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Web Appendix countrywise data.xls	

Tobacco use and perceptions about cessation training among Students in Health Profession: Estimates by countries and WHO regions

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Running title

Tobacco use among students of health profession

Abstract

Introduction

Health professionals play an important role in cessation and prevention of tobacco use. However, previous studies have shown that health professionals who use tobacco use may deter them from providing cessation advise and counseling to their patients.

Methods

Country-wise aggregate data from the Global Health Professional Student Survey on c*urrent cigarette smoking'* (smoking cigarettes on one or more days during past 30 days), and 'current *use of tobacco products other than cigarettes'* (chewing tobacco, snuff, bidis, cigars, or pipes one or more days during the past 30 days) were analysed. We calculated aggregate rates for each World Health Organisation regions as mean prevalence rates weighted by the population of sampling frame and '*health professionals' role'* and '*cessation training'* indicators by '*metaprop*' command on Stata 11.

Results

Overall, smoking prevalence was highest in European countries (20%, medical and 40%, dental students) and the Americas (13%, pharmacy to 23%, dental students). Other tobacco use was higher in eastern Mediterranean (10-23%) and European countries (7-13%). In all WHO regions, ≥70% of students agreed that medical professionals are role models and have a role in advising about smoking cessation to patients and public. Only ≤33% of all students in most WHO regions (except 80% among dental students in the eastern Mediterranean) had received formal training on smoking cessation approaches and ≥80% of all students agreed they should receive a formal cessation training.

Conclusions

Tobacco control should take place together with medical educators to discourage tobacco use among health professional students and implement integrated smoking cessation training into health professions curricula.

Key words

Tobacco Use, **Tobacco** Cessation, Medical Education, Surveys, Prevalence, Health Professionals

Key Points

- An up-to-date comprehensive Global Health Professions Student Survey(GHPSS) report is unavailable.
- Students in Health profession currently using tobacco require cessation advice/assistance.
- Students in health professions are favorable for cessation training.
- Tobacco cessation training needs to be implemented in mainly in Afro-Asia countries

INTRODUCTION

Globally tobacco use is a major preventable cause of premature mortality and morbidity[1] and particularly smoking inclusive of second hand smoke (SHS) is a leading risk factor attributable to 6% of global disability-adjusted life years.[2] An estimated 967 million smokers live in 187 countries and the number is expected to increase with growing population[3] worsening the tobacco epidemic in developing countries[4]. The World Health Organization's(WHO) Framework Convention on Tobacco Control (FCTC) calls for raising taxes, pricing, banning advertisements, strong warning labels, smoke-free air laws, aggressive public education campaigns, packaging restrictions and restrictions on tobacco industry marketing to curb the tobacco epidemic[5]. The WHO FCTC recommends that global tobacco epidemic be monitored through population-based surveys such as Global Tobacco Surveillance System(GTSS) conducted among adults, youth, school personnel and students in health profession[6].

Health professionals can play an important role in cessation and prevention of tobacco use by providing a brief counseling or even a simple advise[7;8] has been underscored in the WHO FCTC. Cessation training for students in health profession may be a potentially very significant contribution in tobacco control efforts[9]. However, health professionals' smoking habit may deter them from providing cessation advise and counseling to their patients because they cannot persuade patients to quit if they were smoking themselves[10;11] and students in health professional have inadequate knowledge about smoking-related diseases and no training on tobacco cessation techniques[12;13].

Studies have shown health professional who are trained in smoking cessation could potentially have impact on their practice in helping smoking patients quit by either interviewing them or referral to quit lines[14-16]. In many Afro-Asian developing countries, tobacco cessation training is not provided at all or given non-systematically[17]. Medical students usually ask smoking history of their patients during hospital clinical rotations, but they seldom ask or advise about cessation[18]. Hence, there is a continued debate on introducing tobacco cessation training into the health professional curricula[19-21]. Global Health Professions Student Survey(GHPSS)[22] has resulted in separate publications on the country-specific estimates for medical,[23] dental[24], nursing[25] and pharmacy[26] disciplines. Yet, there is no comprehensive report for all four disciplines and by WHO regions. Such information about prevalence of tobacco use and the students' attitude towards cessation are important for medical educators and tobacco control policy makers[27;28]. Using GHPSS data, we aim to provide updated global, regional, country-level

estimates on prevalence tobacco use among medical, dental, nursing and pharmacy students and describe their attitudes towards tobacco cessation training.

METHODS

Ethical considerations

GHPSS protocols were approved by the respective WHO regional offices and Centre for Disease Control (CDC) after ethical review procedures for global tobacco surveillance systems. Detailed information was verbally provided to all potential participants before informed consent was obtained. Self-administered questionnaires did not ask for any personal identification details. Ethical approval from each of the participating universities was not required as participation in the study was voluntary and confidentiality was fully guaranteed.

Survey design

The WHO, CDC, and the Canadian Public Health Association have standardized the study procedures for GHPSS questionnaire[29]. The GHPSS is a school-based survey administered to third-year students pursuing advanced degrees in medicine, dentistry, nursing and pharmacy. In each country, trained research coordinators ensured that the standard survey protocols were implemented. The GHPSS used a two-stage sampling design, based on probability proportional to the enrollment of third-year health students in health profession from schools in each country. The GHPSS was conducted as a census of schools and students in most locations and disciplines. In each country, the number of participants were different as the number of schools and students varied.

Data collection

The GHPSS used an anonymous, self-administered questionnaire covering demographics, cigarette smoking and use of other tobacco products, exposure to SHS; desire to quit smoking and training received to provide patient counselling on cessation techniques. The collaborators adapted the core questionnaire by adding questions about local forms of tobacco consumed in each country and translating it into a local language. Local language questionnaires were back-translated to English to check for accuracy and compatibility with the core questionnaire. The survey was conducted in the schools during regular lectures and classroom sessions after a briefing session given by research

coordinators. The responses were recorded on sheets that could be scanned and converted into data at the CDC.

Statistical analysis

A standard set of variables were created from core questions to facilitate cross-country comparisons. *'Current cigarette smoking'* was defined as smoking cigarettes on one or more days during the past 30 days. '*Current use of tobacco products other than cigarettes'* was defined as using chewing tobacco, snuff, bidis, cigars, or pipes (adapted to suit each country) on one or more days during the past 30 days. GHPSS uses SUDAAN software to calculate prevalence estimates and 95% CIs. For countries where census was carried out, a finite population correction was applied to adjust for non-response and variance in prevalence estimates. For countries, where sampling was done, a weighting factor was applied to account for the probability of being sampled in a complex survey design and non-response.

We obtained country-wise aggregate data of GHPSS for 'prevalence of tobacco use' and 'role model and cessation training from GTSS website (http://nccd.cdc.gov/gtssdata/Default/Default.aspx). The survey characteristics are shown in table 1. For each of the four health professional student disciplines, we calculated aggregate prevalence estimates and '*health professionals role'* and '*cessation training'* indicators for six WHO regions and overall (global). Aggregate prevalence estimates for the WHO regions were calculated as means weighted by the population of the sampling frame (national or sub national as appropriate) by age group (20-30 years) from the International Database of the United States Census Bureau (http://www.census.gov/population/international/data/idb/informationGateway.php). For '*health professionals role'* and '*cessation training'* indicators aggregate proportions for WHO regions were calculated based on the raw proportions using '*metaprop*' command[30] with a random effects model on Stata/IC (version 11.0)[31].

RESULTS

Survey and sample characteristics

Table 1 shows the sample characteristics of all surveys included. Data from 236 surveys during 2005 to 2011 from four health professional disciplines were analyzed. The number of countries varied by disciplines; 70(medical), 56(dental and nursing) and 54(pharmacy) and total surveys varied region-wise for all courses; 17(WPRO), 25(SEARO & AFRO), 55(AMRO), 56(EMRO), and 58(EURO) (table 1). A total of 107,527 (68,809, women and 37,886, men) health professional students were surveyed; of whom

51,914 were in medicine while others were in nursing (26,342), dentinstry (14,578) and pharmacy (14,693) courses (table 1). Male-to-female student ratio was highest for nursing (1:4.3) followed by dentistry (1:1.86).

Prevalence of current smoking and other tobacco use in the WHO regions

Overall prevalence of '*current cigarette smoking'* and '*current other tobacco use'* among students of four disciplines, by WHO regions and sex are shown in table 2 whereas weighted prevalence for all surveyed countries and country-wise prevalence for all four disciplines are shown in the web appendix. In general, *'current cigarette smoking'* was higher among dental and pharmacy students and in European countries and the countries survyeyed in the Americas in all disciplines. *'current cigarette smoking'* among female students was higher in European countries and countries in the Americas while both 'current cigarette smoking' and *'current other tobacco use'* were lowest in African and South East Asian countries. Other tobacco use was lower than smoking in the countries of all regions and all disciplines, except for male nursing and male dental students in the Eastern Mediterranean countries, and among dental students in Europen countries, other tobacco use was nearly same as cigarette smoking. Other tobacco use was much higher among male students in countries surveyed in all regions and all disciplines except pharmacy students in the Western Pacific countries.

Cigarette smoking among medical students was highest in European countries (29.2%), followed by countries in the Americas (20.3%) and it was lowest in African countries (8.2%). Male medical students had higher cigarette smoking rates than female students in countries from all regions, but this gap was highest in South East Asian countries (18.4% vs. 0.3%). Among male and female medical students cigarette smoking and other tobacco use were highest in European countries (males 36.0% & 18.9%; females 25.2% & 9.1% respectively). However, lowest male and female cigarette smoking rates were in African countries (males 12.3% and 6.2%) whereas other tobacco use was lowest in the countries of Western Pacific (males 5.6% and females 1.4%) and Africa (male 2.8% and female 6.2%).

Cigarette smoking in dental students was highest in European countries (overall, 40.2%; male, 47.2%; female, 35.2%) and lowest in African (6.5%), Western Pacific (males, 11.0%), and South East Asian (females, 0.1%) countries. The male-to-female gap was highest in South East Asian countries (23.4% vs 0.1%). Other tobacco use was highest in the Eastern Mediterranean countries for both male (23.4%) and

female (8.5%) students, but lowest among male students in the countries of Western Pacific (2.5%) and female students in Africa (4.4%).

Among nursing students overall highest cigarette smoking rate was in European countries (28.3%) and highest other tobacco use rate was in the Eastern Mediterranean countries (23.8%).
Sex-wise cigarette smoking was highest in European countries (males 34.3% and females 27.5%), and lowest in the countries of Africa (male, 10.2%) and South East Asia (female, 0.1%). Other tobacco use in male and female students was highest in the countries of Eastern Mediterranean (27.2%) and Europe (6.8%) respectively. Among pharmacy students overall smoking rate was 38.4% in European countries and about 12% in the countries surveyed in Eastern Mediterranean, South East Asia and Americas. Among pharmacy students, sex-wise smoking rates were also higher in European countries (55.8% male and 34.2% female) and lowest in the countries of Africa (male, 10.8%) and South East Asia (female, 1.1%). Other tobacco use was highest in the countries of Europe (male, 28.9%) and Americas (female, 10.3%) whereas the lowest in the Western Pacific (males, 2.0%) and African (female, 0.6%).

