


Global Status of Knowledge, Attitude and Practice on Tobacco Cessation Interventions Among Dental Professionals: A Systematic Review

Tobacco Use Insights
Volume 15: 1–15
© The Author(s) 2022
Article reuse guidelines:
sagepub.com/journals-permissions
DOI: 10.1177/1179173X221137218


Harsh Priya¹, Manali Deb Barma², Bharathi M Purohit¹,
Deepali Agarwal¹, Upendra Singh Bhadauria¹, Nitesh Tewari³,
Shalini Gupta⁴, Deepika Mishra⁵, Rahul Morankar³,
Vijay Prakash Mathur³ and Ritu Duggal⁶

¹Division of Public Health Dentistry, Centre for Dental Education and Research, All India Institute of Medical Sciences, New Delhi, India. ²National Oral Health Program, Centre for Dental Education and Research, All India Institute of Medical Sciences, New Delhi, India. ³Division of Pedodontics and Preventive Dentistry, Centre for Dental Education and Research, All India Institute of Medical Sciences, New Delhi, India. ⁴Division of Oral Medicine and Radiology, Centre for Dental Education and Research, All India Institute of Medical Sciences, New Delhi, India. ⁵Division of Oral Pathology, Centre for Dental Education and Research, All India Institute of Medical Sciences, New Delhi, India. ⁶Chief, Centre for Dental Education and Research, All India Institute of Medical Sciences, New Delhi, India.

ABSTRACT

BACKGROUND: With the emergence of the WHO Framework Convention on Tobacco Control, globally the use of tobacco has decreased notably, although, it still requires efforts at individual, organizational, community level to decrease the rate further. Dental professionals are at an excellent position to provide tobacco cessation counselling and interventions, however, it is not practiced much due to lack of training and lack of knowledge. Therefore, this systematic review was conducted to assess the global status of knowledge, attitude and practice on tobacco cessation interventions among dental professionals.

MATERIALS AND METHOD: A systematic search of 6 databases with no language restriction since 2000 was undertaken. Studies were included if they assessed knowledge, attitude and practice on tobacco cessation interventions among dental professionals using a validated or prevalidated tool. The data obtained for assessment of knowledge, attitude, practice, curriculum and barriers were represented through heatmaps. Quality assessment of the studies was done using Newcastle Ottawa scale.

RESULTS: Fifty six studies were included in this systematic review. Majority of the studies were found to be of moderate quality. Knowledge regarding the tobacco cessation interventions was more theoretical than practical. All the studies showed a favorable attitude among dental professionals towards tobacco cessation intervention.

CONCLUSION: The included studies lack homogeneity in assessing knowledge, attitude and practice on tobacco cessation interventions. The development and validation of a standardized questionnaire to assess knowledge, attitude and practice on tobacco cessation interventions could be a potentially effective way to uniformly gather data on the subject.

KEYWORDS: oral cancer, smoking, smokeless tobacco, tobacco counselling, nicotine replacement therapy, dental professionals

RECEIVED: May 11, 2022. **ACCEPTED:** October 19, 2022.

TYPE: Systematic Review

DECLARATION OF CONFLICTING INTERESTS: The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

FUNDING: The author(s) received no financial support for the research, authorship, and/or publication of this article.

AUTHOR'S NOTE: Travel Grant by Burrow Foundation for registration and presentation at the Online European Association of Dental Public Health Congress 2021, Abstract number 55 under Education and Oral Epidemiology.

SUPPLEMENTAL MATERIAL: Supplemental material for this article is available online.

CORRESPONDING AUTHOR: Harsh Priya, Division of Public Health Dentistry, Centre for Dental Education and Research, All India Institute of Medical Sciences, 110029, CDER, New Delhi 110029, India. Email: drharshpriya@gmail.com

Introduction

The history of tobacco counseling dates back to the 1970s when the recommendations to dentists to help patients to quit smoking were initiated by the air force dental clinic at Lackland, USA.¹ Tobacco cessation counseling is a practice used by health professionals to train patients on how to quit tobacco use in any form. According to the World Health Organization, tobacco

cessation should be a part of dental practice where dental and non dental professionals should be actively involved in helping patients to quit tobacco.^{2,3}

Dental care professionals are in a better position and therefore play a potential role to identify tobacco users, as during a routine check up intraoral signs such as halitosis, tobacco stains and oral hygiene problems can be examined.⁴ Combating



Creative Commons Non Commercial CC BY-NC: This article is distributed under the terms of the Creative Commons Attribution-NonCommercial 4.0 License (<https://creativecommons.org/licenses/by-nc/4.0/>) which permits non-commercial use, reproduction and distribution of the work without further permission provided the original work is attributed as specified on the SAGE and Open Access pages (<https://us.sagepub.com/en-us/nam/open-access-at-sage>).

the tobacco epidemic should be done through regular tobacco cessation intervention in their everyday clinical practice. However, globally studies have reported that the proportion of tobacco users who receive guidance and counseling from a dental professional is not sufficient.^{5,6}

A comprehensive and integrated tobacco control programme must incorporate both the promotion of quitting smoking as well as the treatment of tobacco dependency. The healthcare professionals can support the smokers in their efforts to stop using tobacco and helping them to overcome their addiction may strengthen other tobacco control strategies as well, which is in fact in line with the WHO FCTC article 14.⁷

Even though the consumption of tobacco has decreased globally by 22.3%, further efforts at tobacco control are required by the community, healthcare professionals and through changes in policy in order to see more decline in the trend of tobacco consumption.⁸

Healthcare professionals must be informed of behavioral as well as pharmacotherapy related measures for tobacco cessation.⁹ Previous systematic reviews have been conducted which have assessed either attitude¹⁰ or practice^{11,12} among different healthcare workforce such as nurses,¹¹ dental professionals,¹⁰ medical professionals,¹³ healthcare workers.¹²

Rationale and aim of the study: With this systematic review, we aim to address the lacunae of compiled data regarding knowledge, attitude and practice among dental professionals globally. Therefore, the aim of this systematic review is to determine the global status of knowledge, attitude and practice regarding tobacco cessation intervention among dental healthcare professionals. The secondary aim of the systematic review is to identify the most common barriers faced during tobacco cessation intervention among dental healthcare professionals and their perception towards inclusion of tobacco cessation activities in their curriculum.

Methodology

The systematic review was conducted according to the PRISMA guidelines. The protocol was registered with Prospero (Trial Number: CRD42021250962).

Search sources

The search was conducted electronically on PubMed, LILACS, Web of Science, Cochrane, CINAHL and Scopus databases from 15th May 2021 to 3rd September 2021 without any restriction of languages and from the year 2000 up till 2021. A search of the grey literature was performed in Google Scholar and Open-Grey. Two authors (NT and HP) performed the literature search independently according to a predefined strategy, and the duplicates were removed using EndNote software.

Search strategy

The 3 reviewers (HP, BMP and NT) identified the possible domains and subdomains using the PICO strategy to recognise the existing related literature on knowledge, attitude and practice on tobacco cessation intervention.

P : Dental Professionals; I : Tool for assessment of knowledge, attitude, practice of the tobacco cessation methods; Comparison: Not applicable; Outcome: Knowledge score, attitude score, practice score, inclusion of tobacco cessation interventions in curriculum, barriers of the dental professionals regarding tobacco cessation interventions and responses of participating dental professionals in percentage.

The search was implemented using the keywords : Tobacco Cessation, Tobacco Counseling, Quitting Tobacco, Smoking and Smokeless Tobacco, Dental Professionals. Partial search was done using the boolean operators (AND, OR) with the keywords. The search strategy was carried out using the keywords and MeSH terms provided in [Supplementary Table 1](#).

Study selection and eligibility criteria

All types of published studies (Cross-sectional, case control, cohort) assessing the knowledge, attitude and practice regarding tobacco cessation counseling among dental professionals were included. Similar studies assessing barriers to tobacco cessation counseling and inclusion of tobacco cessation in the dental curriculum was also included in this review. Randomized clinical Trials and studies with inadequate information regarding methods of development and validation was excluded. Letter to the Editor, Perspective and commentaries were also excluded.

Assessment of risk of bias

The included studies were evaluated for their methodological quality using the Newcastle-Ottawa Quality Assessment Scale¹⁴: Critical appraisal checklist for analytic cross sectional studies by BMP, USB, DA and MDB independently. In case of any disagreement between the reviewers, a fifth reviewer was consulted. Based on their methodological quality, the studies were divided into high, moderate and low risk of bias.

Results

The search strategy yielded a total of 3726 articles from the databases of PubMed, LILACS, Web of Science, Cochrane, CINAHL, and Scopus ([Figure 1](#)). Following removal of articles for duplication, 104 articles were found to be eligible for assessment. A total of 48 studies were further excluded as full text was not available, the survey instrument was not validated, study designs consisted of narrative review, systematic review, intervention studies, knowledge, attitude and practice component was not assessed in many studies and 1 study was conducted among school students.

