

# A global assessment of knowledge of dental students about nicotine replacement therapy: findings from 43 countries

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## Abstract

**Objectives:** Knowledge of nicotine replacement therapy (NRT) is a competency that is expected from receiving training in the treatment for tobacco dependence. This study therefore assessed the knowledge of dental students in 43 countries about NRT.

**Methods:** The 2005–2011 dental Global Health Professions Student Survey data were analysed for 13,040 third-year dental students from 43 countries. Knowledge about NRT was self-reported and country-specific prevalence estimates were calculated. To assess for correlates of knowledge about NRT amongst dental students, a multivariate logistic regression model was fitted ( $P < 0.05$ ), with pooled data from all 43 countries. The model assessed for geographical location, gross national income, tobacco cessation training in school, sex, current tobacco use and survey year.

**Results:** Amongst all dental students, the proportion that knew about NRT ranged from 37.0% (Mongolia) to 97.6% (Slovakia). The odds of knowing about NRT were lower amongst dental students in the Eastern Mediterranean region ( $aOR = 0.52$ ; 95%CI: 0.34–0.79) compared to those in the European region. Dental students in upper-middle-income ( $aOR = 2.46$ ; 95% CI: 1.57–3.85) and high-income countries ( $aOR=4.55$ ; 95% CI: 2.28–9.09) both had higher odds of knowing about NRT compared to dental students in low-income countries. Also, current use of any tobacco product and receipt of tobacco cessation training in school were both associated with higher likelihood of knowing about NRT. No significant gender differences in knowledge of NRT were observed.

**Conclusions:** A large proportion of dental students in several countries knew about NRT. However, disparities in knowledge existed across regions. Enhanced efforts are needed to formally train dental students on tobacco cessation techniques.

## keywords

dentists; students; cessation; tobacco; counselling; education.

## Introduction

Tobacco use is the most important modifiable risk factor for several oral conditions including pre-malignancies and frank oral cancer (1–4). Quitting smoking is beneficial to health at any age, and cigarette smokers who quit before age 35 years have mortality rates similar to those who never smoked (1, 5). Involvement of healthcare professionals in clinical tobacco cessation interventions has been shown to encourage smokers to make a quit attempt and to stop smoking (6). Such clinical

interventions may involve clinical counselling alone or in combination with pharmacologic treatment for nicotine dependence.

Nicotine replacement therapy (NRT) helps to minimise the physical withdrawal symptoms and cravings which smokers may experience at the beginning of a quit attempt by providing the smoker with much less nicotine than a cigarette (7–9). Evidence indicates that pharmacologic treatment of nicotine dependence can double or triple quit rates (10). Most NRT are readily available as over-the-counter medication and include nicotine gum, patch and lozenge.

Research indicates that only a relatively small fraction of dental students and practicing dentists in several countries have received specific training in tobacco cessation interventions (11–13). This is disturbing because several of the oral conditions dental patients sometimes experience may arise from the use of smokeless or smoked tobacco products. It is thus important for dentists to know how to help their patients to stop tobacco use. One of the key competencies for training in the treatment of tobacco dependence is the knowledge of pharmacotherapy, including NRT (14). More so, the recent inclusion of NRT into the World Health Organisation's (WHO) model list of essential medicines during 2009 makes it imperative for all clinicians to develop knowledge and proficiency regarding best practices for pharmacologic treatment of nicotine dependence (15). Hence, to assess the awareness of dental students about pharmacotherapy for nicotine dependence, this study surveyed third-year dental students in 43 countries about their knowledge about NRT. Nationally representative data were obtained from the 2005–2011 dental Global Health Professions Student Survey (GHPSS).

## Methods

### Data source

The dental GHPSS is an anonymous, self-administered survey that collects information from third-year dental students on tobacco use, exposure to second-hand smoke, desire to quit smoking and training received to provide patient counselling on cessation techniques. The dental GHPSS included a census of both students and schools in all sites, where all eligible schools and students were surveyed – except in the Bolivarian Republic of Venezuela, India and Mexico, where a sample of schools was selected with probability proportional to size from all dental schools in the country and a census of students in the selected schools were surveyed.