Perceptions about health professionals' roles and their cessation training

Tables 3 and 4 present '*health professionals role'* and '*cessation training'* indicators for the WHO regions by sex and web appendix presents data for overall pooled average for all surveyed countries, and each participating country for all four disciplines. About 70-90% of all students in health profession recognize that they are role models for their patients and the public, except for medical and pharmacy students in the countries from Europe (65.9% and 65.1%, respectively); dental (14.4%) and pharmacy (51.5%) students in the Western Pacific and pharmacy students in African countries (67.3%). About 78-97% of all students in countries of all regions thought that they have a role in giving advice or information about smoking cessation to their patients (table 3). In the countries surveyed in all the regions, only about 9.2-36.9% of students reported that they had received any formal training in smoking cessation approaches. However, a significantly lower (<5%) proportion of female nursing students and 90% of dental students in the Eastern Mediterranean had received cessation training. More than 80% of all students of surveyed countries in all regions responded that the students in health profession should receive specific training on cessation techniques. All four indicators about the health professionals' role and cessation training in four disciplines were significantly different between the six WHO regions except cessation training among medical, nursing and pharmacy courses (table 4).

DISCUSSION

Tobacco use still a major risk factor for non-communicable diseases[2;3] but cessation training for health professionals remains inadequate, particularly in developing countries[32;33]. The aggregate tobacco use rates among students in health profession varied by regions, disciplines and sex; cigarette smoking was higher among male students in dentistry and pharmacy particularly in the countries surveyed in Europe and Americas. The results from all GHPSS surveys throw light on two main shortcomings in health professionals' role in tobacco control. Firstly, tobacco use among health professional students themselves and second, a lack of formal cessation training in all disciplines, both of which affect their expected role in motivating their patients to quit smoking. On the contrary, students' perceptions towards cessation training were fairly consistent across and favorable towards their role in cessation and receptive towards formal cessation training across surveyed countries in all the regions, four disciplines and both sexes.

Smoking prevalence of up to 40% in the countries surveyed in Europe and Americas (15-30%) from GHPSS concur with reported smoking rates of 30% and higher among medical and dental students in central and eastern European countries. However, the studies were limited by heterogeneity in 'smoker' definitions and varying (one week to one month) periods of recall[10;11]. Such high rates correspond with the higher prevalence among men and women in the general population[3] suggesting the influence of socio-cultural factors[34]. Lower smoking rates in Africa, South East Asia and Western Pacific also correspond with lower adult smoking rates[3] particularly women since it is culturally inappropriate for women to smoke[35]. Other tobacco use rates of up to 27% among male students in surveyed countries in Eastern Mediterranean and Europe are a result of *'Shisha'* (water pipe) smoking prevalent in the region[36].

Smoking cessation should be prioritized for reducing the burden of smoking-related ill health since quitting at any age confers health benefits[37]. Nevertheless, surveys have found that prevalence of former smokers varies from 20-70% and is generally lower in developing countries because physicians seldom advice about quitting[21;32] despite the evidence that even a brief physician advice could have a small effect on smoking cessation[38]. Reasons for smoking patients not receiving any advice about quitting may not only arise from insufficient training, shortage of time and funding for physicians, but also due to lack of policies for smoking cessation, poor infrastructure in the health care system[21;32]. Nurses and pharmacists too play an important role through providing cessation by counselling the

smoking patients[39;40]. However, nursing curricula mainly cover about health hazards of smoking, but do not equip the students with counselling skills, behavioral or pharmacotherapy for smoking cessation[41;42]. In most GHPSS, research coordinators verified with school administrators and were confirm that there was no formal training given on tobacco cessation at any time during the course[43].

Tobacco control should begin among health professionals who should be exemplars. Health professional students agree on them being 'role models' and their role in advising patients[44]. Health professional trainers should also advocate 'no tobacco' to their students, by imparting education on health effects of smoking and motivate smoking students to quit their habit through counseling[33]. Exposure to secondhand smoke was high in educational institutions[23-25]; hence smoke free policies would create a positive message to the students, teachers, patient and doctors[45]. Positive strides should be taken particularly in developing countries towards integrating tobacco cessation education into the existing curricula even if a separate module for tobacco control cannot be introduced[33]. A positive, conducive environment by creating smoke-free health professional schools, hospitals, providing cessation training, would make them exemplars by remaining non-smokers[21].

Our estimates expose wide gaps globally in health professional students' preparation for their future role in smoking cessation. Most evaluation studies on various modalities of tobacco cessation training to improve students' skill to provide smoking cessation are from high income countries,[14-16;46;47] where cessation training is implemented in the curriculum[32]. However, very little is known about effectiveness of cessation training materials and teaching methodologies in different socioeconomic and cultural settings of LMICs of Africa and South East Asia[15;48;49]. More research is needed to study the current curricula on tobacco cessation training in various courses[17;50-52],students' current practices and attitudes [18;53-56] and medical educators' receptivity towards tobacco cessation[57].

Our study limitations are reporting bias of tobacco use and perceptions due to questionnaire-based, self-reporting design of GHPSS and non-extrapolation of our results to the practicing health professionals as described in previous papers[23-26]. In addition, the regional estimates may not be representative of some WHO region since very few countries were included in Africa and Western Pacific. Further, in some countries, the survey response rates were less < 80% (table 1) which may not reflect the true estimates. Nevertheless, we presented regional estimates alongside country-wise updated results (web appendix) to highlight the regional situation for policy makers.

Conclusion

Tobacco use among male medical and dental students are unacceptably high in Europe, United States and Eastern Mediterranean regions. Tobacco control efforts should begin with health professional students themselves abstaining from smoking to be exemplars to their patients and the public. Positive perceptions towards cessation training should be complimented with integrating cessation training into their curricula. A collective effort by tobacco control experts and medical educators is needed to create a conducive and positive 'smoke free' school environment for training student in cessation techniques and further research should be done for better evidence base for effectiveness of implementing tobacco-related curricula.

Abbreviations

GHPSS: Global Health Professions Students' Survey
WHO: World Health Organization
FCTC: Framework Convention On Tobacco Control
LMIC: Low-and-middle-income countries
GTSS: Global Tobacco Surveillance System
CDC: Centre for Disease Control
AFRO: African Regional Office
EMRO: Eastern Mediterranean Regional Office
EURO: Europe Regional Office
AMRO: America Regional Office
SEARO: South-East Asia Regional Office
WPRO: Western Pacific Regional Office

Contributors

CTS and **NR** designed the study, with inputs from two other co-authors. **IA** and **MR** managed data extraction**, CTS** analysed the data and **IA** and **MR** interpreted the findings, with input from all other authors. **CTS** and **NR** co-drafted the manuscript, with critical feedback from **IA** and **MR** authors. All authors approved the final manuscript

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TABLES

Table 1 Characteristics of participating countries, health professional students by male and female and WHO regions

	Number countries	Time period of surveys	Total	Girls	Boys	Response rates
MEDICAL						
AFRO	9	2005-2009	2686	1731	924	51.3, 96.8
EMRO	16	2005-2011	11783	6702	5051	50.8, 100
EURO	20	2006-2011	13776	9044	4686	41.3, 100
AMRO	15	2005-2011	12662	7112	5458	64, 100
SEARO	7	2006-2011	8732	3881	4807	60.9, 92.2
WPRO	3	2005-2007	2275	1022	1233	53.3, 88.9
Total	**70**		**51914**	**29492**	**22159**	
DENTAL						
AFRO	3	2007-2009	285	170	115	74, 76.7
EMRO	13	2006-2011	2655	1560	980	56.2, 87.6

EURO	15	2006-2011	2606	1576	1019	62.7, 100
AMRO	13	2007-2011	5999	3997	1963	66.7, 97.5
SEARO	7	2007-2011	2759	1808	810	83.9, 89.5
WPRO	5	2005-2009	274	173	101	85.5, 100
Total	**56**		**14578**	**9284**	**4988**	
NURSING						
AFRO	7	2005-2009	1650	1131	508	68.4, 96.3
EMRO	14	2006-2010	6660	4508	2086	43, 100
EURO	11	2005-2011	6517	5496	1002	42, 90.2
AMRO	16	2006-2011	5870	5018	807	49.5, 100
SEARO	5	2006-2011	4326	3969	330	86.7, 93
WPRO	3	2005-2007	1319	1121	177	79.3, 100
Total	**56**		**26342**	**21243**	**4910**	
PHARMACY						
AFRO	6	2006-2009	874	500	373	59, 91.3
EMRO	13	2006-2011	3861	2522	1306	38.3, 93.1
EURO	12	2006-2011	2132	1670	459	72.5, 100
AMRO	11	2006-2011	2569	1859	692	74.3, 97.7
SEARO	6	2008-2011	4237	1481	2744	80.7, 84.8
WPRO	6	2005-2009	1020	758	255	79.7, 100
Total	**54**		**14693**	**8790**	**5829**	

Table 2: Weighted prevalence rates (95% CI) of tobacco use by male and female and WHO regions among medical, dental, nursing and pharmacy students

	Current smoking			Current other tobacco use		
	Total	**Girls**	**Boys**	**Total**	**Girls**	**Boys**
MEDICAL*				**MEDICAL**		
AFRO	8.2 (6.3,12.5)	5.0 (3.3,8.6)	12.3 (10.6,19.8)	3.9 (3.0,5.1)	2.8 (1.8,4.4)	6.2 (4.6,8.2)
EMRO	9.9 (8.8, 11.4)	2.9 (2.3,4.0)	20.5 (18.2,23.4)	10.2 (9.1,11.4)	4.8 (4.0,5.8)	18.0 (15.2,20.3)
EURO	29.2 (26.9,32.2)	25.2(22.7,26.8)	36.0 (31.7,40.0)†	12.6 (10.8,16.9)	9.1 (7.1,12.3)	18.9 (15.4,24.1)
AMRO	20.3 (17.0,23.8)	18.5 (14.7,22.6)	22.7 (18.4,27.4)†	7.8 (5.8,10.6)	4.3 (2.8,6.9)	11.6 (8.4,16.2)†
SEARO	12.8 (9.6,16.8)	0.3 (0.2,0.5)	18.4 (13.7,24.3)	9.6 (6.3,14.6)	5.9 (2.5,13.0)	11.9 (7.9,17.8)†

