Factors associated with smoking cessation and smoking cessation interventions in the Gulf Cooperation Council countries

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ABSTRACT

الأهداف: دراسة الدراسات المنشورة للعوامل المرتبطة بالإقلاع بالتدخين ودراسات استخدام أو وصف أدوية الإقلاع عن التدخين في دول المجلس الصحي الخليجي.

الطريقة: أجريت مراجعة الأدبيات المنهجية باستخدام PubMed و Google Scholar والأدبيات. وقد أجريت الدراسة خلال الفترة من أكتوبر وديسمبر 2017م. فيما قد اشتملت المعايير على دراسات للعوامل المرتبطة بالإقلاع أو التدخين أو دراسات استخدام أو وصف أدوية الإقلاع عن التدخين في دول المجلس الصحي الخليجي.

النتائج: واحد و عشرون مقالة وافقت معايير الدراسة. كشف التحليل الموضوعي عن العوامل المرتبطة بالإقلاع عن التدخين والتي تم تصنيفها على مستوى الفرد و الممارس الصحي. وكانت العوامل على مستوى الفردي: الحصول على أدوية الإقلاع عن التدخين وتكاليفها؛ المعرفة بالأضرار القلق حول الصحة؛ الكفاءة الذاتية؛ الإجهاد المتصور؛ مستوى استهلاك التبغ؛ الإيمان بأدوية الإقلاع عن التدخين؛ نصيحة الطبيب؛ الدعم الإجتماعي؛ تنفيذ أنظمه حظر التدخين. وكانت العوامل على مستوى الممارس الصحي: الوقت لتقديم المشورة؛ التدريب لمساعدة المرضى؛ تقبُّل المريض؛ وجود أفضل الممارسات لعلاج المرضى؛ الموارد؛ التصور المتعلق بالمسؤوليات؛ المعرفة بفاعلية الأدوية.

الخاتمة: كشفت هذه المراجعة عن وجود عوائق متصورة متعلقة بالإقلاع عن التدخين بين المدخنين والممارسين الصحيين في دول مجلس التعاون الخليجي. سُلط الضوء على عوامل الثقافية التي تتطلب معالجة من قبل السياسات.

Objectives: To examined published literature describing the predictors of smoking cessation (SC) and cessation interventions in Gulf Cooperation Council (GCC) countries.

Methods: Systematic literature review using PubMed, Google Scholar, and grey literature. The study was conducted between October and December of 2017. Inclusion criteria were studies reporting factors associated with SC or studies of utilization or delivery of SC medications in GCC countries.

Results: Twenty-one articles met the study criteria. Thematic analysis revealed factors associated with SC that were classified as individual or clinician level. Individual-level factors were access and cost of SC medications, knowledge about harms, concern about health, self-efficacy, perceived stress, level of tobacco consumption, belief about SC medications, clinician advice, social support, and enforcement of smoke-free ban. Clinician-level factors were time to provide counseling, training to assist patients, patient acceptance, best practice for treating patients, resources, perception related to responsibilities, and knowledge about effective medications.

Conclusion: This review revealed perceived barriers to SC among smokers and clinicians in GCC countries. It highlighted cultural factors that need to be addressed by tobacco use policies in GCC countries to help smokers quit.

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The Gulf Cooperation Council (GCC) is an intergovernmental political and economic union comprised of 6 countries: Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and United Arab Emirates (UAE). Gulf Cooperation Council countries share not only political and economic interests but also social and health affairs. They have a similar environment, culture, and life style that are associated with similarities of health risk factors. Gulf Cooperation Council countries

