل الحالي، هل تعمل؟*
1. نعم، أقل من 15 ساعة في الأسبوع 2. نعم، 15 ساعة فأكثر في الأسبوع
3. لا أعمل وأبحث عن عمل 4. لا أعمل ولا أبحث عن عمل

A08. معدلك النهائي بامتحان الشهادة الثانوية العامة أو ما يعادلها (لأقرب منزلة عشرية):* _____

A09. ما هو أعلى تحصيل علمي لأبيك؟* 1. بكالوريوس فما فوق 2. دبلوم 3. توجيهي
4. مدرسة أقل من توجيهي 5. لا يقرأ ولا يكتب 6. لا أعرف

A10. ما هو أعلى تحصيل علمي لأمك؟* 1. بكالوريوس فما فوق 2. دبلوم 3. توجيهي
4. مدرسة أقل من توجيهي 5. لا تقرأ ولا تكتب 6. لا أعرف

A11. مقارنة بطلاب الجامعة، كيف تصف وضعك الاقتصادي؟* 1. سيئ 2.مقبول
3. جيد 4. جيد جداً 5. ممتاز 6. امتنع عن الاجابة

معلومات عن جامعتك

A12. الجامعة الملتحق بها:* 1. جامعة بيرزيت 2. الجامعة العربية الأمريكية جنين 3. جامعة الخليل
4. جامعة الأزهر بغزة 5. جامعة القدس 6. الجامعة الإسلامية غزة

A13. هل أنت طالب(ة) بكالوريوس؟* 1. نعم 2. لا

A14. هل أنت طالب(ة) بدوام كامل؟* 1. نعم 2. لا

A15. السنة الدراسية الحالية:* 1. أولى 2. ثانية 3. ثالثة
4. رابعة 5. خامسة 6. سادسة 7. أخرى

A16. الكلية التي تدرس فيها:* _____

A17. معدلك التراكمي في الجامعة (لأقرب منزلة عشرية):* _____

A18. المساعدات التي تتلقاها لدراستك:* 1. نعم، منحة 2. نعم، مساعدة مالية 3. نعم، قرض 4. لا 5. امتنع عن الاجابة
تدخين السجائر
B00. هل تدخن السجائر *حالياً* يومياً، أم بصورة غير يومية، أم لا تدخن مطلقاً؟* 1. يومياً 2. بصورة غير يومية 3. لا أبداً - مطلقاً
B01. ما متوسط عدد السجائر التي تدخنها حالياً*كل يوم*؟ _____
B02. ما متوسط عدد السجائر التي تدخنها حالياً*كل أسبوع*؟ *اذا كنت لا تدخن أسبوعياً، ضع صفر* _____
B03. ما متوسط عدد السجائر التي تدخنها حالياً*كل شهر*؟ *اذا أقل من 1 بالشهر*، حدد _____
B04. هل كنت تدخن السجائر يومياً في *الماضي*؟* 1. نعم 2. لا
B05. هل كنت في *الماضي* تدخن السجائر يومياً، أم بصورة غير يومية، أم لم تدخن مطلقاً؟* 1. يومياً 2. بصورة غير يومية 3. لا أبداً - مطلقاً
B14. كم كان عمرك عندما بدأت تدخين السجائر لأول مرة؟ _____
B15. منذ متى توقفت عن تدخين السجائر؟ 1. أقل من 6 أشهر 2. 6 أشهر- أقل من سنة 3. سنة – أقل من سنتين 4. سنتين – أقل من 3 سنوات 5. 3 سنوات أو أكثر
تدخين الأرجيلة
B06. هل شعرت يوماً بالفضول لتدخين الأرجيلة؟ 1. طبعاً نعم 2. ربما نعم 3. ربما لا 4. طبعاً لا
B07. هل حاولت أو جربت تدخين الأرجيلة حتى ولو لشفطة واحدة؟ 1. نعم 2. لا
B08. هل تدخن الأرجيلة *حالياً* يومياً، أم بصورة غير يومية، أم لا تدخن مطلقاً؟* 1. يومياً 2. بصورة غير يومية 3. لا أبداً - مطلقاً
B12. هل كنت تدخن الأرجيلة يومياً في *الماضي*؟* 1. نعم 2. لا
B13. هل كنت في *الماضي* تدخن الأرجيلة يومياً، أم بصورة غير يومية، أم لم تدخن مطلقاً؟* 1. يومياً 2. بصورة غير يومية 3. لا أبداً - مطلقاً