WPRO	12.8 (10.9,14.9)	3.1 (2.0,5.4)	20.9 (18.6,23.5)	3.8 (2.9,5.1)	1.4 (1.0,2.2)	5.6 (4.3,7.5)
DENTAL*				**DENTAL**		
AFRO	6.5 (8.8, 15.3)	2.6 (2.8,8.6)	12.2 (16.4,29.3)	4.8 (2.7,8.6)	4.4 (1.9,9.6)	6.0 (4.0,9.0)
EMRO	13.0 (10.6,15.8)	5.8 (4.0,8.6)	23.8 (19.1,29.5)	14.8 (12.3,17.6)	8.5 (6.3,11.7)	23.4 (19.0,28.7)
EURO	40.2 (37.4,43.1)	35.2 (31.5,39.3)	47.2 (39.6,55.6)†	13.1 (10.9,17.2)	8.5 (6.2,13.8)	21.0 (17.3,26.6)
AMRO	23.1 (19.8,27.3)	21.9 (18.3,26.5)	26.5 (21.5,33.7)†	9.3 (7.2,12.0)	8.4 (6.1,11.8)	10.7 (6.5,18.9)†
SEARO	9.5 (7.1,13.0)	0.1 (0.0,0.1)	23.4 (17.5,31.5)	9.0 (6.3,12.9)	4.6 (2.7,8.8)	16.8 (12.8,21.8)
WPRO	8.4 (3.5,8.9)	7.1 (3.8,4.6)	11.0 (1.9,6.8)†	5.4 (1.8,8.2)	7.3 (4.5,11.0)	2.5 (0.8,1.3)
NURSING*				**NURSING***		
AFRO	5.2 (4.1,6.7)	1.8 (1.5,4.7)	10.2 (8.4,17.4)	3.1 (2.2,4.5)	2.1 (1.3,3.7)	5.9 (3.7,9.9)
EMRO	12.1 (9.4,11.5)	4.6 (3.8,5.8)	27.7 (21.3,29.1)	23.8 (18.1,22.8)	6.8 (5.6,8.4)	27.2 (20.6,32.0)
EURO	28.3 (24.5,31.6)	27.5 (23.8,31.1)	34.3 (24.2,42.9)†	7.1 (9.3,14.1)	6.8 (8.7,14.0)	10.9 (9.8,23.6)†
AMRO	15.2 (13.4,18.6)	14.3 (12.6,17.8)	20.0 (14.1,27.8)†	6.1 (4.5,9.1)	6.3 (4.7,9.5)	4.8 (1.8,10.8)†
SEARO	3.3 (2.0,5.4)	0.1 (0.1,0.2)	21.8 (13.2,35.1)	4.7 (3.4,6.7)	3.4 (2.1,6.1)	15.2 (9.0,25.1)
WPRO	5.0 (3.7,7.1)	3.2 (2.9,4.6)	15.0 (7.8,31.6)	3.1 (1.6,7.0)	2.2 (1.2,4.1)	15.1 (6.1,33.7)
PHARMACY*				**PHARMACY***		
AFRO	6.0 (4.4,8.6)	2.5 (1.9,5.5)	10.8 (8.2,15.2)	1.6 (1.2,2.1)	0.6 (0.4,1.0)	3.5 (2.8,4.5)
EMRO	12.4 (10.4,14.9)	3.4 (2.5,4.4)	26.3 (22.3,31.4)	12.7 (10.7,15.2)	6.6 (5.1,8.4)	21.6 (18.1,26.1)
EURO	38.4 (33.9,43.0)	34.2 (29.4,39.3)	55.8 (45.6,65.0)	11.7 (9.4,15.6)	7.3 (5.7,11.4)	28.9 (20.7,39.4)
AMRO	12.8 (10.1,16.1)	9.7 (7.1,13.6)	19.0 (14.0,26.1)†	12.1 (9.4,15.7)	10.3 (7.2,14.5)	16.1 (11.0,23.1)†
SEARO	12.9 (10.5,15.7)	1.1 (0.7,1.4)	21.1(17.4,25.7)	9.8 (8.0,11.8)	7.5 (4.7,11.7)	11.3 (8.6,15.8)†
WPRO	19.9 (14.5,25.8)	14.9 (12.1,23.5)	35.5 (24.4,46.8)	3.5 (2.1,5.8)	2.9 (1.5,5.3)	2.0 (0.6,5.6)†

*for these the comparisons between six WHO regions (chi square test) was significant, p<0.05

† for these comparisons between male and female students (chi square test was not significant, p>0.05

Table 3: Health professional students' views about health professional being 'role models' and their role in advising about smoking cessation by WHO region

WHO regions	Do health professionals serve as "role models" for their patients and the public?			Do health professionals have a role in giving advice or information about smoking cessation to patients?		
	Total	Male	Female	Total	Male	Female
MEDICAL*				**MEDICAL***		
AFRO	70.5 (59.1,81.9)	70.9 (58.9,82.9)	68.4 (55.6,81.2)	94.1 (88.9,99.3)	92.7 (86.2,99.2)	93.0 (86.7,99.4)
EMRO	76.2 (72.3,80.1)	73.8 (69.5,78.0)	77.8 (73.5,82.1)	89.8 (87.0,92.7)	89.3 (86.1,92.5)	90.3 (87.4,93.2)
EURO	65.9 (58.5,73.4)	63.2 (55.5,71.0)	67.5 (59.8,75.3)	84.8 (81.4,88.1)	85.1 (81.9,88.3)	88.1(85.0,91.1)
AMRO	78.6 (72.5,84.7)	78.6 (72.5,84.7)	78.9 (72.6,85.2)	95.1 (92.6,97.6)	94.6 (92.1,97.2)	95.3 (92.7,97.9)

SEARO	86.1 (79.7,92.5)	86.8 (78.8,94.7)	86.5 (81.2,91.8)	94.5 (91.9,97.1)	93.0 (89.6,96.5)	95.6 (93.7,97.5)
WPRO	84.1 (65.4,102.7)	80.9 (58.6,103.2)	90.3 (81.5,99.1)	96.0 (90.1,102.0)	90.6(88.1,93.2)	97.8(96.1,99.6)
DENTAL*				**DENTAL***		
AFRO	73.6 (49.1,98.0)	62.2 (52.8,71.5)	72.6 (53.6,91.7)	89.5 (74.3,104.6)	82.9 (61.3,104.5)	87.1(81.5,92.6)
EMRO	76.4 (70.7,82.0)	74.8 (67.9,81.7)	77.3 (71.2,83.5)	89.5 (86.3,92.7)	89.6 (85.7,93.4)	91.0 (88.1,94.0)
EURO	72.8 (64.8,80.8)	68.5 (59.7,77.4)	75.2 (66.7,83.7)	83.8 (79.7,87.9)	82.4 (77.4,87.4)	83.5 (79.4,87.5)
AMRO	78.8 (71.5,86.2)	79.5 (72.7,86.2)	76.8 (70.2,83.4)	88.2 (82.7,93.7)	88.8 (83.1,94.4)	88.5 (82.7,94.2)
SEARO	90.1 (85.3,94.9)	87.4 (79.6,95.1)	90.2 (84.4,96.0)	93.4 (91.3,95.6)	90.6 (87.2,94.0)	95.4 (94.2,96.6)
WPRO	14.4 (8.6,20.2)	14.7 (2.8,26.6)	14.3 (7.6,21.0)	78.4 (71.6,85.3)	79.4 (65.8,93.0)	78.1 (70.2,86.0)
NURSING*				**NURSING***		
AFRO	72.5 (56.3,88.8)	76.0 (62.2,89.8)	65.9 (58.1,73.8)	97.2 (95.3,99.1)	98.6 (97.2,100.0)	96.7 (94.1,99.2)
EMRO	76.2 (72.3,80.1)	73.8 (69.5,78.0)	77.8 (73.5,82.1)	91.4 (88.7,94.0)	89.8 (86.4,93.2)	92.1 (89.5,94.6)
EURO	71.5 (61.2,81.9)	67.2 (56.8,77.5)	72.3 (60.6,84.1)	82.4 (77.0,87.9)	84.5 (81.0,88.1)	81.3 (75.3,87.2)
AMRO	76.3 (70.1,82.6)	75.6 (67.6,83.5)	76.7 (70.3,83.0)	93.8 (91.6,96.1)	93.6 (90.0,97.3)	93.7 (91.4,96.1)
SEARO	90.0 (83.7,96.3)	87.7 (80.2,95.2)	87.7 (80.6,94.7)	96.0 (93.9,98.1)	92.0 (85.6,98.4)	96.4 (94.3,98.4)
WPRO	72.8 (48.0,97.6)	78.6 (51.5,105.8)	71.4 (44.9,98.0)	92.4 (86.6,98.3)	82.2 (67.7,96.8)	93.1 (87.6,98.6)
PHARMACY*				**PHARMACY***		
AFRO	67.3 (51.8,82.8)	68.0 (52.6,83.4)	63.1 (58.1,68.1)	93.6 (86.2,101.0)	87.2(73.4,101.0)	92.5 (81.5,103.5)
EMRO	75.5 (68.2,82.9)	73.4 (65.3,81.4)	76.3 (68.6,84.0)	89.7 (86.1,93.3)	87.6(82.7,92.6)	91.0 (87.6,94.4)
EURO	65.1 (55.0,75.2)	63.2 (52.5,73.9)	65.2 (54.6,75.9)	81.1 (76.1,86.2)	79.4 (72.3,86.5)	82.7 (77.1,88.3)
AMRO	75.6 (66.2,85.0)	74.3 (62.9,85.6)	71.8 (63.4,80.2)	92.8 (87.5,98.0)	90.7 (84.8, 96.5)	93.6 (88.3, 99.0)
SEARO	87.6 (81.8,93.4)	87.8 (82.5,93.2)	86.9 (79.9,94.0)	90.3 (86.0,94.6)	93.2 (89.4,97.1)	90.1 (84.2,96.0)
WPRO	51.5 (-4.4,107.4)	50.0 (0.3,99.6)	52.1 (-5.6,109.8)	95.6 (92.2,99.1)	89.3 (80.1,98.5)	95.0 (88.6,101.4)

***for these the comparisons between six WHO regions (chi square test) was significant, p<0.05**

Table 4: Health professional students' views about them receiving training on cessation and their opinion that health professionals should receive formal training on cessation by WHO region

WHO regions	During your school training, have you ever received any formal training in smoking cessation approaches to use with patients?			Should health professionals get specific training on cessation techniques?		
	Total	Male	Female	Total	Male	Female
MEDICAL				**MEDICAL***		
AFRO	13.1 (5.3,20.9)	23.0 (14.9,31.1)	24.0 (8.5,39.5)	96.2 (94.0,98.5)	94.2 (90.3,98.2)	96.7 (94.5,98.9)
EMRO	14.0 (11.5,16.5)	26.7 (21.9,31.4)	23.5 (18.8,28.1)	92.5 (90.7,94.4)	90.3 (87.9,92.8)	95.0 (93.6,96.4)
EURO	13.6 (10.1,17.0)	22.3 (15.5,29.1)	19.5 (13.9,25.1)	83.0 (79.4,86.6)	80.1 (76.0,84.3)	84.6 (80.9,88.3)
AMRO	13.0 (10.8,15.2)	23.0 (18.9,27.1)	19.0 (14.9,23.1)	95.4 (94.3,96.4)	94.1 (92.5,95.7)	96.8 (96.0,97.5)