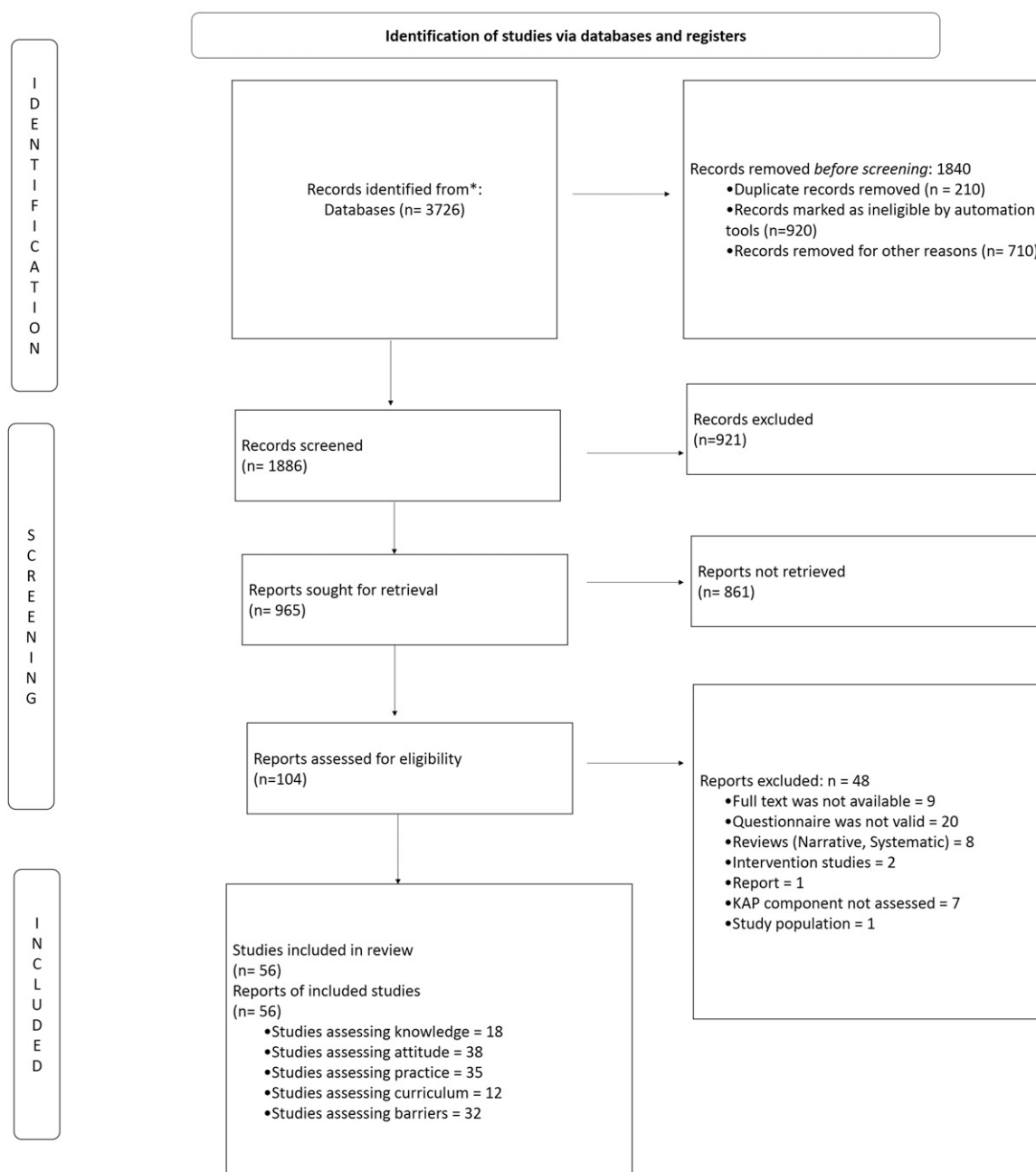


Figure 1. PRISMA flowchart.

Among the fifty six included studies, the majority (twenty-one) of the studies were conducted in South East Asia Region countries, followed by 9 studies in Eastern Mediterranean Region. A total of twenty six studies¹⁵⁻⁴⁰ were conducted among dental students and interns, 3⁴¹⁻⁴³ among dental hygienists, twenty two^{27,29-32,44-56} among dental practitioners, 3⁵⁷⁻⁵⁹ among pediatric dentists and 2^{60,61} among oral surgeons (Table 1).

Based on the inclusion criteria, all the studies had included a validated tool, 3 studies^{15,36,54} have used the Global Health Professions Student Survey (GHPSS) tool, whereas 2 studies^{17,21} have used a modified version of the same.

Since the questions used to assess knowledge, attitude, and practise regarding tobacco cessation counseling varied a lot, the data was visualized using heatmaps (Figures 2 to 4), where the width of the columns represents the number of studies that included the question and the color represents the level of awareness, positive attitude, and practice as 25%, 25-50%, 50-75%, and >75%. The heatmap includes the questions which were a part of the questionnaire in at least 3 or more studies. The similar questionnaires were clubbed together.

A total of seventeen^{18,20,22,23,32,36,38,41,42,44,46,49,50,54,55,67,70} studies had questions related to knowledge about tobacco

Table 1. Study Characteristics of the included studies in the systematic review.

SL NO	AUTHOR YEAR	STUDY DESIGN	COUNTRY	STUDY SETTING, STUDY POPULATION	INSTRUMENT, NUMBER OF QUESTIONS	RESPONSE RATE (%)	MALES AND FEMALES (N)	AGE GROUP (YEARS)	OUTCOME OF THE STUDY
1.	Maharani D A et al ¹⁶ , 2021	Descriptive Cross-sectional	Indonesia	30 Universitas Dental School; Dental Students	Pre-Validated Questionnaire 11	21	M:215 F:1073	Mean Age – 21.5	Intention to provide TCC was significantly associated with more positive attitude recognizing TCC as a dentist's role ($P < .0001$).
2.	Mehta A. et al ¹⁴ , 2020	Descriptive Cross-sectional	India	Private Dental Clinics, Conference, CDEs; Private Clinicians	Validated tool 17	Not Mentioned	M:155 F:142	Grouped as ≤ 35 & ≥36	Younger dentists (≤ 35) performed significantly better than older dentists in attitude and practice towards TCC
3.	Rodakowska E et al ¹⁷ , 2020	Descriptive Cross-sectional	Poland; Italy	Medical University in Białystok, Poland, Sapientia University of Rome, Italy; Dental Students	Modified GHPSS*	79.6	M:182 F:400	15 - ≥ 25	A statistical significance ($P < .001$) was found among the students in their belief that health professionals should routinely advise patients to stop smoking
4.	A C L Da Silva et al ¹⁵ , 2019	Descriptive Cross-sectional	Brazil	School of Dentistry, Universidade Federal de Pernambuco; Dental Students	GHPSS- 38	77.3	M : 99 F:165	19-30	About 90% of the students believe that the probability of tobacco cessation increases if advice comes from a health professional
5.	Kachwaha P et al ¹⁸ , 2019	Descriptive Cross-sectional	India	Dental College; Dental Intern + Dental Students	Developed and Validated 17	Not Mentioned	M:33 F:67	Mean Age – 23.3 (SD – 62) – Intern Mean Age – 22.1(SD – 1.1) - Undergraduate	A statistical significance ($P = .005$) was observed between UGs and Pos that TCC provided by a dentist would help the patient in quitting tobacco
6.	Lorenzo Pouso et al ²⁰ , 2019	Descriptive Cross-sectional	Spain	Faculty of Medicine and Dentistry of Santiago de Compostela; Dental Students	Validated 15	54.5	M35:85	Mean Age – 22.6 (SD – 4.3)	94.2% of the students considered it appropriate to promote tobacco use cessation activities
7.	Liu D.C.Y et al ¹⁹ , 2019	Descriptive Cross-sectional	Hong Kong	Prince Philip Dental Hospital; Dental Students	Pre-Validated 23	100	M92 F:114	Not Mentioned	About 90.2% of the students believe TCC by dentists could assist patients to quit smoking
8.	Thomas J et al ²¹ , 2019	Cross sectional	India	Dental college; Dental Students	GHPSS- Modified	85	M : 129 F : 241	Not mentioned	92% of the students considered education on tobacco use cessation to be the responsibility of dentists/doctors
9.	Al Maweni S et al ¹⁵ , 2018	Cross Sectional	Yemen	Yemeni Dental Association meeting; General Dental Practitioners	Not mentioned 16	47.5	M197 F:85	Not mentioned	71% of the dental professionals believe that questions regarding tobacco habits and cessation like time and it was found to be statistically significant ($P = .001$)
10.	Siddiqui AA et al ¹⁶ , 2018	Descriptive cross sectional	Saudi Arabia	Licensed practicing dentists in the Hail region; Dentists working with the Ministry of Health in the Hail region of Saudi Arabia	Developed and validated 7	70.5	M:102 F:59	Not mentioned	The association between knowledge and practice regarding giving advice by dentist to quit smoking was statistically significant ($P = < .0001$)
11.	Bangena D et al ¹⁷ , 2018	Descriptive Cross-sectional	UAE	hospitals, dental clinics, polyclinics, dental clinics in medical centres, and dental centres in primary healthcare centres in the Northern Emirates; Practising Dentist	Face validated 22	89.3	M:108 F:142	<40 - ≥40	Good attitude was significantly higher ($P = ≤ .01$) among non tobacco users (90.9%) compared to tobacco users (71.0%)
12.	Nor NAM et al ²² , 2018	Cross Sectional	Malaysia	Dental university	Validated tool	66.2%	M:29 F:76	Not mentioned	33.1% of patients believe that smoking cessation counselling was extremely helpful compared to what students perceived (5.7%, $P = < .01$)
13.	Aljimi B et al ¹⁸ , 2017	Descriptive Cross-sectional	Saudi Arabia, Kuwait	Saudi Commission for Health Specialties as well as the Kuwait Dental Association; Practising Dentist	Validated tool	97.2%	M:286 F:180	Mean Age 32.7 ± 9.32	A non smoker status among the dentists was significantly associated with patient education ($P = .002$), giving quit advice to smokers ($P = .000$) and willingness to conduct a tobacco cessation campaign ($P = .000$)
14.	Resende M et al ¹⁹ , 2017	Analytical and descriptive longitudinal	Portuguese	Portuguese Dental Association; Portuguese Dentists	Validated tool 23	27.5	Not mentioned	23 - 59	Counselling for tobacco cessation has increased from 68% (2006) to 86.9% (2013) and it was found to be statistically significant ($P = < .001$)
15.	Yahaya NA et al ²⁰ , 2017	Descriptive Cross Sectional	Malaysia	Dentists registered in the Dental Practitioners' Management Information System (DPMIS) Malaysian Dental Council; Practising Dentists	Validated tool (Theoretical Domain Questionnaire)	100	M:95 F:188	Mean Age 37.1 (± 10.3)	Significantly more ($P = < .05$) public (65.1%) than private (51.2%) dentists believed promoting tobacco cessation was an important professional duty
16.	Zabonkis A. et al ²³ , 2017	Cross sectional	Lithuania	Lithuanian University of Health Sciences; Dental Students	Validated tool	84.2%	M:167 F:168	Mean Age – 33.7	The willingness to patient's smoking cessation was found to be statistically non significant among the 2 groups.
17.	Prabhu A et al ²² , 2017	Descriptive Cross Sectional	India	College of Dental Sciences and Bapuji Dental College, Davangere; Dental students	Validated tool 23	Not mentioned	M:120 F:142	20 - 27	The respondents did not have sufficient knowledge regarding tobacco cessation advice
18.	Rahman B et al ²³ , 2016	Cross Sectional	UAE	College of Dentistry in Ajman University of Science and Technology; dental students	Pre-validated 15	77%	M:140 F:190	17-26	A statistically significance ($P = .005$) was found between tobacco using patients and non using students about a dentist's role to assist a patient in stopping tobacco use

(Continued)

Table 1. Continued.