also have similar trends in health indicators; for instance, recent trends across these countries show a decrease in the crude mortality rate and improve in the life expectancy.[1] Tobacco use is a major public health problem in the GCC countries. It is associated with personal characteristics and social context including the family and peers, community, and public policy.[2] Tobacco use has become culturally popular in GCC countries, social norms regarding tobacco use likely would influence community members.[3] Cigarettes are the main form of tobacco use among smokers; water pipe is the next popular tobacco product, especially among women and youths. The increase use of water pipe may reflect misconceptions of reduced harm and addiction to users, the variety of flavor available, and the poor public health policies aimed at tackling this alternative form of tobacco use.[4] The highest smoking prevalence rate among men occurs in Kuwait (35.4%) while the lowest prevalence is in Oman (12.3%). The highest reported smoking prevalence rate among women appears in Bahrain (5.7%) while the lowest rates are in Oman and Qatar (0.1%).[5] A particular concern is the high smoking rates among adolescents and young adults. Tobacco use rates among young men in the GCC countries range from 4.9% in Oman to 25% in Bahrain, while rates among young women range from 1.7% in Oman to 10.1% in Bahrain.[6] The GCC countries provide free of cost healthcare services to their citizens, who expressed their satisfaction toward the quality of delivered services.[7] The GCC national governments provide access to smoking cessation (SC) treatment including Bupropion (namely, Zyban®, Wellbutrin®), nicotine replacement therapy (NRT) (patch, gum, lozenge, spray or inhaler), and Varenicline (Chantix®) in diverse healthcare settings. The cost coverage of the SC medications varies across the GCC countries. Qatar and Saudi Arabia offer full cost coverage for all types SC treatments while UAE covers the partial cost of them. Bahrain and Kuwait provide coverage for NRT products only, but Oman does not cover the cost of all SC medications.[5] The GCC policy of governments offering SC treatment is a significant policy to help individuals quit smoking. Efforts to successfully facilitate SC treatment need to be culturally relevant. To enhance SC among GCC countries, information is needed on the individual and clinician-related factors

associated with SC treatment policy in these countries. No published manuscript has provided a systematic review on these key areas. In this paper, we conducted a systematic literature review to examine the predictors of SC and interventions to facilitate cessation among smokers in the GCC countries.

Methods. A comprehensive search of published research on PubMed and Google Scholar was conducted between October and December of 2017. The following keyword searches were used in the electronic databases: (smoking OR tobacco products OR tobacco use OR tobacco use cessation OR tobacco use disorder OR smoking cessation) AND (Bahrain OR Kuwait OR Oman OR Qatar OR Saudi Arabia OR United Arab Emirates OR GCC countries OR Gulf Cooperation Council). In addition, relevant grey literature was identified using GCC country governmental websites in order to reduce any possible publication bias. This study was designed according to the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guideline.

Eligible studies included all age groups, male and female individuals who live in the GCC countries as a citizen or resident. Studies that collected information about factors associated with SC or studies about utilizing or delivering SC medications from either smokers or clinicians were included. Studies examining cessation with all forms of tobacco were eligible, including, but not limited, chewing tobacco, cigarettes, cigars, dip, electronic cigarette, midwakh, dokha, shisha, and waterpipe. All types of SC medications, both NRT and non-NRT (bupropion and varenicline), were considered. We included qualitative and quantitative studies, randomized clinical trials (RCTs), quasi-experimental studies, and observational studies. The expanded inclusion criteria were developed as an effort to collect all relevant information about SC in the GCC countries. Finally, we excluded studies that published before 2005, not in English, conducted in non-GCC countries, and did not include human data. Letters to editors, reviews, comments, and correspondences identified during the search process were excluded.