SEARO	10.1 (7.8,12.4)	25.8 (21.4,30.2)	22.5 (18.1,26.9)	93.5 (91.1,96.0)	90.9 (88.6,93.3)	94.8 (92.9,96.7)
WPRO	9.2 (3.8,14.7)	19.2 (11.6,26.9)	25.1 (17.8,32.3)	89.4 (79.5,99.3)	87.0 (74.1,99.9)	90.2 (84.2,96.2)
DENTAL*				**DENTAL***		
AFRO	20.6 (-5.7,46.9)	25.1 (-6.6,56.8)	24.3 (-2.2,50.9)	88.1 (80.0,96.1)	83.9 (77.2,90.6)	82.7 (76.5,89.0)
EMRO	89.5 (86.3,92.7)	89.6 (85.7,93.4)	91.0 (88.1,94.0)	92.9 (90.7,95.1)	91.9 (88.7,95.0)	94.8 (93.1,96.4)
EURO	27.2 (19.7,34.7)	25.5 (18.3,32.7)	24.4 (16.2,32.7)	84.6 (78.9,90.3)	83.3 (76.8,89.9)	85.4 (79.4,91.4)
AMRO	17.6 (12.8,22.4)	21.4 (14.5,28.3)	16.2 (11.7,20.8)	92.7 (90.9,94.6)	91.5 (89.5,93.5)	93.8 (91.9,95.6)
SEARO	24.7 (10.6,38.7)	26.2 (12.2,40.3)	23.6 (6.8,40.3)	88.9 (84.6,93.1)	84.7 (77.4,92.1)	93.3 (91.1,95.5)
WPRO	32.9 (8.2,57.5)	10.9 (-1.8,23.6)	10.4 (5.1,15.8)	95.4 (92.7,98.2)	94.1 (86.2,102)	96.2 (92.5,99.9)
NURSING†				**NURSING***		
AFRO	27.7 (20.5,34.9)	29.5 (21.8,37.3)	2.5 (1.6,3.4)	98.0 (97.3,98.7)	97.9 (96.5,99.3)	97.7 (96.7,98.8)
EMRO	36.9 (27.8,46.0)	39.8 (28.9,50.7)	2.9 (1.9,3.8)	93.9 (92.1,95.7)	92.5 (89.8,95.2)	95.6 (94.0,97.2)
EURO	34.5 (25.5,43.4)	36.8 (24.7,48.9)	3.2 (2.2,4.2)	83.7 (77.3,90.1)	78.3 (68.2,88.4)	83.2 (76.4,89.9)
AMRO	26.1 (22.7,29.5)	30.1(22.7,37.5)	2.5 (2.1,2.9)	96.3 (95.1,97.5)	96.5 (94.4,98.8)	96.3 (95.1,97.6)
SEARO	29.2 (21.3,37.0)	24.6 (15.5,33.7)	3.0 (2.1,3.9)	92.0 (87.7,96.3)	88.5 (80.0,96.9)	92.4 (88.5,96.4)
WPRO	30.9 (22.1,39.6)	37.2 (30.1,44.3)	2.9 (1.8,4.1)	92.1 (84.3,99.9)	82.4 (75.0,89.8)	92.3 (85.8,98.9)
PHARMACY				**PHARMACY***		
AFRO	21.1 (6.4,35.8)	21.2 (8.5,34.0)	24.4 (9.4,39.5)	96.7 (95.4,98.1)	95.9 (93.6,98.2)	96.3 (94.7,98.0)
EMRO	19.0 (14.7,23.3)	21.0 (16.1,25.9)	16.6 (11.8,21.4)	94.2 (92.3,96.2)	93.4 (91.1,95.7)	95.9 (94.2,97.6)
EURO	21.2 (15.0,27.4)	24.2 (13.1,35.4)	19.6 (13.8,25.5)	84.6 (78.3,91.0)	82.8 (76.1,89.6)	85.1 (78.9,91.3)
AMRO	16.8 (12.3,21.4)	17.8 (12.1,23.6)	15.4 (10.4,20.3)	95.2 (93.2,97.2)	92.6 (87.6,97.5)	96.9 (95.6,98.2)
SEARO	22.3 (14.9,29.7)	26.0 (18.3,33.6)	20.8 (12.4,29.3)	91.0 (86.5,95.6)	89.4 (84.4,94.4)	91.7 (86.9,96.5)
WPRO	30.9 (16.9,44.8)	23.9 (3.3,44.5)	23.0 (7.8,38.1)	95.6 (92.4,98.8)	93.9 (89.8,98.0)	96.1 (91.8,100.4)

***for these the comparisons between six WHO regions (chi square test) was significant, p<0.05**

† comparison between male and female nursing students in all regions (chi square) was

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STROBE Statement—Checklist of items that should be included in reports of ***cross-sectional studies***

	Item No	Recommendation	Page number
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	2
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	3
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4
Objectives	3	State specific objectives, including any prespecified hypotheses	4-5
Methods			
Study design	4	Present key elements of study design early in the paper	5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	5
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	*6*
Bias	9	Describe any efforts to address potential sources of bias	NA
Study size	10	Explain how the study size was arrived at	NA
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	6
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	6
		(*b*) Describe any methods used to examine subgroups and interactions	6
		(*c*) Explain how missing data were addressed	NA
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	6
		(*e*) Describe any sensitivity analyses	NA
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	6-7
		(b) Give reasons for non-participation at each stage	NA
		(c) Consider use of a flow diagram	NA
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	7

		(b) Indicate number of participants with missing data for each variable of interest	NA
Outcome data	15*	Report numbers of outcome events or summary measures	7-8
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	NA
		(*b*) Report category boundaries when continuous variables were categorized	NA
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	NA
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	NA
Discussion			
Key results	18	Summarise key results with reference to study objectives	9
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	10
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	10
Generalisability	21	Discuss the generalisability (external validity) of the study results	11
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	11

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Prevalence of tobacco use and perceptions of health professions students about cessation training: results from Global Health Professions Student Survey

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Prevalence of tobacco use and perceptions of health professions students about cessation training: results from Global Health Professions Student Survey

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Running title

Tobacco use among students of health professions

Abstract

Introduction

Health professionals play an important role in providing advice to their patients about tobacco prevention and cessation. However, previous studies have shown that health professionals who personally use tobacco may be deterred from providing cessation advice and counselling to their patients. We aim to provide estimates on prevalence of tobacco use health professions students and describe their attitudes towards tobacco cessation training.

Methods

Country-wise aggregate data from Global Health Professional Student Survey on *current cigarette smoking'* (smoking cigarettes on one or more days during past 30 days), and 'current *use of tobacco products other than cigarettes'* (chewing tobacco, snuff, bidis, cigars, or pipes one or more days during the past 30 days) were analysed. For each World Health Organisation regions, we estimated mean prevalence rates weighted by the population of sampling frame and '*health professionals' role'* and '*cessation training'* indicators by '*metaprop*' command on stata 11.

Results

A total 107,527 students participated in 236 surveys done among four health profession disciplines in 70 countries, with a response rates of 40-100%. Overall, smoking prevalence was highest in European countries (20%, medical and 40%, dental students) and the Americas (13%, pharmacy to 23%, dental students). Other tobacco use was higher in eastern Mediterranean (10-23%) and European countries (7-13%). In all WHO regions, ≥70% of students agreed that medical professionals are role models and have a role in advising about smoking cessation to the patients and public. Only ≤33% of all students in most WHO regions (except 80% among dental students in eastern Mediterranean) had received formal training on smoking cessation approaches and ≥80% of all students agreed they should receive formal cessation training.

Conclusions

Tobacco control should take place together with medical educators to discourage tobacco use among health professional students and implement integrated smoking cessation training into health professions curricula.

Key words

Tobacco Use, **Tobacco** Cessation, Medical Education, Surveys, Prevalence, Health Professionals

Strengths and limitations of this study

- An up-to-date comprehensive Global Health Professions Student Survey(GHPSS) report is unavailable.
- Students in health professions currently using tobacco require cessation advice/assistance.
- Students in health professions are favorable to receive cessation training.
- Tobacco cessation training needs to be implemented mainly in Afro-Asian countries

INTRODUCTION

Globally tobacco use is a major preventable cause of premature mortality and morbidity[1] and particularly smoking inclusive of second hand smoke (SHS) is a leading risk factor attributable to 6% of global disability-adjusted life years.[2] An estimated 967 million smokers live in 187 countries and the number is expected to increase with growing population[3] worsening the tobacco epidemic in developing countries.[4] The World Health Organization's(WHO) Framework Convention on Tobacco Control (FCTC) recommends that global tobacco epidemic be monitored through population-based surveys such as Global Tobacco Surveillance System(GTSS) conducted among adults, youth, school personnel and students in health professions.[5]

Health professionals such as doctors, dentists, nurses and pharmacists can play an important role in cessation and prevention of tobacco use by providing a brief counseling or even a simple advise[6,7] has been underscored in the WHO FCTC. Cessation training for students in health profession may be a potentially very significant contribution in tobacco control efforts.[8] However, health professionals' smoking habit may deter them from providing cessation advise and counseling to their patients because they cannot persuade patients to quit if they were smoking themselves.[9,10] Students in health professional have inadequate knowledge about smoking-related diseases and no training on tobacco cessation techniques.[11,12]

Health professionals who are trained in smoking cessation could potentially have impact on their practice in helping smoking patients quit by either interviewing them or referral to quit lines[13-15]. In many Afro-Asian developing countries, tobacco cessation training is not provided at all or given non-

systematically.[16] Medical students usually ask smoking history of their patients during hospital clinical rotations, but they seldom ask or advise about cessation.[17] Hence, there is a continued debate on introducing tobacco cessation training into the health professional curricula.[18-20] Global Health Professions Student Survey(GHPSS)[21] has resulted in separate publications on the country-specific estimates for medical,[22] dental[23], nursing[24] and pharmacy[25] disciplines. Yet, there is no comprehensive report for all four disciplines and estimates by WHO regions. Such information about prevalence of tobacco use and the students' attitude towards cessation are important for medical educators and tobacco control policy makers.[26,27] Using GHPSS data, we aim to provide updated global, regional, country-level estimates on prevalence tobacco use among medical, dental, nursing and pharmacy students and describe their attitudes towards tobacco cessation training.

METHODS

Survey design The WHO, Centres for Disease Control (CDC), and the Canadian Public Health Association have standardized the study procedures for administering a validated core GHPSS questionnaire.[28] The GHPSS is a school-based cross-sectional survey administered to third-year students pursuing advanced degrees in medicine, dentistry, nursing and pharmacy. In each country, trained research coordinators ensured that the standard survey protocols were implemented. The GHPSS used a two-stage sampling design, based on probability proportional to enrollment size of third-year health students in health profession from schools in each country. The GHPSS was conducted as a census of schools and students in most locations and disciplines. In each country, the number of participants were different as the number of schools and students varied.

Data collection

The GHPSS used validated anonymous, self-administered questionnaire covering demographics, cigarette smoking and use of other tobacco products, exposure to SHS,desire to quit smoking and training received to provide patient counselling on cessation techniques. The collaborators adapted core questionnaire by adding questions about local forms of tobacco consumed in each country. Where appropriate the English version of the questionnaire wastranslated into native language of the country. Native language questionnaires were back-translated to English to check for accuracy and compatibility with the core questionnaire. The survey was conducted in the schools during regular lectures and

classroom sessions after a briefing session given by research coordinators. The responses were recorded on sheets that could be scanned and converted into data at the CDC. All surveys followed the standardized procedures for selecting the schools and data analyses processing.

Ethical considerations

GHPSS protocols were approved by the respective WHO regional offices and CDC after ethical review procedures for global tobacco surveillance systems. Detailed information was verbally provided to all potential participants before informed consent was obtained. Self-administered questionnaires did not ask for any personal identification details.

Statistical analyses

GHPSS has created a standard set of variables were created from core questions to facilitate cross-country comparisons. *'Current cigarette smoking'* was defined as smoking cigarettes on one or more days during the past 30 days. '*Current use of tobacco products other than cigarettes'* was defined as using chewing tobacco, snuff, bidis, cigars, or pipes (adapted to suit each country) on one or more days during the past 30 days. GHPSS uses SUDAAN software to calculate prevalence estimates and their 95% CIs. For countries where census was carried out, a finite population correction was applied to adjust for non-response and variance in prevalence estimates. For countries, where sampling was done, a weighting factor was applied to account for the probability of being sampled in a complex survey design and non-response.