### Measures

#### Self-reported knowledge about NRT

Self-reported knowledge about NRT was defined as a 'yes' response to the question: 'have you ever heard of nicotine replacement product therapies in tobacco cessation programmes (such as nicotine patch or gum)?'

#### Education in school on asking about patients' tobacco use status

Education in school on asking about patients' tobacco use status was defined as a 'yes' response to the question: 'During your dental school training, did you learn that it is important to record tobacco use history as part of a patient's general medical history?'

#### Education in school on offering assistance to help tobacco users quit

Education in school on offering assistance to help tobacco users quit was defined as a 'yes' response to the question: 'During

your dental school training, did you learn that it is important to provide educational materials to support smoking cessation to patients who want to quit smoking?'

### Current use of tobacco products

Current use of any tobacco product was defined as a report by a student who had smoked manufactured or hand-rolled cigarettes or used any non-cigarette tobacco products (including smoked and smokeless tobacco products such as cigars, pipes, water pipes, chewing tobacco or other tobacco products) on  $\geq 1$  day during the past 30 days.

### Socio-demographic factors

Socio-demographic factors assessed included sex (male or female); geographical location and the income group of country.

Geographical location was based on the six WHO regions and included the following regions and countries: the African region ( $n = 3$  countries: Algeria, Kenya and Senegal); the Eastern Mediterranean Region ( $n = 11$  countries: Islamic Republic of Iran, Lebanon, Libyan Arab, Oman, Pakistan, Saudi Arabia, Sudan, Syrian Arab Republic, Tunisia, and Yemen); the European region ( $n = 10$  countries: Albania, Armenia, Bosnia & Herzegovina, Bulgaria, Czech Republic, Lithuania, Russian Federation, Serbia, Slovenia, and Slovakia); the region of the Americas ( $n = 10$  countries: Argentina, Bolivarian Republic of Venezuela, Bolivia, Chile, Guatemala, Mexico, Panama, Paraguay, Trinidad & Tobago, and Uruguay); the South-East Asian region ( $n = 7$  countries: Bangladesh, India, Indonesia, Myanmar, Nepal, Sri Lanka and Thailand); and the Western Pacific region ( $n = 2$  countries: Cambodia and Mongolia).

The categorisation of countries into income groups in this study followed the World Bank classification (16) and was based on the countries' Gross National Income or GNI during the corresponding survey year. Based on this criterion, income categories included the following: low-income ( $n = 5$  countries: Bangladesh, Cambodia, Kenya, Myanmar, and Nepal); lower-middle income ( $n = 19$  countries: Albania, Algeria, Armenia, Bolivia, Bosnia & Herzegovina, Guatemala, India, Indonesia, Islamic Republic of Iran, Mongolia, Morocco, Pakistan, Paraguay, Senegal, Sri Lanka, Sudan, Syrian Arab Republic, Tunisia, and Yemen); upper-middle income ( $n = 14$  countries: Argentina, Bolivarian Republic of Venezuela, Bulgaria, Chile, Lebanon, Libyan Arab, Lithuania, Mexico, Panama, Russian Federation, Serbia, Slovakia, Thailand, and Uruguay) and high-income countries ( $n = 5$  countries: Czech Republic, Oman, Saudi Arabia, Slovenia, and Trinidad & Tobago).

### Analysis

Data from each country were weighted to account for the complex survey design. Overall and sex-specific prevalence estimates of knowledge about NRT amongst dental students were calculated for each country and compared using chi-square statistics. For all countries where a complete census of dental schools and dental students were taken (i.e. all sites excluding Bolivarian Republic of Venezuela, India and Mexico), a finite population

correction factor was applied to take into account non-response and used in the variance of the estimates.

To assess for correlates of knowledge about NRT amongst dental students, a multivariate logistic regression model was fitted with pooled data from all 43 countries. The model adjusted for geographical location, gross national income, tobacco cessation training in school, sex, current tobacco use, and survey year. All statistical tests were two-tailed and the level of statistical significance was set at  $P < 0.05$ . Data analyses were performed with Stata 11 (StataCorp 2009, TX), and results are presented by WHO region.