SL NO	AUTHOR YEAR	STUDY DESIGN	COUNTRY	STUDY SETTING, STUDY POPULATION	INSTRUMENT, NUMBER OF QUESTIONS	RESPONSE RATE (%)	MALES AND FEMALES (N)	AGE GROUP (YEARS)	OUTCOME OF THE STUDY
19.	Dumitrescu AL et al. ⁶⁴ 2016	Cross Sectional	Sibu	Faculty of Medicine, University "Lucian Blaga" Sibiu; first to sixth year dental students	Pre-validated 38	100%	M:51 F:134	22.20 ± 2.94	56.6% believed considered it is a part of their role as a dentist to assist in tobacco cessation but it was not statistically significant
20.	Albert DA et al. ⁶⁵ 2016	Mixed method	USA	Post-Doctoral Residency Programs in New York; Residents and faculty in dental specialty postdoctoral programs	Pre-validated Quantitative – 31 items Qualitative – 6 themes	31.3%	M:26 F:24	Not mentioned	Statistically significant differences in tobacco cessation intervention across specialties but not between residents and faculty
21.	Sharma G et al. ⁶⁶ 2016	Cross Sectional	India	Dental colleges in Bangalore; Dental Interns and Masters MDS Students	Validated tool 25	100	M:65 F:167	Mean Age 24.68 ± 2.76 years	Statistically significant difference was found between interns and PGs for items related to tobacco cessation practice
22.	Awan KH et al. ⁶⁷ 2015	Cross Sectional	Saudi Arabia	General dental practitioners (GDPs) and dental students in Saudi Arabia	Validated tool 17	86.5	M : 256 F : 86	130 (mean age, 30 [SD, 5] years) were GDPs and 212 (mean age, 21 [SD, 3] years) were dental students	62% of general dental practitioners and 67% of dental students rated smoking cessation and prevention as important
23.	RazaviSM et al. ⁶⁸ 2015	Cross Sectional	Iran	Dental school; Dentists and Senior Dental Students	Validated tool	Not mentioned	M: 72 F:124	Not mentioned	78% of students and 74% of dentists agreed that tobacco cessation programs should be a part of dentists responsibility
24.	Bhat N et al. ⁶⁹ 2014	Cross Sectional	India	3 dental colleges in Udaipur; Dentists and students	Pre-validated 26	Not mentioned	M:84 F:67	20-41 and above	98.7% of the dentists agreed it was their responsibility to provide smoking cessation counseling
25.	Dable RA et al. ⁷⁰ 2014	Cross Sectional	India	Dental College; Dental students	Validated tool 21	53%	Not mentioned	<20 - ±20	The perception regarding responsibility of dentist to help in tobacco cessation changed from 75.5% (Module I) to 90.6% (Module II) and it was statistically significant (P = .002)
26.	Nordin ASA et al. ⁷¹ 2014	Workshop	Malaysia	Malaysian Dentist	Validated tool	Not mentioned	M: 55 F : 168	33.6 (6.99)	71.6% believed they can be effective in helping their patient to stop smoking
27.	BalapanavarAY et al. ⁷² 2013	Cross-Sectional	India	Dental colleges across India; Dental Interns	Validated tool	Not mentioned	M:481 F:1040	Not mentioned	The self-assessed knowledge, attitude, practices and barriers were found to be statistically significant (P = .0001)
28.	KhalilM et al. ⁷³ 2013	Cross sectional	Kuwait	Dental practitioners MOH	Validated tool 48	97	M:77 F:68	Male dentists was higher (34.0 ± 11.5 years) than that of the females (30.3 ± 8.7 years) (P < .03)	12% reported they always incorporate tobacco cessation activities into their practices and it was statistically significant (P = .003)
29.	Munigaboopathy V et al. ⁷⁴ 2013	Cross Sectional	India	Dental college; Interns	Validated tool 35		M:139 F:317	22.7 ± .94	68.9% of the students agreed that tobacco counseling will help patients to quit tobacco
30.	Prakash P et al. ⁷⁵ 2013	Cross Sectional	USA	Dentists in Delta Dental	Validated tool	98	M : 233 F : 38	Not mentioned	58% believe it is important as a part of dentist's role to intervene regarding patient's tobacco use and it was statistically significant (P = .001)
31.	Taligi RL et al. ⁷⁶ 2013	Cross Sectional	India	Dental college and clinic; Third year, Interns, Dentists	Validated tool	98	Not mentioned	22.4	91.4% believed it is dentist's responsibility to educate patients about risk of tobacco use but it was not statistically significant (P = .611)
32.	González-Martínez Ret al. ⁷⁷ 2012	Cross Sectional	USA	American Association of Oral Maxillofacial Surgeons (AAOMS); Oral Surgeons	Validated tool 38	52.4	96.5% males	56 + 87	66.5% agreed that it is within the scope of dental practice to help smokers quit
33.	Almehdy AE et al. ⁷⁸ 2011	Cross Sectional	Iran	Iran, Schools of Dentistry 11 Dental School; Senior Dental Students	Validated tool 25	82	M : 106 F : 229	24.6±3.8	47% are optimistic about the capability of dentists in tobacco cessation
34.	Amit S et al. ⁷⁹ 2011	Cross Sectional	India	Students and dentists	Pre-validated tool	84	M:103 F:65	20-25 years:	92.1% of the dental students feel the need for tobacco cessation activity
35.	Chandrasekar J et al. ⁸⁰ 2011	Cross Sectional	India	Practising dentist	Validated tool 35	73	M:62 F:52	Not mentioned	79.4% of the students were in support of inclusion of cessation technique in dental school curriculum, but it was not statistically significant (P = .70)
36.	Ehizele AO et al. ⁸¹ 2011	Cross sectional	Nigeria	Final year dental students	Validated tool 8	98.9	M : 95 F : 85	25.4 ± 3.0	

(Continued)

Table 1. Continued.

SL NO	AUTHOR YEAR	STUDY DESIGN	COUNTRY	STUDY SETTING, STUDY POPULATION	INSTRUMENT, NUMBER OF QUESTIONS	RESPONSE RATE (%)	MALES AND FEMALES (N)	AGE GROUP (YEARS)	OUTCOME OF THE STUDY
37.	Pate AM et al. ⁷¹ 2011	Cross sectional	USA	AAPD members	Pre-validated tool 24	23.1	M : 191 F : 40	More than 51 years of age	92% believe that tobacco cessation is a responsibility of the dental profession
38.	Rajasurendran P et al. ³⁵ 2011	Cross sectional	India	3 dental colleges; Third, fourth year students and interns	Validated tool 22	96	M:98 F:231	Mean 21.86	90.2% of students feel tobacco cessation counseling provided by a dentist would help the patient in quitting tobacco and it was found to be statistically significant (P = .005)
39.	Studzis JL et al. ⁴¹ 2011	Cross sectional	USA	Practising and licensed dental hygienists	Risk Behaviour Diagnosis Scale	18.4	M:1 F:307	(mean=13.9 sd=10.5)	64% of dentists were willing to participate in tobacco cessation training programs
40.	Succar CT et al. ⁷² 2011	Cross sectional	USA	Licensed practising dentist	Validated tool 26	21.4	M : 899 F : 333	Mean - 47 years	98% disagree that it is within the scope of dental practice to ask about tobacco use
41.	UN OG et al. ²⁷ 2011	Cross sectional	Nigeria	Clinical students and dentists	Validated tool	81.9	M : 71 F : 65	≤20 21-24 25-29 ≥30	97.3% support the role of dentist in giving advice on tobacco cessation, however it was not statistically significant
42.	Chowdhury MTH et al. ³⁸ 2011	Cross Sectional	Bangladesh	6 Dental colleges; Fourth year students	GHPSS*	79	M:86 F:100	19-24	Over 72% thought it was appropriate for a dental professional to give tobacco cessation
43.	Clareboets S et al. ⁴³ 2011	Cross Sectional	United Kingdom	Clinical dental	Validated tool	89	M:44% F:56%	Not mentioned	85.9% final year students and 53.1% entry level agreed talking about smoking is part of professional practice and it was statistically significant (P = .002)
44.	Pizzo G et al. ⁴² 2010	Cross sectional	Italy	University of Palermo; Dental Students, Dental Hygienists	Pre-validated (European Union Working Group on Tobacco and Oral Health) 20	Not mentioned	M : 100 F : 78	Not mentioned	99% believe TCC is important to be included in daily practice
45.	Saddichha S et al. ⁵¹ 2010	Cross Sectional	India	NIMHANS; Dental Surgeons	GHPSS* 45	100	M:58 F:42	36.3 (6D-5.32)	87.3% agree that advising on tobacco use cessation is dentist's role however it is not significant
46.	Vered Y et al. ³⁷ 2010	Cross Sectional	Israel	Jerusalem Dental Medicine School; Dental Students	Validated tool	99	M:134 F:137	24.3- 2.86	Most students were comfortable providing TCC to both smokers (92%) and spit tobacco users (93%)
47.	Harris JL et al. ⁴⁵ 2009	Cross sectional	USA	12 Dental Hygienist Programs; Senior Dental Hygienists	Validated tool 26	65	M:5 F:151	18 - 85 and above	57.7% agree smoking cessation activities are peripheral to dentistry
48.	Mumtaz R et al. ⁵² 2008	Cross Sectional	Pakistan	3 dental colleges + 3 tertiary dental hospitals; Dental students; Practising dentists	Validated tool	66.20	M : 119 F : 103	Not mentioned	80% agree it is their duty to help patients to quit tobacco
49.	Yee C et al. ⁵⁹ 2008	Cross Sectional	USA	AAPD members; Paediatric dentists	Validated tool 26	82	M : 813 F : 479	43 years	Respondents with formal training in providing treatment for tobacco dependence were more likely than respondents without training to report that they counsel at least 51% of their patients (χ ² 3 = 63.13, P < .01)
50.	Crews KM et al. ⁶¹ 2008	Descriptive	USA	American Association of Oral Maxillofacial Surgeons; Oral Surgeons	Pre-validated tool 38	52.4	M:2644 F: 96	56.0 ± 8.7 years	56% agree it is their duty to help patients to quit tobacco
51.	Gansky SA et al. ⁶⁸ 2007	Cross Sectional	USA	AAPD members; Pediatric dentists	Validated tool 45	65	M:75% F: 25%	≤39 - ≥50 years	40% agree it is the responsibility and duty of every dentist to co-operate in anti-tobacco programs
52.	Vanobbergen J et al. ⁶⁹ 2007	Cross Sectional	Belgium	Ghent university; Dental students	Validated tool	81	M: 38% F: 62%	Mean - 21.73+ 4.16	80% considered tobacco cessation counseling a duty of every dentist
53.	Polychonopoulou et al. ⁶⁸ 2004	Cross Sectional	Greece	University of Athens Dental school; Dental students	Validated tool	97.60	M: 72 F: 93	Not mentioned	Attitudes of incoming dental students appear to be positive regarding the dental professional's responsibility to educate patients about the risks of tobacco use.
54.	Victoroff KZ et al. ⁶⁰ 2004	Cross Sectional	USA	Midwestern dental school; 1 st year dental students	Validated tool 26	99	M : 104 F : 35	Not mentioned	Student's confidence to counsel smokers to quit was low and did not differ significantly by year (P = .42)
55.	Rikard Bell G et al. ⁶⁴ 2003	Cross Sectional	Australia	Australian Dental Association	Validated tool	88	M:120 F:112	≤21 and above	21% believe in the role of paediatric dentists in stopping adolescents from smoking
56.	Shenkin JD et al. ⁶⁷ 2003	Cross Sectional	USA	AAPD Annual meeting; Paediatric dentists	Validated tool 11	Not mentioned	M : 98 F : 75	≤ 30 - 70 or more	