We obtained country-wise aggregate data of GHPSS for 'prevalence of tobacco use' and 'role model and cessation training from GTSS website (http://nccd.cdc.gov/gtssdata/Default/Default.aspx). For each of the four health professional student disciplines, we calculated aggregate prevalence estimates and '*health professionals' role'* and '*cessation training'* indicators for six WHO regions and overall (global). Aggregate prevalence estimates for the WHO regions were calculated as means weighted by the population of the sampling frame (national or sub national as appropriate) by age group (20-30 years) from the International Database of the United States Census Bureau (http://www.census.gov/population/international/data/idb/informationGateway.php). For '*health professionals role'* and '*cessation training'* indicators aggregate proportions for WHO regions were calculated based on the raw proportions using '*metaprop*' command[29] with a random effects model on Stata/IC (version 11.0).[30]

RESULTS

Survey and sample characteristics

Table 1 shows the sample characteristics of all surveys included for analyses and countries surveyed by WHO regions. Data from 236 surveys during 2005 to 2011 from four health profession disciplines were analyzed. The number of countries surveyed varied by disciplines; 70(medical), 56(dental and nursing) and 54(pharmacy) and total surveys varied region-wise for all courses; 17(WPRO), 25(SEARO & AFRO), 55(AMRO), 56(EMRO), and 58(EURO) (table 1). A total of 107,527 (68,809, females and 37,886, males) health professional students were surveyed; of whom 51,914 were in medicine while others were in nursing (26,342), dentinstry (14,578) and pharmacy (14,693) courses (table 1). Male-to-female student ratio was highest for nursing (1:4.3) followed by dentistry (1:1.86). Country-wise, discipline-wise and sex-wise sample of students surveyed are shown in web appendix.

Prevalence of current smoking and other tobacco use in the WHO regions

Overall prevalence of '*current cigarette smoking'* and '*current other tobacco use'* among students of four disciplines, by WHO regions and sex are shown in table 2 whereas weighted prevalence for all surveyed countries and country-wise prevalence for all four disciplines are shown in the web appendix. In general, *'current cigarette smoking'* was higher among dental and pharmacy students and in European countries and the countries surveyed in the Americas in all disciplines. *'Current cigarette smoking'* among female students was higher in European countries and countries in the Americas while both 'current cigarette smoking' and *'current other tobacco use'* were lowest in African and south-east Asian countries. Other tobacco use was lower than smoking in the countries of all regions and all disciplines, except for male nursing and male dental students in the eastern Mediterranean countries, and among dental students in Europen countries, other tobacco use was nearly same as cigarette smoking. Other tobacco use was much higher among male students in countries surveyed in all regions and all disciplines except pharmacy students in the western Pacific countries.

Cigarette smoking among medical students was highest in European countries (29.2%), followed by countries in the Americas (20.3%) and lowest in African countries (8.2%). Male medical students had higher cigarette smoking rates than female students in countries from all regions, but this gap was highest in south-east Asian countries (18.4% vs. 0.3%). Among male and female medical students cigarette smoking and other tobacco use were highest in European countries (males 36.0% & 18.9%;

females 25.2% & 9.1% respectively). However, lowest male and female cigarette smoking rates were in African countries (males 12.3% and 6.2%) whereas other tobacco use was lowest in the countries of Western Pacific (males 5.6% and females 1.4%) and Africa (male 2.8% and female 6.2%).

Cigarette smoking in dental students was highest in European countries (overall, 40.2%; male, 47.2%; female, 35.2%) and lowest in African (6.5%), western Pacific (males, 11.0%), and south-east Asian (females, 0.1%) countries. The male-to-female gap was highest in south-east Asian countries (23.4% vs 0.1%). Other tobacco use was highest in the eastern Mediterranean countries for both male (23.4%) and female (8.5%) students, but lowest among male students in the countries of western Pacific (2.5%) and female students in Africa (4.4%).

Among nursing students overall highest cigarette smoking rate was in European countries (28.3%) and highest other tobacco use rate was in the eastern Mediterranean countries (23.8%).
Sex-wise cigarette smoking was highest in European countries (males 34.3% and females 27.5%), and lowest in the countries of Africa (male, 10.2%) and south-east Asia (female, 0.1%). Other tobacco use in male and female students was highest in the countries of eastern Mediterranean (27.2%) and Europe (6.8%) respectively. Among pharmacy students overall smoking rate was 38.4% in European countries and about 12% in the countries surveyed in eastern Mediterranean, south-east Asia and Americas. Among pharmacy students, sex-wise smoking rates were also higher in European countries (55.8% male and 34.2% female) and lowest in the countries of Africa (male, 10.8%) and south-east Asia (female, 1.1%). Other tobacco use was highest in the countries of Europe (male, 28.9%) and Americas (female, 10.3%) whereas the lowest in the Western Pacific (males, 2.0%) and African (female, 0.6%).

Perceptions about health professionals' roles and their cessation training

Tables 3 and 4 present '*health professionals' role'* and '*cessation training'* indicators for the WHO regions by sex and web appendix presents data for overall pooled average for all surveyed countries, and each participating country for all four disciplines. About 70-90% of all students in health profession recognize that they are role models for their patients and the public, except for medical and pharmacy students in the countries from Europe (65.9% and 65.1%, respectively); dental (14.4%) and pharmacy (51.5%) students in the Western Pacific and pharmacy students in African countries (67.3%). About 78-97% of all students in countries of all regions thought that they have a role in giving advice or information about smoking cessation to their patients (table 3). In the countries surveyed in all the

regions, only about 9.2-36.9% of students reported that they had received any formal training in smoking cessation approaches. However, a significantly lower (<5%) proportion of female nursing students and 90% of dental students in the Eastern Mediterranean had received cessation training. More than 80% of all students of surveyed countries in all regions responded that the students in health profession should receive specific training on cessation techniques. All four indicators about the health professionals' role and cessation training in four disciplines were significantly different between the six WHO regions except cessation training among medical, nursing and pharmacy courses (table 4).

DISCUSSION

Tobacco use still a major risk factor for non-communicable diseases[2,3] but cessation training for health professionals remains inadequate, particularly in developing countries.[31,32] The aggregate tobacco use rates among students in health profession varied by regions, disciplines and sex; cigarette smoking was higher among male students in dentistry and pharmacy particularly in the countries surveyed in Europe and Americas. The results from all GHPSS surveys throw light on two main shortcomings in health professionals' role in tobacco control. Firstly, tobacco use among health professional students themselves and second, a lack of formal cessation training in all disciplines, both of which affect their expected role in motivating their patients to quit smoking. On the contrary, students' perceptions towards cessation training were fairly consistent across and favorable towards their role in cessation and receptive towards formal cessation training across surveyed countries in all the regions, four disciplines and both sexes.

Smoking prevalence of up to 40% in the countries surveyed in Europe and Americas (15-30%) from GHPSS concur with reported smoking rates of 30% and higher among medical and dental students in central and eastern European countries. Most countries surveyed had smoking rates of over 20% reaching up to 60%. However, the studies were limited by heterogeneity in 'smoker' definitions and varying (one week to one month) periods of recall.[9,10] Such high rates correspond with the higher prevalence among men and women in the general population[3] suggesting the influence of socio-cultural factors.[33] Lower smoking rates in Africa, south-east Asia and western Pacific also correspond with lower adult smoking rates[3] particularly women since it is culturally inappropriate for women to smoke.[34] Other tobacco use rates of up to 27% among male students in surveyed countries in eastern Mediterranean and Europe are a result of *'Shisha'* (water pipe) smoking prevalent in the region.[35]

Smoking cessation should be prioritized for reducing the burden of smoking-related ill health since quitting at any age confers health benefits.[36] Nevertheless, prevalence of former smokers varies from 20-70%, generally lower in developing countries because physicians seldom advice about quitting[20,31] despite the evidence that even a brief physician advice could have a small effect on smoking cessation.[37] Reasons for smoking patients not receiving any advice about quitting may not only arise from insufficient training, shortage of time and funding for physicians, but also due to lack of policies for smoking cessation, poor infrastructure within the health care system.[20,31]. Nurses and pharmacists too play an important role through providing cessation by counselling the smoking patients.[38,39] However, nursing curricula mainly cover about health hazards of smoking, but do not equip the students with counselling skills, behavioral or pharmacotherapy for smoking cessation.[40,41] In most GHPSS, research coordinators verified with school administrators and were confirmed that there was no formal training given on tobacco cessation at any time during the course[21].

Tobacco control should begin among health professionals themselves by being exemplars. Health professions students in GHPSS generally agree on them being 'role models' and their role in advising patients.[42] Health professions student trainers should also advocate on 'no tobacco' to their students by imparting education on health effects of smoking and motivating smoking students to quit their habit through counseling.[32] More emphasis on health professions students staying smoke-free in European and American countries where smoking rates were higher. Exposure to secondhand smoke was high in educational institutions;[22,24,43] hence smoke free policies would create a positive message to the students, teachers, patient and doctors.[44] Positive strides should be taken particularly in developing countries towards integrating tobacco cessation education into the existing curricula even if a separate module for tobacco control cannot be introduced.[32] A positive, conducive environment by creating smoke-free health professional schools, hospitals, providing cessation training, would make them exemplars by remaining non-smokers.[20]

Our estimates expose wide gaps globally in health professional students' preparation for their future role in smoking cessation. Most evaluation studies on various modalities of tobacco cessation training to improve students' skill to provide smoking cessation are from high income countries,[13-15,45,46] where cessation training is implemented in the curriculum.[31] However, very little is known about effectiveness of cessation training materials and teaching methodologies in different socioeconomic and cultural settings of LMICs of Africa and South East Asia.[14,47,48] More research is needed to study the current

curricula on tobacco cessation training in various courses,[16,49-51]students' current practices and attitudes [12,17,52-54] and medical educators' receptivity towards tobacco cessation.[55] More recently different modalities of training medical students on smoking cessation training have been studied; yet, none provide any conclusive evdidence on their effectiveness.[56-58] Lack of time, long term retention of conselling skills and lack of practice are reported as main barriers to implementation of tobacco cessation training.[55,59]. More research needs to be done using to establish the impact of tobacco curriculum on future practice of health professionals.

Our study limitations are reporting bias of tobacco use and perceptions due to questionnaire-based, self-reporting design of GHPSS and non-extrapolation of our results to the practicing health professionals as described in previous papers.[22,24,25,43] In addition, regional estimates may not be representative of some WHO region since very few countries were included in Africa and Western Pacific. Further, in some countries, survey response rates were less < 80% (table 1) which may not reflect the true estimates. Nevertheless, we presented regional estimates alongside country-wise updated results (web appendix) to highlight the regional situation for policy makers.

Conclusion

Tobacco use among male medical and dental students are unacceptably high in Europe, United States and Eastern Mediterranean regions. Tobacco control efforts should begin with health professional students themselves abstaining from smoking to be exemplars to their patients and the public. Positive perceptions towards cessation training should be complimented with integrating cessation training into their curricula. A collective effort by tobacco control experts and medical educators is needed to create a conducive and positive 'smoke free' school environment for training student in cessation techniques and further research should be done for better evidence base for effectiveness of implementing tobacco-related curricula.

