The State of Tobacco Use Cessation in the Arab World

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The State of Tobacco Cessation in the Arab World

A Dissertation Presented by

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To

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Dedication

This dissertation is dedicated to:

My father Yaseen Bhadila, my mother Eman Bannoub
and my siblings Ghalia, Mohammed, and Raghad.

You were always proud of me.
Without your endless love and support I would have not made it.

Acknowledgments

I would like to give special thanks for everyone who contributed to my DMSc journey at Harvard School of Dental Medicine

Preface

Despite the global reduction in tobacco use, the number of smokers is continuing to grow in the Eastern Mediterranean and African Regions.[1] Currently, four out of the only six countries in the world where tobacco use is still rising, are Arab countries (Egypt, Jordan, Lebanon, and Oman).[1] Moreover, smoking-attributable diseases cost the Middle East and North Africa over 29 billion U.S. dollars each year.[2] While tobacco use prevention might reduce demand in upcoming generations, cessation initiatives deal with the disease burden in the present and near future. Prevention and treatment are both equally important.

The purpose of this dissertation is to analyze of the state of tobacco cessation in the Arab World on multiple levels using the socio-ecological model (SEM) approach **(Figure 1).**[3] The World Health Organization (WHO) identified tobacco data from the Eastern Mediterranean region as the least robust of all regions.[1] This multilevel approach will paint a clearer picture on the smoking cessation status in the Arab World and identify challenges and opportunities in the implementation of demand reduction measures:

Individual and Interpersonal levels: We utilized the Global Youth Tobacco Survey to describe the smoking cessation (SC) behaviors of the youth and, study the association between SC behavior and receiving cessation help. National Surveillance for adults were lacking; Global Adult Tobacco Surveys were only available for Egypt, 2009 and Qatar, 2013. Study I "The State of Youth's Smoking Cessation in the Arab World" tackled this aspect of the dissertation.

Organizational level: We reviewed the regional and local reports of health professionals from 2012 to 2022, to provide a qualitative summary of the Tobacco Use Cessation (TUC) services in healthcare settings and TUC training in academic institutions in the Arab countries.

Policy level: Using the latest WHO FCTC reports, we assessed the national implementation of WHO FCTC Article 14 (key demand reduction measures) in the Arab countries.

Study II "Tobacco Cessation Measures in the Arab World: Policy Surveillance and Review of Health Professionals' Role" tackled these aspects of the dissertation.
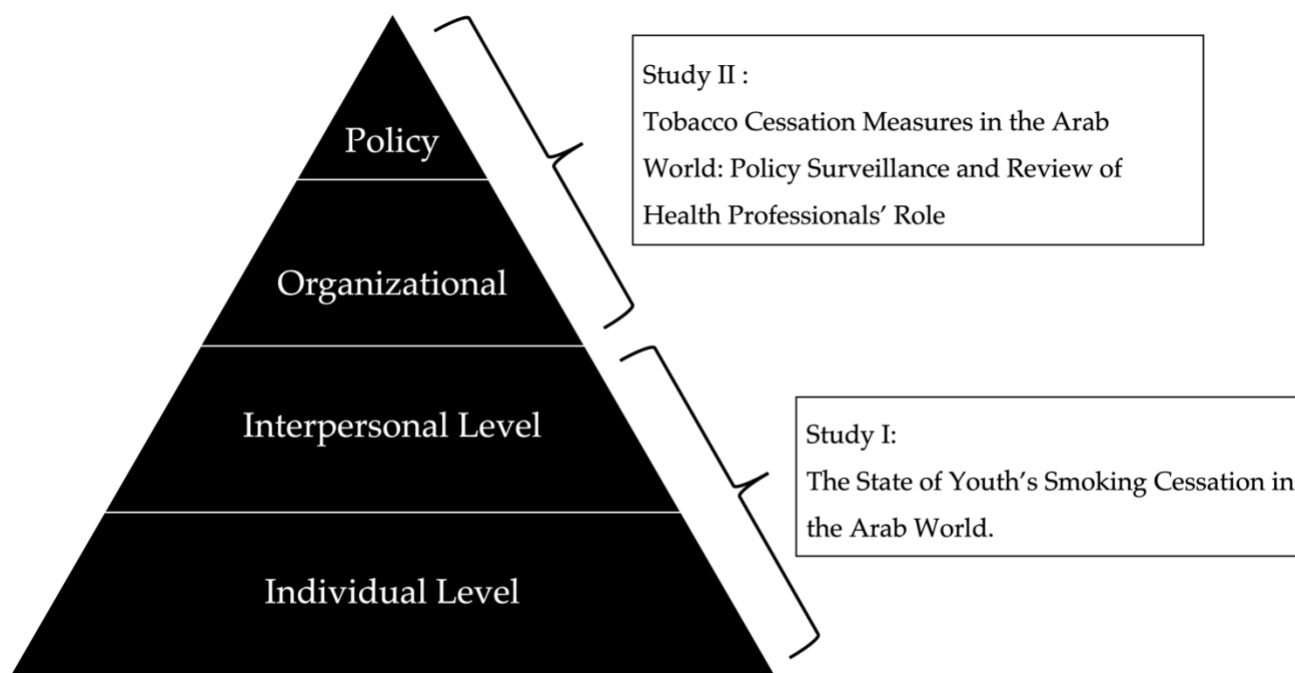
Figure 1. Thesis Structure: Tobacco use cessation using the socio-ecological model (SEM).

Goal and Objectives

Dissertation Goal

To assess the state of tobacco use cessation in the Arab World including behaviors, service provision and policies.

Dissertation Objectives

Study I: The State of Youth's Smoking Cessation in the Arab World

Objective 1: To describe the SC behavior for Arab youth including quit intention, quit attempts and the intention to continue smoking in the future.

Objective 2: To explore the association between receiving external cessation help and SC behaviors.

Study II: Tobacco Cessation Measures in the Arab World:
Policy Surveillance and Review of Health Professionals' Role

Objective 3: To assess the implementation of FCTC Article 14 provisions in the Arab World using the latest WHO reports.

Objective 4: To provide a qualitative summary of local and regional reports of TUC services in healthcare settings and TUC training in academic institutions in the Arab countries.

Abbreviations

5As: Ask, Advice, Assess, Assist, Arrange follow-up

AFR: African Region

AOR: Adjusted Odds Ratio

CI: Confidence Interval

COPD: Chronic Obstructive Pulmonary Disease

CrI: Credible Interval

EMR: Eastern Mediterranean Region

FCTC: Framework Convention on Tobacco Control

GYTS: Global Youth Tobacco Survey

HIC: High Income Country

LIC: Low Income Country

LMIC: Lower Middle-Income Country

MENA: Middle East and North Africa

MIC: Middle Income Country

MOR: Median Odds Ratio

NCD: Non-communicable diseases

NRT: Nicotine Replacement Therapy

OR: Odds Ratio

PCP: Primary Care Physicians

PHC: Primary Healthcare centers

SC: Smoking Cessation

SEM: socio-ecological model

SHS: Secondhand Smoke

STROBE: Strengthening the Reporting of Observational Studies in Epidemiology

TDT: Tobacco Dependance Treatment

TUC: Tobacco Use Cessation

UAE: United Arab Emirates

UN: United Nations

The Arab World at a Glance

The Arab world is home to nearly 428 million people spread over West Asia and Africa.[4] The League of Arab States consists of 22 diverse countries, yet they share sociocultural, economic, and geopolitical relations. These countries are Algeria, Bahrain, Comoros, Djibouti, Egypt, Iraq, Kuwait, Jordan, Lebanon, Libya, Mauritania, Morocco, Oman, Palestine, Qatar, Saudi Arabia, Somalia, Sudan, Syria, Tunisia, United Arab Emirates and Yemen. The Arab league was established in March 1945 as a nationalist movement to overcome the western colonial legacy and regional rivalries.[5] However, the concept of Arab unity stems from centuries of shared political, social, and religious values that shaped their identity. This movement aimed to establish the Arab countries' sovereignty in the international community during the post-World War II era.[5] According to the World Bank classification, the Arab league consists of six high-income countries of the Gulf Cooperation Council (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates), [4] four low-income countries (Sudan, Somalia, Syrian Arab Republic, and Yemen) and the rest are upper and lower-middle income countries.[4]

One of the shaping events of the Modern Arab history is the series of uprisings that started in 2010 known as the "Arab Spring". In 2014, Batniji et al reported that the region has witnessed significant improvements in their human developmental indicators, such as under-5 mortality and life expectancy[6] and it has been argued that these improvements coupled with the high expectations from the progressive educated youth, have shaped the revolution of the Arab Spring.[7]

Epidemiologically, the Arab world is relatively young with a third of its population below the age of 15, and a life expectancy of 72.[4] Their young age dependency ratio (the number of dependent children relative to working age adults) is 52%. This ratio is higher that the global average of 39%. Developmental and health indicators differ according to the income level of each

country.[4] In 2014, the Lancet published a series on health in the Arab World, one of which was a report on the non-communicable disease (NCD) burden in the region.[8] Rahim et al. found that NCD burden (ischemic heart diseases, diabetes, cancer, and chronic lung diseases) has increased with some variation between countries. The burden was attributed to rapid lifestyle transitions and increase in tobacco use, physical inactivity, and obesity.[8] Additionally, Mokdad et al. reported that smoking is one of the major causes of morbidity and mortality in the Arab world and chronic obstructive pulmonary disease (COPD) is one of the top ten causes of disability. Causes of COPD include air pollution, smoking, and second-hand smoke exposure.[9]

WHO Framework Convention on Tobacco Control (FCTC)

In response to the globalization of the tobacco epidemic, the WHO developed its first global evidence-based treaty known as the Framework Convention on Tobacco Control (WHO FCTC) to reaffirm the right of all people to the highest standard of health. The WHO FCTC provides regulatory strategies to reduce tobacco demand and supply. The WHO FCTC opened for signature in June 2003 in Geneva and ended on 29 June 2004 in New York at the United Nations (UN) Headquarters. The treaty closed in signature with 168 Signatories, which makes it one of the most embraced treaties in UN history. The agreement entered into force on 27 February 2005 and Parties are legally bound by the treaty's provisions.[10]

Article 6 to 14 contains the core demand reduction provisions in the WHO FCTC. This includes demand reduction using price and tax measures and non-price measures to reduce the demand such as protection from tobacco smoke exposure, regulation of tobacco products contents and labelling, raising public awareness, regulating tobacco advertising and tobacco dependence treatment. Meanwhile Article 15 to 17 provides core supply reduction provisions which are: controlling illicit trade, sales to and by minors, and supporting economically viable alternatives. The WHO FCTC includes provisions that address liability, technical and scientific cooperation as well as the exchange of information which are under Articles 20, 21 and 22.[10]

Following this, the WHO developed the MPOWER policy package as an action plan to help countries fulfill the WHO FCTC treaty and achieve their goals in reducing smoking prevalence. **MPOWER** stands for **M**onitor tobacco use and policies, **P**rotect people from tobacco smoke, **O**ffer help to quit, **W**arn the public about tobacco dangers, **E**nforce policies and **R**aise tobacco taxes.[11]

The State of Youth's Smoking Cessation in the Arab World

I. Abstract

Objectives: To: (1) describe the smoking cessation (SC) behaviors including quit intention, quit attempts and intention to continue smoking in the future and (2) to explore the association between receiving external cessation help and SC behaviors.

Methods: We used data from the Global Youth Tobacco Survey (2013-2018). Using surveys of young adolescents from 15 Arab countries, we calculated prevalence of SC behaviors and cessation help. We used a multilevel model to estimate the association between SC behaviors and cessation help, adjusted for sex, age, household and school smoke exposure, cigarettes smoked per day, perceived difficulty of quitting, being taught the dangers of tobacco, and survey year.

Results: 70.0% of respondents wanted to quit smoking, 58.1% tried to quit the past year, however, 47.2% of expressed the decision to continue smoking. Most smokers received help to quit from social circles (61.6%) and 10.9% received professional help. Overall, the strength of the association for quit intention was larger for receiving professional help (OR 3.33, 95%CI 1.86-5.95) than social circles (OR 1.81, 95%CI 1.36 - 2.43). Receiving both, professional and social help demonstrated a larger association with quit attempts than receiving social help only.

Conclusion: Most of Arab schoolchildren have the desire to quit smoking and have attempted to do so. Receiving SC help from either professional sources or social circles were associated with positive SC behaviors. Healthcare providers and parents should engage in youth SC counseling to facilitate successful quit.