*GHPSS = Global Health Professions Student Survey

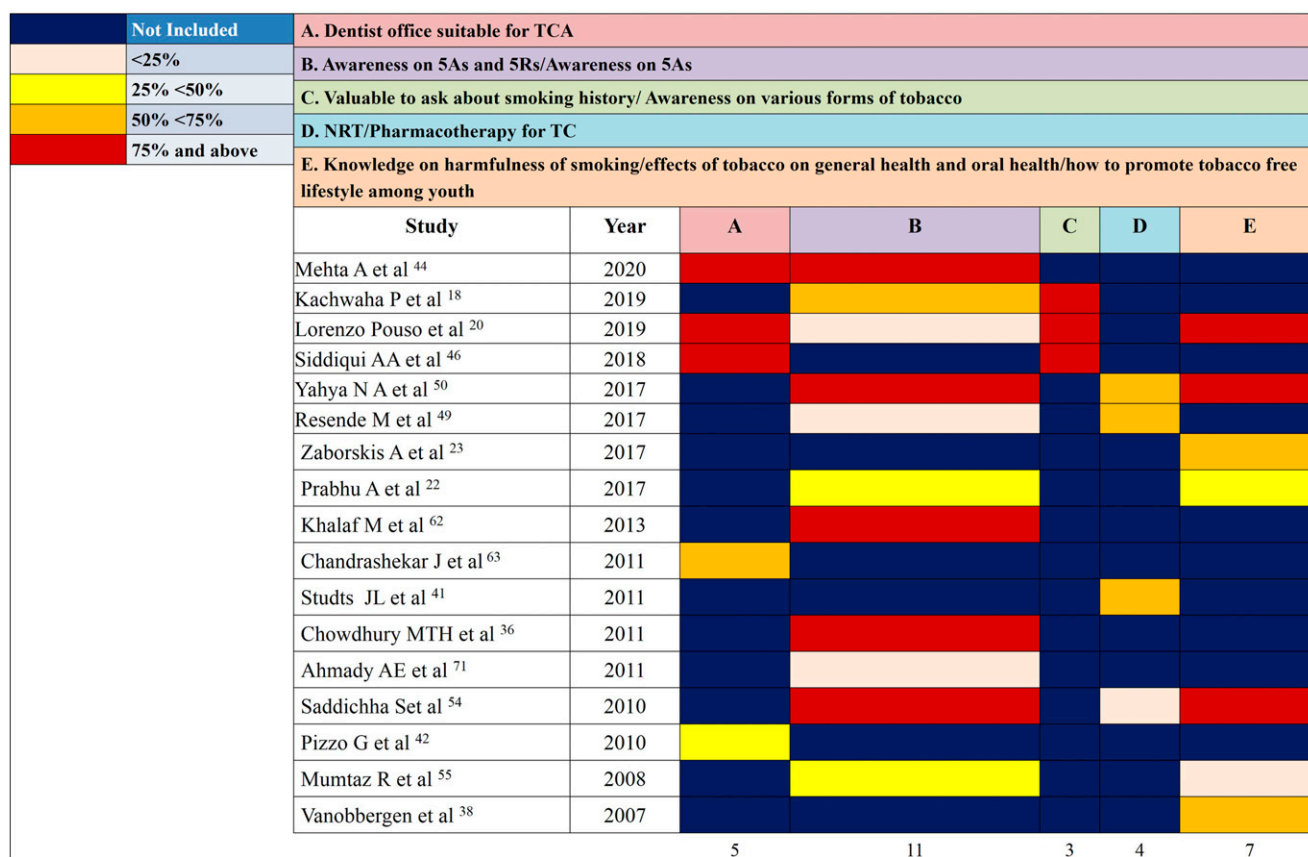


Figure 2. Heatmap of questions on knowledge towards tobacco cessation interventions.

cessation counseling (Figure 2), among which eleven^{18,20,22,32,36,44,49,50,54,55,67} studies assessed the awareness on 5As and 5R where the knowledge score was found to be in the range of 75% and above in only 5 studies.^{36,44,50,54,67} Awareness on various forms of tobacco was reported in only 3 studies^{18,20,46} and in all 3 studies, the knowledge score was high. Knowledge on NRT/pharmacotherapy was also reported in studies conducted by Yahya NA et al,⁵⁰ Resende M et al,⁴⁹ Studts JL et al⁴¹ and Saddichha S et al⁵⁴ and in majority it was found to be between 50-75%.

Figure 3 depicts thirty seven studies^{15-18,23-26,28-33,36,37,39-42,44-46,48-50,52,55-57,61,64,65,68,70,71} which assessed the attitude of dental professionals towards tobacco cessation counseling. A positive attitude was observed among the dental professionals in the majority of the studies^{18,23-25,28-33,37,39-42,46,48,49,55-57,61,64,65,68,70} regarding advising patients to quit tobacco. Responses to negative impact of tobacco cessation counseling were also included and studies^{16,18,24,30,32,33,40-42,45,50,52,56,70,65,71} were found to be less negative towards tobacco cessation counseling as a part of clinical practice.

Among the thirty four studies^{18,19,22,26,28-30,33-35,37,41,43-51,54-56,58,59,61,67,70,68} which assessed the practice among dental professionals on tobacco cessation counseling (Figure 4), this review found that dental professionals were in the practice of conducting tobacco cessation counseling.^{18,19,30,33-35,43,46,47,49,50,54,56,66}

The practice of 5As was followed more as compared to 5Rs, as evident from Figure 4. It was also observed that brief counseling was more prevalent as compared to prescribing NRT,^{22,29,35,37,43,49,51,59,68,66} drugs.^{22,41,44,49,68,66}

All twelve studies^{15,21,30,35,36,44,46,49,57,58,68,66} reported that study participants had a formal training in tobacco cessation (Figure 5) and among thirty one^{16,18,19,22,26,28-33,35,37,39,41,42,44,48,50,52,53,55,56,58,59,61,67,70,66,68,71} studies which assessed barriers related to tobacco cessation interventions (Figure 6), time and training were cited to be the most common barriers.

Risk of bias analysis was conducted using Newcastle Ottawa scale¹⁴ (Table 2). Upon quality assessment, 9 studies^{17,28,30,32,47,51,54,70,64} had high quality of evidence, thirty six studies^{15,16,19,22,24-27,29,31,33-37,41-44,48-50,53,55,59,67,65,62,63,66,69,71} were of moderate quality.

In this current study, quality analysis (Table 3) was done using GRADE to highlight crucial information about the quality of evidence of the included studies. The quality of evidence for all the studies was found to be moderate.

Discussion

The habit of tobacco consumption is one of the biggest public health threats the world is facing where about 8 million people a year around the world are affected.⁷² Tobacco cessation

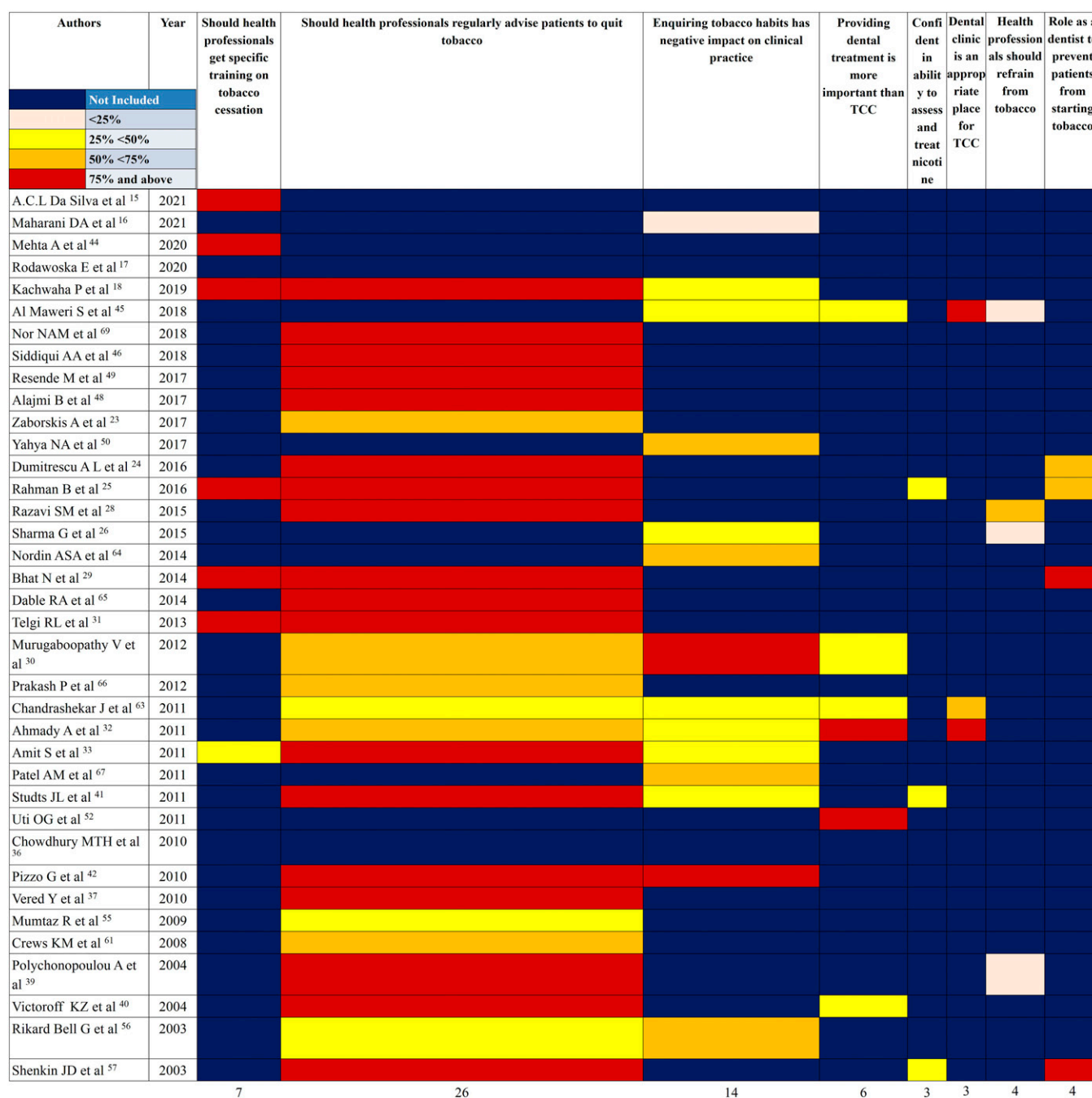


Figure 3. Heatmap of questions on attitude towards tobacco cessation interventions.

interventions must be advocated strongly to result in benefits over manifolds for the tobacco users.⁷³ For healthcare professionals, providing tobacco cessation counseling should be one of the key roles. Especially for dental professionals, it is implied that it is an obligation which is required to restrict the consumption of tobacco.⁷⁴ Despite this, there is a lack in evidence generated data on the knowledge, attitude or perception and practice of dental professionals on tobacco cessation interventions.