Abbreviations

GHPSS: Global Health Professions Student Survey
WHO: World Health Organization
FCTC: Framework Convention On Tobacco Control
LMIC: Low-and-middle-income countries
GTSS: Global Tobacco Surveillance System
CDC: Centre for Disease Control
AFRO: African Regional Office

EMRO: Eastern Mediterranean Regional Office
EURO: Europe Regional Office
AMRO: America Regional Office
SEARO: South-East Asia Regional Office
WPRO: Western Pacific Regional Office

Contributors

CTS and **NR** designed the study, with inputs from two other co-authors. **IA** and **MR** managed data extraction**, CTS** analysed the data and **IA** and **MR** interpreted the findings, with input from all other authors. **CTS** and **NR** co-drafted the manuscript, with critical feedback from **IA** and **MR** authors. All authors approved the final manuscript

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TABLES

Table 1 Characteristics of participating countries, health professions students by male and female and World Health Organisation (WHO) regions

	Number countries	Time period of surveys	Total	Female	Male	Range of response rates
Medicine						
AFRO	9	2005-2009	2686	1731	924	51.3, 96.8
EMRO	16	2005-2011	11783	6702	5051	50.8, 100
EURO	20	2006-2011	13776	9044	4686	41.3, 100
AMRO	15	2005-2011	12662	7112	5458	64, 100
SEARO	7	2006-2011	8732	3881	4807	60.9, 92.2
WPRO	3	2005-2007	2275	1022	1233	53.3, 88.9
Total	**70**		**51914**	**29492**	**22159**	
Dentistry						
AFRO	3	2007-2009	285	170	115	74, 76.7
EMRO	13	2006-2011	2655	1560	980	56.2, 87.6
EURO	15	2006-2011	2606	1576	1019	62.7, 100
AMRO	13	2007-2011	5999	3997	1963	66.7, 97.5
SEARO	7	2007-2011	2759	1808	810	83.9, 89.5
WPRO	5	2005-2009	274	173	101	85.5, 100
Total	**56**		**14578**	**9284**	**4988**	
Nursing						
AFRO	7	2005-2009	1650	1131	508	68.4, 96.3
EMRO	14	2006-2010	6660	4508	2086	43, 100
EURO	11	2005-2011	6517	5496	1002	42, 90.2
AMRO	16	2006-2011	5870	5018	807	49.5, 100
SEARO	5	2006-2011	4326	3969	330	86.7, 93
WPRO	3	2005-2007	1319	1121	177	79.3, 100
Total	**56**		**26342**	**21243**	**4910**	
Pharmacy						
AFRO	6	2006-2009	874	500	373	59, 91.3
EMRO	13	2006-2011	3861	2522	1306	38.3, 93.1
EURO	12	2006-2011	2132	1670	459	72.5, 100
AMRO	11	2006-2011	2569	1859	692	74.3, 97.7
SEARO	6	2008-2011	4237	1481	2744	80.7, 84.8
WPRO	6	2005-2009	1020	758	255	79.7, 100
Total	**54**		**14693**	**8790**	**5829**	

The list of countries in each regions are given below as per WHO regional offices. The number of countries surveyed and year of survey varied for each health profession discipline and WHO regions

AFRO – Algeria, Côte d'Ivoire, Ghana, Kenya, Mozambique, Niger, Senegal, Uganda, Zambia
EMRO- Bahrain, Egypt, Gaza Strip West Bank, Islamic Republic of Iran, Iraq, Jordan, Lebanon, Libyan Arab Jamahiriya, Morocco,Oman, Pakistan, Saudi Arabia, Somalia, Sudan, Syrian Arab Republic,Tunisia, Yemen

EURO- Albania, Armenia, Bosnia and Herzegovina,Bulgaria, Croatia,Czech Republic,Georgia,Greece,Italy,Kyrgyzstan,Latvia,Lithuania, Macedonia , Republic of Moldova Poland, Russian Federation,Serbia,Slovakia,Slovenia,Spain,Turkey,Ukraine,
AMRO-Argentina, Barbados, Plurinational State of Bolivia, Brazil, Belize, Chile, Costa Rica,Cuba, Havana, Guatemala, Guyana, Jamaica, Mexico, Panama,Paraguay,Peru, Saint Lucia Suriname, Trinidad and Tobago,Uruguay , Bolivarian Republic of Venezuela
SEARO- Bangladesh, India, Indonesia, Myanmar, Nepal, Sri Lanka, Thailand
WPR- Cambodia, Fiji, Lao PDR, Mongolia, Papua New Guinea, Philippines, South Korea, Viet Nam,

Table 2: Weighted prevalence rates (95% CI) of tobacco use by male and female and WHO regions among medical, dental, nursing and pharmacy students

	Current smoking			Current other tobacco use		
	Total	**Girls**	**Boys**	**Total**	**Girls**	**Boys**
Medicine*				**Medicine**		
AFRO	8.2 (6.3,12.5)	5.0 (3.3,8.6)	12.3 (10.6,19.8)	3.9 (3.0,5.1)	2.8 (1.8,4.4)	6.2 (4.6,8.2)
EMRO	9.9 (8.8, 11.4)	2.9 (2.3,4.0)	20.5 (18.2,23.4)	10.2 (9.1,11.4)	4.8 (4.0,5.8)	18.0 (15.2,20.3)
EURO	29.2 (26.9,32.2)	25.2(22.7,26.8)	36.0 (31.7,40.0)†	12.6 (10.8,16.9)	9.1 (7.1,12.3)	18.9 (15.4,24.1)†
AMRO	20.3 (17.0,23.8)	18.5 (14.7,22.6)	22.7 (18.4,27.4)†	7.8 (5.8,10.6)	4.3 (2.8,6.9)	11.6 (8.4,16.2)†
SEARO	12.8 (9.6,16.8)	0.3 (0.2,0.5)	18.4 (13.7,24.3)	9.6 (6.3,14.6)	5.9 (2.5,13.0)	11.9 (7.9,17.8)†
WPRO	12.8 (10.9,14.9)	3.1 (2.0,5.4)	20.9 (18.6,23.5)	3.8 (2.9,5.1)	1.4 (1.0,2.2)	5.6 (4.3,7.5)
Dentistry*				**Dentistry**		
AFRO	6.5 (8.8, 15.3)	2.6 (2.8,8.6)	12.2 (16.4,29.3)	4.8 (2.7,8.6)	4.4 (1.9,9.6)	6.0 (4.0,9.0)
EMRO	13.0 (10.6,15.8)	5.8 (4.0,8.6)	23.8 (19.1,29.5)	14.8 (12.3,17.6)	8.5 (6.3,11.7)	23.4 (19.0,28.7)
EURO	40.2 (37.4,43.1)	35.2 (31.5,39.3)	47.2 (39.6,55.6)†	13.1 (10.9,17.2)	8.5 (6.2,13.8)	21.0 (17.3,26.6)
AMRO	23.1 (19.8,27.3)	21.9 (18.3,26.5)	26.5 (21.5,33.7)†	9.3 (7.2,12.0)	8.4 (6.1,11.8)	10.7 (6.5,18.9)†
SEARO	9.5 (7.1,13.0)	0.1 (0.0,0.1)	23.4 (17.5,31.5)	9.0 (6.3,12.9)	4.6 (2.7,8.8)	16.8 (12.8,21.8)
WPRO	8.4 (3.5,8.9)	7.1 (3.8,4.6)	11.0 (1.9,6.8)†	5.4 (1.8,8.2)	7.3 (4.5,11.0)	2.5 (0.8,1.3)
Nursing*				**Nursing***		
AFRO	5.2 (4.1,6.7)	1.8 (1.5,4.7)	10.2 (8.4,17.4)	3.1 (2.2,4.5)	2.1 (1.3,3.7)	5.9 (3.7,9.9)
EMRO	12.1 (9.4,11.5)	4.6 (3.8,5.8)	27.7 (21.3,29.1)	23.8 (18.1,22.8)	6.8 (5.6,8.4)	27.2 (20.6,32.0)
EURO	28.3 (24.5,31.6)	27.5 (23.8,31.1)	34.3 (24.2,42.9)†	7.1 (9.3,14.1)	6.8 (8.7,14.0)	10.9 (9.8,23.6)†
AMRO	15.2 (13.4,18.6)	14.3 (12.6,17.8)	20.0 (14.1,27.8)†	6.1 (4.5,9.1)	6.3 (4.7,9.5)	4.8 (1.8,10.8)†
SEARO	3.3 (2.0,5.4)	0.1 (0.1,0.2)	21.8 (13.2,35.1)	4.7 (3.4,6.7)	3.4 (2.1,6.1)	15.2 (9.0,25.1)
WPRO	5.0 (3.7,7.1)	3.2 (2.9,4.6)	15.0 (7.8,31.6)	3.1 (1.6,7.0)	2.2 (1.2,4.1)	15.1 (6.1,33.7)
Pharmacy*				**Pharmacy***		
AFRO	6.0 (4.4,8.6)	2.5 (1.9,5.5)	10.8 (8.2,15.2)	1.6 (1.2,2.1)	0.6 (0.4,1.0)	3.5 (2.8,4.5)
EMRO	12.4 (10.4,14.9)	3.4 (2.5,4.4)	26.3 (22.3,31.4)	12.7 (10.7,15.2)	6.6 (5.1,8.4)	21.6 (18.1,26.1)
EURO	38.4 (33.9,43.0)	34.2 (29.4,39.3)	55.8 (45.6,65.0)	11.7 (9.4,15.6)	7.3 (5.7,11.4)	28.9 (20.7,39.4)
AMRO	12.8 (10.1,16.1)	9.7 (7.1,13.6)	19.0 (14.0,26.1)†	12.1 (9.4,15.7)	10.3 (7.2,14.5)	16.1 (11.0,23.1)†
SEARO	12.9 (10.5,15.7)	1.1 (0.7,1.4)	21.1(17.4,25.7)	9.8 (8.0,11.8)	7.5 (4.7,11.7)	11.3 (8.6,15.8)†
WPRO	19.9 (14.5,25.8)	14.9 (12.1,23.5)	35.5 (24.4,46.8)	3.5 (2.1,5.8)	2.9 (1.5,5.3)	2.0 (0.6,5.6)†

*for these the comparisons between six WHO regions (chi square test) was significant, p<0.05

† for these comparisons between male and female students (chi square test was not significant, p>0.05

Table 3: Health professional students' views about health professional being 'role models' and their role in advising about smoking cessation by WHO regions