The initial online database searches by using the above keywords yielded 1261 articles in total (PubMed (n=260), Googol Scholar (n=998), and grey literature (n=3). These studies were reviewed based on their titles and abstracts. After resolving duplicate, removing irrelevant articles, the eligible articles became 21. Full-text of these studies were obtained to apply the inclusion/exclusion criteria for further review (**Figure 1**). The quality of evidence strengthens the causal
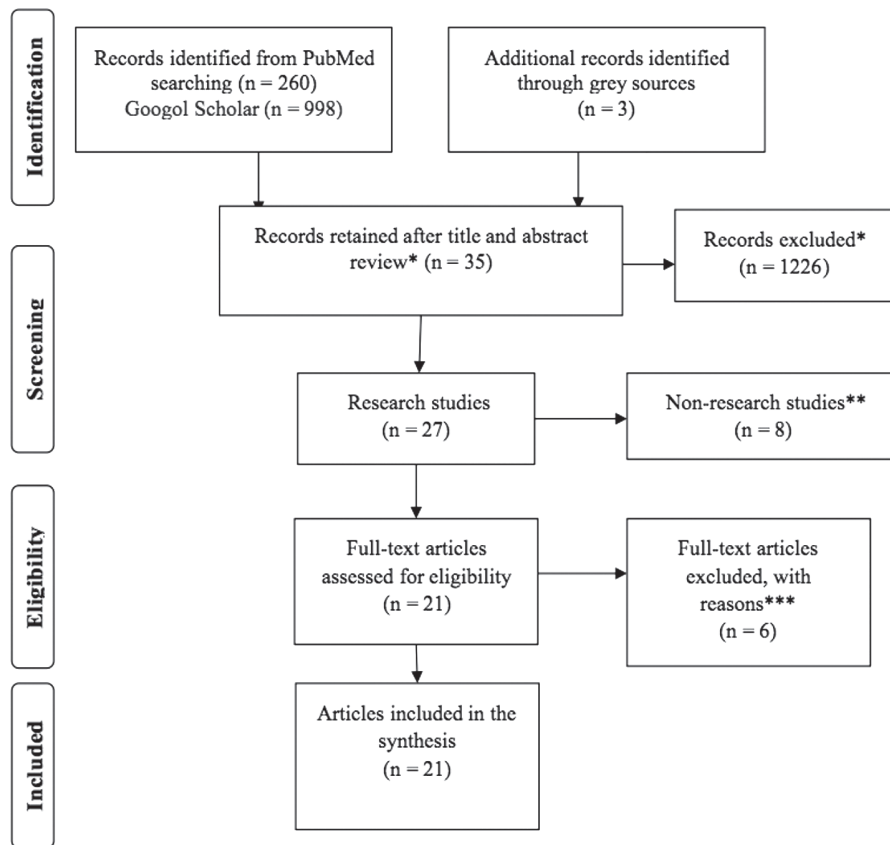
Figure 1 - Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram depicting the selection of papers at each stage. Note: Records excluded for the following reasons. *Excluded results that were unrelated to the topic of the review or duplicates. **Letter to the editor (n=2), review (n=2), correspondence (n=1), a medical guideline (n=1), and governmental documents (n=2). ***unstated outcomes (n=1), included Yemen as a pervious GCC country (n=1), had non-smoking patients (n=1), had no interventions (n=3)

inferences. All eligible studies were given a grade. To assess the quality of each study, we utilized the Grades of Recommendation, Assessment, Development, and Evaluation (GRADE) model. The GRADE model would determine the range of the confidence that estimates the effect of the policy. The GRADE model has 4 primary grades: high, moderate, low, or very low. The quality of evidence was assessed based on 4 essential elements: study design, study quality, consistency, and directness (**Appendix 1**).[8]

Data from eligible studies were extracted and summarized in a spreadsheet. The extracted data were organized as author names, year, country, study setting, study design, population, outcomes relevant to SC use and deliver, and information needed to examine the risk of bias of each study naemly, randomization protocols, and response rate in cross-sectional studies

(**Appendix 2**).[9] Due to the diversity of articles in term of countries, populations, and settings, the results did not appropriately fit the meta-analysis method of synthesis. The findings were reported by narrative summary and realistic synthesis in which evidence was selected, recorded, and analyzed to enhance the causal inference of the policy and its outcomes.[10]

Results. A total of 21 articles met the eligibility criteria and were included in this review. Studies were one experimental study, namely, RCT; 20 observational studies: one prospective cohort study obtained from the grey literature, and 19 cross-sectional surveys, one of them from grey literature. The quality of studies was graded as high (4.8%), moderate (28.6%), low (28.6%), or very low (38.1%). The number of the included articles based on their countries ranged from zero to

Table 1 - The percentage of yielded articles based on their countries.

Country	Number of included articles (%)
Bahrain	3 (14.3)
Kuwait	3 (14.3)
Oman	0 (0)
Qatar	2 (9.5)
Saudi Arabia	9 (42.9)
United Arab Emirates (UAE)	3 (14.3)
GCC countries	1 (4.8)
Total	21 (100)

9 articles. The majority of studies were conducted in Saudi Arabia while no article was found from Oman (**Table 1**) (**Appendix 2** provides a detailed summary of studies).

Experimental study. Only one RCT study was included in this review that was graded based the randomization protocol and its outcomes.