## Results

### Characteristics of study participants

In total, this study analysed data for 13,040 third-year dental students from 43 countries during 2005–2011. About 95% or more of all dental students were younger than 30 years old. The proportion of female dental students ranged from 22.7% in Myanmar to 87.2% in Slovenia. The number of dental students who completed the survey in each country ranged from 18 students in one dental school (Trinidad & Tobago) to 1,658 students in 17 dental schools (Bolivia). Other characteristics of the study population are shown in Table 1.

### Prevalence of self-reported knowledge about NRT

Amongst all dental students, the proportion that knew about NRT ranged from 37.0% in Mongolia to 97.6% in Slovakia. In the African region, prevalence ranged from 44.4% in Senegal to 79.2% in Kenya. In the Eastern Mediterranean region, prevalence ranged from 51.6% in Tunisia to 81.9% in Lebanon. In the European region, prevalence ranged from 51.8 in Armenia to 97.6% in Slovakia. In the region of the Americas, prevalence ranged from 51.1% in Bolivia to 97.0% in Guatemala. Prevalence in the South-East Asian region ranged from 50.4% in Myanmar to 86.2% in Nepal. In the Western Pacific region, prevalence rates in Mongolia and Cambodia were 37.0% and 43.5%, respectively (Table 2).

### Factors associated with knowledge about NRT

After adjusting for potential confounders, knowledge about NRT was significantly associated with geographical and income group of country, receipt of tobacco cessation training in school, and current tobacco use status of dental students. By geographical region, the odds of knowing about NRT were significantly lower amongst dental students in the Eastern Mediterranean ( $aOR = 0.52$ ; 95% CI: 0.34–0.79), the Americas ( $aOR = 0.50$ ; 95% CI: 0.39–0.63), South East Asia ( $aOR = 0.51$ ; 95% CI: 0.35–0.74), and Western Pacific ( $aOR = 0.18$ ; 95% CI: 0.11–0.31) regions compared to those in the European region. No significant differences were noted between dental students in the African region when compared to the European region (Table 3).

On stratifying by income group of country, a significant gradient was observed, with the likelihood of knowing about

NRT rising with increasing gross national income of country. Dental students in upper-middle-income ( $aOR = 2.46$ ; 95% CI: 1.57–3.85) and high-income countries ( $aOR = 4.55$ ; 95% CI: 2.28–9.09) both had significantly higher odds of knowing about NRT compared to dental students in low-income countries. Dental students from lower-middle-income countries had higher odds of knowing about NRT compared to those from low-income countries although this difference did not attain statistical significance ( $aOR = 1.26$ ; 95% CI: 0.85–1.87).

In addition, being taught about the importance of asking about patients' tobacco use status ( $aOR = 1.87$ ; 95% CI: 1.54–2.26), as well as the importance of offering assistance to help smokers quit ( $aOR = 1.68$ ; 95% CI: 1.40–2.02), both significantly increased the likelihood of knowing about NRT. Furthermore, being a current user of any tobacco product ( $aOR = 1.32$ ; 95% CI: 1.15–1.51) conferred significantly higher odds of knowing about NRT. Knowledge about NRT did not vary significantly by sex.

## Discussion

This study indicated that knowledge about NRT was generally high amongst dental students in most countries. In 18 of 43 countries surveyed, over 75% of dental students knew about NRT. However, significant disparities were observed amongst some populations. For example, by geographical location, the likelihood of knowing about NRT was significantly higher amongst dental students in the European region compared to most other regions, which may be due to regional differences in prevalence and intensity of cigarette smoking (10). Low awareness of NRT amongst health profession students in countries with low smoking prevalence or intensity may be because NRT might not be indicated in most instances for the treatment of tobacco use in these countries.