Studies included in this systematic review have assessed the knowledge, attitude and practice regarding tobacco cessation interventions among healthcare professionals, however, no

study has collated the data therefore, this current study was conceptualized to quantitatively assess those various studies in order to identify useful information which may be used for future development of a standardized questionnaire or methodology for tobacco cessation interventions.

Studies from developed nations are lesser in comparison, the reason for which could be an already existing system of tobacco cessation interventions among those nations.^{75,76} Since, the prevalence of tobacco is higher in the developing countries,⁷⁵ there should be provisions for generating awareness regarding tobacco cessation counseling among the healthcare professionals. Regarding the knowledge component, eleven

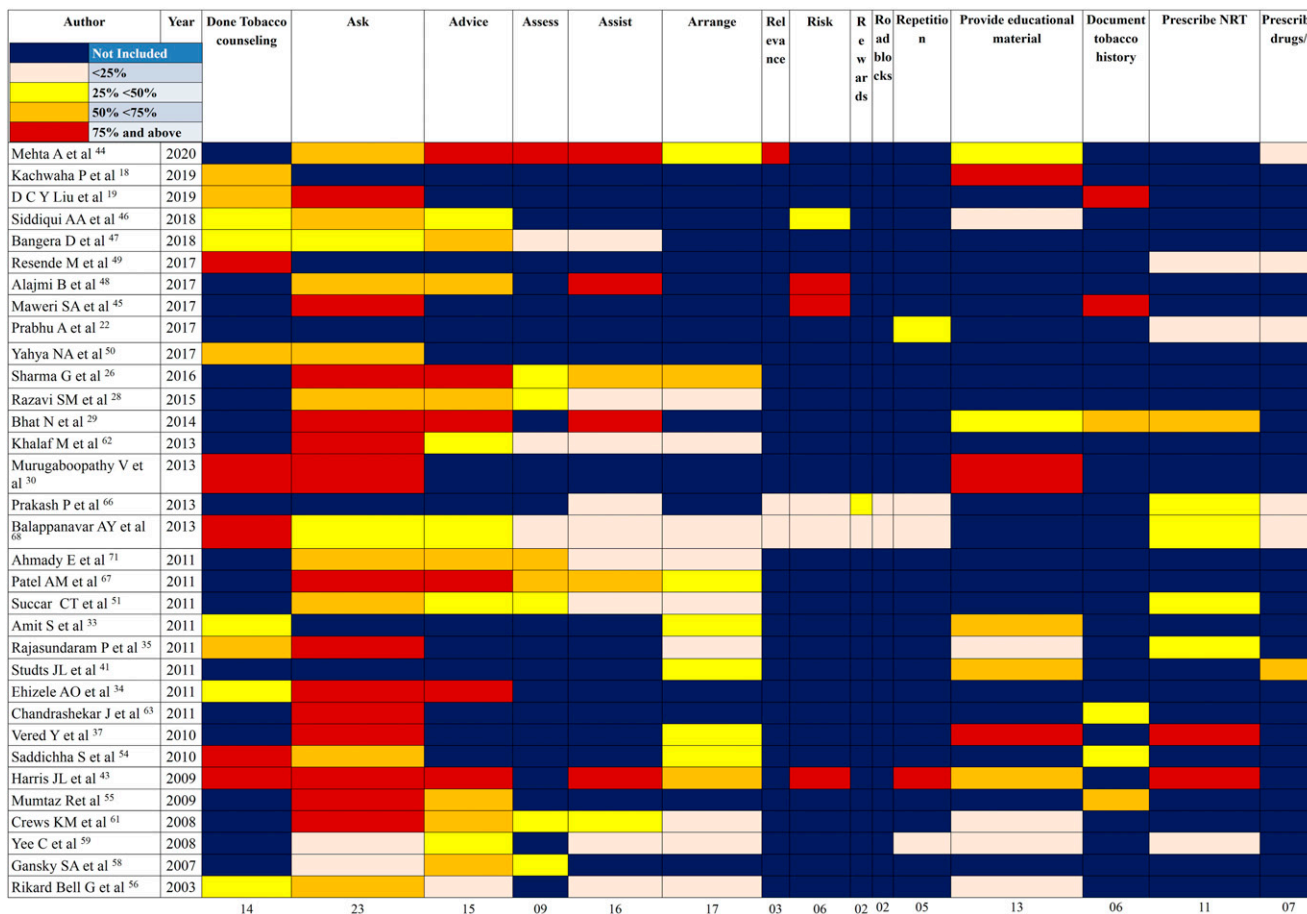


Figure 4. Heatmap of questions on practice towards tobacco cessation interventions.

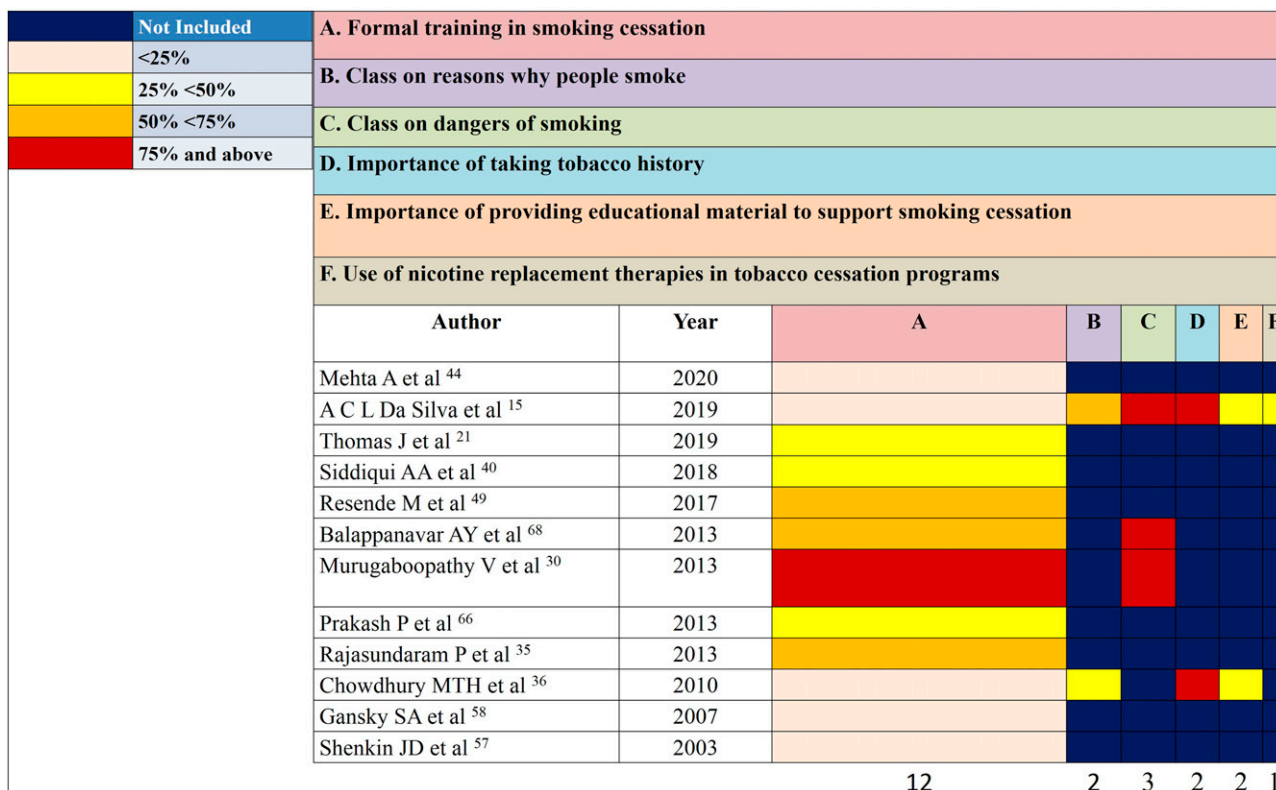


Figure 5. Heatmap of questions on curriculum on tobacco cessation interventions.