B14. كم كان عمرك عندما بدأت تدخين الأرجيلة لأول مرة ؟ _____

B09. ما متوسط عدد جلسات تدخين الأرجيلة التي تشارك فيها حالياً*في يوم*؟_____

B10. ما متوسط عدد جلسات تدخين الأرجيلة التي تشارك فيها حالياً*في الأسبوع*؟ *اذا كنت لا تدخن أسبوعياً، ضع صفر* _____

B11. ما متوسط عدد جلسات تدخين الأرجيلة التي تشارك فيها حالياً*في الشهر*؟ *اذا أقل من 1 بالشهر*، حدد _____

B15. منذ متى توقفت عن تدخين الأرجيلة؟ 1. أقل من 6 أشهر 2. 6 أشهر- أقل من سنة
3. سنة – أقل من سنتين 4. سنتين – أقل من 3 سنوات 5. 3 سنوات أو أكثر

B16. في آخر مرة قمت فيها بتدخين الأرجيلة، ما طول المدة (الساعات: الدقائق) التي شاركت بها في جلسة تدخين الأرجيلة؟_____

B18. في آخر مرة قمت فيها بتدخين الأرجيلة، كم عدد الأشخاص الآخرين الذين شاركتهم نفس الأرجيلة أثناء جلسة التدخين؟ _____

B19. في آخر مرة قمت فيها بتدخين الأرجيلة، كم "راس" أرجيلة دخنت أثناء مشاركتك في جلسة التدخين؟ _____

B17. في آخر مرة قمت فيها بتدخين الأرجيلة، هل شاركت الأرجيلة مع غيرك من الأشخاص؟*

1. نعم – مع نفس المبسم 2. نعم – بتغيير المبسم 3. لا 4. لا أعرف

بيئة تدخين الأرجيلة

C00a. هل من المقيمين معك يدخن الأرجيلة:

	نعم	لا	لا أعرف	لا ينطبق
والدك				
والدتك				
أخوك				
أختك				
رفاقك في السكن				

C00b. هل من المقيمين معك يدخن السجائر:

	نعم	لا	لا أعرف	لا ينطبق
والدك				
والدتك				
أخوك				
أختك				
رفاقك في السكن				

C01. هل توجد أرجيلة في مكان سكنك الحالي؟ 1. نعم 2. لا

C02. إذا عرض عليك أحد أصدقائك تدخين الأرجيلة (عزمك) هل توافق؟

1. طبعاً نعم 2. ربما نعم 3. ربما لا 4. طبعاً لا

C03. معدل مصروفك الشهري للترفيه (مثل: المطاعم، المقاهي، السينما،...) بالشيقل: _____

C04. معدل مصروفك الشهري على الأرجيلة، سواء بالمنزل، المقهى، الشقة، أو بالسكن بالشيقل؟ *إذا كنت من غير المدخنين "للأرجيلة،" اكتب صفر* ----------

C05. هل دخنت الأرجيلة في حرم الجامعة خلال السنة الماضية؟* *اذا كنت من غير المدخنين للأرجيلة "حالياً،" اختار الخيار الأخير.*

1. نعم 2. لا 3. لا ينطبق - لا أدخن الأرجيلة حالياً

C06. في آخر مرة قمت فيها بتدخين الأرجيلة، هل كنت لوحدك أم مع غيرك من الأشخاص؟

1. لوحدي 2. مع آخرين

C07. في آخر مرة قمت فيها بتدخين الأرجيلة، أين قمت بالتدخين؟

1. المنزل 2. المقهى/المطعم 3. الجامعة 4. أخرى

C08. في آخر مرة قمت فيها بتدخين الأرجيلة، هل قمت بتدخين تبغ بنكهات معينة، أم تبغ بدون نكهات، أم كلاهما؟ 1. محلى بنكهات 2. بدون نكهات 3. كلاهما

C09. في آخر مرة قمت فيها بتدخين الأرجيلة، هل كانت المياه الموجودة في وعاء الأرجيلة ممزوجة بمواد أخرى؟ 1. نعم 2. لا 3. لا أعرف

C11. الأسباب التي تدفعك لتدخين الأرجيلة:

	دائماً	في معظم الوقت – غالباً	أحياناً	أبداً
للاسترخاء				
جزء من الجلسات الاجتماعية				
للاندماج مع الأصدقاء				
جزء من ثقافة المجتمع الشرقي				
ملل – زهق				
لتخفيف الضغوطات (الدراسة، العمل، الحياة)				
الفضول				
للاستمتاع بمذاقها أو بطعمها				

C10. هل توجد فترة (فترات) يزيد فيها تدخينك للأرجيلة؟* *اذا كنت من غير المدخنين للأرجيلة "حالياً"، اختار الخيار الأخير*