High quality of evidence. The RCT study was conducted in Qatar and was graded as a high quality of evidence. It was primarily evaluated based on the randomization that gave equal probability of a smoking individual to be assigned to either sample or control group. Procedures were controlled to assure that all subjects were treated the same except for the SC services given to the smoking participants in the sample group. Outcomes were measured using the continuous abstinence at 12 months and the daily number of cigarettes smoked. El Hajj et al[11] examined the effectiveness of trained ambulatory pharmacists in delivering SC services (both therapeutic and behavioral interventions). They recruited 314 smoking adults, 97.8% of them were men who were other than Qatari or Egyptian. After adjusting for nationality, the reviewed RCT study found no statistically significant differences between intervention group and control group. But the daily number of cigarettes at 3 and 6 months for those who relapsed had significant reductions compared to control group at 95% CI (p=0.041, p=0.018,).[11]

Observational studies. Multiple cross-sectional studies were included. These studies used survey questionnaires and narrative findings. The quality of evidence of the observational studies ranged from moderate to very low. The grade was given based on the reliability and generalizability of methods and outcomes.

Moderate quality of evidence. A total of 6 moderate studies were included. A study assessed the changes in scores of implementing tobacco use policies, including SC programs and smoke-free policy, in the Eastern Mediterranean region. The cessation program was evaluated by the authors who used a checklist that had scores ranged from 0 to 4 (0= unavailable data, 1= none, 2= NRT and/or some cessation services [neither cost-covered], 3= NRT and/or some cessation services [at least 1 cost-covered], 4= national quitline, and both NRT and some cessation services cost-covered). The GCC countries' scores in cessation programs have fluctuated. From 2011 to 2013, the scores were improved in Kuwait (3 to 4), declined in Bahrain (4 to 3) and Saudi Arabia (4 to 3), and stabilized in Oman (2), Qatar (3), and UAE (4). According to the grade of smoke free policy, Bahrain, Qatar, and UAE did not report data while Kuwait, Oman, and Saudi Arabia improved their compliances with the policy.[12]

Two cross-sectional Kuwaiti studies explored the predictors of SC among governmental employees and industrial workers. The first study found that personal self-efficacy is a significant predictor for quitting among governmental employees. The self-efficacy could be developed through the short duration of smoking and less daily cigarette consumption.[13] In the second study, industrial workers who intended to quit received NRT mainly patches. More than 50% of the quitters (abstinence from tobacco for >3 months) reasoned their quit to the knowledge of the harmful effect of smoking on health, 12.4% stated physician advice, and 6.5% reported cost reasons. The study also found a significant association between smoke-free workplace policy and quit rate (OR=3.58).[14] One study from Bahrain provided information about the effectiveness of the quit tobacco clinics that improved access to free SC medications. About 93% of male smokers, 80.6% of them were Bahraini, used NRT and counseling sessions. Only 11.7% had to purchase NRT from private entities, 7.2% of them found the cost unaffordable. Results showed that 56.5% of participants quitted all tobacco forms. Compared to tobacco smokers, shisha smokers were more successful in quitting. The study found a significant statistical relationship between successful quit and number of previous quit attempts at 21 months duration and number of clinic visits.[15] Two Saudi studies assessed the feasibility to deliver SC medications among physicians. Lack of time and training were the main reasons that discourage physicians from delivering SC services. Ninety-six percent of general and family practitioners, who worked in 2 academic medical centers in Riyadh City, had not prescribed SC pharmacotherapy to their patients.[16] Similarly, at least 50% of family practitioners, general internists, cardiologists, and vascular surgeons in four regions of Saudi Arabia would not advice smokers who have history of heart diseases to use SC medications.[17]

Low quality of evidence. Six studies were graded as low quality of evidence. Two Saudi studies investigated quit motivational factors among smokers and quitters. The intention to quit among school-age youths was associated with the level of tobacco consumptions, the perceived knowledge about the dangers of smoking, and the cost of tobacco.[18] Recently, Abdelwahab et al[19] assessed adult smokers' perception of the effectiveness of cessation interventions. The majority agreed that school-based intervention and media awareness are proactive approaches, and 70.9% of participants believed that NRT is an effective method for cessation.[19]