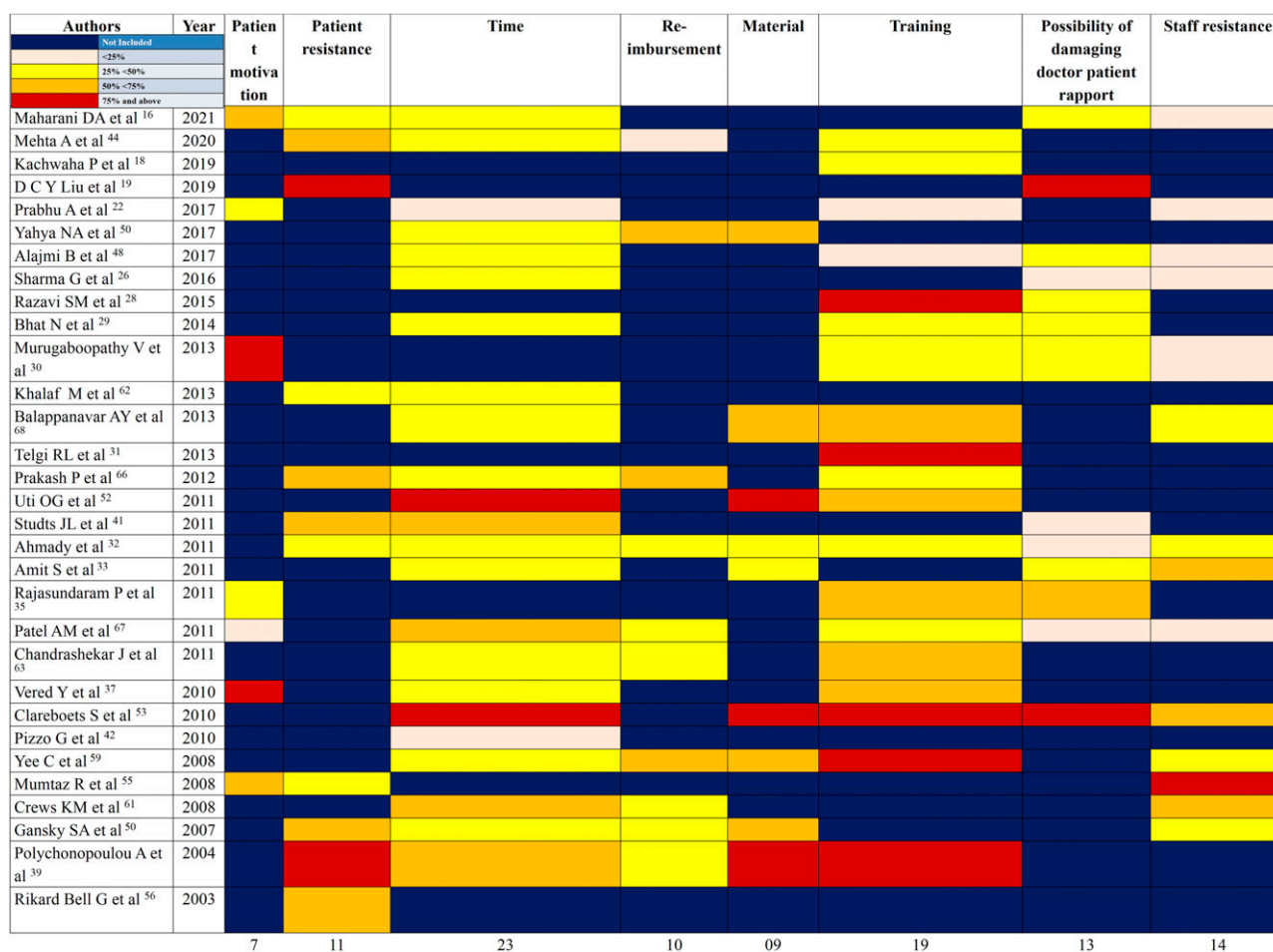


Figure 6. Heatmap of questions on barrier towards tobacco cessation interventions.

studies^{18,20,22,32,36,44,49,50,54,55,67} assessed the awareness on 5As and 5Rs of tobacco cessation and among those, 5 studies^{36,44,50,54,67} showed awareness to be above 80%, however in certain studies^{18,58,59} the practice of 5As was found to be as low as 11%,¹⁸ therefore there is a further need to incorporate 5As as a major intervention for tobacco cessation, as it is an established method of brief tobacco counseling which is not time consuming.

Four studies^{41,49,50,54} enquired on the knowledge of Nicotine Replacement Therapy/Pharmacotherapy among the healthcare professionals and it was below 75% among all studies. Attitude of the healthcare professionals is another crucial component while providing tobacco cessation counseling. Most of the studies had included questions evaluating the same. More than 75% of the healthcare professionals in about eighteen studies^{18,24,25,28,29,31,33,37,39-42,46,48,49,57,64,62} showed a positive attitude towards advising patients to quit tobacco. Similar findings were reported by Goel D,⁷⁷ where favorable attitudes were observed in spite of poor practice regarding tobacco counseling. In 7 studies^{18,26,32,33,41,45,70} 25-50% of the healthcare professionals believe enquiring on

tobacco habits leads to a negative influence on clinical practice.

This attitude among healthcare providers must be altered through training and thus create a positive impact for the patients. Various studies have remarked on the effectiveness of tobacco cessation counseling training for healthcare providers.⁷⁸⁻⁸⁰ Training programs are also shown to change the attitude of the healthcare professionals in tackling the barriers towards tobacco cessation counseling.⁸¹ The training programs must be comprehensive, tailor made to target different sectors of population and must be reinforced at regular intervals, based on the current dynamic policies⁸² and program developments on tobacco control.

Out of twenty three studies, fourteen studies^{19,26,29,30,34,35,37,43,45,55,61,67,70,71} reported that the healthcare professionals ask the patients about their tobacco consumption and it was found to be around more than 75%, as depicted in the heatmap. It is evident from the findings that compared to practice of 5Rs, more dental professionals practice 5As. This finding is partly consistent with a systematic review of doctor's smoking status and their practice towards tobacco cessation interventions.¹³

Table 2. Risk of bias assessment of included studies in the systematic review.

SL NO	STUDIES AUTHOR YEAR	SELECTION (SAMPLE)		REPRESENTATIVENESS OF THE SAMPLE		SAMPLE SIZE	NON-RESPONDENTS	ASCERTAINMENT OF THE EXPOSURE (RISK FACTOR)	COMPARABILITY OF GROUPS		OUTCOME ASSESSMENT OF THE OUTCOME		STATISTICAL TEST	TOTAL SCORE HIGH (> 7), MODERATE (5-7), OR LOW (< 5)
		REPRESENTATIVENESS OF THE SAMPLE	REPRESENTATIVENESS OF THE SAMPLE	CONTROL FOR MOST IMPORTANT FACTOR	CONTROL FOR OTHER FACTORS				ASSESSMENT OF THE OUTCOME	ASSESSMENT OF THE OUTCOME				
1.	Maharani et al ¹⁶ (2021)	1	0	0	0	0	2	1	1	1	1	1	1	7
2.	Mehta et al ⁴⁴ (2020)	1	1	1	1	0	2	0	0	0	1	1	1	7
3.	Rodakowska et al ¹⁷ (2020)	1	1	1	1	1	2	1	1	1	1	1	1	9
4.	A C L Da Silva et al ¹⁵ (2019)	1	0	0	0	0	2	0	0	0	1	1	1	5
5.	Kachwaha et al ¹⁸ (2019)	0	0	0	0	0	1	0	0	0	1	1	1	3
6.	Lorenzo Pouso et al ⁶⁰ (2019)													
7.	Liu et al ¹⁹ (2019)	1	0	0	1	1	1	0	0	0	1	1	1	5
8.	Thomas J et al ⁶¹ (2019)	1	0	0	0	0	1	0	0	0	1	0	0	3
9.	Al Maweni S et al ⁴⁵ (2017)	1	0	0	0	0	1	0	0	0	1	1	1	4
10.	Siddiqui AA et al ⁴⁶ (2018)	1	0	0	0	0	1	0	0	0	1	1	1	4
11.	Bangera et al ¹⁷ (2018)	1	1	1	1	1	2	1	0	0	1	1	1	8
12.	Nor NAM et al ⁶² (2018)	1	1	1	1	1	2	1	0	0	1	1	1	7
13.	Alajimi B et al ⁴⁸ (2017)	1	1	0	0	0	1	0	0	0	1	1	1	5
14.	Resende M et al ⁴⁹ (2017)	1	1	0	0	0	0	0	0	0	1	1	1	4
15.	Yahya NA et al ⁶⁰ (2017)	1	1	0	0	0	2	0	0	0	1	1	1	6
16.	Zaborskis A et al ²³ (2017)	1	1	1	1	1	2	0	0	0	1	1	1	7
17.	Prebhu A et al ⁶² (2017)	1	1	0	0	0	0	0	0	0	1	1	1	4
18.	Rahman B et al ²⁵ (2016)	1	1	1	1	1	2	0	0	0	1	1	1	7
19.	Dumitrescu AL et al ²⁴ (2016)	1	1	0	0	0	2	0	0	0	1	1	1	6
20.	Albert DA et al ⁶³ (2015)	1	1	0	0	0	2	0	0	0	1	1	1	6
21.	Sharma G et al ⁶⁴ (2015)	1	1	0	0	0	2	1	0	0	1	1	1	7
22.	Awan KH et al ²⁷ (2015)	0	1	0	0	0	2	1	0	0	1	1	1	6
23.	Razavi SM et al ²⁸ (2015)	0	1	0	0	0	2	1	0	0	1	1	1	6
24.	Bhat N et al ²³ (2014)	0	1	1	1	1	1	1	0	0	1	1	1	6
25.	Dable RA et al ⁶⁴ (2014)	1	1	1	1	1	1	1	1	1	1	1	1	8
26.	Nordin ASA et al ⁶⁵ (2014)	0	1	0	0	0	1	1	0	0	1	1	1	5
27.	Baiappanavar AY et al ⁶⁶ (2013)	1	1	1	1	1	2	1	1	1	1	1	1	9
28.	Khalaf M et al ⁶⁷ (2013)	1	0	0	1	0	2	0	0	0	1	1	1	6
29.	Murgaboopathy V et al ³⁶ (2013)	1	0	0	0	0	2	0	0	0	1	1	1	5
30.	Prakash P et al ⁶⁸ (2013)	1	1	1	1	1	1	0	0	0	1	1	1	6

(Continued)

Table 2. Continued.

SL NO	STUDIES AUTHOR, YEAR	SELECTION (SAMPLE)			COMPARABILITY OF GROUPS			OUTCOME		TOTAL SCORE HIGH (> 7), MODERATE (5-7), OR LOW (< 5)
		REPRESENTATIVENESS OF THE SAMPLE	SAMPLE SIZE	NON-RESPONDENTS	ASCERTAINMENT OF THE EXPOSURE (RISK FACTOR)	CONTROL FOR MOST IMPORTANT FACTOR	CONTROL FOR OTHER FACTORS	ASSESSMENT OF THE OUTCOME	STATISTICAL TEST	
31.	Tejgi RL et al. ³¹ (2013)	1	1	1	1	1	1	1	1	8
32.	González-Martínez R et al. ³⁰ (2012)	1	0	1	1	0	0	0	0	4
33.	Ahmady A E et al. ³⁹ (2011)	1	1	1	1	0	0	0	1	6
34.	Amit S et al. ³³ (2011)	1	0	1	1	0	0	0	0	4
35.	Chandrashekar J et al. ⁷⁶ (2011)	1	1	1	1	0	0	0	0	5
36.	Ehizele AO et al. ³⁴ (2011)	1	0	1	2	1	1	1	1	8
37.	Patel AM et al. ⁷¹ (2011)	1	0	1	1	0	0	0	1	5
38.	Rajesundaram P et al. ³⁵ (2011)	1	0	1	2	1	1	1	1	8
39.	Studts JL et al. ⁴¹ (2011)	1	1	1	1	0	0	0	1	6
40.	Succar C T et al. ⁵¹ (2011)	1	1	1	1	0	0	0	1	6
41.	Ull OG et al. ³² (2011)	1	1	1	2	0	0	0	1	7
42.	Chowdhury MTH et al. ³⁶ (2011)	1	0	1	1	1	1	1	1	7
43.	Claeboets S et al. ³³ (2011)	1	0	1	2	0	0	0	1	6
44.	Pizzo G et al. ⁴² (2010)	1	1	1	1	1	1	1	1	8
45.	Saddichha S et al. ⁵⁴ (2010)	0	0	1	1	0	0	0	0	3
46.	Vered Y et al. ³⁷ (2010)	1	0	1	0	0	0	0	1	4
47.	Harris JL et al. ⁴³ (2009)	1	1	1	2	0	0	0	1	7
48.	Mumtaz R et al. ³⁵ (2008)	1	1	1	2	0	0	0	0	6
49.	Yee C et al. ⁵⁵ (2008)	1	1	1	2	0	0	0	1	7
50.	Crews KM et al. ⁶¹ (2008)	1	1	0	1	0	0	0	1	5
51.	Gansky S A et al. ⁵⁹ (2007)	1	1	1	1	0	0	0	1	6
52.	Vanobbergen J et al. ³⁸ (2007)	1	0	1	2	1	1	1	1	8
53.	Polychoopoulou A et al. ³⁹ (2004)	1	0	1	1	0	0	0	1	5
54.	Victoroff KZ et al. ⁴⁰ (2004)	1	0	1	2	0	0	0	1	6
55.	Rikard Bell G et al. ⁵⁶ (2003)	1	0	1	1	0	0	0	1	5
56.	Shenkin J D et al. ⁶⁷ (2003)	1	0	0	2	0	0	0	1	5

Table 3. Grade analysis of all the overall included studies in the systematic review.