1. نعم 2. لا 3. لا ينطبق – لا أدخن الأرجيلة حالياً

C10a. الفترة (الفترات) التي تتزايد فيها تدخينك للأرجيلة:

	نعم	لا
العطل السنوية		
العطل الصيفية		
الامتحانات/الضغوطات		

المعرفة والتوجهات والتصورات اتجاه تدخين الأرجيلة

D01. ما هو المصدر الرئيسي لمعلوماتك عن الأرجيلة ؟

1. الإنترنت 2. العائلة 3. الأصدقاء 4. مختصي صحة 5. غير ذلك، حدد: --------

D02. حسب معرفتك، أي مِن التالي لا يشجع على تدخين الأرجيلة؟

	نعم	لا	لا أعرف
المجتمع			
الدين			
العائلة			
المعلومات الصحية			
السعر/ التكاليف			
قناعات داخلية			

D03. هل ترى أن تدخين الأرجيلة مضرّ بالصحة؟

1. طبعاً نعم 2. ربما نعم 3. ربما لا 4. طبعاً لا

D04. هل تعتقد أن تدخين الأرجيلة يسبب الإدمان؟

1. نعم 2. لا 3. لا أعرف

D05. استناداً إلى ما تعرف أو تعتقد، هل تدخين *الأرجيلة* يسبب أمراضاً خطيرة؟

1. نعم 2. لا 3. لا أعرف

D06. حسب معلوماتك أو معتقداتك، هل يسبب تدخين الأرجيلة ما يلي:

	نعم	لا	لا أعرف
السكتة الدماغية (جلطات دموية في المخ قد تسبب الشلل)؟			
النوبة القلبية - الذبحة الصدرية؟			
سرطان الرئة؟			
سرطان المعدة؟			
سرطان المثانة؟			
الولادة المبكرة؟			
هشاشة العظم؟			

D07. استناداً إلى ما تعرف أو تعتقد، هل تدخين الأرجيلة أقل ضرراً، أو لا يختلف، أو أكثر ضرراً مقارنة بتدخين السجائر؟

1. أكثر ضرراً 2. لا يوجد اختلاف 3. أقل ضرراً 4. لا أعرف

D09. حسب معلوماتك أو معتقداتك، هل يسبب استنشاق الدخان الصادر من أرجيلة أشخاص آخرين أمراضاً خطيرة لدى غير المدخنين؟ 1. نعم 2. لا 3. لا أعرف

D10. حسب معلوماتك أو معتقداتك، هل تظن أن استنشاق دخان الأرجيلة من الأشخاص المدخنين يسبب التالي لدى غير المدخنين:

	نعم	لا	لا أعرف
السكتة الدماغية (جلطات دموية في المخ قد تسبب الشلل)؟			
سرطان الرئة في الأطفال؟			
سرطان الرئة في الكبار؟			
النوبة القلبية - الذبحة الصدرية؟			

D12. خلال الثلاثين يوماً الماضيين، هل لاحظت أي تحذيرات صحية على منتجات الأرجيلة سواء بالمنزل، المقهى، الشقة، أو بالسكن؟

1. نعم 2. لا 3. لم أرى أي منتجات أرجيلة

D11. ما هي احتمالية طلبك من شخص غريب أن يتوقف عن التدخين إذا لم يكن باستطاعتك تغيير مكان جلوسك أثناء وجودك في مطعم/مقهى؟

1. احتمالية كبيرة 2. احتمالية متوسطة 3. لا يوجد احتمالية

مؤشرات الصحة

E00. مقارنة بأصدقائك، كيف تقيم صحتك بشكل عام؟ سيئة 1 2 3 4 5 ممتازة

E01. إلى أي مدى أنت راض عن صحتك؟ 1. غير راض إطلاقاً 2. غير راض
3. لا راض ولا غير راض 4. راض 5. راض جداً

E02. كيف تقيم جودة حياتك؟ 1. سيئة جداً 2. سيئة
3. لا سيئة ولا جيدة 4. جيدة 5. جيدة جداً

E03. إلى أي مدى أنت راض عن حياتك؟ 1. غير راض إطلاقاً 2. غير راض
3. لا راض ولا غير راض 4. راض 5. راض جداً

E04. هل قمت بزيارة طبيب أو مقدم رعاية صحية آخر خلال الـ 12 شهراً الماضية؟* 1. نعم 2. لا