In a Bahraini study, waterpipe smoking adults in Cafés were surveyed to explore reasons behind intention to quit. Researchers found that receiving physician advice, opposing families to waterpipe smoking, and considering oneself as an unhooked were the main predictors of quit intentions.[20] In a Saudi prospective cohort study, Alraihan[21] (2016) looked at the feasibility of offering SC treatment by comparing mobile SC clinics to fixed clinics in ten regions. Mobile SC clinics, where NRT given for free, leaded to 55.74% quit attempts across both genders and all age groups while fixed SC clinics had 44.26% quit attempts.[21] In term of clinicians, 2 studies focused on the feasibility around delivering SC medications among different medical specialties in Saudi Arabia and dentists in Kuwait. Studies reported multiple reasons hinder the advice and assistance including insufficient time, inadequate training, unclear guideline, and patient resistance to and compliance with physician advice.[22,23]

Very low quality of evidence. Eight studies were evaluated as a deficient quality of evidence. Two cross-sectional studies surveyed smoking adults in Saudi Arabia and UAE about their perceived factors that affect their decision to quit smoking. Knowledge of harms, health concerns, self-willpower, social support, and level of stress were mentioned in these studies.[24,25] Six studies assessed the feasibility of delivering SC services across diverse health practitioners including general physicians and nurses in UAE, dentists in Saudi Arabia, primary care physicians in Bahrain, and pharmacists in Qatar. Barriers to advice smokers included lack of resources namely, educational materials and referral agencies, patient resistance, inadequate skills, perceived unrelated jobs, and limited time.[26-31] Two studies of them reported the lack of knowledge about non-NRT such as Bupropion.

Themes from included studies. **Table 2** presents themes that were found in the included studies. Themes were categorized into 2 groups: factors influencing the utilization of SC treatment at the individual level and factors affect the delivering of SC medications at the clinician level. At the individual level, access to SC medications, cost of medications, concern about health, and social support were more often stated in the literature review. Other factors were knowledge about the harms of smoking, self-efficacy, perceived stress, level of tobacco consumption, belief on the SC pharmacotherapy, clinician advice, and enforcement of smoke-free policy in public and workplace. At the clinician level, time for counseling smoking patients, training to assist patients, patient acceptance, and knowledge about the effective SC medications were more frequently stated in the included studies. Other factors involve best practice evidence for treating and refereeing smoking patients, resources, namely, educational materials and referral clinics, and perception related to responsibilities.

Discussion. This review examined studies that explored factors associated with SC and use of SC medications in the GCC countries. The grading of evidence and the analysis of themes helped in assessing the SC treatment policy. The GCC countries show success

Table 2 - Themes emerging from the thematic analysis.

Individual level	Clinician level
Access to SC	Best practice evidence for treating and refereeing smoking patients
Belief in the SC medications	Knowledge about the effective SC medications
Clinician advice	Patient acceptance
Concern about health	Perception related to responsibilities
Cost of SC medications	Resources, namely, educational materials and referral clinics
Enforcement of smoke-free in public and workplace	Time for counseling smoking patients
Knowledge about the harms of smoking	Training to assist patients
Level of tobacco consumption	
Perceived stress and coping	
Self-efficacy	
Social support	
SC - smoking cessation	

in addressing tobacco epidemic. Since the availability of SC treatment promote cessation among tobacco users, the GCC governments provide fully and/or partially coverage for SC medications for their citizens.[6] Despite the GCC countries' efforts to facilitate SC treatment, there were perceived barriers that discourage the use and delivery of the SC medications. From the individual perspective, the availability of SC medications in the GCC countries did not enhance the utilization because of the lack of social support, access constraints, and cost challenges facing smoking population who pay (at least partially) for these medications.[32] In addition, clinicians were less likely to advise patients to quit and recommend use of SC medications due to their limited time with patients and inadequate training to deliver SC services.

The shortage of physicians in GCC countries may explain physicians' barriers to deliver SC treatment.[7] Therefore, most GCC countries made an effort to expand access to SC services by increasing the number of cessation clinics and involving non-physician clinicians such as nurses and pharmacists to deliver SC services. Moreover, sociocultural factors in GCC countries could illustrate the barriers to use SC medications and quit smoking. GCC populations are influenced by their peers and families, which are critical units in the community.[33] Since the tobacco smoking became culturally popular in GCC countries, efforts need to be exerted to reduce the visibility of smoking in public. Smoke free policies in public and private entities should be well implemented and enforced to create antismoking norms, motivate smokers to quit, and protect individuals from the harmful effects of exposure to secondhand smoke.