WHO regions	Think that health professionals serve as "role models" for their patients and the public			Think that health professionals have a role in giving advice or information about smoking cessation to the patients		
	Total	Male	Female	Total	Male	Female
Medicine*				**Medicine***		
AFRO	70.5 (59.1,81.9)	70.9 (58.9,82.9)	68.4 (55.6,81.2)	94.1 (88.9,99.3)	92.7 (86.2,99.2)	93.0 (86.7,99.4)
EMRO	76.2 (72.3,80.1)	73.8 (69.5,78.0)	77.8 (73.5,82.1)	89.8 (87.0,92.7)	89.3 (86.1,92.5)	90.3 (87.4,93.2)
EURO	65.9 (58.5,73.4)	63.2 (55.5,71.0)	67.5 (59.8,75.3)	84.8 (81.4,88.1)	85.1 (81.9,88.3)	88.1(85.0,91.1)
AMRO	78.6 (72.5,84.7)	78.6 (72.5,84.7)	78.9 (72.6,85.2)	95.1 (92.6,97.6)	94.6 (92.1,97.2)	95.3 (92.7,97.9)
SEARO	86.1 (79.7,92.5)	86.8 (78.8,94.7)	86.5 (81.2,91.8)	94.5 (91.9,97.1)	93.0 (89.6,96.5)	95.6 (93.7,97.5)
WPRO	84.1 (65.4,102.7)	80.9 (58.6,103.2)	90.3 (81.5,99.1)	96.0 (90.1,102.0)	90.6(88.1,93.2)	97.8(96.1,99.6)
Dentistry*				**Dentistry***		
AFRO	73.6 (49.1,98.0)	62.2 (52.8,71.5)	72.6 (53.6,91.7)	89.5 (74.3,104.6)	82.9 (61.3,104.5)	87.1(81.5,92.6)
EMRO	76.4 (70.7,82.0)	74.8 (67.9,81.7)	77.3 (71.2,83.5)	89.5 (86.3,92.7)	89.6 (85.7,93.4)	91.0 (88.1,94.0)
EURO	72.8 (64.8,80.8)	68.5 (59.7,77.4)	75.2 (66.7,83.7)	83.8 (79.7,87.9)	82.4 (77.4,87.4)	83.5 (79.4,87.6)
AMRO	78.8 (71.5,86.2)	79.5 (72.7,86.2)	76.8 (70.2,83.4)	88.2 (82.7,93.7)	88.8 (83.1,94.4)	88.5 (82.7,94.3)
SEARO	90.1 (85.3,94.9)	87.4 (79.6,95.1)	90.2 (84.4,96.0)	93.4 (91.3,95.6)	90.6 (87.2,94.0)	95.4 (94.2,96.6)
WPRO	14.4 (8.6,20.2)	14.7 (2.8,26.6)	14.3 (7.6,21.0)	78.4 (71.6,85.3)	79.4 (65.8,93.0)	78.1 (70.2,86.0)
Nursing*				**Nursing***		
AFRO	72.5 (56.3,88.8)	76.0 (62.2,89.8)	65.9 (58.1,73.8)	97.2 (95.3,99.1)	98.6 (97.2,100.0)	96.7 (94.1,99.3)
EMRO	76.2 (72.3,80.1)	73.8 (69.5,78.0)	77.8 (73.5,82.1)	91.4 (88.7,94.0)	89.8 (86.4,93.2)	92.1 (89.5,94.7)
EURO	71.5 (61.2,81.9)	67.2 (56.8,77.5)	72.3 (60.6,84.1)	82.4 (77.0,87.9)	84.5 (81.0,88.1)	81.3 (75.3,87.3)
AMRO	76.3 (70.1,82.6)	75.6 (67.6,83.5)	76.7 (70.3,83.0)	93.8 (91.6,96.1)	93.6 (90.0,97.3)	93.7 (91.4,96.0)
SEARO	90.0 (83.7,96.3)	87.7 (80.2,95.2)	87.7 (80.6,94.7)	96.0 (93.9,98.1)	92.0 (85.6,98.4)	96.4 (94.3,98.5)
WPRO	72.8 (48.0,97.6)	78.6 (51.5,105.8)	71.4 (44.9,98.0)	92.4 (86.6,98.3)	82.2 (67.7,96.8)	93.1 (87.6,98.6)
Pharmacy*				**Pharmacy***		
AFRO	67.3 (51.8,82.8)	68.0 (52.6,83.4)	63.1 (58.1,68.1)	93.6 (86.2,101.0)	87.2(73.4,101.0)	92.5 (81.5,103.5)
EMRO	75.5 (68.2,82.9)	73.4 (65.3,81.4)	76.3 (68.6,84.0)	89.7 (86.1,93.3)	87.6(82.7,92.6)	91.0 (87.6,94.4)
EURO	65.1 (55.0,75.2)	63.2 (52.5,73.9)	65.2 (54.6,75.9)	81.1 (76.1,86.2)	79.4 (72.3,86.5)	82.7 (77.1,88.3)
AMRO	75.6 (66.2,85.0)	74.3 (62.9,85.6)	71.8 (63.4,80.2)	92.8 (87.5,98.0)	90.7 (84.8, 96.5)	93.6 (88.3, 99.0)
SEARO	87.6 (81.8,93.4)	87.8 (82.5,93.2)	86.9 (79.9,94.0)	90.3 (86.0,94.6)	93.2 (89.4,97.1)	90.1 (84.2,95.9)
WPRO	51.5 (-4.4,107.4)	50.0 (0.3,99.6)	52.1 (-5.6,109.8)	95.6 (92.2,99.1)	89.3 (80.1,98.5)	95.0 (88.6,101.4)

***for these the comparisons between six WHO regions (chi square test) was significant, p<0.05**

Table 4: Health professional students' views about them receiving training on cessation and their opinion that health professionals should receive formal training on cessation by WHO region

WHO regions	Have ever received any formal training in smoking cessation Approaches to use with patients in their school training			Think that health professionals should get specific training on cessation techniques		
	Total	**Male**	**Female**	**Total**	**Male**	**Female**
	Medicine			**Medicine***		
AFRO	13.1 (5.3,20.9)	23.0 (14.9,31.1)	24.0 (8.5,39.5)	96.2 (94.0,98.5)	94.2 (90.3,98.2)	96.7 (94.5,99.9)
EMRO	14.0 (11.5,16.5)	26.7 (21.9,31.4)	23.5 (18.8,28.1)	92.5 (90.7,94.4)	90.3 (87.9,92.8)	95.0 (93.6,96.4)
EURO	13.6 (10.1,17.0)	22.3 (15.5,29.1)	19.5 (13.9,25.1)	83.0 (79.4,86.6)	80.1 (76.0,84.3)	84.6 (80.9,88.3)
AMRO	13.0 (10.8,15.2)	23.0 (18.9,27.1)	19.0 (14.9,23.1)	95.4 (94.3,96.4)	94.1 (92.5,95.7)	96.8 (96.0,97.5)
SEARO	10.1 (7.8,12.4)	25.8 (21.4,30.2)	22.5 (18.1,26.9)	93.5 (91.1,96.0)	90.9 (88.6,93.3)	94.8 (92.9,96.7)
WPRO	9.2 (3.8,14.7)	19.2 (11.6,26.9)	25.1 (17.8,32.3)	89.4 (79.5,99.3)	87.0 (74.1,99.9)	90.2 (84.2,96.2)
	Dentistry*			**Dentistry ***		
AFRO	20.6 (-5.7,46.9)	25.1 (-6.6,56.8)	24.3 (-2.2,50.9)	88.1 (80.0,96.1)	83.9 (77.2,90.6)	82.7 (76.5,89.0)
EMRO	89.5 (86.3,92.7)	89.6 (85.7,93.4)	91.0 (88.1,94.0)	92.9 (90.7,95.1)	91.9 (88.7,95.0)	94.8 (93.1,96.4)
EURO	27.2 (19.7,34.7)	25.5 (18.3,32.7)	24.4 (16.2,32.7)	84.6 (78.9,90.3)	83.3 (76.8,89.9)	85.4 (79.4,91.4)
AMRO	17.6 (12.8,22.4)	21.4 (14.5,28.3)	16.2 (11.7,20.8)	92.7 (90.9,94.6)	91.5 (89.5,93.5)	93.8 (91.9,95.7)
SEARO	24.7 (10.6,38.7)	26.2 (12.2,40.3)	23.6 (6.8,40.3)	88.9 (84.6,93.1)	84.7 (77.4,92.1)	93.3 (91.1,95.5)
WPRO	32.9 (8.2,57.5)	10.9 (-1.8,23.6)	10.4 (5.1,15.8)	95.4 (92.7,98.2)	94.1 (86.2,102)	96.2 (92.5,99.9)
	Nursing†			**Nursing***		
AFRO	27.7 (20.5,34.9)	29.5 (21.8,37.3)	2.5 (1.6,3.4)	98.0 (97.3,98.7)	97.9 (96.5,99.3)	97.7 (96.7,98.7)
EMRO	36.9 (27.8,46.0)	39.8 (28.9,50.7)	2.9 (1.9,3.8)	93.9 (92.1,95.7)	92.5 (89.8,95.2)	95.6 (94.0,97.2)
EURO	34.5 (25.5,43.4)	36.8 (24.7,48.9)	3.2 (2.2,4.2)	83.7 (77.3,90.1)	78.3 (68.2,88.4)	83.2 (76.4,89.9)
AMRO	26.1 (22.7,29.5)	30.1(22.7,37.5)	2.5 (2.1,2.9)	96.3 (95.1,97.5)	96.5 (94.4,98.8)	96.3 (95.1,97.4)
SEARO	29.2 (21.3,37.0)	24.6 (15.5,33.7)	3.0 (2.1,3.9)	92.0 (87.7,96.3)	88.5 (80.0,96.9)	92.4 (88.5,96.4)
WPRO	30.9 (22.1,39.6)	37.2 (30.1,44.3)	2.9 (1.8,4.1)	92.1 (84.3,99.9)	82.4 (75.0,89.8)	92.3 (85.8,98.9)
	Pharmacy			**Pharmacy***		
AFRO	21.1 (6.4,35.8)	21.2 (8.5,34.0)	24.4 (9.4,39.5)	96.7 (95.4,98.1)	95.9 (93.6,98.2)	96.3 (94.7,98.0)
EMRO	19.0 (14.7,23.3)	21.0 (16.1,25.9)	16.6 (11.8,21.4)	94.2 (92.3,96.2)	93.4 (91.1,95.7)	95.9 (94.2,97.6)
EURO	21.2 (15.0,27.4)	24.2 (13.1,35.4)	19.6 (13.8,25.5)	84.6 (78.3,91.0)	82.8 (76.1,89.6)	85.1 (78.9,91.4)
AMRO	16.8 (12.3,21.4)	17.8 (12.1,23.6)	15.4 (10.4,20.3)	95.2 (93.2,97.2)	92.6 (87.6,97.5)	96.9 (95.6,98.3)
SEARO	22.3 (14.9,29.7)	26.0 (18.3,33.6)	20.8 (12.4,29.3)	91.0 (86.5,95.6)	89.4 (84.4,94.4)	91.7 (86.9,96.5)
WPRO	30.9 (16.9,44.8)	23.9 (3.3,44.5)	23.0 (7.8,38.1)	95.6 (92.4,98.8)	93.9 (89.8,98.0)	96.1 (91.8,100.5)

***for these the comparisons between six WHO regions (chi square test) was significant, p<0.05**

† comparison between male and female nursing students in all regions (chi square) was

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STROBE Statement—Checklist of items that should be included in reports of ***cross-sectional studies***

	Item No	Recommendation	Page number
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	2
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	3
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4
Objectives	3	State specific objectives, including any prespecified hypotheses	4-5
Methods			
Study design	4	Present key elements of study design early in the paper	5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	5
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	*6*
Bias	9	Describe any efforts to address potential sources of bias	NA
Study size	10	Explain how the study size was arrived at	NA
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	6
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	6
		(*b*) Describe any methods used to examine subgroups and interactions	6
		(*c*) Explain how missing data were addressed	NA
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	6
		(*e*) Describe any sensitivity analyses	NA
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	6-7
		(b) Give reasons for non-participation at each stage	NA
		(c) Consider use of a flow diagram	NA
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	7

		(b) Indicate number of participants with missing data for each variable of interest	NA
Outcome data	15*	Report numbers of outcome events or summary measures	7-8
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	NA
		(*b*) Report category boundaries when continuous variables were categorized	NA
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	NA
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	NA
Discussion			
Key results	18	Summarise key results with reference to study objectives	9
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	10
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	10
Generalisability	21	Discuss the generalisability (external validity) of the study results	11
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	11

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Prevalence of tobacco use and perceptions of health professions students about cessation training: results from Global Health Professions Student Survey

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Web Appendix countrywise data.xls	

Prevalence of tobacco use and perceptions of health professions students about cessation training: results from Global Health Professions Student Survey

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Running title

Tobacco use among students of health professions

Abstract

Introduction

Health professionals play an important role in providing advice to their patients about tobacco prevention and cessation. Health professionals who use tobacco may be deterred from providing cessation advice and counseling to their patients. We aim to provide estimates on prevalence of tobacco use health professions students and describe their attitudes towards tobacco cessation training.