E08. حالياً، هل تمارس أي نشاط بدني لمدة لا تقل عن 30 دقيقة؟

1. نعم، 2-3 / أسبوعياً 2. نعم، أقل من 2-3 / أسبوعياً 3. لا

E05. كم مرة زرت فيها طبيبًا أو مقدم رعاية صحية خلال الـ 12 شهراً الماضية؟ هل كانت مرة واحدة أو مرتين، أم من 3 إلى 5 مرات، أم 6 مرات، أم أكثر من ذلك؟

1. من 1 الى 2 2. من 3 الى 5 3. 6 أو أكثر 4. لا ينطبق

E06. أثناء أية زيارة إلى الطبيب أو مقدم الرعاية الصحية خلال الـ 12 شهراً الماضية، هل سُئِلت عما إذا كنت تدخن التبغ؟ 1. نعم 2. لا

E07. هل تعاني من أي مشاكل صحية؟ اذا نعم، حدد في السؤال E07a 1. نعم 2. لا

E07a. ما هي المشاكل الصحية التي تعاني منها؟ _____

رأيك حول تدخين الأرجيلة

F00. هل تؤيد تدخين الأرجيلة بالأماكن التالية:

	نعم	لا
أماكن العمل		
المدارس		
الجامعات		
بيت العائلة		
المطاعم (في الداخل)		
المطاعم (في الخارج)		
مقاهي (في الداخل)		
مقاهي (في الخارج)		
أماكن التسوق العامة (في الداخل)		
أماكن التسوق العامة (في الخارج)		

F01. هل تعتقد أن تدخين الأرجيلة يشعر المدخنين بالارتياح خلال الجلسات الاجتماعية؟

1. أكثر ارتياحاً 2. أقل ارتياحاً 3. لا يوجد فرق

F02. هل تعتقد أن الأشخاص الذين يدخنون الأرجيلة يحظون بأصدقاء أكثر أو أقل؟

1. أصدقاء أكثر 2. أصدقاء أقل 3. لا يوجد فرق مقارنة بالأشخاص غير المدخنين

F03. هل تعتقد أن الأشخاص الذين يدخنون الأرجيلة:

1. أكثر جاذبية 2. أقل جاذبية 3. لا يوجد فرق بالجاذبية مقارنة بالأشخاص غير المدخنين

التدخين والسجائر الإلكترونية

G00. هل سمعت من قبل عن السجائر الإلكترونية؟* 1. نعم 2. لا

G01. هل تستخدم *حالياً* السجائر الإلكترونية يومياً، أو بصورة غير يومية، أم لم تستخدمها مطلقاً؟*

1. يومياً 2. بصورة غير يومية 3. لا أبداً – مطلقاً

G02. هل استخدمت من قبل، *ولو مرة واحدة*، سيجارة إلكترونية؟ 1. نعم 2. لا

G03. هل اشتريت في أي وقت مضى أو رأيت أحداً يشتري سجائر إلكترونية محلياً؟*
1. نعم 2. لا

شكراً لمشاركتكم، رأيكم يهمنا!

Annex 3: Communication with pilot and selected study universities.

a. Letter sent (through fax) to Bethlehem University to request approval on conducting the *pilot* study.

حضرة (الإسم)،
(المسمى الوظيفي واسم الجامعة)
رقم الفاكس

الموضوع: المساعدة في اتمام بحث رسالة ماجستير للطالبة مارينا طقطق

تحية طيبة وبعد،

تقوم الطالبة مارينا طقطق من طلبة برنامج الماجستير في الصحة العامة والمجتمعية – جامعة بيرزيت، بعمل بحث لرسالة ماجستير بعنوان "انتشار ظاهرة تدخين الارجيلة والعوامل المرتبطة بها وتوجهات المدخنين ومدى معرفتهم بأضرارها بين طلاب الجامعات في فلسطين". تشتمل الدراسة على ست جامعات فلسطينية وهي جامعة بيرزيت، الجامعة العربية الأمريكية جنين، جامعة الخليل، جامعة الأزهر بغزة، جامعة القدس، الجامعة الإسلامية غزة.

نود أن نقوم بعمل الدراسة الإستطلاعية (Pilot Study) على طلابكم في جامعة بيت لحم.
نرجو ترشيح شخص لمتابعة آلية البحت والتي تشتمل على

1. وضع النسخة الكترونية من استمارة البحث على صفحة الطالب.
2. تعبئة الاستمارة ورقياً مع 100 طالب.

ولمزيد من الاستفسار يرجى الاتصال مع مارينا طقطق رقم أو جوال وايميل أو سهاد جادالله رقم تلفون المكتب (2982020).

نشكر لكم تعاونكم الدائم،

د. نڤين أبو ارميلة
مديرة المعهد

b. Letter sent (through fax) to selected universities to request approval on conducting the study.