Study limitations. We were not able to identify studies that provided accurate data on the use of SC treatment, and we found few studies of clinicians' attitudes in delivering SC medications. This review could not quantify the actual effect of GCC policies affecting the use of SC medications due to limited information. Furthermore, the inference should be made by cautious. Although the GCC countries have similar cultures, individuals' characteristics in each country are different.

Health policy research is a new field in the GCC countries. Therefore, future research with strong study designs and methodologies are needed to assess the effectiveness, efficacy, equity and feasibility of tobacco control measures. In particular, studies are needed to examine whether SC treatment policy can successfully help smokers to quit and tackle the use of tobacco in GCC countries.

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Appendix 1 - Quality of Evidence Grades*.[8]

Grade	Definition	Criteria for underlying methodology
High	Very confidence that the true effect lays close to that of the estimate of the effect.	Randomized Clinical Trials (RCTs); Quasi Experimental Design (QED) such as time-series or Difference in Differences (DinD).
Moderate	Moderately confidence in the effect estimate: The true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantiality different.	RCTs or QED with one identified problem: Qualitative or observational research that has good methodology and shows strong effects or answers important questions about implementation with high generalizability in population of interest.
Low	Limited confidence in the effect estimate: The true effect may be substantially different from the estimate of the effect.	RTCs or QED with two identified problems in the methodology/analysis. Qualitative and observational research with low generalizability to population of interest.
Very low	Little confidence in the effect estimate: The true effect is likely to be substantially different from the estimate of effect.	Triple-downgraded RCT or QED; downgraded qualitative/ observational studies; or case series/case reports.

*This table was developed using information from the stated reference. RCT - Randomized Control Trial, HPs - Health Professionals

Appendix 2 - Summary and quality grade of studies included in the review by study design*.