II. Introduction

The Arab world is home to nearly 428 million people spread over West Asia and Africa.[4] The League of Arab States consists of 22 diverse countries, yet they share sociocultural, economic, and geopolitical relations. One of the many challenges the region is grappling with is the tobacco use epidemic.[12] Despite the global decrease in tobacco smoking prevalence, the Middle East and North Africa region is witnessing a 104% relative increase in the number of adult smokers since 1990.[13] In 2019, smoking prevalence for males between the ages of 15-19 reached to 35% in some Arab countries compared to the global prevalence of 12.8%.[14] In 2015, it was estimated that about 0.8% of the Middle East and North Africa region gross domestic product was lost due to mortality from smoking-attributable diseases which is over than 29 billion U.S. dollars.[2]

These escalating trends are normalizing the social perception of tobacco use and influencing the youth's decision to initiate smoking as well as discouraging quit attempts.[15] Given that the majority of current smokers have initiated tobacco smoking between the ages of 14 and 25 years,[14] these findings are alarming because nicotine is highly addictive.[16] The intergenerational cycle of tobacco use from childhood to adulthood is likely to become a self-fulfilling prophecy. Data from the previous decade found that 27.4% to 50.8% school-aged Arab children expressed a desire to quit smoking, meanwhile, quit attempts ranged from 24.9% to 44.8%.[17] Quit attempts could be derailed by the scarcity of youth smoking cessation (SC) counseling in the region.[12]

Although most of the Arab countries ratified the WHO Framework Convention on Tobacco Control (FCTC) treaty,[18] tobacco control policies are overpowered by population growth, and tobacco industry interferences in the region.[12] The WHO built on the FCTC treaty by presenting the "MPOWER" package which introduces policy measures to control tobacco demand. Of recent years, the Arab world made considerable strides in banning tobacco advertisements, enforcing

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smoke-free laws and tobacco taxation.[16] However, few countries reached the highest level of achievement in monitoring tobacco use, providing comprehensive cessation services, and warning about the dangers of tobacco.[16]

Years after the first wave of uprisings in 2010 known as the "Arab Spring", the region is still reckoning with its political and social ramifications. The current regional instability and economic stagnation may come at the expense of improving youth tobacco surveillance and control activities.[19] Consequently, there is paucity of data describing the Arab youth SC behaviors and their interplay with cessation help. In this study, we aimed to (1) describe the SC behavior for Arab youth including quit intention, quit attempts and the intention to continue smoking in the future, and (2) to explore the association between receiving external cessation help and SC behaviors. This paper sought to provide an updated profile of the youth cessation behavior as part of monitoring tobacco use dynamics in the region.

III. Methods

The Arab league includes most of the countries from the Middle East and North Africa (MENA) region such as Algeria, Bahrain, Djibouti, Egypt, Iraq, Kuwait, Jordan, Lebanon, Libya, Morocco, Oman, Palestine, Qatar, Saudi Arabia, Syria, Tunisia, United Arab Emirates and Yemen. The rest of the Arab countries are Comoros, Mauritania, Somalia, and Sudan, which are in Africa. It might be misleading to simply generalize findings to all Arab states due to their diversity, especially in availability of economic resources. Similar to Mokdad et al.[9] we grouped countries according to their World Bank income category at the year of survey administration. High income countries included: Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates. Meanwhile, Middle- and low-income countries included: Algeria, Comoros, Djibouti, Egypt, Iraq, Jordan, Lebanon, Libya, Mauritania, Morocco, Palestine, Somalia, Sudan, Syria, Tunisia, and Yemen.

Data Source and Study Population:

We used data from the Global Youth Tobacco Survey (GYTS),[20] a survey jointly developed by the World Health Organization (WHO) and the U.S. Centers of Disease Control and Prevention. It is an anonymous, school-based, self-administered survey to young adolescents in grades associated with age 13 to 15 years. The survey utilizes a two-stage random cluster sampling method whereby schools are the primary sampling units. The probability of school selection is proportional to class enrollment size. National surveys produce samples representative of the general population of young adolescents in each country. All surveys were approved by the local national authority, often either the Ministry of Health or Education, and an ethical committee.

Informed consents were also obtained from students and parents prior to the survey. The survey data were publicly available on the WHO website, as part of the 4-year turnover of GYTS.

The detailed methodology of GYTS is published elsewhere.[20] The inclusion criteria of a country survey were as follows: (1) the survey was administered during or after 2010, in cases where countries presented with two or more surveys, the most recent was included and (2) the survey included data about students age, sex, cigarette smoking status and SC behaviors. We excluded Somalia and Sudan surveys because they were conducted before 2010. Comoros was excluded because it was missing key variables including age and sex.

Analyses were restricted to current cigarette smokers. *Current cigarette smoking* was defined as smoking a cigarette on at least one day in the past month. This was assessed using the following question: "During the past 30 days, on how many days did you smoke cigarettes?".

Outcome Measures:

We assessed three different SC indicators as the main outcomes. Firstly, quit intention was assessed using the question "Do you want to stop smoking now?". Students who answered "Yes" were considered having an intention to quit. Secondly, a quit attempt was assessed using the following question: "During the past 12 months, did you ever try to stop smoking?", and thus answering "Yes" was considered a quit attempt. Lastly, intention for continuous prospect use was assessed using the question: "At any time during the next 12 months do you think you will use any form of tobacco?". Answers were dichotomized to: "Yes" or "No". Current smokers who answered "Definitely Yes" or "Probably Yes" were considered as having an intention for continuous use.

Main Predictor:

The receipt of external SC help was the main predictor. Our SC help variable had four options, "Received professional help only", "Received help from family and/or friends only", "Received help from both professional and family/friends" or "Received no help". This was assessed using the following question "Have you ever received help or advice to help you stop smoking?".

Exposure Measures:

The intensity of current smoking habit was measured by the number of cigarettes smoked per day in the past 30 days, assessed using the following question: "During the past 30 days. How many cigarettes did you usually smoke per day?".

The child's perception of smoking cessation difficulty was assessed by asking if they think it would be difficult to quit once someone has started smoking tobacco. The answer was either "Yes" or "No".

Household smoke exposure was defined as being exposed at least one day in the past week using the following questions: "During the past 7 days, on how many days has anyone smoked inside your home, in your presence?".

Exposure to smoke in school was assessed by asking if the child saw anyone smoking inside the school building or outside on school property during the past 30 days. The answer was either "Yes" or "No".

Learning about tobacco dangers in school was a binary variable assessed using the following question: "During the past 12 months, were you taught in any of your classes about the

dangers of tobacco use?". Children who were warned about tobacco dangers in school responded by "Yes", in contrast to children who responded with "No" or "Not sure".

Libya, Saudi Arabia, and Syria surveys were excluded from the analyses because they did not include a question about the perceived difficulty of quitting tobacco use. Lebanon's survey was excluded because it did not ask (1) explicitly about receiving SC help from both professional sources and family or friends, and (2) if they were taught the dangers of cigarette smoking and waterpipe separately. We included the question about cigarette smoking in our analysis.

Other Covariates:

For the individual-level variables, we included the age (11 to 17 years old) and sex (Female or Male) of the child. Country-level variables were the year of survey administration. Data about the year of WHO FCTC treaty ratification were extracted from the WHO website and included in the descriptive analysis.

Statistical Analysis:

We calculated weighted estimates to generate nationally representative results. Weights were adjusted for three complex survey design variables: the primary sampling unit, stratum, and a final weight that combined poststratification and non-response weights. We presented overall, income-category specific and country-specific frequencies for the outcome and predictor measures.

Logistic multilevel random-intercept models were used to account for the clustering of the respondents (level 1) within their schools (Level 2), and nesting of schools within their respective countries (level 3). We tested the association between the main predictor and the outcome, adjusted

for sex, age, secondhand smoke exposure in household, secondhand smoke exposure in school, number of cigarettes smoked per day, perceived difficulty of quitting smoking, being taught in school the dangers of tobacco use, and survey administration year. We presented models for the overall, and income-category specific estimates. We also ran an interaction model to examine whether the association between receiving cessation help and SC behaviors differs according to the child being taught in school the dangers of tobacco use.

Measures of association were reported as odd ratios (ORs) and adjusted ORs, with their respective 95% confidence intervals (95%CI). Findings were considered statistically significant if the p-value were less than 0.05. Models were restricted to current cigarette smokers and conducted as complete-case analysis. Median odds ratio and 95% credible intervals (MOR and 95%CrI) were used as measures of variation. MOR is interpreted as the median value of the odds of having a positive SC behavior (e.g., odds of reporting a quit attempt) that are determined by unexplained factors at the school and country levels. An MOR close to 1 suggests little variation in school or country-level effect, while an MOR greater than 1 suggests a stronger effect compared to individual factors.[21] This report is adherent to the guidelines of Strengthening the Reporting of Observational Studies in Epidemiology (STROBE).[22]

IV. Results

We included fifteen Arab countries (5 HICs and 10 MICs or LICs countries). 43,068 schoolchildren between that age of 11 to 17 (50.0% boys) were included in the univariate and bivariate analysis. The overall prevalence of current cigarette smoking was 6.7% (7.6% in HICs and 6.7% in MICs and LICs). The highest prevalence of current cigarette smoking was in Palestine (19.0%), followed by Kuwait (13.5%) and Mauritania (13.2%); **Table 1** summarized the included GYTS surveys and participants' characteristics. **Table 2** presents the weighted prevalence of SC behaviors distributed over the characteristics of current cigarette smokers. We found that the majority of smokers: (1) perceived the act of quitting smoking as difficult, (2) were exposed to secondhand smoke in home and school, and (3) were not taught in school the dangers of tobacco use.

Table 3 shows the prevalence of different SC behaviors and the type of cessation help the child received. Overall, 70.0% of Arab children expressed a desire to quit smoking, 58.1% tried to quit smoking in the past twelve months, and 47.2% of current smokers seeing themselves still smoking in the future. Most cigarette smokers received help to quit smoking from their family of friends (61.6%) and only 10.9% received professional help. The country with the highest prevalence of cessation trials were Yemen (80.9%) followed by Tunisia (77.2%). In Egypt, 64.0% of children see themselves smoking in the future, followed by 61.5% In Kuwait. Almost a third of current smokers in Qatar and Djibouti have never received any help to quit smoking (32.5% and 30.3%, respectively). Meanwhile, only three out of one hundred Kuwaiti children and five out of one hundred Algerian children received professional cessation help. In Qatar, only 45.5% of children received help from family or friends to quit smoking compared to 68.2% in Tunisia and 65.2% in Egypt.

Table 4 presents the pooled estimated of the multivariable association between different smoking cessation behaviors and the receipt of SC help. In general, receiving cessation help from either professional or social sources were associated with positive SC behaviors among schoolchildren compared to children who received no help. Overall, the strength of the association for quit intention was larger for receiving professional help (OR 3.33, 95%CI 1.86-5.95) than help from family and/or friends (OR 1.81, 95%CI 1.36-2.43). Receiving both, professional and social help demonstrated larger association with quit attempts (OR 2.53, 95%CI 1.75-3.67) than receiving social help only (OR 1.89, 95%CI 1.44-2.49). Receiving professional help demonstrated a protective association against the intention to continue smoking in the future (OR 0.48, 95%CI 0.32-0.71) (all with P<0.05). Students who were taught the dangers of tobacco smoking in school had 45% increased odds of attempting to quit and 25% less odds of expressing a decision to continue smoking in the future compared to children who did receive such messages in school (all with P<0.05).

Moreover, smoking ≥ 5 cigarettes a day was negatively associated with quit intention and quit attempts (OR 0.43, 95%CI 0.33-0.56 and OR 0.53, 95%CI 0.42 - 0.68, respectively). A child who smokes ≥ 5 cigarettes a day has more than twice the odds of expressing a decision to continue smoking in the future. Additionally, household SHS exposure was associated with a 31% decrease in the odds of quit intention, and 22% less odds of attempting to quit. Meanwhile, SHS exposure in school was associated with a 36% increase in the decision to continue smoking in the future (all with P<0.05). The median odds ratios showed that school was associated slightly more closely with quit attempts and intention for future use than the country the child lives in.

In HICs, students who received professional help had more than three times the odds of expressing a desire to quit smoking (OR 3.63, 95%CI 1.37-9.60) compared to students who did

not receive any help. In MICs and LICs, students who received professional help had more than two times the odds of wanting and attempting to quit smoking (OR 2.90, 95%CI 1.41-5.97 and OR 2.65, 95%CI 1.43-4.91; respectively), compared to students who did not receive any help. (**Table 5**). Additionally, we found no clear interaction between receiving cessation help and being taught the dangers of tobacco use in school (p>0.05).

V. Discussion

We found that the overall prevalence of current cigarette smoking was 6.7% and did not vary widely by economic category. Six out of ten Arab children who smokes tried to quit smoking in the past twelve months (at the time of survey administration). Of particular concern, almost half of the smokers see themselves continuing smoking in the future. We observed a strong relationship between receiving professional cessation help and positive cessation behavior among schoolchildren. We found that receiving cessation help and being taught the dangers of tobacco use in school, were significantly associated with cessation attempts. Conversely, being a female, a child who smokes five or more cigarettes a day, being exposed to SHS at home or school were significantly associated with negative SC behaviors. The median odds ratios showed that school was a factor slightly more important than the country the child lives in with regards to SC behaviors. Prevention at the school level might be easier than changes at the country level.