Similarly, by income group, the likelihood of knowing about NRT was lowest amongst students in low-income countries and highest amongst students in high-income countries, which may be due to stronger national tobacco control programmes in more affluent countries. Smoking cessation programmes are primarily the responsibility of each country's healthcare system and are most effective when they are part of a coordinated and well-funded tobacco control programme (10). Unlike some low- and middle-income countries, high-income countries may have the resources to offer a wide range of free cessation services as part of their comprehensive tobacco control programmes, including free access to pharmacotherapy for nicotine dependence for all smokers that visit healthcare centres. Hence, dental students in such countries may have several exposures to clinical cessation interventions over the course of their dental training. This is well illustrated with New Zealand, where tobacco cessation intervention is one of the national government's top priorities, and where the healthcare system follows an 'ABC' model; Ask smoking status, give Brief advice, and offer Cessation support (10). The United Kingdom National Health Service also provides cessation support to all smokers who are ready to quit (17). The global disparities in access to clinical tobacco cessation interventions are highlighted by the WHO's 2011 report on the global tobacco epidemic,

TABLE 1. Characteristics of Surveyed Dental Students in 43 Countries, Global Health Professions Student Survey, 2005–2011 (n = 13, 40)

Region/Country	Income category of country during survey year	Survey year	Number of respondents	Number of dental schools <sup>1</sup>	overall response rate	% females	% aged <30 years
African region							
Algeria	Lower-middle	2007	225	2	76.7	62.5	99.3
Kenya	low	2008	24	1	86.2	50.0	100.0
Senegal	Lower-middle	2009	36	1	74.0	52.8	100.0
Eastern Mediterranean region							
Islamic Republic of Iran	Lower-middle	2007	303	15	58.7	53.7	96.6
Lebanon	Upper-middle	2006	71	3	64.0	67.2	100.0
Libyan Arab	Upper-middle	2006	162	8	39.1	71.8	100.0
Sudan	Lower-middle	2007	135	6	56.3	61.3	100.0
Syrian Arab Republic	Lower-middle	2006	475	4	86.2	38.2	99.3
Tunisia	Lower-middle	2007	123	1	62.4	79.5	100.0
Morocco	Lower-middle	2010	119	2	87.1	74.7	100.0
Saudi Arabia	High	2010	73	5	83.1	43.3	97.4
Oman	High	2010	52	1	86.7	87.0	100.0
Pakistan	Lower-middle	2011	400	8	70.3	62.4	98.2
Yemen	Lower-middle	2009	389	6	84.0	64.3	99.8
European region							
Albania	Lower-middle	2011	224	4	84.8	56.7	97.9
Armenia	Lower-middle	2006	149	3	62.7	58.7	100.0
Bosnia & Herzegovina	Lower-middle	2006	170	3	94.4	66.9	100.0
Czech Republic	High	2011	187	4	81.3	65.8	98.9
Lithuania	Upper-middle	2006	72	2	64.3	82.6	100.0
Russian Federation	Upper-middle	2006	583	5	80.0	63.2	100.0
Serbia	Upper-middle	2006	212	3	73.7	41.5	99.0
Slovakia	Upper-middle	2006	42	2	100.0	66.7	100.0
Slovenia	High	2007	39	1	100.0	87.2	100.0
Bulgaria	Upper-middle	2009	193	3	93.8	59.4	96.4
Region of the Americas							
Argentina	Upper-middle	2007	237	4	95.7	67.2	96.6
Bolivia	Lower-middle	2007	1,658	17	91.8	59.8	95.4
Chile	Upper-middle	2008	792	22	72.2	55.3	97.6
Guatemala	Lower-middle	2008	99	3	86.4	76.1	95.9
Mexico	Upper-middle	2006	1,301	15	74.1	68.3	98.9
Paraguay	Lower-middle	2008	147	7	65.7	75.6	98.0
Trinidad & Tobago	High	2008	18	1	66.7	55.6	100.0
Uruguay	Upper-middle	2008	95	2	94.3	73.7	94.7
Panama	Upper-middle	2008	57	2	86.1	68.3	100.0
Venezuela, Bolivarian Republic of National	Upper-middle	2011	1233	4	86.0	82.4	98.8
South East Asia region							
Bangladesh	Low	2009	337	9	86.0	59.8	98.8
India	Lower-middle	2009	711	15	83.6	67.6	99.8
Indonesia	Lower-middle	2007	753	9	89.5	82.3	99.9
Myanmar	Low	2009	260	2	75.7	22.7	98.8
Nepal	Low	2011	73	4	83.9	45.1	100.0
Thailand	Upper-middle	2011	566	8	84.6	68.7	100.0
Sri Lanka	Lower-middle	2011	59	1	86.6	74.1	100.0
Western Pacific region							
Cambodia	Low	2005	47	1	85.5	43.5	100.0
Mongolia	Lower-middle	2007	139	2	100.0	75.0	99.3