Author's name (year)	Country/setting	Study design/population/ quality grade	Outcomes related to smoking cessation
Experimental study			
El Hajj et al[11] (2017)	Qatar, public and private ambulatory pharmacies	RCT, 314 smoking indivisibles.	Intervention: Promote smoking cessations (Use medications, behavioral therapy) for smokers by educated pharmacists.
		Grade: high, blindness‡, randomization‡	Self-reported continuous abstinence at 12 months was higher in intervention group but was not statistically significant.
Observational study			
Moderate quality of evidence grade			
Heydari et al[12] (2014)	GCC countries	Cross-sectional study, 22 countries (response rate: N/R) with missing data Grade: moderate, research analysis‡, measurement‡, raters‡, generalizability§	0-4 smoking cessation services (0=data not reported, 1=none, 2= NRT and/or some cessation services (neither cost-covered), 3= NRT and/or some cessation services (at least 1 cost-covered), 4= National quit line, and both NRT and some cessation services cost-covered) NRT and/or some cessation services (neither cost-covered) NRT and/or some cessation services (at least 1 cost-covered) National quit line, and both NRT and some cessation services cost-covered Kuwait: 4, Saudi Arabia 3 Bahrain 3 Oman 2 UAE 4 Qatar 3
Badr & Moody[13] (2005)	Kuwait, government ministries	Cross-sectional study: (response rate: N/R), 657 male smoking employees	Reason for quit: significantly higher self-efficacy due to short duration of smoking, less excessiveness, and less daily cigarette consumption.
		Grade: moderate, research instrument‡, measurement‡, compassion contemplators versus pre-contemplators‡, generalizability§	
Al-Omran[17] (2012)	Saudi Arabia, hospitals	Cross sectional survey (response rate: 59%), 897 physicians (family physicians, general internists, cardiologists, and vascular surgeons)	NRT would be recommended by 50% and 43% of physician for patients with coronary artery disease (CAD) and peripheral artery disease (PAD), respectively. 42% and 37% of physicians would refer CAD and PAD patients to smoking cessation clinics.
		Grade: moderate, causality§, generalizability‡, recruitment participants‡	Barriers to delivering risk reduction therapy including NRT: lack of management guideline, lack of knowledge of treating patient, and absence of education in risk education therapy.
Gaafar & Basiony[14] (2013)	Kuwait, factories	Cross-sectional study (response rate: 90.8%), 2620 smoking employees	Reason for quit: 12.4% of quitters stated physician advice. The Strong relationship between smoking policy at work and quitting (OR=3.58).
		Grade: moderate, sample size‡, generalizability‡	Reason for smoking: to relieve boredom, feel relaxed, relieve anger and frustration, relieve pressure of working hard, to concentrate at work, and to mix in social situations.
Hamadeh et al[15] (2017)	Bahrain quit tobacco clinics	Cross-sectional study (response rate: 54.8%); 194 male smoking individuals receiving smoking cessation services.	56.5% of participants had quit all forms of tobacco after attending the QTC, shisha smokers > cigarette smokers.
		Grade: moderate, outcomes‡, methodology‡, statistical relationship‡	About 93.0% received NRT + counseling sessions [Nicotine chewing gums and patches combined (79%), Given either Bupropion or Champix (3.6%)].
			Only 11.7% purchased NRT from a private pharmacy while the remaining received it for free from the QTC. For those who purchased NRT out of pocket, the cost was unaffordable to 7.2%.
			Statistically significantly related to successfully quitting all types of tobacco with more than three visits to the clinics and previous quit attempts of 21 months duration or more.
Jradi[16] (2017)	Saudi Arabia, primary health care clinics at medical centers	Cross-sectional survey (response rate: 57.4%), 216 general and family practitioners	96% of participants did not prescribe pharmacotherapy. 57% of participants supported the use of nicotine replacement therapy to help smokers quit.
		Grade: moderate, methodology‡, outcomes‡	Barriers to delivering smoking cessation services: lack of time (72.6%) and lack of training (66.9%).
Low quality of evidence grade			
Borgan et al[20] (2013)	Bahrain, waterpipe café	Cross-sectional survey (response rate: 90.7%), 419 smoking adults.	Reasons for interest in quit: physician advice, family opposes waterpipe and considering oneself as an unhooked.
		Grade: low, + randomization, generalizability§	Forty-five percent of respondents were asked by physicians about their smoking habits, and 56% of them received advice from physicians to quit.
Khalaf[23] (2013)	Kuwait, Ministry of Health dental clinics	Survey study (response rate: 97%), 150 general dentists	Cessation activity and arranged to follow up showed a positive significant correlation with the cessation knowledge, barriers to cessation activities, willingness to perform cessation activities, practitioner expectations, and confidence cessation.
		Grade: low, recruitment participants§, survey measure‡	A strong correlation with confidence and cessation knowledge ($p<0.001$) was present.
			Barriers to smoking cessation activity: 30% of dentists had perceived patience resistance, patient compliance, and time.

Appendix 2 - Summary and quality grade of studies included in the review by study design*. Continued

Al-Zalabani et al[18] (2015)	Saudi Arabia, schools.	Cross-sectional survey (response rate: N/R), 307 smoking students Grade: low, - overrepresentation male students, - generalizability, + methodology	Significant association between intention to quit and other factors: male (adjusted OR=3.25), age at 1st trial of smoking (an age of 10-15 years was associated with an adjusted OR=2.11), and an age of more than 15 years was associated with an adjusted OR=3.10, days of smoking in the past 30 days (less than 10 days was associated with an adjusted OR=2.31), and days ranging from 10-19 was associated with an adjusted OR=3.42), knowing that smoking is hazardous to health (adjusted OR=3.04, 95), and supporting smoking bans in public places (adjusted OR=1.89). Reason for quit: preserving health and saving money.
Abdelwahab et al[19] (2016)	Saudi Arabia, governmental public health care centers.	Cross sectional study (response rate: 99.8%), 1497 smoking individuals Grade: low, + randomization, - overrepresented male, - generalizability.	Perception about most effective cessation methods: participants reported School awareness program (88.6%), NRT (70.9%) TV (78.5%), Radio (74.4%).
Al-Omran[22] (2007)	Saudi Arabia, a teaching hospital.	Cross-sectional survey (response rate: 60.7%), 84 physicians (family physicians, general internists, cardiologists, and vascular surgeons) Grade: low, - generalizability	Approximately 25.5% of physicians would recommend NRT for smokers who have PAD. Barriers to delivering risk reduction therapy including NRT for PAD: lack of PAD management guideline, lack of knowledge of treating PAD patient, and absence of education in risk education therapy.
Alraihan[21] (2016)	Saudi Arabia, smoking cessation clinics	Prospective cohort study, 30210 smoking individuals Grade: low, - generalizability, - outcome representation.	Mobile smoking cessation clinics improve access to smoking cessation services. Mobile clinics led to higher attempt to quit compared to fix smoking cessation clinics (55.74% in mobile vs. 44.26% in fixed).