Overall, quit intentions levels were higher than quit attempts with some variability among countries (quit attempts were 41.9% in Oman compared to 77.2% in Tunisia). Prevalence of quit attempts among Arab children (58.1) were relatively comparable to United States youth estimates (65.8%)[23] and lower than the European estimates (77.3%).[24] Most of the Arab youth who are cigarette smokers have the motivation to quit and could benefit from adopting youth-centered evidence-based cessation interventions. However, a quit attempt does not reflect the length of the child abstinences from smoking. A systematic review of 52 studies found that the median relapse prevalence for adolescents was 92% within one year of a cessation attempt.[25] Meanwhile only 19% of adolescents who attempt to quit smoking remain abstinent for at least one year.[26] These results allude to the difficulties faced by the youth to break their nicotine dependence, and that cessation support should be readily available as part of the local tobacco prevention and control efforts.

Over half of current cigarette smokers received help to quit smoking from their family of friends and only 10.9% received professional help. These findings raise the concern that most of the Arab children receive cessation advice from non-evidence-based sources. On the other hand, by understanding the significant role a family plays in the Arab culture, this pattern can be used to create cessation programs where friends and family are engaged with the child as part of their support system. Cessation interventions can include parental education on how best to support their children to successfully quit. However, family support or direct parental involvement in a cessation treatment program alone is not enough to affect adolescents' compliance and motivation to quit.[27]

Our multilevel analysis estimated the odds of reporting a quit intention to be greater with receiving professional help than receiving no help. A child has over two times the odds of attempting to quit with receiving both, professional and social help compared to no help. Receiving professional help showed a protective association against expressing the decision to continue smoking. The survey questions do not differentiate between whether the child received one to one advice or whether it was group counseling. According to the most recent Cochrane review for adolescents' tobacco cessation interventions, group-based behavioral interventions were more promising than individual counselling or pharmacological interventions.[28] However, evidence is still limited regarding the most effective intervention for long term smoking cessation.

Regarding the Individual-level determinants of SC, students who were taught the dangers of tobacco smoking in school had significantly higher odds of attempting to quit. They also had lower odds of expressing a decision to continue smoking in the future compared to children who did receive such messages in school. Meanwhile, being exposed to SHS at school was significantly associated with negative SC behaviors. The school environment plays a significant role in shaping

the child's behaviors toward smoking.[29,30] A multilevel analysis using the health behavior in school-aged children (HBSC) survey found that the presence of antismoking policy measures and messages in curriculum were negatively associated with smoking behavior among adolescents.[30] Additionally, Pbert et al. found that delivering a SC intervention by school nurse to adolescent boys was an effective and practical model to short-term abstinence. It also enhanced short-term reductions in smoking intensity in both genders.[31] A school-based quasi-experimental controlled trial conducted in Saudi Arabia using 10-hour educational intervention found positive short-term preventive effects on behaviors and attitudes. However, the positive effects have faded two years post-intervention.[32] Additional research is needed to improve long-term smoking abstinence among adolescents.

Similarly, being exposed to SHS at home was significantly associated with negative SC behaviors.[33] Xi et al, found that 53.7% of Eastern Mediterranean children between the age of 13-15 and 50.1% of African children are exposed to SHS. They found that exposure to SHS and/or parenteral tobacco use were significantly associated with tobacco use. The strength of association was larger for maternal use compared to paternal.[33] Additionally, a systematic review found that exposure to SHS was positively associated with smoking initiation and negatively associated with SC.[15]

On a global level, the WHO FCTC treaty was signed by 19 Arab countries (13 of which were included in our study).[18] Article 14 of the treaty provides evidence-based policy measures to promote cessation and reduce the demand of smoking.[34] The Arab World has progressed in banning tobacco advertisements, enforcing smoke-free laws and tobacco taxation [16] However, few countries reached the highest level of achievement providing comprehensive cessation services[16] SC among adolescents remains one of the most challenging topics in public health. In 2020, the

US Preventive Series Task Force published that there is insufficient evidence to conduct risk and benefit analysis for providing feasible primary care SC intervention among schoolchildren.[35] The Arab world is relatively young with a third of its population below the age of 15.[4] Also, the majority of the countries are classified as middle and low-income with burdened human and financial resources.[4] As the population ages, the burden of non-communicable diseases will increase with a hefty cost. Feasible youth-centered evidence-based cessation services as well as prevention are key for a healthier generation to come.

The strengths of our study lie within: (1) that we utilized GYTS; which is a globally validated survey, with nationally representative data; (2) we covered the majority of the Arab countries in our analysis for better representation, and that (3) the three-level hierarchical models adjusted for outcomes clustering within schools and countries. However, this study must be interpreted within its limitations. The GYTS is a voluntary survey that is subject to recall and desirability bias. Furthermore, the current cigarette smoker classification might have included experimental users. Utilizing conventional cigarette smoking might underestimate the children smoking status. This can occur due to the presence of other forms of tobacco use such as waterpipes, e-cigarettes, midwakh and others. Also, quit success is not measured in GYTS; for this reason, we expanded our view on SC behaviors to include quit intentions, attempts and future use. The small sample size in some of exposure variables may have led to relatively low precision and wider confidence intervals. Casual inference cannot be assumed due to the observational nature of the study. Moreover, GYTS does not include children who come from marginalized groups such as street children, children who are not enrolled in schools and children in refugee camps. It also important to highlight that regional wars and conflicts may have affected the tobacco surveillance

activities in the Arab world. For example, Sudan and Somalia's latest GTYS turnout was in 2006; meanwhile Libya and Syria's GYTS were in 2010.

In conclusion, we found that most Arab schoolchildren have the desire to quit smoking and have attempted to do so. Policymakers and researchers could focus on improving professional cessation services and equip parents with tools to facilitate informed cessation conversations with their youth.

VI. Conclusion

Most Arab schoolchildren have the desire to quit smoking and have attempted to do so. There was a strong relationship between receiving professional cessation help and positive cessation behavior. We found that receiving cessation help and being taught the dangers of tobacco use in school, were associated with cessation attempts. Conversely, being a female, a child who smokes five or more cigarettes a day, being exposed to SHS at home or school were associated with negative SC behaviors. Policymakers and researchers could focus on improving the availability and demand for professional cessation services and equip parents with tools to facilitate informed cessation conversation with their youth.

VII. Tables

Table 1. Survey Characteristics of the Global Youth Tobacco Survey (Country-Specific and Pooled Income- Specific Estimates), 2013-2018.

Country	Survey Year	Sample Size (n)	Response Rate (%)	Boys n (%)	Prevalence of Current Cigarette Smokers Weighted % (95%CI)	World Bank Income Group[#]	Year of WHO FCTC ratification
Overall	2013-2018	43,068	89.3*	21,397 (50.0)	6.7 (5.6-8.1)	-	2004-2010
Overall HICs	-	14,656	87.6*	6,940 (47.6)	7.6 (6.5-8.9)	-	2004-2007
Bahrain	2015	3,641	76.9	1,804 (50.0)	10.8 (7.1-16.1)	HIC	2007
Kuwait	2016	2,477	87.7	1,123 (45.4)	13.5 (10.3-17.6)	HIC	2006
Oman	2016	2,208	91.1	1,069 (48.5)	2.6 (1.4-4.8)	HIC	2005
Qatar	2018	2,071	89.0	1,028 (49.9)	6.7 (4.9-09.0)	HIC	2004
United Arab Emirates	2013	4,259	93.2	1,916 (45.2)	7.9 (6.0-10.3)	HIC	2005
Overall, MICs and LICs	-	28,412	90.2*	14,457 (51.3)	6.7 (5.5-8.1)	-	2004-2010
Algeria	2013	6,228	96.7	2,997 (48.3)	9.2 (7.8-10.7)	UMIC	2006
Djibouti	2013	1,818	84.5	948 (52.8)	7.7 (5.7-10.4)	LMIC	2005
Egypt	2014	2,471	89.2	1,408 (57.6)	5.1 (2.8-9.0)	LMIC	2005
Iraq	2014	2,047	88.1	1,346 (66.4)	11.2 (7.0-17.6)	UMIC	2008
Jordan	2014	2,120	93.1	1,165 (55.0)	11.9 (8.4-16.6)	LMIC	2004
Mauritania	2018	3,740	91.3	1,691 (45.8)	13.2 (8.8-19.3)	LMIC	2005
Morocco	2016	3,915	86.0	1,937 (49.8)	2.6 (1.8-3.7)	LMIC	Not Ratified
Palestine	2016	1,518	95.2	781 (52.4)	19.0 (13.6-26.0)	LMIC	Not Ratified
Tunisia	2017	2,448	92.8	1,088 (44.6)	7.9 (6.4-9.7)	LMIC	2010
Yemen	2014	2,107	85.1	1,096 (53.2)	6.8 (4.5-10.3)	LMIC	2007

Note. **CI:** Confidence Interval. **HICs:** High Income Countries. **MICs:** Middle Income Countries. **UMIC:** Upper Middle-Income Country. **LMIC:** Lower Middle-Income Country. **LICs:** Low Income Countries. **(*):** Average response rate. **(#)**: World Bank Group income category at the year of survey administration. **WHO FCTC:** World Health Organization, Framework Convention on Tobacco Control.

Table 2. Description of the study population and prevalence of smoking cessation behaviors for school children who are current cigarette smokers, aged 11-17 (Global Youth Tobacco Survey 2013-2018)

Characteristics	Sample Distribution	Quit Intention (Weighted %)	Quit Attempt (Weighted %)	Intention to continue smoking in the future (Weighted %)
N Individuals (Weighted %)	3,441 (100.0)	1,330 (70.0)	1,394 (58.1)	1,467 (47.2)
Countries Income Group				
HICs	32.4	37.4	45.4	53.5
MICs/LICs	67.6	44.5	39.7	46.0
Receipt of Tobacco Cessation Help				
No Help	18.4	13.7	12.5	16.4
Professional Help	9.4	9.3	11.2	11.1
Social Help[#]	58.1	61.4	57.9	60.0
Professional and Social Help	14.1	15.5	18.4	12.4
Sex				
Female	21.1	9.2	12.7	11.9
Male	78.9	90.8	87.3	88.1
Age (Years)				
11	1.6	0.3	0.7	2.1
12	2.9	0.9	1.1	1.4
13	14.4	11.6	11.3	13.1
14	22.0	25.1	20.8	26.6
15	29.1	25.4	24.6	28.6
16	17.1	16.3	20.0	13.8
17	13.0	20.4	21.5	14.4
Number of Cigarettes per day				
5 or less	76.0	73.5	77.4	64.2
More than 5	24.0	26.5	22.6	35.8
Perceived Difficulty of Quitting Smoking				
Not Difficult	43.9	38.2	44.0	29.5

Difficult	56.1	61.8	56.0	70.5
Household Secondhand Smoke Exposure				
Not Exposed	38.7	36.1	36.9	23.9
Exposed	61.3	63.9	63.1	76.1
School Secondhand Smoke Exposure				
Not Exposed	29.3	16.4	20.7	15.4
Exposed	70.7	83.6	79.4	84.6
Taught the dangers of tobacco in school				
No	58.3	59.9	52.1	69.3
Yes	41.7	40.1	47.9	30.7
Survey Year				
2013	27.9	27.4	31.7	17.0
2014	21.0	54.5	48.3	63.2
2015	8.5	0.5	0.8	0.9
2016	21.7	10.5	11.2	12.2
2017	5.0	5.4	6.4	4.8
2018	15.9	1.7	1.6	2.1

Note. HICs: High Income Countries. **MICs:** Middle Income Countries. **LICs:** Low Income Countries. (#) **Social help** means receiving help from family and/or friends.

Table 3. Prevalence of Cigarette Smoking Cessation Behavior and Reported Source of Cessation Help Received for school children, who are current cigarette smokers, aged 11-17 (Country-Specific and Pooled Income- Specific Estimates, 2013-2018).