حضرة (الإسم)،
(المسمى الوظيفي واسم الجامعة)
رقم الفاكس

الموضوع: المساعدة في اتمام بحث رسالة ماجستير للطالبة مارينا طقطق

تحية طيبة وبعد،

تقوم الطالبة مارينا طقطق من طلبة برنامج الماجستير في الصحة العامة والمجتمعية – جامعة بيرزيت، بعمل بحث لرسالة ماجستير بعنوان "انتشار ظاهرة تدخين الارجيلة والعوامل المرتبطة بها وتوجهات المدخنين ومدى معرفتهم بأضرارها بين طلاب الجامعات في فلسطين". تشتمل الدراسة على ست جامعات فلسطينية وهي جامعة بيرزيت، الجامعة العربية الأمريكية جنين، جامعة الخليل، جامعة الأزهر بغزة، جامعة القدس، الجامعة الإسلامية غزة.

نرجو منكم تسهيل عمل الطالبة مارينا لإتمام البحث بترشيح شخص لمتابعة آلية البحث التي تتضمن:-

1. تزويدها بعدد الطلاب الملتحقين في الكليات المختلفة بالجامعة بشكل كامل لعام 2014، حتى يتم احتساب حجم العينة المطلوب.
2. إرسال نسخة الكترونية من استمارة البحث إلى طلبة الجامعة حيث تكون مشاركة الطالب اختيارية.

ولمزيد من الاستفسار يرجى الاتصال مع مارينا طقطق رقم أو جوال وايميل أو سهاد جادالله رقم تلفون المكتب (2982020).

نشكر لكم تعاونكم الدائم،

د. نفين أبو ارميلة
مديرة المعهد

c. Email to selected universities to follow-up on the initial letter (in annex 1a).

حضرة (الإسم)،

(المسمى الوظيفي واسم الجامعة)

تحية وبعد،

أود أن أشكر لكم تعاونكم وموافقتكم على مشاركة طلبتكم في دراسة رسالتي الماجستير حول استهلاك التبغ بين طلاب جامعات فلسطين.

لقد تم إنهاء العمل الميداني المطلوب للدراسة الإستطلاعية حيث أظهر الطلاب تجاوباً إيجابياً في تعبئة الإستمارة الإلكترونية.

نحن الآن بصدد البدء بالعمل الميداني للدراسة في جميع الجامعات المختارة. سوف أقوم بإرسال رسالةٍ قصيرةٍ توضح للطلبة هدف الدراسة مع رابط الاستبيان ويرجى منكم إرسالها للطلبة من خلال **وضع رابط الإستبيان على صفحة الطالب (جميع طلاب البكالوريس)**. وأرجو منكم إرسال نسخة لبريدي الالكتروني عن رسالتكم للطلبة لمتابعة سير جمع البيانات.

أظهرت نتائج الدراسة الإستطلاعية أنه قد يلزمنا ثلاثة أسابيع لجمع عدد البيانات المطلوبة وهي 460 طالب وطالبة تقريباً.

وأود أن أطلب منكم إرسال رسالة تذكير موجهة للطلبة مع الرابط كل أربعة أيام لمدة ثلاثة أسابيع حتى نحصل على العدد المطلوب.

وسوف أقوم بالتواصل معكم لمتابعة سير جمع البيانات. سنقوم بمشاركتكم نتائج البحث بعد إتمام متطلبات الدراسة.

في حال وجود أي استفسار أو مشكلة، أرجو أن تتواصلوا معي عن طريق بريدي الإلكتروني أو جوال أو الإتصال مع معهد الصحة العامة والمجتمعية في جامعة بيرزيت (2982020).

ونتطلع إلى تعاونكم ودعمكم في هذه الدراسة.

ولكم جزيل الشكر،

مارينا طقطق

d. Email to selected universities to provide the online survey link.

حضرة (الإسم)،

(المسمى الوظيفي واسم الجامعة)

تحية وبعد،

بناءً على ما تم الإتفاق عليه، الرجاء مشاركة الرسالة التالية مع طلبتكم. ولكم جزيل الشكر.

مارينا طقطق

الزملاء الطلبة الأعزاء،
أقوم بدراسة حول **استهلاك التبغ بين طلاب الجامعات الفلسطينية**، تشمل المدخنين وغير المدخنين، كجزء من رسالة الماجستير. إذا كنت موافقاً على المشاركة في هذا البحث، اضغط على الرابط. نتطلع لتشاركنا بآرائك!
وشكراً

https://docs.google.com/forms/d/1qInzU3vIaKA7iFRjqwi0XbO9kcAyU0FJKXrIN3NVoj4/viewform?usp=send_form

e. The announcement letter of the study shared with some of the selected universities (Hebron University, AAUJ and Al-Quds University) as a form of advertising.