Numbers of respondents were unweighted whilst percentages were weighted to account for the complex survey design.

<sup>1</sup>Complete census of all dental schools in the country, except for Bolivarian Republic of Venezuela, India and Mexico where a sample of dental schools was taken.

TABLE 2. Prevalence of Self-Reported Knowledge About Nicotine Replacement Therapy Amongst Dental Students in 43 Countries, Overall and by Sex, Global Health Professions Student Survey, 2005–2011 (n = 13, 040)

Region/Country	Survey year	Overall% (95% CI)	Females% (95% CI)	Males% (95% CI)
<b>African region</b>				
Algeria (n = 225)	2007	64.0 (43.5–84.5)	68.3 (44.2–92.3)	57.4 (45.0–69.8)
Kenya (n = 24)	2008	79.2 (79.2–79.2)	75.0 (75.0–75.0)	83.3 (83.3–83.3)
Senegal (n = 36)	2009	44.4 (44.4–44.4)	31.6 (–)	58.8 (58.8–58.8)
<b>Eastern Mediterranean region</b>				
Islamic Republic of Iran (n = 303)	2007	69.7 (59.0–80.3)	67.9 (55.4–80.4)	72.3 (61.7–82.9)
Lebanon (n = 71)	2006	81.9 (74.5–89.4)	84.1 (68.2–100.0)	77.6 (63.5–91.6)
Libyan Arab (n = 162)	2006	56.3 (50.4–62.2)	58.8 (51.2–66.4)	50.8 (46.1–55.6)
Sudan (n = 135)	2007	73.5 (65.7–81.3)	75.4 (66.7–84.1)	70.3 (58.6–82.0)
Syrian Arab Republic (n = 475)	2006	58.2 (51.3–65.1)	58.8 (48.3–69.4)	57.8 (49.7–66.0)
Tunisia (n = 123)	2007	51.6 (51.6–51.6)	55.2 (55.2–55.2)	36.0 (36.0–36.0)
Morocco (n = 119)	2010	65.4 (63.0–67.7)	69.2 (63.3–75.1)	56.5 (42.4–70.7)
Saudi Arabia (n = 73)	2010	81.8 (75.0–88.5)	82.9 (70.6–95.2)	80.5 (75.7–85.3)
Oman (n = 52)	2010	55.1 (55.1–55.1)	52.5 (52.5–52.5)	50.0 (–)
Pakistan (n = 400)	2011	61.4 (46.3–76.5)	58.2 (37.1–79.4)	66.6 (56.3–76.9)
Yemen (n = 389)	2009	64.4 (62.2–66.6)	67.0 (59.9–74.1)	59.9 (50.2–69.6)
<b>European region</b>				
Albania (n = 224)	2011	73.6 (68.8–78.4)	71.1 (63.4–78.8)	76.8 (76.2–77.4)
Armenia (n = 149)	2006	51.8 (39.1–64.5)	52.0 (27.7–76.3)	49.8 (35.1–64.5)
Bosnia & Herzegovina (n = 170)	2006	85.2 (80.7–89.6)	84.1 (75.7–92.5)	87.3 (83.2–91.4)
Czech Republic (n = 187)	2011	94.1 (91.0–97.2)	95.1 (91.9–98.2)	92.3 (88.1–96.5)
Lithuania (n = 72)	2006	76.0 (59.0–93.1)	76.4 (61.4–91.4)	74.1 (46.4–100.0)
Russian Federation (n = 583)	2006	88.5 (85.5–91.5)	90.1 (86.3–93.9)	85.4 (83.2–87.7)
Serbia (n = 212)	2006	86.2 (83.0–89.3)	81.0 (68.2–93.9)	89.4 (87.0–91.8)
Slovakia (n = 42)	2006	97.6 (92.6–100.0)	100.0 (–)	92.9 (76.6–100.0)