Country	Weighted Prevalence of Smoking Cessation Behavior (95% CI)			Weighted Prevalence of Cessation Help Received (95% CI)			
	Quit Intention	Quit Attempt	Intention to continue smoking in the future	No Help	Professional Help	Social Help	Professional and Social Help
Overall	70.0 (64.4-75.1)	58.1 (47.6-67.9)	47.2 (39.5-55.1)	14.8 (12.5-17.6)	10.9 (7.8-15.1)	61.6 (55.8-67.1)	12.6 (9.6-16.5)
Overall, for HICs	54.4 (49.3-59.5)	62.0 (57.7-66.1)	53.5 (48.2-58.7)	20.6 (17.7-23.8)	7.6 (5.8-10.0)	56.4 (52.6-60.2)	15.4 (12.8-18.3)
Bahrain	51.2 (42.3-60.0)	60.9 (53.3-68.0)	53.9 (46.9-60.8)	13.8 (8.6-21.3)	9.9 (5.8-16.2)	60.7 (51.0-69.7)	15.6 (10.7-22.2)
Kuwait	55.4 (45.3-65.1)	66.5 (59.1-73.1)	61.5 (52.0-70.2)	20.1 (15.7-25.2)	3.2 (1.6-6.4)	59.5 (52.4-66.3)	17.2 (12.2-23.8)
Oman	57.8 (34.9-77.7)	41.9 (21.2-65.9)	31.9 (19.8-47.1)	6.8 (2.5-17.0)	16.1 (6.9-33.0)	60.8 (44.4-75.0)	16.4 (9.8-26.1)
Qatar	52.1 (43.7-60.4)	54.9 (46.4-63.1)	44.7 (29.7-60.7)	32.5 (22.3-44.6)	12.4 (6.2-23.4)	45.5 (37.0-54.2)	9.7 (4.8-18.7)
United Arab Emirates	54.2 (44.6-63.4)	62.9 (54.7-70.3)	53.9 (44.7-62.8)	26.0 (20.2-32.8)	7.7 (4.7-12.6)	52.1 (45.2-58.9)	14.2 (10.1-19.5)
Overall, for MICs and LICs	70.9 (64.8-76.3)	57.9 (46.9-68.2)	46.9 (38.7-55.2)	14.5 (12.1-17.4)	11.1 (7.8-15.5)	61.9 (55.8-67.6)	12.5 (09.3-16.5)
Algeria	82.7 (78.1-86.4)	74.3 (69.8-78.4)	36.6 (32.7-40.7)	14.8 (12.0-18.1)	5.0 (3.2-7.7)	60.9 (56.8-64.9)	19.4 (16.0-23.3)
Djibouti	65.3 (50.1-77.9)	50.2 (38.8-61.6)	34.0 (24.1-45.5)	30.3 (17.8-46.7)	11.8 (6.6-20.2)	51.5 (38.5-64.4)	6.3 (3.2-12.2)
Egypt	69.7 (51.3-83.4)	42.4 (21.0-67.1)	64.0 (44.2-80.0)	11.8 (6.4-20.7)	15.4 (5.2-38.1)	65.2 (43.8-81.9)	7.5 (2.1-23.4)
Iraq	68.8 (55.9-79.3)	56.9 (48.6-64.8)	35.3 (28.8-42.5)	6.4 (3.6-11.3)	12.7 (7.4-21.0)	64.8 (58.8-70.3)	16.1 (10.3-24.3)
Jordan	56.6 (46.2-66.5)	55.9 (45.7-65.6)	54.5 (45.6-63.2)	25.0 (18.6-32.6)	8.9 (4.99-15.39)	53.2 (43.7-62.5)	12.9 (7.2-22.2)
Mauritania	75.9 (66.2-83.5)	52.6 (38.8-66.1)	42.8 (33.0-53.3)	10.7 (6.1-18.2)	19.7 (14.9-25.7)	52.8 (45.6-59.9)	16.8 (11.1-24.7)
Morocco	54.4 (36.0-71.7)	45.3 (29.6-62.1)	38.5 (23.0-56.7)	18.3 (8.6-34.9)	17.9 (10.8-28.0)	57.2 (38.3-74.1)	6.7 (1.5-25.2)
Palestine	53.1 (44.1-62.0)	53.6 (43.4-63.5)	44.7 (34.4-55.5)	25.8 (17.8-35.9)	6.9 (4.0-11.7)	56.2 (47.1-64.8)	11.1 (7.3-16.5)
Tunisia	76.6 (65.0-85.2)	77.2 (65.4-85.8)	42.9 (34.8-51.5)	14.5 (9.8-20.8)	5.4 (2.6-11.0)	68.2 (60.5-75.0)	11.9 (7.4-18.7)
Yemen	79.8 (69.9-87.1)	80.9 (70.6-88.2)	32.8 (22.7-44.7)	18.1 (12.7-25.2)	12.2 (5.0-26.8)	61.0 (52.8-68.6)	8.8 (4.5-16.4)

Note. CI: Confidence Interval. HICs: High Income Countries. MICs: Middle Income Countries. LICs: Low Income Countries. Social help means receiving help from family and/or friends.

Table 4. The pooled estimates of the association between smoking cessation behaviors and receiving cessation help among schoolchildren between the age of 11-17 years who are current cigarette smokers (2013-2018, n= 3,441 from 15 countries).

Measures	Smoking Cessation Behavior [Adjusted OR and (95%CI)]					
	Quit Intention	**p-value**	**Quit Attempt**	**p-value**	**Intention to continue smoking in the future**	**p-value**
Tobacco Cessation Help						
No Help	Reference		Reference		Reference	
Professional Help	**3.33 (1.86-5.95)**	**<0.001**	**2.36 (1.42 - 3.92)**	**0.001**	**0.48 (0.32-0.71)**	**<0.001**
Social Help#	**1.81 (1.36-2.43)**	**<0.001**	**1.89 (1.44 - 2.49)**	**<0.001**	0.87 (0.68-1.10)	0.242
Professional and Social Help	**2.26 (1.52-3.35)**	**<0.001**	**2.53 (1.75 - 3.67)**	**<0.001**	1.08 (0.78-1.50)	0.622
Taught the dangers of tobacco in school						
No	Reference		Reference		Reference	
Yes	1.21 (0.95-1.53)	0.119	**1.45 (1.17 - 1.81)**	**0.001**	**0.75 (0.63-0.91)**	**0.003**
Age, years	1.05 (0.94-1.16)	0.381	0.98 (0.89 - 1.07)	0.649	0.99 (0.91-1.07)	0.752
Sex						
Male	Reference		Reference		Reference	
Female	**0.60 (0.43-0.84)**	**0.003**	**0.63 (0.46 - 0.87)**	**0.005**	**1.38 (1.06-1.79)**	**0.017**
Number of Cigarettes per day						
< 5	Reference		Reference		Reference	
≥ 5	**0.43 (0.33-0.56)**	**<0.001**	**0.53 (0.42 - 0.68)**	**<0.001**	**2.43 (1.94-3.04)**	**<0.001**
Perceived Difficulty of Quitting Smoking						
Not Difficult	Reference		Reference		Reference	
Difficult	1.03 (0.81-1.30)	0.819	1.1 (0.88 - 1.36)	0.409	**1.54 (1.28-1.86)**	**<0.001**
Household Secondhand Smoke Exposure						
Not Exposed	Reference		Reference		Reference	
Exposed	**0.69 (0.54-0.87)**	**0.002**	**0.78 (0.62 - 0.98)**	**0.036**	**1.36 (1.12-1.65)**	**0.002**
School Secondhand Smoke Exposure						
Not Exposed	Reference		Reference		Reference	
Exposed	0.84 (0.647-1.1)	0.204	0.84 (0.65 - 1.09)	0.188	**1.86 (1.50-2.29)**	**<0.001**
Survey Year	0.89 (0.73-1.09)	0.257	0.94 (0.81 - 1.09)	0.432	0.97 (0.83-1.14)	0.728
Country-Level MOR (95% Crl)	1.75 (1.42-2.43)		1.45 (1.22-2.02)		1.56 (1.32-2.04)	
School-Level MOR (95% Crl)	1.68 (1.42-2.16)		1.78 (1.54-2.16)		1.76 (1.55-2.07)	

Note. OR: Odds Ratio. **CI:** Confidence Interval. **(#):** Social help means receiving help from family and/or friends. **MOR:** Median odds ratio, as a measure of variation. **CrI:** Credible Interval.

Table 5. Income group-specific estimates of the association between smoking cessation behaviors and receiving cessation help among schoolchildren between the age of 11-17 years who are current cigarette smokers (2013-2018).

Tobacco Cessation Help	Smoking Cessation Behavior [Adjusted* OR and (95%CI)]					
	Quit Intention	p-value	Quit Attempt	p-value	Intention to continue smoking in the future	p-value
HICs (n= 1,115, 5 countries)						
No help	Reference		Reference		Reference	
Professional Help	**3.63 (1.37-9.60)**	**0.009**	1.74 (0.68 - 4.44)	0.250	**0.41 (0.20-0.83)**	**0.014**
Social Help#	**1.86 (1.15-3.01)**	**0.011**	**1.86 (1.19 - 2.89)**	**0.006**	1.15 (0.77-1.71)	0.489
Professional and Social Help	**2.88 (1.53-5.44)**	**0.001**	**2.77 (1.50 - 5.09)**	**0.001**	1.38 (0.81-2.37)	0.238
MICs and LICs (n= 2,326, 10 countries)						
No help	Reference		Reference		Reference	
Professional Help	**2.90 (1.41-5.97)**	**0.004**	**2.65 (1.43-4.91)**	**0.002**	**0.52 (0.32- 0.83)**	**0.006**
Social Help#	**1.79 (1.24-2.58)**	**0.002**	**1.94 (1.37-2.75)**	**<0.001**	0.75 (0.56-1.02)	0.065
Professional and Social Help	**1.90 (1.15-3.15)**	**0.012**	**2.44 (1.52-3.91)**	**<0.001**	0.95 (0.63-1.43)	0.808

Note. HICs: High Income Countries. **MICs:** Middle Income Countries. **LICs:** Low Income Countries. **OR:** Odds Ratio. **CI:** Confidence Interval. **(#):** Social help means receiving help from family and/or friends. **(*)** Adjusted for sex, age, household smoke exposure, school smoke exposure, number of cigarettes smoked per day, perceived difficulty of quitting, being taught the dangers of tobacco in school, and survey year.

Tobacco Cessation Measures in the Arab World: Policy Surveillance and Review of Health Professionals' Role

I. Abstract

Objectives: We aimed to (1) assess the implementation of FCTC Article 14 provisions in the Arab World using the latest WHO reports and to (2) review the local and regional reports of tobacco use cessation (TUC) services provided by healthcare professionals in Arab countries.

Methods: For policy surveillance we used the 2020 data from the WHO FCTC web-based implementation database of the reports submitted to the WHO Convention Secretariat. We assigned composite scores for the different provisions of FCTC Article 14. Meanwhile, the review of local reports was conducted by searching and summarizing the literature about TUC in the Arab countries from 2012 to 2022 using PubMed and EMBASE databases.

Results: According to the analysis of 2020 WHO data, Bahrain, Tunisia, and Sudan received the highest implementation score for WHO FCTC Article 14, among HICs, MICs and LICs categories, respectively. Seven countries reported having toll-free telephone quit lines. Eight countries reported providing Nicotine Replacement Therapy (NRT) to the public and 3 are fully covering their cost using public funding. The inclusion of tobacco dependence treatment curricula in healthcare education was hardly implemented. These findings were also supported by a review of the regional and local reports. Most healthcare schools do not include TUC counseling, the 5As or NRT intervention in their clinical training. Students believe that they are inadequately prepared to provide necessary TUC services to their patients.

Conclusion: We urge Arab countries to fully implement Article 14, develop and adapt a national strategy for tobacco use cessation and utilize existing infrastructure of primary health centers to provide cost-effective, broad-reach TUC activities.

II. Introduction

In response to the tobacco epidemic worldwide, the World Health Organization's (WHO) developed the Framework Convention on Tobacco Control (known as WHO FCTC) treaty. The WHO FCTC is a global law-binding evidence-based treaty, entered into force in February 2005.[10] It has been ratified by 182 countries, covering 90% of the world's population.[18] The objective of the WHO FCTC treaty is to protect current and future generations from the harmful effects of tobacco use and exposure, affirming the human right to the highest standard of health.[10] Countries with the highest level of implementation of the WHO FCTC key-demand reduction measures experienced significant decreases in tobacco smoking prevalence in a dose-response fashion.[36] Among the 182 countries who ratified WHO FCTC are 19 Arab countries, representing nations from the WHO Eastern Mediterranean Region (EMR) and African Region (AFR).[18]

In 2015, Bilano et al. projected that the highest smoking levels will shift from low- and middle-income countries in the Western Pacific and European region to those in Africa and the Middle East[37] Despite the global reduction in tobacco use, numbers of smokers are continuing to grow in the African Region and the Eastern Mediterranean Region.[1] Around 17% of the total population who are living in countries where tobacco use is on the rise, reside in the Middle East, which is the highest proportion compared to other regions[1] Moreover, four out of the only six countries in the world where tobacco use is still rising are Arab countries (Egypt, Jordan, Lebanon and Oman).[1] The increasingly growing epidemic of tobacco smoking in the region and the expected additional burden of non-communicable diseases calls for urgent action to promote and invest in smoking cessation services.[38]

Article 14 of the WHO FCTC outlined offering smoking cessation help for tobacco users as a core demand reduction measure.[10] Most middle and low-income countries have not fully

implemented Article 14 provisions,[39] and tobacco cessation programs in Arab countries have not been emphasized as strongly as smoking prevention programs.[1] Therefore, the objective of this paper is to (1) assess the implementation of FCTC Article 14 provisions in the Arab World using the latest WHO reports and to (2) provide a qualitative summary of the local and regional reports of tobacco use cessation (TUC) services provided by healthcare professionals in Arab countries. This study provides an extensive overview of TUC measures on a national and organizational levels. It supports the call for full implementation of Article 14 as a pressing step to reduce smoking-attributable morbidity and mortality in the Arab population.