إعلان عن استبيان لرسالة ماجستير

الزملاء الطلبة الأعزاء،
تقوم باحثة دراسات عليا من جامعة بيرزيت بدراسة حول **استهلاك التبغ بين طلاب الجامعات الفلسطينية**، تشمل المدخنين وغير المدخنين، كجزء من رسالة الماجستير.

إذا كنت موافقاً على المشاركة في هذا البحث، اضغط على **الرابط** الموجود على **صفحة الطالب** على موقع (اسم الجامعة). وشكراً

نتطلع لتشاركنا بآرائك!

f. Email to selected universities to thank them for their participation in the study (I) for those that reached the required sample size and (II) those that did not.

(I)

حضرة (الإسم)،

(المسمى الوظيفي واسم الجامعة)

تحية طيبة وبعد،

نود إعلامكم بأننا قد أنهينا العمل المطلوب في (اسم الجامعة) بنجاح حيث أظهر الطلاب تجاوباً في تعبئة الإستمارة الإلكترونية.

وعليه نتوجه بالشكر الجزيل لحضرتكم وللطاقم الإداري الذي سهل عملنا في الجامعة، والشكر أيضاً لطلبة (اسم الجامعة) لدعمهم ومشاركتهم في الدراسة.

نحن نعمل على تحليل النتائج والتي سنشاركم بتنائجها بعد إتمام متطلبات الدراسة.

ولكم جزيل الشكر،

مارينا طقطق

(II)

حضرة (الإسم)،

(المسمى الوظيفي واسم الجامعة)

تحية طيبة وبعد،

نود أن نشكركم على تسهيل عملية جمع البيانات المطلوبة لرسالة بحث الماجستير. كما نود إعلامكم بأن اليوم هو **آخر يوم** لجمع البيانات للعمل الميداني المطلوب، مع العلم بأننا لم نحصل على عدد الاستمارات المطلوبة من جامعتكم. بإمكانكم الآن إزالة رابط الإستبيان عن صفحة الطالب.

وعليه نتوجه بالشكر الجزيل لحضرتكم وللطاقم الإداري الذي سهل عملنا في الجامعة، والشكر أيضاً لطلبة (اسم الجامعة) لدعمهم ومشاركتهم في الدراسة.

نحن نعمل على تحليل النتائج والتي سنشاركم بنتائجها بعد إتمام متطلبات الدراسة.

ولكم جزيل الشكر،
مارينا طقطق

Annex 4: Selected socio-demographic and university-related characteristics of participants by university attended, stratified by gender.

Variable/ Category	Total (N=2,146)		Women (N=1,077)	Men (N=1,069)
	n	%	%	%
AAUJ[b] (n=384)				
Age (in years)				
≤ 18 years old	67	18.3	22.7*	16.0*
19 years old	81	22.1	25.0	20.6
20 years old	89	24.3	28.1	22.3
21 years old	62	16.9	14.1	18.5
≥ 22 years old	67	18.3	10.2	22.7
Current employment status				
Yes, employed	87	22.7	6.0***	31.6***
Not employed, but looking for a job	73	19	12.7	22.4
Not employed	224	58.3	81.3	46
High school tawjihi or equivalent grade				
≤ 69.9	32	8.7	1.6***	12.5***
70.0-79.9	99	26.8	10.9	35.4
80.0-89.9	127	34.4	34.1	34.6
≥ 90.0	111	30.1	53.5	17.5
Mother's highest educational level				
Tawjihi and above	272	70.8	79.1**	66.4**
Less than tawjihi	112	29.2	20.9	33.6
Current year in university				
First year	126	33.3	44.3**	27.5**
Second year	91	24.1	21.4	25.5
Third year	94	24.9	23.7	25.5
Fourth year and above	67	17.7	10.7	21.5
Current faculty of study				
Arts & Humanities	142	40.7	31.6***	45.1***
Sciences	70	20.1	13.2	23.4
Health Sciences	137	39.3	55.3	31.5