Very low quality of evidence grade

Wyne et al[29] (2006)	Saudi Arabia, private practices, private group practices, and government clinics/ hospitals	Survey study (Response rate: 62.5%), 250 general dental practitioners Grade: very low, -outcomes, - methodology	Barriers to delivering smoking cessation services: 59.2% of the respondents were either "not at all confident" or only "somewhat confident" in their ability to help children and adolescents in smoking cessation. 37% thought the smoking cessation counseling would "not at all" be effective and 38.5% only "moderately effective."
Awad & O'Loughlin[26] (2007)	UAE, private healthcare settings	Cross-sectional study (response rate: 56%), 450 GP Grade: very low, generalizability§, measure instrument§	General Practitioners offered preventive advice to more than half preadolescents (29%), adolescents (50%), and young adults (65%). Male GPs provided more smoking cessation advise Perceived barriers to providing smoking prevention counseling: lack of educational materials, lack of community resources, and lack of time
Shaikh et al[25] (2008)	UAE, Cafes	Cross-sectional survey (response rate: N/R), 202 male waterpipe smoking adults Grade: very low, generalizability§, causality‡	The relationship between attempt to quit and knowledge of harms was statistically significant Reasons for smoke: peer pressure Reason for quit: health concern
Fadhil I[30] (2009)	Bahrain, primary health centers	Cross-sectional survey (response rate: 55%), 217 primary care physicians. Grade: very low, generalizability§, selection bias	Ninety-one percent of physicians were familiar with nicotine replacement therapy (chewing gum, skin patches), but their knowledge was gained in practice Thirteen percent of physicians were familiar with non-nicotine medications (bupropion) for smoking cessation. Reasons for not delivering smoking cessation: belief that other health professionals: psychologists and pharmacists are responsible for managing tobacco dependence cases
Sreedharan et al[27] (2010)	UAE, tertiary teaching hospital.	Cross-sectional study (Response rate: N/R), 108 nurses Grade: very low, generalizability§	Thirty-one percent of nurses were unaware of the existence of smoking cessation clinics Barriers to delivering smoking cessation advice: lack of time, lack of training, perceived unrelated job, and unwillingness of patients
El Hajj & Al Nakeeb[31] (2012)	Qatar, pharmacies.	Cross-sectional study: (response rate: 40%), 318 pharmacists Grade: very low, recall bias, response rate§	Only 21 % of respondents reported that they always or most of the time asked their patients if they smoke Participants were more likely advising patients about the use of nicotine replacement gums and patches while less likely suggesting prescription for Buproprion from a physician Barriers to delivering smoking cessation: lack of time and patient interest.
Al-Mobeeriek et al[28] (2013)	Saudi Arabia, hospitals	Cross-sectional survey (response rate: 70.3%), 300 dentists. Grade: very low, - study population: restricted practice according to gender	Approximately 22.9% of dentists would assist patients to quit, 7.3% would refer them to physicians, and 9.8% would prescribe nicotine replacement therapy for patients Barriers to delivering quit advice were lack of resources such as patient education materials and referral resources, anticipated negative patient reaction, uncertainty about the dentists' role in smoking cessation, lack of time, and lack of skills
Baig et al[24] (2016)	Saudi Arabia, a medical university and public settings.	Cross-sectional survey (response rate: 87.6%), 438 smoking adults Grade: very low, - descriptive data§, selection bias§, - recruitment§, generalizability§	Barriers to quitting were lack of willpower in quitting, coping with stress at home or working place, social pressure, and extreme liking towards smoking

* Randomized Control Trial (RCT), HPs - Health Professionals, ‡indicated good or strong, §indicated unclear or weak, N/R - not reported, GCC - Gulf Cooperation Council, NRT - nicotine replacement therapy, UAE - United Arab Emirates, ORT - odds ratio, QTC - quit tobacco clinic GP - General Practitioners