III. Methods

III.a. Policy Surveillance:

For policy surveillance, we analyzed the WHO data from 19 Arab countries located in AFR and EMR. Morocco, Palestine (West Bank and Gaza), and Somalia did not ratify the WHO FCTC; thus, they were not part of the policy analysis. **Figure 1** shows Article 14 as mentioned by the WHO FCTC.[10]

Data source: We extracted the data from the WHO FCTC web-based implementation database (www.untobaccocontrol.org/impldb/). The database contains a web-platform with information on the countries' implementation status of each FCTC measures. Data are gathered using a biannual voluntary submission from the Health Ministries of each country to the WHO Convention Secretariat. We utilized the most recent data, reported between January 2020 to March 2020. When some of the country-level measures were unavailable, we referred to the official country reports uploaded under Party profiles to extract the necessary data. The WHO survey for Health Ministries requests numerous metrics to measure the level of implementation, we categorized them in six groups **(Figure 2)** as follows:

1- Design and implementation of programs to promote cessation.

2- Healthcare providers involvement in offering counseling services.

3- Incorporation of tobacco dependence treatment (TDT) into healthcare curricula.

4- Provision and inclusion of diagnosis and TDT in health and educational facilities.

5- Availability of Nicotine Replacement Therapy (NRT).

6- Cost coverage of cessation program and NRTs using public funding.

Analyses: We described the variations in the implementation of Article 14 provisions to define the demand reduction landscape in the Arab world. An implementation score of 1 was given to countries who answered (*Yes*), and 0 if (*No*). For cost coverage of cessation program and NRT

using public funding; countries received a score of 1 if the answer was (*Fully Covered*), a score of 0.5 if the answer was (*Partially Covered*) and a score of 0 if (*Not covered*). Missing data were recorded whenever a country chose not to report their level of implementation. Countries received a score of implementations in each of the six categories. A final composite score for Article 14 implementation was calculated for each country. Data were analyzed using STATA; StataCorp, V15.1, 2017 and Microsoft ® Excel V16.58.

Given that the surveys submitted to the FCTC Convention Secretariat are selectively reported and filled by a ministry of health official, some discrepancies are expected. To mitigate such discrepancies, we referred to the 2019 WHO's Global Report on the Tobacco Epidemic[40] where the data are obtained independently by WHO officials. The WHO's Global Report does not include all the measures presented in the FCTC Secretariat reports. They also include data for all countries regardless of their WHO FCTC status.

III.b. Health Professionals Role

To summarize the health professional role in providing TUC interventions, we conducted a narrative literature review. We searched the PubMed and EMBASE databases to retrieve TUC services literature in Arab-speaking countries. The search was restricted to English-language studies published within the past ten years (1st of January 2012–28th of February 2022). **Appendix A** presents our search strategy and results. We chose the most relevant studies to be included in the review and they are listed in the references. This review was focused around two main topics in TUC:

Topic (1) TUC Training in Healthcare Education.

Topic (2) TUC Provision by Healthcare Professionals.

IV. Results

IV.a. Policy Surveillance

Table 1 summarized the Arab countries parties' characteristics and their adult smoking prevalence. **Table 2** summarized the implementation score for the six policy measure categories for 19 Arab countries. Bahrain, Tunisia, and Sudan received the highest implementation score for WHO FCTC Article 14, among HICs, MICs and LICs, respectively. **Supplemental tables (1-6)** illustrate the individual scores of Article 14's implementation for countries that ratified the WHO FCTC.

Seven out of 19 countries reported having a toll-free telephone quitline. All countries, expect Djibouti and Oman implemented media campaigns to promote tobacco cessation. Seven out of 19 have implemented programs to promote cessation specially designed for women including pregnant and underage girls. Most programs designed to promote cessation are conducted in health-care facilities, followed by educational institutions, workplaces then sporting events.

Regarding the level of healthcare provider involvement in offering counseling services, Bahrain, Iraq, Tunisia, and Qatar demonstrated the highest scores. Physicians, followed by social workers and family doctors were the healthcare providers most involved in providing TUC counseling. Dentists and pharmacists provided TUC counseling in seven and five countries, respectively.

In respect to incorporating TDT into the curricula of health professional training at pre- and post-qualification levels, most Arab countries incorporated TDT in their medical curricula (except for Djibouti, Kuwait, Lebanon, Mauritania, Saudi Arabia, and Syria). Eight out of 19 countries teach nurses in nursing school about TDT, meanwhile only Bahrain, Comoros, Iraq, Qatar, and Tunisia reported that dental and pharmacy schools include such topics in their training.

Nicotine Replacement Therapy (NRT) is available in eight countries. However, it is only fully covered by public funding by three (Saudi Arabia, Qatar, and Jordan). Other countries provided full cost coverage in cessation programs in primary or specialized health care centers. For instance, Bahrain, Kuwait, Qatar, and Saudi Arabia provide full cost coverage for cessation programs in primary healthcare centers (PHC), meanwhile Iraq, Jordan, Lebanon, Libya, Mauritania, Sudan, UAE, and Tunisia partially cover such programs in PHCs. Kuwait and Saudi Arabia provide the highest levels of cost coverage for cessation programs and NRTs.

Supplemental tables (1-6)

We found some discrepancies between the 2020 Reports submitted to the FCTC Convention Secretariat and the 2019 WHO's Global Report on the Tobacco Epidemic [40]. For instance, in 2019, Bahrain, Tunisia, Jordan had no toll-free telephone quitlines. Moreover, NRTs are available in the pharmacies of Iraq and Oman, and are fully covered in Bahrain, Kuwait, and Tunisia (in addition to the previously mentioned countries; Saudi Arabia, Qatar, and Jordan). Concerning Arab countries that did not ratify the WHO FCTC, Morocco, Palestine, and Somalia, have no national toll-free quitlines. However, Palestine and Morocco provide NRTs in pharmacies, which are not covered by the national health system. In Somalia, NRTs are still not available to the public. Moreover, the 2019 report had some additional tobacco control measures. It was reported that only six countries included NRTs in their essential medicine lists (Algeria, Bahrain, Iraq, Kuwait, Qatar, and Saudi Arabia). Patients' tobacco use status is routinely recorded on medical records of four out of 22 Arab countries (Iraq, Kuwait, Saudi Arabia, UAE). Nine countries had national tobacco clinical guidelines, which are Algeria, Bahrain, Egypt, Iraq, Kuwait, Morocco, Qatar, Saudi Arabia, and Tunisia. Additionally, it was reported that nine countries do not have a national tobacco cessation strategy (Comoros, Djibouti, Egypt, Libya, Mauritania Qatar, Somalia, Sudan,

and Syria). **Figure 3** illustrates the percentage of the Arab population covered by national policies of tobacco cessation measures mentioned in the 2019 WHO's Global Report on the Tobacco Epidemic (including Morocco, Palestine, and Somalia).

IV.b. Health Professionals Role

In this review we included a total of 19 studies. Eight reports about the TUC training in healthcare education and 11 reports about the TUC provision by healthcare professionals.

1. TUC Training in Healthcare Education:

Jradi et al.[41] surveyed 90 medical schools from 19 Middle Eastern and North African (MENA) countries about the inclusion of tobacco education in their curricula. The majority of medical schools (~60%) reported no curricular content on tobacco dependance pharmacotherapy (including waterpipes and smokeless tobacco). One-third of the participating medical schools did not cover waterpipe smoking, despite it being the most popular form of smoking in the MENA region. The behavioral interventions recommended by the WHO MPOWER package were inadequately covered, and most of TDT topics were discussed in basic science courses rather that clinical courses.[41]

In pharmacy schools,[42] El Hajj et al. surveyed 120 pharmacy schools in 13 Middle Eastern countries about their tobacco dependence curriculum. Less than half of the schools (42.4%) reported teaching their students about the 5A's strategy for tobacco cessation intervention (Ask, Advice, Assess, Assist, Arrange follow-up) and over 80% of the schools perceived the coverage of the 5As to be inadequate. Approximately 90% of the school reported didactic lectures to be the most frequently used approach in TDT curriculum.[42]

From the students' perspectives, 34.2% of senior medical students in Cairo University, Egypt reported receiving patient-oriented training on TDT in school.[43] Meanwhile, 79% of fifth year medical students in Saudi Arabia[44] reported not having any form of clinical training on smoking cessation and only 8% reported that they discuss smoking cessation with patients in hospitals or during clinical rotations. Only 2 out of 10 surveyed medical students in Saudi Arabia thought that they were adequately prepared to offer TUC counseling to their patients.[44] In Lebanon, 60% of sixth-year medical students, reported that they have inadequate knowledge of tobacco dependance pharmacotherapy to be able to provide an effective TUC intervention.[45] Meanwhile, in Sudan, Almahdi et al. surveyed students from medical, dental, nursing and pharmacy school to assess the perception of their roles in Toombak cessation (a popular form of smokeless tobacco in Sudan).[46] They found that 43.4% received no training on tobacco use cessation and 47.3% have poor knowledge about Toombak cessation interventions.[46]

In dentistry, a qualitative study among dental students and faculty from Kuwait [47] found that the use of the 5As strategy has not been well integrated into clinical practice for both, students, and faculty.[47] Moreover, a study of clinical and preclinical dental students in India, Saudi Arabia, the UAE, and Yemen found that the majority of the students disagree with some of the TUC statements. These statements included the importance of the dentist's role in explaining the dangers of smoking to smokers and providing help to their patients with TUC interventions.[48]

2. TUC Provision by Healthcare Professionals:

Most of the studies conducted to assess the involvement of healthcare professionals in providing TUC services were among physicians and dentists.[49, 50, 51, 52, 53, 54, 55, 56, 57, 58] In medical settings, 84.3% of primary care physicians (PCP) from Palestine have not received any TUC

training, and 66% (n = 93) offer smoking cessation advice without further follow-up.[49] In Egypt, 26.5% of physicians serving in a tertiary care university hospital had no training on smoking cessation, and only 32.4% received formal TUC training during medical school.[56] In Oman, a sample of PCPs demonstrated poor knowledge on TDT despite their positive attitudes toward such treatments. However, 28.6% reported feeling confident to provide TUC interventions for their patients.[50] In Saudi Arabia, 46.2% of the sampled PCPs reported that they routinely advise their patients to quit smoking. The willingness to offer TUC counselling was significantly associated with the smoking status of the PCP.[52] In Lebanon, a sample of PCPs were asked about both, cigarette and waterpipe smoking cessation activities in their practice.[53] The majority of the PCPs reported that they frequently ask their patient about their smoking habits, yet they tend to counsel patients against cigarette smoking more that waterpipe.[53] In Jordan, a study surveyed family physicians, internists, nurses, and dentists working in academic hospitals of the ministry of health.[59] They found that 18.4% received TUC training and about half of the sampled professionals often ask about smoking habits as well as advise patients to quit.[59]

In dental settings, only 37% of dentists from the Northern United Arab Emirates[54] reported adequate practice of providing TUC counseling, including the 5As. However, 88% reported a positive attitude toward providing TUC advice. Positive attitudes toward TUC cessation were observed more among dentists who have been in practice for 10 years or less compared to senior dentists.[54] In Kuwait and Saudi Arabia,[57] 78.1% of sampled dentists reported routinely asking patients about their tobacco use status and 77% provided quit advice for smokers. It is noteworthy that dentists who smoke were unwilling to engage in tobacco cessation activities, including patient education, offering patients quit advice, or conducting TUC campaigns. The most reported barrier for providing TUC advice was lack of time.[57] Another Kuwaiti study for general dentists[58] working

for the ministry of health found that 12% routinely incorporate the 5As into their practice, and the majority find performing TUC counseling as an effective activity.[58] In recent years, a different study of dentists in Jeddah, Saudi Arabia practicing in academic institutions and outpatient dental clinics found that only 13.2% reported receiving formal training on TUC counseling.[51] In Yemen, positive attitudes toward TUC were observed among dental professionals, where 83.5% reported routinely asking about tobacco use and 85% provide advise against tobacco use. However, around half believe that TUC intervention may negatively affect the economics of their clinical practice and believed that the provision of dental interventions is more important than TUC counseling. Recent graduates and non-smokers showed relatively better attitudes and practices than smokers and more senior dentists.[55]

V. Discussion

This study provided an inclusive overview of TUC practices on a national and organizational levels in the Arab World. It sought to identify opportunities and challenges related to demand reduction in the region. Policy wise, we found that promoting TUC in health care facilities, workplaces and in media, in addition to the inclusion of TDT in national healthcare system were implemented in most Arab countries. Nevertheless, major inadequacies were presented in the provision of telephone quit lines, the availability and cost coverage of nicotine replacement therapy. Additionally, the inclusion of TDT curricula in healthcare education was hardly implemented. These findings were also supported by a closer look using the regional and local reports from 2012 to 2022. The majority of healthcare schools do not include TUC counseling, the 5As or NRT in their clinical training. Students believe that they are inadequately prepared to provide necessary TUC services to their patients. These inadequacies were extended to healthcare professionals in their practice where the majority did not provide TUC counseling to their patients.