Current cumulative university grade point average (GPA)				
≤ 69.9	50	13.2	6.8***	16.6***
70.0-79.9	177	46.7	33.3	53.8
≥ 80.0	152	40.1	59.8	29.6
Birzeit (n=384)				
Age (in years)				
≤ 18 years old	66	17.4	20.1***	14.4***
19 years old	91	24.0	26.6	21.1
20 years old	83	21.9	22.1	21.7
21 years old	85	22.4	24.6	20.0
≥ 22 years old	54	14.2	6.5	22.8
Marital status				
Single	363	94.5	91.1**	98.4**
Other [a]	21	5.5	8.9	1.6
Current residence				
With family	307	79.9	86.6**	72.5**
Other	77	20.1	13.4	27.5
Current employment status				
Yes, employed	60	15.6	7.9***	24.2***
Not employed, but looking for a job	105	27.3	22.8	32.4
Not employed	219	57.0	69.3	43.4
Current faculty of study				
Arts & Humanities	183	47.7	55.4***	39.0***
Sciences	164	42.7	29.2	57.7
Health Sciences	37	9.6	15.3	3.3
Current cumulative university grade point average (GPA) (n=376)				
≤ 69.9	22	5.9	5.1*	6.7*
70.0-79.9	240	63.8	59.1	69.1
≥ 80.0	114	30.3	35.9	24.2
Al-Quds (n=255)				
Marital status				
Single	228	89.4	82.6**	95.0**
Other [a]	27	10.6	17.4	5.0

Current employment status				
Yes	67	26.3	8.7***	40.7***
Not employed, but looking for a job	62	24.3	19.1	28.6
Not employed	126	49.4	72.2	30.7
High school tawjihi or equivalent grade				
≤ 69.9	45	17.9	15.9*	19.6*
70.0-79.9	84	33.5	31.0	35.5
80.0-89.9	59	23.5	19.5	26.8
≥ 90.0	63	25.1	33.6	18.1
Current cumulative university grade point average (GPA)				
≤ 69.9	46	18.3	12.3*	23.2*
70.0-79.9	128	50.8	49.1	52.2
≥ 80.0	78	31.0	38.6	24.6
Hebron (n=355)				
Age (in years)				
≤ 18 years old	89	26.1	28.6*	17.3*
19 years old	68	19.9	17.7	28
20 years old	69	20.2	22.2	13.3
21 years old	66	19.4	19.2	20
≥ 22 years old	49	14.4	12.4	21.3
Current employment status				
Yes	37	10.4	2.5***	39.0***
Not employed, but looking for a job	68	19.2	18.7	20.8
Not employed	250	70.4	78.8	40.3
High school tawjihi or equivalent grade				
≤ 69.9	28	7.9	6.5***	13.0***
70.0-79.9	100	28.3	25.0	40.3
80.0-89.9	147	41.6	41.7	41.6
≥ 90.0	78	22.1	26.8	5.2
Father's highest educational level				
Tawjihi and above	259	73.0	69.8*	84.4*
Less than tawjihi	96	27.0	30.2	15.6

Al-Azhar (n=384)				
Marital status				
Single	356	92.7	88.5*	95.3*
Other [a]	28	7.3	11.5	4.7
Current employment status				
Yes	40	10.4	6.1***	13.1***
Not employed, but looking for a job	169	44.0	30.4	52.5
Not employed	175	45.6	63.5	34.3
High school tawjihi or equivalent grade				
≤ 69.9	125	32.9	24.0***	38.5***
70.0-79.9	114	30.0	21.9	35
80.0-89.9	85	22.4	24.0	21.4
≥ 90.0	56	14.7	30.1	5.1
Current faculty of study				
Arts & Humanities	246	64.7	60.7**	67.2**
Sciences	79	20.8	17.2	23
Health Sciences	55	14.5	22.1	9.8
Current cumulative university grade point average (GPA)				
≤ 69.9	68	18.1	14.3**	20.5**
70.0-79.9	196	52.1	46.9	55.5
≥ 80.0	112	29.8	38.8	24.0
Al-Islamic (n=384)				
Marital status				
Single	344	89.6	83.5***	96.2***
Other [a]	40	10.4	16.5	3.8
Employment status				
Yes	38	9.9	5.5***	14.7***
Not employed, but looking for a job	128	33.3	27.5	39.7
Not employed	218	56.8	67.0	45.7
High school tawjihi or equivalent grade				
≤ 69.9	26	6.9	4.6*	9.3*
70.0-79.9	93	24.6	23.0	26.4
80.0-89.9	152	40.2	38.3	42.3
≥ 90.0	107	28.3	34.2	22

Current faculty of study				
Arts & Humanities	227	59.4	66.5***	51.6***
Sciences	111	29.1	19.5	39.6
Health Sciences	44	11.5	14.0	8.8
*Significant at the <0.05 level; **Significant at the <0.01 level; ***Significant at the <0.001 level; [a] Other includes: engaged, married, separated, divorced, widowed; [b] AAUJ: Arab American University Jenin				

Annex 5: Social patterns and habits of current waterpipe smokers among the study sample, stratified by gender.