Slovenia (n = 39)	2007	97.4 (97.4–97.4)	97.1 (97.1–97.1)	100.0 (–)
Bulgaria (n = 193)	2009	95.6 (92.0–99.3)	96.3 (92.5–100.0)	94.6 (87.1–100.0)
<b>Region of the Americas</b>				
Argentina (n = 237)	2007	65.4 (62.4–68.5)	70.3 (67.9–72.7)	55.9 (45.6–66.3)
Bolivia (n = 1658)	2007	51.1 (48.1–54.1)	50.7 (45.6–55.7)	51.7 (49.5–54.0)
Chile (n = 792)	2008	85.0 (83.0–87.1)	82.2 (78.5–85.9)	88.5 (86.2–90.8)
Guatemala (n = 99)	2008	97.0 (96.6–97.3)	96.0 (95.3–96.7)	100.0 (–)
Mexico (n = 1301)	2006	82.4 (78.9–86.0)	83.0 (79.3–86.6)	81.3 (77.2–85.4)
Paraguay (n = 147)	2008	60.4 (50.5–70.3)	60.0 (56.7–63.4)	61.7 (31.3–92.1)
Trinidad & Tobago (n = 18)	2008	94.4 (94.4–94.4)	90.0 (90.0–90.0)	100.0 (–)
Uruguay (n = 95)	2008	90.5 (87.6–93.5)	88.6 (86.5–90.7)	96.0 (92.2–99.8)
Panama (n = 57)	2008	77.1 (70.5–83.7)	74.3 (68.7–79.9)	83.2 (72.5–93.9)
Venezuela, Bolivarian Republic of, National (n = 1233)	2011	68.9 (64.9–72.8)	70.3 (65.6–75.1)	63.2 (60.8–65.6)
<b>South East Asian region</b>				
Bangladesh (n = 337)	2009	47.4 (35.2–59.6)	46.7 (34.1–59.3)	48.5 (35.7–61.3)
India (n = 711)	2009	62.9 (57.2–68.7)	65.4 (58.7–72.1)	57.4 (47.3–67.5)
Indonesia (n = 753)	2007	69.3 (65.9–72.6)	69.5 (65.0–74.0)	69.4 (61.5–77.3)
Myanmar (n = 260)	2009	50.4 (31.9–68.9)	41.0 (24.7–57.4)	53.1 (34.2–72.0)
Nepal (n = 73)	2011	86.2 (83.5–88.8)	78.6 (74.6–82.6)	92.8 (87.6–98.0)
Thailand (n = 566)	2011	72.2 (63.6–80.9)	71.9 (65.4–78.5)	72.2 (56.7–87.7)
Sri Lanka (n = 59)	2011	74.6 (74.6–74.6)	76.7 (76.7–76.7)	66.7 (66.7–66.7)
<b>Western Pacific region</b>				
Cambodia (n = 47)	2005	43.5 (43.5–43.5)	28.0 (28.0–28.0)	65.0 (–)
Mongolia (n = 139)	2007	37.0 (21.9–52.1)	34.3 (23.8–44.7)	45.5 (20.1–70.8)

Some 95% confidence intervals (95% CI) may not be present, or when shown may not vary from the point estimate because a complete census of all dental schools and all dental students in the country was taken. All data were weighted to account for the complex survey design.

which indicated that 80% of high-income countries provide at least some cost coverage for tobacco dependence, compared to only about 40% of middle-income countries and 0% of

low-income countries (10). This underscores the need for developing countries to strengthen their national tobacco control programmes and their healthcare system to provide clinical