Using the WHO summary report on the Global Tobacco Epidemic 2019, Al-Mulla et al. briefly described the status of TUC services in the EMR. The study did not include African Arab populations, and included Afghanistan, Iran, and Pakistan, which are non-Arab EMR countries.[38] Furthermore, Al-Monshi and Ibrahim, reported the progress in implementation of tobacco control measures from 2008 to 2020 in six Arab countries that forms the Gulf Cooperation Council.[60] They included four measures of Article 14 alongside other core supply-reduction measures of FCTC. In this study we focused on the 2020 implementation status of Article 14 and expanded the view to include all Arab countries. We also reviewed the regional and local reports of health professionals' roles in TUC.

Overall, there is a considerable advancement in implementing WHO FCTC measure in high income Arab countries except for Oman.[60] Consistent with our findings, it was reported that Oman implemented the least number of the FCTC Article 14 measures, despite it being listed as one of the only six countries in the world where tobacco use is still rising (as well as Egypt, Jordan and Lebanon)[1,40] This is an urgent call for continuous surveillance and tighter implementation of Article 14 measures in countries that had historically low smoking prevalence levels.[61] On the other hand, Bahrain, Tunisia and Sudan received the highest implementation score for WHO FCTC Article 14, among HICs, MICs and LICs categories, respectively. Meanwhile, according to the 2019 WHO report, the years of highest level of achievement for tobacco cessation measures were 2008 in UAE, 2012 in Kuwait and 2018 in Saudi Arabia.

We found that seven out of 19 Arab countries have implemented programs to promote cessation specially designed for women including pregnant and underage girls. Given that the majority of school-age smokers are boys,[62] it would be beneficial to design youth-centered TUC programs that target them. Such programs should be culturally adapted and tailored to the popular forms of tobacco used among schoolchildren. Popular forms of tobacco use include, but not limited to; conventional cigarettes, waterpipe, smokeless tobacco or midwakh.

In our policy analysis, we found that 7 out of 19 countries have telephone quit lines. The discrepancy found between the 2020 data and 2019 report regarding the quit lines was due to recent changes by Bahrain. Bahrain has newly integrated a hotline for their cessation clinics[63] however, Jordan and Tunisia have yet to adopt this measure.[40] This means that by 2020, only five Arab countries had toll-free national quitlines. Additionally, we found that NRTs are legally available in eight countries. The 2019 WHO report indicates that NRTs are fully covered by national health insurance in three more countries -other than Saudi Arabia, Qatar, and Jordan- which are Bahrain,

Kuwait, and Tunisia.[40] AlMulla et al. reported that over 75% of the EMR people who have legal access to NRTs, the therapy is not covered by their national health insurance.[38] The importance of full coverage of NRTs was highlighted in Lindson et al. report which stated that providing free pharmacotherapy, with counseling by an allied health professional, increased smoking quit rates in primary care settings.[64] On an organization level, healthcare professionals can increase cessation rates by a leading force. The effectiveness of tobacco dependence support facilities such as telephone quit lines could be undermined by the lack of well-trained health professionals to guide smokers with TUC. Carson et al. reported that training health professionals to provide TUC interventions resulted in a significant effect on the smoking prevalence levels, and abstinence duration.[65] The WHO developed a comprehensive TDT training package for PCPs[66] that can be utilized by academic and healthcare institutions in the region. Such training should be part of the national standards of accreditation for healthcare schools.

In our study, we found that most Arab countries reported having national policies to incorporate TDT in their medical curricula and few included such training in nursing, dental and pharmacy schools. On an organizational level, our review of regional and local reports found that TDT is inadequately integrated in formal training during school, and consequently, there exists a lack of implementation in clinical practice. Training healthcare professionals to perform effective TUC is imperative because smokers who seek professional help are three times as likely to successfully quit than those unassisted.[67] Previous Cochrane reviews supported the effectiveness of: (1) the combination of behavioral programs with TUC aid (NRT or e-cigarettes) provided by dental professionals,[68] (2) behavioral support by community pharmacists[69] and nurses[70] on improving cessation rates and abstinence duration. However, simple advice by health professionals

has a minor effect on cessation rates.[71,68] This highlights the importance of providing a combination of counseling, pharmacotherapy, and regular follow-ups for a successful quit.

Fiscal and human resource constraints in Arab countries could be a barrier to the full implementation of FCTC Article 14. It is important to note that 80% of the world's 1 billion smokers are in low- and middle-income countries,[72] and that cost-effective demand reduction measures are a necessity to reduce NCD burden on healthcare systems.[1] A recent meta-analysis on the efficacy of smoking cessation interventions in low- and middle-income countries[73] found that, the combination of behavioral counseling and NRTs are effective in aiding abstinence for ≥ 6 months.[73] The 2019 WHO report revealed that the reduction rates in smoking levels in AFR and EMR need to be more dramatic to stop the continuing increase in the numbers of tobacco users.[1] Therefore, instead of limiting TDT to specialized health centers, existing primary health care and academic infrastructure could be utilized for cost-effective, broad-reach activities. To increase reach, Nakkash et al. called for building partnerships between academics and activists in the Arab world, who have a strong will to create change in the realm of tobacco control.[74] These professional networks can create a unified public pressure to effectively adopt global strategies in local settings.[74]

This study must be interpreted in the context of its limitations; the reports submitted to the FCTC Convention Secretariates are voluntary and self-reported by a ministry of health official, which make them subject to report bias. Policy surveillance on a national level may capture the available policies but not the level of enforcement or implementation. The regional and local reviews conducted in our study are not nationally representative and may overestimate or underestimate the level of TDT practices in Arab countries.

VI. Conclusions

We provided an overview of TUC practices on a national and organizational level in the Arab World to identify opportunities and challenges related to demand reduction. We found major inadequacies in the provision of telephone quit lines, the accessibility of nicotine replacement therapy and the inclusion of TDT curricula in healthcare education. These findings were also supported by a closer look using the regional and local reports from 2012 to 2022. Therefore, we urge Arab countries to:

1- Fully implement FCTC Article 14 as a pressing step to reduce the smoking-attributable morbidity and mortality in Arab population.

1- Continuously monitor smoking prevalence and smoking cessation services.

2- Design youth-centered and culturally adapted TUC programs.

3- Develop and adapt a national strategy for TUC.

4- Integrate TDT training in health professional education as part of the national standards of healthcare school accreditation.

5- Utilize existing infrastructure of primary health centers to provide cost-effective, broad-reaching TUC activities.

VII. Figures and Tables

Figure 1. Article 14 as mentioned by the WHO FCTC.

Article 14: Demand reduction measures concerning tobacco dependence and cessation

1. Each Party shall develop and disseminate appropriate, comprehensive, and integrated guidelines based on scientific evidence and best practices, taking into account national circumstances and priorities, and shall take effective measures to promote cessation of tobacco use and adequate treatment for tobacco dependence.

2. Towards this end, each Party shall endeavor to:

(a) design and implement effective programmes aimed at promoting the cessation of tobacco use, in such locations as educational institutions, health care facilities, workplaces and sporting environments;

(b) include diagnosis and treatment of tobacco dependence and counselling services on cessation of tobacco use in national health and education programmes, plans and strategies, with the participation of health workers, community workers and social workers as appropriate;

(c) establish in health care facilities and rehabilitation centers programmes for diagnosing, counselling, preventing, and treating tobacco dependence; and

(d) collaborate with other Parties to facilitate accessibility and affordability for treatment of tobacco dependence including pharmaceutical products pursuant to Article 22. Such products and their constituents may include medicines, products used to administer medicines and diagnostics when appropriate.

Figure 2: WHO FCTC Article 14 Provisions

Categories of Article 14 Recommendations

1- Design and implementation of programs to promote cessation in each country:

Implemented:
- Telephone quit lines
- Media campaigns to promote tobacco cessation
- Programs specially designed for underage girls and young women
- Programs specially designed for women
- Programs specially designed for pregnant women

Designed programs to promote cessation in:
- Educational institutions
- Health-care facilities
- Workplaces
- Sporting environments

2- Healthcare providers involvement offering counseling services:
- Physicians
- Dentists
- Family doctors
- Traditional practitioners
- Other medical professionals
- Nurses
- Midwives
- Pharmacists
- Community workers
- Social workers

3- Incorporation of tobacco dependence treatment into healthcare:
- Medical schools
- Dental schools
- Nursing schools
- Pharmacy schools

4- Provision and inclusion of tobacco dependance diagnosis and treatment in health and educational facilities:

Included diagnosis and treatment in national:
- Tobacco control programs
- Health programs
- Educational programs
- Health-care system

Facilities providing programs on diagnosis and treatment:
- Primary health care
- Specialist health-care systems
- Specialized centres
- Rehabilitation centres

5- Availability of Nicotine Replacement Therapy (NRT):
- Nicotine replacement therapy
- Treatment with bupropion
- Treatment with varenicline

6- Cost coverage of cessation program and NRTs using public funding:
- Nicotine replacement therapy

- Buproprion
- Varenicline
- Programs in primary health care
- Programs in specialist health-care systems
- Programs in specialized centers
- Programs in rehabilitation centers
- Programs in other diagnostic and treatment services

Table 1. Arab countries characteristics, total population of 436,080,728.

Party	Continent	WHO Region	World Bank Income Group	Year of FCTC Ratification	Population size*	Prevalence of current tobacco use (%of adults) **
Algeria	Africa	AFR	LMIC	2006	43,851,043	18.8
Bahrain	Asia	EMR	HIC	2007	1,701,583	25.1
Comoros	Africa	AFR	LMIC	2005	869,595	19.5
Djibouti	Africa	EMR	LMIC	2005	988,002	**24.5**
Egypt	Africa and Asia	EMR	LMIC	2005	102,334,403	21.4
Iraq	Asia	EMR	UMIC	2008	40,222,503	22.2
Jordan	Asia	EMR	UMIC	2004	10,203,140	42.0
Kuwait	Asia	EMR	HIC	2006	4,270,563	22.1
Lebanon	Asia	EMR	UMIC	2005	6,825,442	42.6
Libya	Africa	EMR	UMIC	2005	6,871,287	25.1
Mauritania	Africa	AFR	LMIC	2005	4,649,660	17.3
Oman	Asia	EMR	HIC	2005	5,106,622	9.6
Qatar	Asia	EMR	HIC	2004	2,881,060	14.0
Saudi Arabia	Asia	EMR	HIC	2005	34,813,867	16.6
Sudan	Africa	EMR	LIC	2005	43,849,269	9.6
Syria	Asia	EMR	LIC	2004	17,500,657	29.0
Tunisia	Africa	EMR	LMIC	2010	11,818,618	26.0
United Arab Emirates	Asia	EMR	HIC	2005	9,890,400	18.2
Yemen	Asia	EMR	LIC	2007	29,825,968	20.9
Morocco	Africa	EMR	LMIC	Did not ratify	36,910,558	14.7
Palestine	Asia	EMR	LMIC	Did not ratify	4,803,269	Not reported
Somalia	Africa	EMR	LIC	Did not ratify	15,893,219	Not reported

Note. AFR: African Region. **EMR:** Eastern Mediterranean Region. **HIC:** High Income Country. **UMIC:** Upper Middle-Income Country. **LMIC:** Lower Middle-Income Country. **LIC:** Low Income Country. (*****) World Bank Data (2020). (******) World Bank Data (2018) and WHO FCTC Reports (2020), Djibouti prevalence was obtained from www.tradingeconomics.com using 2016 data.

Table 2. Implementation scores for WHO FCTC Article 14 provisions for 19 Arab countries according to the countries 2020 Reports submitted to the FCTC Convention Secretariat.