CERTAINTY ASSESSMENT							CERTAINTY	IMPORTANCE
NUMBER OF STUDIES	STUDY DESIGN	RISK OF BIAS	INCONSISTENCY	INDIRECTNESS	IMPRECISION	OTHER CONSIDERATIONS		
All Studies								
56	Observational studies	Not serious	Not serious	Not serious	Not serious	All plausible residual confounding would reduce the demonstrated effect	⊕⊕⊕⊕ Moderate	IMPORTANT
Studies assessing knowledge								
18	Observational studies	Not serious	Not serious	Not serious	Not serious	All plausible residual confounding would reduce the demonstrated effect	⊕⊕⊕⊕ Moderate	IMPORTANT
Studies assessing attitude								
38	Observational studies	Not serious	Not serious	Not serious	Not serious	All plausible residual confounding would reduce the demonstrated effect	⊕⊕⊕⊕ Moderate	IMPORTANT
Studies assessing practice								
35	Observational studies	Not serious	Not serious	Not serious	Not serious	All plausible residual confounding would reduce the demonstrated effect	⊕⊕⊕⊕ Moderate	IMPORTANT
Studies assessing curriculum								
12	Observational studies	Not serious	Not serious	Not serious	Not serious	All plausible residual confounding would reduce the demonstrated effect	⊕⊕⊕⊕ Moderate	IMPORTANT
Studies assessing barriers								
32	Observational studies	Not serious	Not serious	Not serious	Not serious	All plausible residual confounding would reduce the demonstrated effect	⊕⊕⊕⊕ Moderate	IMPORTANT

Only ten studies^{22,29,35,37,43,49,51,59,68,66} reported the dental professionals were in the practice of prescribing NRT, which is very low and efforts must be undertaken to educate the dental professionals on NRT and pharmacotherapy as well. The most common barriers in providing tobacco cessation counseling as enlisted by the studies were time,^{16,22,26,29,32,33,37,39,41,42,44,48,50,52,53,58,59,61,67,70,66,68,71} followed by training,^{18,22,28-32,35,37,39,44,48,52,53,59,66,68,71} and this similar finding was reported in a study conducted among African healthcare workers as well¹²

The findings from this systematic review suggests that there is a need to develop and validate a standardized questionnaire to assess the knowledge, attitude and practice of tobacco cessation counseling among healthcare professionals.

There is lack of homogeneity among the included studies with regard to the questionnaires used, study population, therefore meta-analysis could not be done for the current study. There is a difference in the outcome measures of the studies as many studies have assessed either knowledge, attitude or practice rather than the entire KAP component, therefore it is difficult to compare and draw conclusions regarding the same. None of the studies have deducted any knowledge, attitude and practice score from their findings, hence it was not possible to quantify the knowledge, attitude and practice level.

Future implications and recommendation

The results imply that there is an urgent requirement to modify the current dental education curriculum to improve dental student's involvement in tobacco control, as before entering the workforce, students should have tobacco cessation intervention training during their academic years.

Conclusion

The current findings of this systematic review shows that knowledge regarding aspects of tobacco cessation among dental professionals was lacking in developing countries. In spite of a favorable attitude towards tobacco cessation intervention, practice of conducting tobacco cessation counseling was not prevalent. A well designed structured questionnaire should be developed and validated for international comparisons to assess the knowledge, attitude and practice among healthcare professionals. The above stated recommendations could be incorporated in future studies assessing knowledge, attitude and practice among healthcare providers.

REFERENCES

- Christen AG. The dentist's role in helping patients to stop smoking. *J Am Dent Assoc.* 1970;81:1146-1152.
- Alblowi JA. Perception of tobacco counseling and cessation among dental practitioners. *J Smok Cessat.* 2021;2021:6692525.
- AlMulla A, Kouyoumjian S, ElNakib N. Cross-sectional online survey to determine the prevalence, knowledge, attitude and practice of tobacco cessation among governmental healthcare workers in Qatar. *BMJ Open.* 2021;11:e044379.
- Chaffee BW, Couch ET, Ryder MI. The tobacco-using periodontal patient: role of the dental practitioner in tobacco cessation and periodontal disease management. *Periodontol* 2000. 2016;71:52-64.
- Helakorpi S, Patja K, Prättälä R, et al. Health behaviour and health among the Finnish adult population. *Publications of the National Public Health Institute B*, 2009; 8.
- Fiore MC, Jaén CR, Baker TB, et al. *Treating tobacco use and dependence: 2008 update.* Rockville, MD: US Department of Health and Human Services; 2008. <http://www.das.state.ct.us/rfpdoc/dph/results/2009-0916.pdf>
- World Health Organization. *WHO Framework Convention on Tobacco Control: Guidelines for Implementation of Article 5. 3, Articles 8 To 14.* World Health Organization; 2013.
- WHO. *WHO global report on trends in prevalence of tobacco use 2000-2025.* World Health Organization; 2021.
- Madhu PP, Kumar PGN, Prashant GM. Knowledge, attitude and practice regarding tobacco cessation methods among the dental professionals: A cross-sectional study. *J Oral Health Comm.* 2019;13(1):21-26. <https://scholar.archive.org/work/3fzdyvm3jvvh5ifj4ma6fgps2y/access/wayback/>. <https://www.johcd.org/doi/pdf/10.5005/jp-journals-10062-0042>
- Virtue SM, Waldron EM, Darabos K, et al. Dental students' attitudes toward tobacco cessation in the dental setting: A systematic review. *J Dent Educ.* 2017;81:500-516.
- Duaso MJ, Bakhshi S, Mujika A, et al. Nurses' smoking habits and their professional smoking cessation practices. A systematic review and meta-analysis. *International Journal of Nursing Studies.* 2017;67:3-11.
- Ilesanmi OS, Agwai VI, Afolabi AA. A systematic review of tobacco smoking cessation services in Africa: Practices and challenges faced by healthcare workers. *jidhealth.* 2021;4:371-379.
- Duaso MJ, McDermott MS, Mujika A, et al. Do doctors' smoking habits influence their smoking cessation practices? A systematic review and meta-analysis. *Addiction.* 2014;109:1811-1823.
- Herzog R, Álvarez-Pasquin MJ, Díaz C, et al. Are healthcare workers' intentions to vaccinate related to their knowledge, beliefs and attitudes? A systematic review. *BMC Public Health.* 2013;13:154.
- Da Silva Leonel ACL, Bonan PRF, de Castro JFL, Pontual ADA. Tobacco use, attitudes, knowledge, and perception about smoking cessation counseling Among Brazilian Dental Students: A cross-sectional study. *J Cancer Educ.* 2021;36(1):143-151.
- Maharani DA, Nadira KV, Setiawati F, et al. Intention to provide tobacco cessation counseling among Indonesian dental students and association with the theory of planned behavior. *BMC Oral Health.* 2021;21:23.
- Rodakowska E., Mazur M, Baginska J, et al. Smoking prevalence, attitudes and behavior among dental students in Poland and Italy. *Int J Environ Res Public Health.* 2020;17(20):7451.
- Kachwaha P, Singhal DK, Singh N. Perceptions regarding tobacco cessation counselling among dental students and graduates: A cross-sectional study. *Asian Pac J Cancer Prev.* 2019;20:2589-2593.
- Liu DCY, Yi Ho TC, Duangthip D, Gao SS, Man Lo EC, Chu CH. Dental students' awareness, preparedness and barriers towards managing tobacco-using patients—a cross-sectional study. *Int J Environ Res Public Health.* 2019;16(10):1862.
- Lorenzo-Pouso AI, Pérez-Sayáns M, Pérez-López D, et al. Knowledge about the relation between tobacco and disease and the attitude toward advising the cessation of its consumption among a group of Spanish dental students. *J Cancer Educ.* 2019;34:145-153.
- Thomas J, Kumar RV, Akhil S, et al. Prevalence of smoking among dental students and gauging their knowledge about tobacco cessation methods: An original study. *J Family Med Prim Care.* 2019;8:1562-1566.
- Prabhu A, Jain JK, Sakeenabhi B, et al. Smoking cessation advice: knowledge, attitude, and practice among clinical dental students'. *J Pharm Bioallied Sci.* 2017;9: S117-S120.
- Zaboriskis A, Volkyte A, Narbutaite J, et al. Smoking and attitudes towards its cessation among native and international dental students in Lithuania. *BMC Oral Health.* 2017;17:106.
- Dumitrescu A. L., Ibric S, Ibric-Cioranu V. Opinions of Romanian Dental Students Toward Tobacco Use Interventions in the Dental Setting. *J Cancer Educ.* 2016;31(1):172-180.
- Rahman B, Hawas N, Rahman MM. Opinions of dental students toward tobacco cessation intervention in the United Arab Emirates. *Int Dent J.* 2016;66:304-310.
- Sharma G, Puranik MP, Sowmya KR. Nicotine Replacement Therapy in Dental Settings: An Exploratory Survey in Bangalore City, India. *Addict Health.* 2016;8: 25-32.
- Awan KH, Hammam MK, Warnakulasuriya S. Knowledge and attitude of tobacco use and cessation among dental professionals. *Saudi Dent J.* 2015;27:99-104.
- Razavi SM, Zolfaghari B, Doost ME, et al. Attitude and practices among dentists and senior dental students in Iran toward tobacco cessation as an effort to prevent oral cancer. *Asian Pac J Cancer Prev.* 2015;16:333-338.