Variable/ Category	Total (N=2,146)		Women (N=1,077)	Men (N=1,069)
	n	%	%	%
Reason for WTS: to relax				
Never	83	18.0	21.8	16.6
Sometimes	156	33.8	34.5	33.5
Most of the time	223	48.3	43.7	49.9
Reason for WTS: to fit in during social gatherings				
Never	52	11.0	8.7	11.8
Sometimes	123	26.0	25.4	26.2
Most of the time	298	63.0	65.9	62.0
Reason for WTS: to fit in with friends				
Never	70	15.0	17.2	14.2
Sometimes	125	26.8	28.7	26.2
Most of the time	271	58.2	54.1	59.6
Reason for WTS: to conform with the WTS tie to the Eastern culture				
Never	251	55.2	55.8	54.9
Sometimes	107	23.5	27.5	22.1
Most of the time	97	21.3	16.7	23.0
Reason for WTS: to relive boredom				
Never	47	9.9	10.4	9.7
Sometimes	135	28.3	33.6	26.4
Most of the time	295	61.8	56.0	63.9
Reason for WTS: to relive stress				
Never	86	18.3	18.9	18.1
Sometimes	107	22.8	22.1	23.0
Most of the time	277	58.9	59.0	58.9
Reason for WTS: to fulfill curiosity				
Never	196	43.3	30.2*	47.8*
Sometimes	138	30.5	37.1	28.2
Most of the time	119	26.3	32.8	24.0

Reason for WTS: to enjoy the taste or flavor				
Never	45	9.4	8.8	9.7
Sometimes	114	23.9	23.2	24.1
Most of the time	318	66.7	68.0	66.2
Did you share your waterpipe with others?				
Yes, different mouthpiece	199	35.8	37.3	35.2
Yes, same mouthpiece	265	47.7	49.0	47.1
No	85	15.3	12.4	16.4
I don't know	7	1.3	1.3	1.2
Where did you smoke?				
Home/other residence	187	37.3	51.5**	32.2**[a]
Restaurants/ coffeeshops	275	54.8	43.2	58.9
University	12	2.4	3.0	2.2
Friends' house	15	3.0	0.0	4.1
Other	13	2.6	2.3	2.7
Did you smoke alone or with others?				
Alone	41	8.1	4.5	9.4
With others	463	91.9	95.5	90.6
Did you smoke waterpipe with flavored or unflavored tobacco or both?				
Flavored tobacco	417	82.9	95.5***	78.4***
Unflavored tobacco	45	8.9	1.5	11.6
Both, flavored and unflavored tobacco	41	8.2	3.0	10.0
Was the water in the waterpipe bowl mixed with other substances?				
Yes	30	6.0	7.6***	5.4***
No	402	80.1	68.9	84.1
I don't know	70	13.9	23.5	10.5
Do you experience a marked increase in WTS during exams and stress periods?				
No	92	42.2	38.0	43.5
Yes	126	57.8	62.0	56.5
Do you experience a marked increase in WTS during summer vacation?				
No	31	13.5	20.0	11.4
Yes	199	86.5	80.0	88.6

*Significant at <0.05 level; **Significant at <0.01 level; ***Significant at <0.001 level;
[a] Analyze with caution (more than 20% of cells have expected cell count less than 5)

Annex 6: The prevalence of tobacco smoking among Palestinian youth aged 17-25 years old (for all youth and for enrolled students) for the years 2000, 2004, 2006 and 2010.

Survey source (year)	Waterpipe tobacco smoking, N (%)	Other tobacco types,* N (%)	Non-smoker,** N (%)
Waterpipe tobacco smoking – for youth 17-25 years old			
DHS [a] (2000)	8 (0.5)	189 (10.7)	1569 (88.8)
DHS (2004)	17 (0.8)	191 (8.5)	2033 (90.7)
FHS [b] (2006)	22 (0.8)	210 (7.5)	2555 (91.7)
FHS (2010)	78 (2.0)	300 (7.8)	3467 (90.2)
Waterpipe tobacco smoking – for youth enrolled in university			
DHS (2000)	43 (0.7)	1335 (20.9)	4999 (78.4)
DHS (2004)	74 (1.3)	937 (16.5)	4671 (82.2)
FHS (2006)	79 (1.2)	1090 (16.5)	5431 (82.3)
FHS (2010)	848 (1.5)	8498 (14.5)	49112 (84.0)
*Other types of tobacco include: cigarettes, pipes, and dual cigarettes and waterpipe; **Non-smokers include: ex-smokers and never smokers; [a] Demographics and Health Survey; [b] Family Health Survey			