Country's Income Category	Country	Design and implementation of programs to promote cessation	Healthcare providers offering counseling services	Incorporation of TDT into healthcare curricula	Inclusion of diagnosis & TDT in health and educational facilities	Availability of NRT	Cost coverage of cessation program and NRTs using public funding	Total Score
HICs	**Bahrain**	6	8	4	6	3	5.5	32.5
	Qatar	5	7	4	8	3	0.5	27.5
	UAE	9	5	2	8	2	0	26
	Saudi Arabia	7	4	0	8	3	0	22
	Kuwait	9	4	0	5	2	1.5	21.5
	Oman	1	0	1	3	0	0.5	5.5
MICs	**Tunisia**	9	8	4	8	1	0	30
	Algeria	5	1	2	6	1	6	21
	Comoros	5	1	4	6	0	4	20
	Iraq	1	8	4	5	0	2	20
	Jordan	7	2	1	6	2	1.5	19.5
	Egypt	6	2	1	5	0	2	16
	Libya	5	3	1	5	0	1	15
	Mauritania	4	2	0	5	0	0.5	11.5
	Lebanon	3	1	0	3	0	1.5	8.5
	Djibouti	4	0	0	0	0	2.5	6.5
LICs	**Sudan**	3	6	3	5	0	0	17
	Syria	8	0	0	0	0	0	8
	Yemen	4	0	1	3	0	0	8

Note. **UAE:** United Arab Emirates. **HICs:** High Income Countries. **MICs:** Middle-Income Countries. **LIC:** Low Income Countries. **TDT:** Tobacco Dependence Treatment. **NRT:** Nicotine Replacement Therapy.

Figure 3. Percentage of Arab Population Covered by Tobacco Cessation Measures according to the 2019 WHO's Global Report on the Tobacco Epidemic (including Morocco, Palestine, and Somalia).
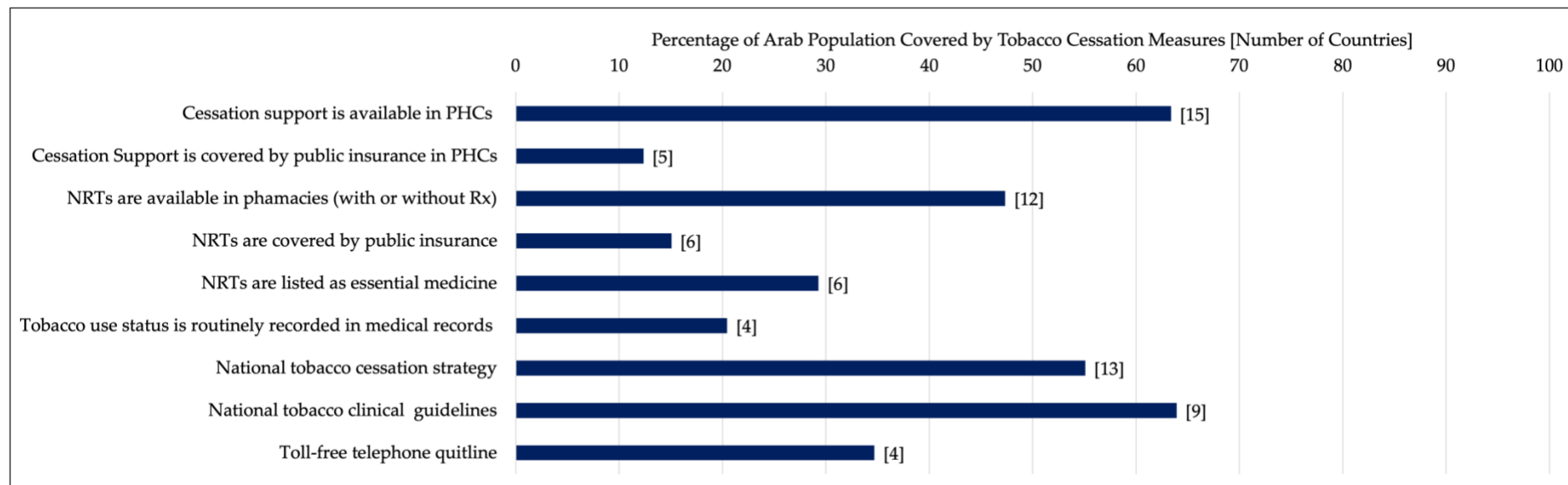
VIII. Supplementary Material

Appendix. A: Search Strategy and Results

<div align="center">

PubMed

</div>

Constant:

Concept (1): Smoking Cessation

("Smoking Cessation"[Mesh] OR "Tobacco Use Cessation Devices"[Mesh] OR "Tobacco Use Cessation"[Mesh]) OR (("Smoking"[Mesh] OR "Tobacco Products"[Mesh] OR "Tobacco"[Mesh] OR "Tobacco Use"[Mesh] OR "Tobacco Use Disorder"[Mesh] OR smoke*[tiab] OR smoking*[tiab] OR tobacco[tiab] OR "tobacco dependence" [tiab]))) AND (cessation[tiab] or prevent*[tiab] or quit*[tiab] OR abstinence[tiab] OR counse* [tiab] OR interven* [tiab] OR "treat*" [tiab]))

Concept (2): Arab Countries

AND ((((((((((((((((((((((("Bahrain"[Mesh]) OR "Iraq"[Mesh])) OR "Jordan"[Mesh]) OR "Kuwait"[Mesh]) OR "Lebanon"[Mesh]) OR "Oman"[Mesh]) OR "Qatar"[Mesh]) OR "Saudi Arabia"[Mesh]) OR "Syria"[Mesh]) OR "United Arab Emirates"[Mesh]) OR "Yemen"[Mesh]) OR "Algeria"[Mesh]) OR "Comoros"[Mesh]) OR "Djibouti"[Mesh]) OR "Egypt"[Mesh]) OR "Libya"[Mesh]) OR "Mauritania"[Mesh]) OR "Morocco"[Mesh]) OR "Somalia"[Mesh]) OR "Sudan"[Mesh]) OR "Tunisia"[Mesh]) OR (("Arab World"[Mesh]) OR "Arabs"[Mesh])) OR (Middle Eastern[Title/abstract] OR Middle East[Title/abstract] OR Arab World[Title/abstract] OR Arabs[Title/abstract] OR Arabs[Title/abstract] OR Arabic Speaking[Title/abstract] OR Algeria[Title/abstract] OR Bahrain[Title/abstract] OR Comoros[Title/abstract] OR Djibouti[Title/abstract] OR Egypt[Title/abstract] OR Iraq[Title/abstract] OR Jordan[Title/abstract] OR Kuwait[Title/abstract] OR Lebanon[Title/abstract] OR Libya[Title/abstract] OR Mauritania[Title/abstract] OR Morocco[Title/abstract] OR Oman[Title/abstract] OR Palestine[Title/abstract] OR Qatar[Title/abstract] OR Saudi Arabia[Title/abstract] OR Somalia[Title/abstract] OR Sudan[Title/abstract] OR Syria[Title/abstract] OR Tunisia[Title/abstract] OR United Arab Emirates[Title/abstract] OR UAE[Title/abstract] OR Yemen[Title/abstract] OR Algerian*[Title/abstract] OR Bahraini*[Title/abstract] OR Comorian*[Title/abstract] OR Djiboutian*[Title/abstract] OR Egyptian*[Title/abstract] OR Iraqi*[Title/abstract] OR Jordanian*[Title/abstract] OR Kuwaiti*[Title/abstract] OR Lebanese*[Title/abstract] OR Libyan*[Title/abstract] OR Mauritanian*[Title/abstract] OR Moroccan*[Title/abstract] OR Omani*[Title/abstract] OR Palestinian*[Title/abstract] OR Qatari*[Title/abstract] OR Saudi Arabian*[Title/abstract] OR Somalian*[Title/abstract] OR Somali*[Title/abstract] OR Sudanese*[Title/abstract] OR Syrian*[Title/abstract] OR Tunisian*[Title/abstract] OR Emirati*[Title/abstract] OR Yemeni*[Title/abstract]))

Changeable:

Concept (3)-Topic (1): In Healthcare Education

AND ("educat*" [tiab] OR "facult*" [tiab] OR "school" [tiab]) AND ("dent*" [tiab] OR "medi*" [tiab] OR "pharm*" [tiab] OR "nurs*" [tiab] OR "prof*" [tiab] OR "phys*" [tiab])

Concept (3)-Topic (2): In Health Care Settings

AND ("clinic*" [ti] OR "dent*" [ti] OR "medi*" [ti] OR "pharm*" [ti] OR "nurs*" [ti] OR "prof*" [ti] OR "physi*" [ti])

Constant Filter: AND (y_10[Filter])

EMBASE

Constant:

Concept (1): Smoking
('Smoking Cessation'/exp OR ' Tobacco Use Cessation Devices '/exp OR ' Tobacco Use Cessation '/exp OR 'smoking cessation program'/exp) OR ('smoking'/exp OR 'tobacco'/exp OR 'tobacco dependence'/exp OR smoking:ti,ab OR tobacco:ti,ab OR smoke*:ti,ab) AND ((cessation:ti,ab OR abstinence*:ti,ab OR prevent*:ti,ab OR quit:ti,ab))

Concept (2): Arab Countries
AND ('bahrain'/exp OR 'bahraini'/exp OR 'iraq'/exp OR 'iraqi'/exp OR 'algeria'/exp OR 'algerian'/exp OR 'djibouti'/exp OR 'egypt'/exp OR 'egyptian'/exp OR 'jordan'/exp OR 'jordanian'/exp OR 'kuwait'/exp OR 'kuwaiti'/exp OR 'lebanon'/exp OR 'lebanese'/exp OR 'libyan arab jamahiriya'/exp OR 'mauritania'/exp OR 'mauritanian'/exp OR 'morocco'/exp OR 'moroccan'/exp OR 'oman'/exp OR 'omani'/exp OR 'palestine'/exp OR 'palestinian'/exp OR 'qatar'/exp OR 'qatari'/exp OR 'saudi arabia'/exp OR 'saudi'/exp OR 'somalia'/exp OR 'somali (citizen)'/exp OR 'sudan'/exp OR 'sudanese'/exp OR 'syrian arab republic'/exp OR 'syrian'/exp OR 'tunisia'/exp OR 'tunisian'/exp OR 'united arab emirates'/exp OR 'emirati'/exp OR 'yemen'/exp OR 'yemeni'/exp OR 'arab world'/exp OR 'arab'/exp OR 'middle eastern':ti,ab,kw OR 'middle east':ti,ab,kw OR 'arab world':ti,ab,kw OR arab:ti,ab,kw OR arabs:ti,ab,kw OR 'arabic speaking':ti,ab,kw OR algeria:ti,ab,kw OR bahrain:ti,ab,kw OR comoros:ti,ab,kw OR djibouti:ti,ab,kw OR egypt:ti,ab,kw OR iraq:ti,ab,kw OR jordan:ti,ab,kw OR kuwait:ti,ab,kw OR lebanon:ti,ab,kw OR libya:ti,ab,kw OR 'libyan arab jamahiriya':ti,ab,kw OR mauritania:ti,ab,kw OR morocco:ti,ab,kw OR oman:ti,ab,kw OR palestine:ti,ab,kw OR qatar:ti,ab,kw OR 'saudi arabia':ti,ab,kw OR somalia:ti,ab,kw OR sudan:ti,ab,kw OR syria:ti,ab,kw OR 'syrian arab republic':ti,ab,kw OR tunisia:ti,ab,kw OR 'united arab emirates':ti,ab,kw OR uae:ti,ab,kw OR yemen:ti,ab,kw OR algerian*:ti,ab,kw OR bahraini*:ti,ab,kw OR comorian*:ti,ab,kw OR djiboutian*:ti,ab,kw OR egyptian*:ti,ab,kw OR iraqi*:ti,ab,kw OR jordanian*:ti,ab,kw OR kuwaiti*:ti,ab,kw OR lebanese*:ti,ab,kw OR libyan*:ti,ab,kw OR mauritanian*:ti,ab,kw OR moroccan*:ti,ab,kw OR omani*:ti,ab,kw OR palestinian*:ti,ab,kw OR qatari*:ti,ab,kw OR 'saudi arabian*':ti,ab,kw OR saudi:ti,ab,kw OR somalian*:ti,ab,kw OR somali*:ti,ab,kw OR sudanese*:ti,ab,kw OR syrian*:ti,ab,kw OR tunisian*:ti,ab,kw OR emirati*:ti,ab,kw OR yemeni*:ti,ab,kw OR 'arab culture':ti,ab,kw OR 'arabic culture':ti,ab,kw OR 'arabic world':ti,ab,kw)

Changeable:
Concept (3)-Topic (1): In Healthcare Education
AND ((educat*:ti,ab,kw OR facult*:ti,ab,kw OR school*:ti,ab,kw) AND (dent*:ti,ab,kw OR med*:ti,ab,kw OR pharm*:ti,ab,kw OR nurs*:ti,ab,kw OR prof*:ti,ab,kw OR phys*:ti,ab,kw))

Concept (3)-Topic (2): In Health Care Settings
AND (clinic*:ti,kw OR dent*:ti,kw OR med*:ti,kw OR pharm*:ti,kw OR nurs*:ti,kw OR prof*:ti,kw OR phys*:ti,kw)

Constant Filter: AND (2012:py OR 2013:py OR 2014:py OR 2015:py OR 2016:py OR 2017:py OR 2018:py OR 2019:py OR 2020:py OR 2021:py OR 2022:py)

Search Results:

Topics	Number of Articles	
	PubMed	**EMBASE**
TUC Training in Healthcare Education	266	267
TUC Services by Healthcare Professionals	255	255

Supplemental Table 1. The design and implementation of programs to promote tobacco use cessation, 2020.