29. Bhat N, Jyothirmai-Reddy J, Gohil M, et al. Attitudes, practices and perceived barriers in smoking cessation among dentists of Udaipur City, Rajasthan, India. *Addict Health*. 2014;6:73-80.
30. Murugaboopathy V, Ankola AV, Hebbal M, et al. Indian dental students' attitudes and practices regarding tobacco cessation counseling. *J Dent Educ*. 2013;77:510-517.
31. Telgi RL, Telgi CR, Chaudary S, et al. Tobacco use cessation: Attitudes of dental fraternity of Moradabad City (India). *J Smok Cessat*. 2013;8:91-96.
32. Ahmady AE, Golmohammadi S, Ayremlou S, et al. Tobacco cessation practices of senior dental students in Iran. *Int Dent J*. 2011;61:302-306.
33. Amit S, Bhambal A, Saxena V, et al. Tobacco cessation and counseling: a dentists' perspective in Bhopal city, Madhya Pradesh. *Indian J Dent Res*. 2011;22:400-403.
34. Ehizele AO, Azodo CC, Ezeja EB, et al. Nigerian dental students' compliance with the 4As approach to tobacco cessation. *J Prev Med Hyg*. 2011;52:12-16.
35. Rajasundaram P, Sequeira PS, Jain J. Perceptions of dental students in India about smoking cessation counseling. *J Dent Educ*. 2011;75:1603-1610.
36. Chowdhury MTH, Pau A, Croucher R. Bangladeshi dental students' knowledge, attitudes and behaviour regarding tobacco control and oral cancer. *J Cancer Educ*. 2010;25:391-395.
37. Vered Y, Livny A, Zini A, et al. Dental students' attitudes and behavior toward smoking cessation as part of their professional education. *Teach Learn Med*. 2010;22:268-273.
38. Vanobbergen J, Nuytens P, van Herk M, et al. Dental students' attitude towards anti-smoking programmes: A study in Flanders, Belgium. *Eur J Dent Educ*. 2007;11:177-183.
39. Polychonopoulou A, Gatou T, Athanassouli T. Greek dental students' attitudes toward tobacco control programmes. *Int Dent J*. 2004;54:119-125.
40. Victoroff KZ, Dankulich-Huryn T, Haque S. Attitudes of incoming dental students toward tobacco cessation promotion in the dental setting. *J Dent Educ*. 2004;68:563-568.
41. Studts JL, Burris JL, Kearns DK, et al. Evidence-based tobacco cessation treatment by dental hygienists. *American Dental*. 2011;85(1):13-21. <https://jdh.adha.org/content/85/1/13.short>
42. Pizzo G, Licata ME, Piscopo MR, et al. Attitudes of Italian dental and dental hygiene students toward tobacco-use cessation. *Eur J Dent Educ*. 2010;14:17-25.
43. Harris JL, Patton LL, Wilder RS, et al. North Carolina dental hygiene students' opinions about tobacco cessation education and practices in their programs. *J Dent Educ*. 2009;73:539-549.
44. Mehta A, Kaur G, Popli R, et al. Tobacco use cessation efforts among private dental practitioners of Delhi, India. *Dentistry 3000*. 2020;8:11-23.
45. Al-Maweri S. A., Al-Soneidar WA, AlMaqtari A, Hunaish A, Al-Sufyani G, Halboub E. Tobacco Cessation Counseling_ Attitudes and Practices among Yemeni Dental Professionals. *J Cancer Educ*. 2018;33(5):1088-1093.
46. Siddiqui AA. Evaluation of smoking cessation advice in dental practice by dentists working in Hail region, Saudi Arabia. *International Medical Journal*. 2018;25:32-35.
47. Bangera D, Takana M, Muttappallymyalil J. Tobacco cessation: attitude and practice of dentists in Northern United Arab Emirates. *East Mediterr Health J*. 2018;24:419-426.
48. Alajmi B, Abu-Hammad O, Al-Sharrad A, et al. Tobacco cessation support among dentists: A cross-sectional survey in Saudi Arabia and Kuwait. *Tob Prev Cessat*. 2017;3:121.
49. Resende M, Pereira-Lopes O, Silva OM, et al. Assessment of tobacco use and tobacco cessation counseling by Portuguese dentists. *Rev Port Estomatol Med Dent Cir Maxilofac*. 2017;58(1):2-7. <https://repositorio-aberto.up.pt/handle/10216/111531>. <https://repositorio-aberto.up.pt/handle/10216/111531>
50. Yahya NA, Saub R, Nor MM, et al. Knowledge, attitudes, and capabilities for smoking cessation counselling in dental practice. *Southeast Asian J Trop Med Public Health*. 2017;48:926-937.
51. Succar CT, Hardigan PC, Fleisher JM, Godel JH. Survey of tobacco control among Florida dentists. *J Community Health*. 2011;36(2):211-218. doi:10.1007/s10900-010-9299-5. PMID: 20714795.
52. Uti OG, Sofola OO. Smoking cessation counseling in dentistry: attitudes of Nigerian dentists and dental students. *J Dent Educ*. 2011;75:406-412.
53. Clareboets S, Sivarajasingam V, Chestnutt IG. Smoking cessation advice: Knowledge, attitude and practice among clinical dental students. *Br Dent J*. 2010;208:173-177.
54. Saddichha S, Rekha DP, Patil BK, et al. Knowledge, attitude and practices of Indian dental surgeons towards tobacco control: Advances towards prevention. *Asian Pac J Cancer Prev*. 2010;11:939-942.
55. Mumtaz R, Khan AA, Moeen F, et al. The role of Pakistani dentists in tobacco cessation. *Int Dent J*. 2008;58:356-362.
56. Rikard-Bell G, Groenlund C, Ward J. Australian dental students' views about smoking cessation counseling and their skills as counselors. *J Public Health Dent*. 2003;63:200-206.
57. Shenkin JD, Horowitz AM, Drury TF, et al. Attitudes of pediatric dentists towards tobacco intervention for children and adolescents: A pilot survey. *Pediatr Dent*. 2003;25:53-60.
58. Gansky SA, Ryan JL, Ellison JA, et al. Patterns and correlates of tobacco control behavior among American association of pediatric dentistry members: A cross-sectional national study. *BMC Oral Health*. 2007;7:13.
59. Yee C, Gansky SA, Ellison JA, et al. Tobacco control in pediatric dental practices: A survey of practitioners. *Pediatr Dent*. 2008;30:475-479.
60. González-Martínez R, Delgado-Molina E, Gay-Escoda C. A survey of oral surgeons' tobacco-use-related knowledge and intervention behaviors. *Med Oral Patol Oral Cir Bucal*. 2012;17:e588-e593.
61. Crews KM, Sheffer CE, Payne TJ, et al. A survey of oral and maxillofacial surgeons' tobacco-use-related knowledge, attitudes and intervention behaviors. *J Am Dent Ass*. 2008;139:1643-1651.
62. Nor NAM, Repen MC, Zakaria Z, et al. Dental students as smoking cessation counsellors: Patients' and providers' perspective. *IJUM Med J Malaysia*. 2018; 17: 23-30. <https://journals.iium.edu.my/kom/index.php/imjm/article/view/289>
63. Albert DA, Bruzelius E, Ward A, et al. Identifying multilevel barriers to tobacco intervention in postdoctoral dental education. *J Dent Educ*. 2016;80:408-415.
64. Dable RA, Wasnik PB, Pawar BR, et al. Assessment of professional competency and need of smoking cessation counseling for dental students. *J Educ Eval Health Prof*. 2014;11-26.
65. Nordin ASA, Kadir RA, Yahya NA, et al. Empowering Malaysian dentists to tobacco dependence treatment conduct. *Int Dent J*. 2014;64:206-212.
66. Balappanavar AY, Sardana V, Gupta P. Nationwide survey of fifth-year dental students' perceptions about tobacco prevention, control, and curriculum in India. *J Dent Educ*. 2013;77:1384-1393.
67. Khalaf M. Smoking cessation practices in Kuwaiti general dental clinics. *Med Princ Pract*. 2013;22:576-582.
68. Prakash P, Belek MG, Grimes B, et al. Dentists' attitudes, behaviors, and barriers related to tobacco-use cessation in the dental setting. *J Public Health Dent*. 2013;73:94-102.
69. Ebn Ahmady A, Khoshnevisan MH, Heidari N, et al. Dentists' familiarity with tobacco cessation programs in dental settings in Iran. *J Public Health Dent*. 2011;71:271-277.
70. Chandrashekar J, Manjunath BC, Unnikrishnan M. Addressing tobacco control in dental practice: A survey of dentists' knowledge, attitudes and behaviours in India. *Oral Health Prev Dent*. 2011;9:243-249.
71. Patel AM, Blanchard SB, Christen AG, et al. A survey of United States periodontists' knowledge, attitudes, and behaviors related to tobacco-cessation interventions. *J Periodontol*. 2011;82:367-376.
72. Tichenor M, Sridhar D. Metric partnerships: Global burden of disease estimates within the World Bank, the World Health Organisation and the Institute for Health Metrics and Evaluation. *Wellcome Open Res*. 2019;4:35.
73. Fanshawe TR, Halliwell W, Lindson N, et al. Tobacco cessation interventions for young people. *Cochrane Database Syst Rev*. 2017;11:CD003289.
74. Mitra DK, Pawar SD, Mandal A, et al. Attitudes of dental professionals toward tobacco use. *J Indian Soc Periodontol*. 2015;19:317-321.
75. Kumar N, Janmohamed K, Jiang J, et al. Tobacco cessation in low- to middle-income countries: A scoping review of randomized controlled trials. *Addict Behav*. 2021;112:106612.
76. Abdullah AS, Stillman FA, Yang L, et al. Tobacco use and smoking cessation practices among physicians in developing countries: A literature review (1987-2010). *Int J Environ Res Public Health*. 2013;11:429-455.
77. Goel D, Chaudhary PK, Khan A, et al. Acquaintance and approach in the direction of tobacco cessation among dental practitioners—a systematic review. *Int J Prev Med*. 2020;11:167.
78. Nethan ST, Hariprasad R, Babu R, et al. Project ECHO: A potential best-practice tool for training healthcare providers in oral cancer screening and tobacco cessation. *J Cancer Educ*. 2020;35:965-971.
79. LA Torre G, D'Egidio V, Patrissi R, et al. Effectiveness of a training course on smoking cessation knowledge and behaviour for health profession students: the SISMA project. *J Prev Med Hyg*. 2019;60:E119-E123.
80. Hasan SI, Mohd Hairi F, Ahmad Tajuddin NA, et al. Empowering healthcare providers through smoking cessation training in Malaysia: A preintervention and postintervention evaluation on the improvement of knowledge, attitude and self-efficacy. *BMJ Open*. 2019;9:e030670.
81. Grech J. Impact of a nurse-led brief tobacco cessation training program for healthcare professionals. *Public Health Nurs*. 2021;38:869-878.
82. WHO Framework Convention on Tobacco Control overview, <https://fctc.who.int/who-fctc/overview> (accessed 9 July 2022).