TABLE 3. Pooled Multivariate<sup>1</sup> Logistic Regression Analyses Assessing Correlates of Knowledge About Nicotine Replacement Therapy Amongst Dental Students in 43 Countries, Global Health Professions Student Survey, 2005–2011 (n = 13, 040)

Characteristic	Unadjusted odds ratios (95% CI)	Adjusted odds ratios (95% CI)
<i>Country Classification</i>		
WHO geographical region		
European region	1.00 <sup>ref</sup>	1.00 <sup>ref</sup>
African region	0.33 (0.15–0.74)	0.69 (0.31–1.57)
Eastern Mediterranean region	0.33 (0.26–0.43)	0.52 (0.34–0.79)
Region of the Americas	0.52 (0.42–0.64)	0.50 (0.39–0.63)
South East Asian region	0.35 (0.27–0.45)	0.51 (0.35–0.74)
Western Pacific region	0.13 (0.07–0.22)	0.18 (0.11–0.31)
World Bank Income group		
Low-income	1.00 <sup>ref</sup>	1.00 <sup>ref</sup>
Lower-Middle income	1.41 (0.94–2.12)	1.26 (0.85–1.87)
Upper-Middle income	2.93 (1.98–4.33)	2.46 (1.57–3.85)
High income	5.81 (2.63–12.82)	4.55 (2.28–9.09)
<i>Tobacco cessation training in dental school</i>		
Taught to ask about patients' tobacco use		
No	1.00 <sup>ref</sup>	1.00 <sup>ref</sup>
Yes	2.18 (1.77–2.69)	1.87 (1.54–2.26)
Taught to assist smokers to quit		
No	1.00 <sup>ref</sup>	1.00 <sup>ref</sup>
Yes	1.56 (1.32–1.84)	1.68 (1.40–2.02)
<i>Tobacco use and socio-demographic characteristics</i>		
Current any tobacco user <sup>2</sup>		
No	1.00 <sup>ref</sup>	1.00 <sup>ref</sup>
Yes	1.38 (1.24–1.54)	1.32 (1.15–1.51)
Sex		
Female	1.00 <sup>ref</sup>	1.00 <sup>ref</sup>
Male	0.88 (0.74–1.04)	0.92 (0.77–1.09)
Survey year (per unit increase)	0.96 (0.92–1.00)	0.94 (0.90–0.99)

CI, confidence interval; ref, referent category.

All data were weighted to account for the complex survey design.

<sup>1</sup>Adjusted for all factors listed in table.

<sup>2</sup>Defined as use of at least one of the following tobacco products on  $\geq 1$  day during the past 30 days: manufactured or hand rolled cigarettes, cigars, pipes, water pipes or smokeless tobacco products (e.g. chewing tobacco).

cessation interventions to help smokers quit. The dental setting has been suggested as an ideal setting to provide such cessation support (18).

Mere knowledge about NRT or simply having heard about NRT – as was assessed in the study – is not a guarantee of proficiency in use of NRT to assist smokers to quit. However, the lack thereof is a strong indicator of lack of competency in the pharmacologic treatment of nicotine dependence. Our study indicated that in some countries, less than half of dental students had ever heard of NRT. This may be because primary health physicians have been the main focus for tobacco cessation in several countries. More so, evidence from several countries indicates that dentists are less active than other health professionals in counselling patients on tobacco cessation (12, 13, 19). However, dentists are well suited to help their patients