Party	Implemented		Implemented Programs to promote cessation specially designed for			Designed Programs to promote cessation in				Country's Total Implementation Score
	Telephone Quitlines	Media campaigns to promote tobacco cessation	Underage girls and young women	Women in general	Pregnant women	Educational institutions	Health-care facilities	Workplaces	Sporting environments	
Kuwait	✓	✓	✓	✓	✓	✓	✓	✓	✓	9
Tunisia	✓	✓	✓	✓	✓	✓	✓	✓	✓	9
UAE	✓	✓	✓	✓	✓	✓	✓	✓	✓	9
Syria	✗	✓	✓	✓	✓	✓	✓	✓	✓	8
Jordan	✓	✓	✓	✓	✓	✓	✓	✗	✗	7
Saudi Arabia	✓	✓	✓	✓	✓	✓	✓	✗	✗	7
Algeria	✗	✓	✗	✗	✗	✓	✓	✓	✓	5
Bahrain	✓	✓	✓	✓	✓	✗	✓	✗	✗	6
Egypt	✓	✓	✗	✗	✗	✓	✓	✓	✓	6
Comoros	✗	✓	✗	✗	✗	✓	✓	✓	✓	5
Libya	✗	✓	✗	✗	✗	✓	✓	✓	✓	5
Qatar	✗	✓	✗	✗	✗	✓	✓	✓	✓	5
Sudan	✗	✓	✗	✗	✗	✗	✓	✓	✗	3
Yemen	✗	✓	✗	✗	✗	✓	✓	✓	✗	4
Djibouti	✗	✗	✗	✗	✗	✓	✓	✓	✓	4
Mauritania	✗	✓	✗	✗	✗	✓	✓	✓	✗	4
Lebanon	✗	✓	✗	✗	✗	✓	✓	✗	✗	3
Iraq	✗	✓	✗	✗	✗	✗	✗	✗	✗	1
Oman	✗	✗	✗	✗	✗	✗	✓	✗	✗	1
Total	7	17	7	7	7	15	18	13	10	

Note: (✓): Yes. (✗): No. **UAE:** United Arab Emirates.

Supplemental Table 2. Healthcare providers offering counseling services, 2020.

Party	Physicians	Family doctors	Dentists	Pharmacists	Other medical professionals	Midwives	Social workers	Community workers	Traditional practitioners	Country Total Implementation Score
Bahrain	✓	✓	✓	✓	✓	✓	✓	✓	✗	8
Iraq	✓	✓	✓	✓	✓	✓	✓	✗	✓	8
Tunisia	✓	✓	✓	✓	✓	✓	✓	✓	✗	8
Qatar	✓	✓	✓	✓	✓	✗	✓	✓	✗	7
Sudan	✓	✓	✓	✗	✗	✗	✓	✓	✓	6
UAE	✓	✓	✓	✓	✗	✗	✓	✗	✗	5
Kuwait	✓	✓	✗	✗	✓	✗	✓	✗	✗	4
Saudi Arabia	✓	✓	✗	✗	✓	✗	✓	✗	✗	4
Libya	✓	✗	✗	✗	✓	✗	✓	✗	✗	3
Egypt	✓	✗	✗	✗	✗	✗	✓	✗	✗	2
Jordan	✓	✓	✗	✗	✗	✗	✗	✗	✗	2
Mauritania	✓	✗	✓	✗	✗	✗	✗	✗	✗	2
Algeria	✓	✗	✗	✗	✗	✗	✗	✗	✗	1
Comoros	✓	✗	✗	✗	✗	✗	✗	✗	✗	1
Lebanon	✓	✗	✗	✗	✗	✗	✗	✗	✗	1
Djibouti	✗	✗	✗	✗	✗	✗	✗	✗	✗	0
Oman	✗	✗	✗	✗	✗	✗	✗	✗	✗	0
Syria	✗	✗	✗	✗	✗	✗	✗	✗	✗	0
Yemen	✗	✗	✗	✗	✗	✗	✗	✗	✗	0
	15	9	7	5	7	3	10	4	2	

Note: (✓): Yes. (✗): No. **UAE:** United Arab Emirates.

Supplemental Table 3. Incorporation of tobacco dependence treatment into the curricula of health professional training at pre- and post-qualification levels, 2020.

Party	Medical schools	Dental schools	Nursing schools	Pharmacy schools	Country Total Implementation Score
Bahrain	✓	✓	✓	✓	4
Comoros	✓	✓	✓	✓	4
Iraq	✓	✓	✓	✓	4
Qatar	✓	✓	✓	✓	4
Tunisia	✓	✓	✓	✓	4
Sudan	✓	✓	✓	✗	3
Algeria	✓	✗	✓	✗	2
UAE	✓	✗	✓	✗	2
Egypt	✓	✗	✗	✗	1
Jordan	✓	✗	✗	✗	1
Libya	✓	✗	✗	✗	1
Oman	✓	✗	✗	✗	1
Yemen	✓	✗	✗	✗	1
Djibouti	✗	✗	✗	✗	0
Kuwait	✗	✗	✗	✗	0
Lebanon	✗	✗	✗	✗	0
Mauritania	✗	✗	✗	✗	0
Saudi Arabia	✗	✗	✗	✗	0
Syria	✗	✗	✗	✗	0
	13	6	8	5	

Note: (✓): Yes. (✗): No. **UAE:** United Arab Emirates.

Supplemental Table 4. The provision and inclusion of tobacco dependance diagnosis and treatment in health and educational facilities, 2020.

Party	Included diagnosis and treatment in national				Facilities providing programs on diagnosis and treatment					Country Total Implementation Score
	Tobacco control programs	Health programs	Educational programs	Health-care system	Primary health care	Secondary and tertiary health care	Specialist health-care systems	Specialized centers for cessation	Rehabilitation centers	
Qatar	✓	✓	✓	✓	✓	✓	✗	✓	✓	8
Saudi Arabia	✓	✓	✓	✓	✓	✓	✓	✓	✗	8
Tunisia	✓	✓	✓	✓	✓	✓	✓	✓	✗	8
UAE	✓	✓	✓	✓	✓	✓	✓	✗	✓	8
Algeria	✓	✓	✗	✓	✓	✓	✓	✗	✗	6
Bahrain	✓	✓	✓	✓	✓	✓	✗	✗	✗	6
Comoros	✓	✓	✓	✓	✗	✗	✓	✓	✗	6
Jordan	✓	✓	✓	✓	✓	✗	✗	✓	✗	6
Egypt	✓	✓	✓	✓	✗	✗	✗	✓	✗	5
Iraq	✓	✓	✓	✓	✓	✗	✗	✗	✗	5
Kuwait	✓	✓	✗	✓	✓	✗	✗	✓	✗	5
Libya	✓	✓	✗	✓	✓	✗	✗	✓	✗	5
Mauritania	✓	✓	✗	✓	✓	✓	✗	✗	✗	5
Sudan	✓	✓	✗	✓	✓	✗	✗	✗	✓	5
Lebanon	✓	✗	✗	✓	✓	✗	✗	✗	✗	3
Oman	✓	✓	✓	✗	✗	✗	✗	✗	✗	3
Yemen	✓	✓	✓	✗	✗	✗	✗	✗	✗	3
Djibouti	✗	✗	✗	-	✗	✗	✗	✗	✗	0
Syria	✗	✗	✗	✗	✗	✗	✗	✗	✗	0

Note: (✓): Yes. (✗): No. **UAE:** United Arab Emirates.

Supplemental Table 5. The availability of Nicotine Replacement Therapy (NRT), 2020.

Party	Nicotine replacement therapy in general	Treatment with Bupropion	Treatment with Varenicline	Country Total Implementation Score
Bahrain	✓	✓	✓	3
Qatar	✓	✓	✓	3
Saudi Arabia	✓	✓	✓	3
Jordan	✓	✗	✓	2
Kuwait	✓	✗	✓	2
UAE	✓	✗	✓	2
Algeria	✓	✗	✗	1
Tunisia	✓	✗	✗	1
Comoros	✗	✗	✗	0
Djibouti	✗	✗	✗	0
Egypt	✗	✗	✗	0
Iraq	✗	✗	✗	0
Lebanon	✗	✗	✗	0
Libya	✗	✗	✗	0
Mauritania	✗	✗	✗	0
Oman	✗	✗	✗	0
Sudan	✗	✗	✗	0
Syria	✗	✗	✗	0
Yemen	✗	✗	✗	0

Note: (✓): Yes. (✗): No. (NRT): Nicotine Replacement Therapy. **UAE:** United Arab Emirates.

Supplemental Table 6. Cost coverage of cessation program and Nicotine Replacement Therapy (NRT) using public funding for 2020.

Party	In Primary health care	In Specialist health-care systems	In Specialized centers	In Rehabilitation centers	In other diagnostic and treatment services	NRTs Cost in general	Buproprion	Varenicline	Country's Total Implementation Score
Saudi Arabia	✓	✓	✓	✗	✓	✓	✓	✗	6
Qatar	✓	÷	✓	÷	÷	✓	✓	-	5.5
Kuwait	✓	✓	✓	✓	-	-	✗	-	4
Sudan	÷	✗	✓	✓	✗	-	-	-	2.5
Jordan	÷	✗	÷	✗	-	✗	✓	-	2
UAE	÷	-	-	✓	-	-	÷	-	2
Egypt	✗	÷	÷	÷	-	-	-	-	1.5
Libya	÷	✗	÷	÷	-	-	-	-	1.5
Tunisia	÷	÷	-	-	÷	✗	✗	-	1.5
Bahrain	✓	✗	✗	✗	✗	✗	✗	-	1
Iraq	÷	✗	✗	✗	-	-	-	-	0.5
Lebanon	÷	-	-	-	-	-	-	-	0.5
Mauritania	÷	-	-	-	-	-	-	-	0.5
Algeria	✗	✗	✗	✗	✗	✗	✗	-	0
Comoros	✗	✗	✗	-	-	-	-	-	0
Djibouti	-	-	-	-	-	-	-	-	0
Oman	-	-	-	-	-	-	-	-	0
Syria	-	-	-	-	-	-	-	-	0
Yemen	-	-	-	-	-	-	-	-	0

Note: (✓): Fully Covered. (÷): Partially covered. (✗): Not Covered. (-): Not reported. (NRT): Nicotine Replacement Therapy. **UAE:** United Arab Emirates.

Summary

In this dissertation we analyzed the state of tobacco cessation in the Arab World on multiple levels using the socio-ecological model (SEM). We painted a clearer picture on the tobacco cessation status in the Arab World and identified challenges and opportunities in the implementation of demand reduction measures.

On the individual and interpersonal levels, we utilized the Global Youth Tobacco Survey to study the SC behaviors of the youth. We focused on youth for two reasons: (1) the Arab world is relatively young with a third of its population below the age of 15 and (2) national surveillance for adults were lacking; Global Adult Tobacco Surveys were only available for Egypt, 2009 and Qatar 2013. **In Study I,** we found that most Arab schoolchildren have the desire to quit smoking and have attempted to do so. There was a strong relationship between receiving professional cessation help and positive cessation behavior. We found that receiving cessation help and being taught the dangers of tobacco use in school, were associated with cessation attempts. Conversely, variables such as being a female, a child who smokes five or more cigarettes a day, or being exposed to SHS at home or school were associated with negative SC behaviors. We believe that policymakers and researchers could focus on improving the availability and demand for professional cessation services and equip parents with tools to facilitate informed cessation conversation with their youth.

On the national policy and organizational levels, we used the latest WHO FCTC reports to assess the national implementation of WHO FCTC Article 14 (key demand reduction measures) in the Arab countries. Additionally, we reviewed the regional and local reports of health professionals from 2012 to 2022, to provide a qualitative summary of the TUC services in

healthcare settings and TUC training in academic institutions. **In Study II,** we found major inadequacies in the provision of telephone quit lines, the accessibility of nicotine replacement therapy and the inclusion of TDT curricula in healthcare education. Bahrain, Tunisia, and Sudan received the highest implementation score for WHO FCTC Article 14, among HICs, MICs and LICs categories, respectively. A closer look using the regional and local reports found that most healthcare schools do not include TUC counseling, the 5As or NRT in their clinical training. These inadequacies were extended to healthcare professionals in their practice where the majority did not provide TUC counseling to their patients. **Therefore, we urge Arab countries to:**

1- Fully implement FCTC Article 14 as a pressing step to reduce the smoking-attributable morbidity and mortality in Arab population.

1- Continuously monitor smoking prevalence and smoking cessation services.

2- Design youth-centered and culturally adapted TUC programs.

3- Develop and adapt a national strategy for TUC.

4- Integrate TDT training in health professional education as part of the national standards of healthcare school accreditation.

5- Utilize existing infrastructure of primary health centers to provide cost-effective, broad-reaching TUC activities.

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