to quit tobacco use because of several factors. First, it may be relatively easier for dentists to readily detect oral or peri-oral signs or symptoms of tobacco use during oral examinations. This is important because some patients (particularly adolescents) who use tobacco may be unwilling to disclose their tobacco use status because of perceived social undesirability of tobacco use (20). In addition, the relatively long duration of some dental consultations, such as for scaling and polishing, may provide excellent opportunities to engage patients in tobacco cessation intervention. Furthermore, dental patients with tobacco-attributable conditions such as acute necrotising ulcerative gingivitis, or oral cancer, have unique challenges such as difficulties in eating, chewing, drinking, breathing, speaking, as well as aesthetic challenges, which may have a negative impact on quality of life (21). The emotional trauma associated with such conditions may tend to make dental patients comply with recommended therapy. Finally, because of the expensive and time-intensive nature of some dental treatments such as root canal therapy, dental implants, crown/bridgework and orthodontic treatment, coupled with the adverse effect which smoking may have on the success of such treatment, it may be easier for dentists to convince their patients to quit smoking on the basis of both the overall oral and systemic health benefits of quitting, as well as the economic benefits (i.e., averted costs from failed dental treatment secondary to smoking). Such advice to quit smoking may be accompanied by pharmacologic treatment for nicotine dependence.

The fact that knowledge of NRT was associated with being taught to ask about patients' tobacco use status and offer assistance to help smokers quit underscores the need for dental schools to incorporate tobacco cessation training as an integral part of dental education. In line with the guidelines of Article 12 of the WHO's Framework Convention on Tobacco Control (22) and the U.S. Public Health Service Clinical Practice Guideline for treating tobacco use and dependence (23), dental students should be taught to regularly implement the recommended five step approach to help smokers quit, also known as '5 A's' which includes the following: *Asking* all patients whether they use tobacco; *Advising* all smokers to quit; *Assessing* smokers' willingness to quit; *Assisting* smokers with quitting (including the use of pharmacotherapy); and *Arranging* follow-up contact to prevent relapse.

To enhance the self-efficacy of practicing dentists in implementing tobacco cessation intervention, education through continuing medical education, seminars and workshops may be necessary. However, such training may be most beneficial if inculcated into dental students early during their professional training. This may be achieved by integrating tobacco cessation training as a core component of the training of dental students (19). Dental classes such as pharmacology, oral medicine and community dentistry/dental public health may be modified to include modules on pharmacologic treatment of tobacco dependence. Such training should be based on the best practices for nicotine dependence treatment and emphasise clinically relevant information such as indications and contraindications, dosage/duration of use, and patient instructions for use of NRT. In addition, because treatment dose is dependent on level of nicotine addiction, it is important for dental students to be taught how to assess for nicotine dependence.

The fact that being a tobacco user was associated with knowledge of NRT is not surprising and may be due to past use of NRT by dental students who currently use tobacco. Health profession students who use any products should be encouraged to quit because it is possible for patients to view them as role models (12, 13). More so, health professionals who use tobacco products may be less inclined to assist smokers to quit. Hospital administrators can also enact policies to make all hospital environment 100% smoke-free so as to encourage health professionals including dental and other health profession students to quit.

The findings in this report are subject to some limitations. First, knowledge about NRT was self-reported and may have resulted in recall bias. Second, the GHPSS surveyed third-year students, so it is possible that students received training on patient cessation techniques during the latter (e.g. clinical) years of their programmes. However, to assess whether this was the case in the countries surveyed, the GHPSS research coordinators from each country raised this question to school administrators or others with knowledge of curricula for didactic training of health profession students following the completion of the survey and found that in over 80% of countries assessed, there was no formal training received by students on tobacco cessation at any time during their training (19). Thus, the results found in this study may be reflective of both pre-clinical and clinical dental students in the majority of countries assessed. However, it must be noted that because these students may have had relatively little interaction with patients whilst in dental school, these results may not be generalisable to practicing clinicians in any of the countries. Finally, because there were limited countries for which data were available these findings may not be generalisable to the respective regions. For example, the surveyed countries in the European region were mainly former Eastern-European and Balkanic countries, whose dental education may be different from Scandinavian or other European countries.

## Conclusion

This study showed that a large proportion of dental students in several countries know about NRT. However, disparities in knowledge existed by geographical location, gross national income, age and tobacco use status. Enhanced and sustained efforts are needed to integrate tobacco cessation training as a core component of the training of dental students through classes.

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## Conflict of interest

The authors have no competing interests to report.

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