Methods

Country-wise aggregate data from the Global Health Professional Student Survey on '*current cigarette smoking'* (smoking cigarettes on one or more days during past 30 days), and 'current *use of tobacco products other than cigarettes'* (chewing tobacco, snuff, bidis, cigars, or pipes one or more days during the past 30 days) were analysed. For each World Health Organisation regions, we estimated mean prevalence rates of tobacco use weighted by the population of sampling frame and aggregate proportions for '*health professionals' role'* and '*cessation training'* indicators using '*metaprop*' command on stata 11.

Results

A total of 107,527 students participated in 236 surveys done among four health professions disciplines in spanning 70 countries with a response rates of 40-100%. Overall, smoking prevalence was highest in European countries (20%, medical and 40%, dental students) and Americas (13%, pharmacy to 23%, dental students). Other tobacco use was higher in eastern Mediterranean (10-23%) and European countries (7-13%). In most WHO regions, ≥70% of the students agreed that medical professionals are role models, have a role in advising about smoking cessation to the patients and public. Only ≤33% of all students in most WHO regions (except 80% dental students in eastern Mediterranean) had received formal training on smoking cessation approaches and ≥80% of all students agreed they should receive formal cessation training.

Conclusions

Tobacco control should take place together with medical educators to discourage tobacco use among health professional students and implement integrated smoking cessation training into health professions curricula.

Key words

Tobacco Use, Tobacco Cessation, Medical Education, Surveys, Prevalence, Health Professionals

Strengths and limitations of this study

- An up-to-date comprehensive Global Health Professions Student Survey(GHPSS) report is unavailable.
- Health professions students who are currently using tobacco require cessation advice to quit the habit.
- health professions students are favorable to receive cessation training.
- Tobacco cessation training needs to be implemented mainly in Afro-Asian countries.
- Our regional estimates were non-representative and inconsistent due to limited coverage of countries and small survey samples some WHO regions.

INTRODUCTION

Globally, tobacco use is a major preventable cause of premature mortality and morbidity[1]. Tobacco smoking inclusive of second hand smoke (SHS) is a leading risk factor attributable to 6% of global disability-adjusted life years[2]. An estimated 967 million smokers living in 187 countries is expected to increase with growing population[3] and worsening tobacco epidemic in developing countries[4]. The World Health Organization's(WHO) Framework Convention on Tobacco Control (FCTC) recommends that global tobacco epidemic be monitored through population-based surveys conducted through Global Tobacco Surveillance System(GTSS) among adults, youth, school personnel and students in health professions[5].

Health professionals such as doctors, dentists, nurses, pharmacists, optometrists and so on who can play an important role in cessation and prevention of tobacco use by providing a brief counseling or even a simple advise[6;7] has been underscored in the WHO FCTC. Cessation training for students in health profession may be a potentially very significant contribution in tobacco control efforts[8]. However, health professionals' smoking habit may deter them from providing cessation advise and counseling to their patients because they cannot persuade patients to quit if they were smoking themselves[9;10]. Health professions students have inadequate knowledge about smoking-related diseases and no training on tobacco cessation techniques[11;12].

Training health professionals insmoking cessation could potentially have an impact on professional practice byhelping smoking patients quit either by interviewing or referring them to cessation clinics[13-15]. In many medical schools of Afro-Asian developing countries, tobacco cessation training is not provided at all or given non-systematically[16]. Medical students usually ask smoking history of their patients during hospital clinical rotations but they seldom ask or advise about cessation[17]. Hence, there is a continued debate on introducing tobacco cessation training into health professions curricula[18-20]. Global Health Professions Student Survey(GHPSS)[21] has resulted in separate publications on country-specific estimates for medical,[22] dental[23], nursing[24] and pharmacy[25] disciplines. Yet, there is no comprehensive report on estimates by WHO regions for all four disciplines. Such information about prevalence of tobacco use and the students' attitude towards cessation are important for medical educators and tobacco control policy makers[26;27]. Using aggregated GHPSS data, we aim to provide updated global, regional, country-level estimates on prevalence tobacco use among medical, dental, nursing and pharmacy students and describe their attitudes towards tobacco cessation training.

METHODS

Survey design

The WHO, Centers for Disease Control (CDC), and the Canadian Public Health Association have standardized the study procedures for administering a validated core GHPSS questionnaire[28]. The GHPSS is a school-based, cross-sectional survey administered to third-year students pursuing advanced degrees in medicine, dentistry, nursing and pharmacy. In each country, trained research coordinators ensured that standard survey protocols were implemented. The GHPSS used a two-stage sampling design, based on probability proportional to enrollment size of third-year students in health professions schools in each country. The GHPSS was conducted as a census of schools and students in most locations and disciplines. In each country, the number of participants were different as the number of schools and students varied [29].

Data collection

The GHPSS used validated anonymous, self-administered questionnaire covering demographics, cigarette smoking and use of other tobacco products, exposure to SHS, desire to quit smoking and training received to provide patient counselling on cessation techniques. The collaborators adapted core

questionnaire by adding questions about local forms of tobacco consumed in each country. Where appropriate the English version questionnaire was translated into native language of the country. Native language questionnaires were back-translated to English to check for accuracy and compatibility with the core questionnaire. The survey was conducted in the schools during regular lectures and classroom sessions after a briefing session given by the research coordinators. The responses were recorded on sheets that could be scanned and converted into data at the CDC. All surveys followed standardized procedures for selecting the schools, data analyses and processing.

Patient and Public Involvement

The GHPSS was carried out considering the needs of the public in terms of competencies to help smokers quit their habits. Patients or public were not directly involved or participated in the research. Neverthless, the main results, data sets and core indicators were made available in the public domain.

Ethical considerations

GHPSS protocols were approved by the respective WHO regional offices and CDC after ethical review procedures for global tobacco surveillance systems. Detailed information was verbally provided to all potential participants and informed consent was obtained. Self-administered questionnaires did not ask for any personal identification details.

Statistical analyses

GHPSS has created a standard set of variables from the core questions to facilitate cross-country comparisons. *'Current cigarette smoking'* was defined as smoking cigarettes on one or more days during the past 30 days. *'Current use of tobacco products other than cigarettes'* was defined as using chewing tobacco, snuff, bidis, cigars, or pipes (adapted to suit each country) on one or more days during the past 30 days. GHPSS uses SUDAAN software to calculate prevalence estimates and their 95% confidence intervals (95% CIs). For countries where census was carried out, a finite population correction was applied to adjust for non-response and variance in prevalence estimates. For countries, where sampling was done, a weighting factor was applied to account for the probability of being sampled in a complex survey design and non-response.

We obtained country-wise aggregate data of GHPSS for 'prevalence of tobacco use' and 'role model and cessation training from GTSS website (http://nccd.cdc.gov/gtssdata/Default/Default.aspx). For each of

the four health professions disciplines, we calculated aggregate prevalence estimates and '*health professionals role'* and '*cessation training'* indicators for the six WHO regions and overall (global). Aggregate prevalence estimates for the WHO regions and and four health professions disciplines were calculated as means weighted by the population of the sampling frame (national or sub national as appropriate) by age group (20-30 years) from the International Database of the United States Census Bureau (http://www.census.gov/population/international/data/idb/informationGateway.php). For '*health professionals role'* and '*cessation training'* indicators we first obtained raw proportions from the original data sets. Aggregate proportions for the WHO regions and four health professions disciplines were calculated from the raw proportions using '*metaprop*' command[30] with a random effects model on Stata/IC (version 11.0)[31].

RESULTS

Survey and sample characteristics

Table 1 shows sample characteristics of all surveys included for analyses and countries surveyed by WHO regions. Data from 236 surveys implemented during 2005 to 2011 covering four health professions disciplines spanning 70 countries were analyzed. The number of countries surveyed varied by disciplines; 70(medical), 56(dental and nursing) and 54(pharmacy) and total surveys varied region-wise for all courses; 17(WPRO), 25(SEARO & AFRO), 55(AMRO), 56(EMRO), and 58(EURO) (Table 1). A total of 107,527 (68,809, females and 37,886, males) health professions students were surveyed; of whom 51,914 were in medicine while others were in nursing (26,342), dentistry (14,578) and pharmacy (14,693) courses (Table 1). Male-to-female student ratio was highest for nursing (1:4.3) followed by dentistry (1:1.86). Country-wise, discipline-wise and sex-wise sample of students surveyed are shown in the web appendix.

Prevalence of current smoking and other tobacco use in the WHO regions

Overall prevalence of '*current cigarette smoking'* and '*current other tobacco use'* among students of four disciplines, by WHO regions and sex are shown in Table 2 whereas weighted prevalence for all surveyed countries and country-wise prevalence for four disciplines are shown in the web appendix. In general, by disciplines *'current cigarette smoking'* was higher among dental and pharmacy students whereas overall prevalence in all four disciplines was highest in European countries followed by countries surveyed in the Americas. *'Current cigarette smoking'* among female students was higher in European countries and countries in the Americas while both 'current cigarette smoking' and *'current other tobacco use'* were

lowest in African and south East Asian countries. Other tobacco use was lower than smoking in the countries of all regions and all disciplines, except for male nursing and male dental students in the eastern Mediterranean countries, and dental students in European countries where other tobacco use was nearly same as cigarette smoking. Other tobacco use was much higher among male students in countries surveyed in all regions and all disciplines except pharmacy students in the Western Pacific countries.

Cigarette smoking among medical students was highest in European countries (29.2%), followed by countries in the Americas (20.3%) and lowest in African countries (8.2%). Male medical students had higher cigarette smoking rates than female students in countries from all regions, but the gap was highest in south East Asian countries (18.4% vs. 0.3%). Among male and female medical students cigarette smoking and other tobacco use were highest in European countries (males 36.0% & 18.9%; females 25.2% & 9.1% respectively). However, lowest male and female cigarette smoking rates were in African countries (males 12.3% and female 5.0%) whereas other tobacco use was lowest in the countries of Western Pacific (males 5.6% and females 1.4%) and Africa (male 6.2% and female 2.8%).

Cigarette smoking in dental students was highest in European countries (overall, 40.2%; male, 47.2%; female, 35.2%) and lowest in African (6.5%), western Pacific (males, 11.0%), and south-east Asian (females, 0.1%) countries. The male-to-female gap was highest in south East Asian countries (23.4% vs 0.1%). Other tobacco use was highest in the eastern Mediterranean countries for both male (23.4%) and female (8.5%) students, but lowest among male students in the countries of Western Pacific (2.5%) and female students in Africa (4.4%).

Among nursing students overall highest cigarette smoking rate was in European countries (28.3%) and highest other tobacco use rate was in the eastern Mediterranean countries (23.8%). Sex-wise, cigarette smoking rate was highest in European countries (males 34.3% and females 27.5%), and lowest in the countries of Africa (male, 10.2%) and south-east Asia (female, 0.1%). Other tobacco use in male and female nursing students was highest in the countries of eastern Mediterranean (27.2%) and Europe (6.8%) respectively.

Among pharmacy students, overall smoking rate was 38.4% in European countries and about 12% in the countries surveyed in eastern Mediterranean, south-east Asia and Americas. Among pharmacy students,

sex-wise smoking rates were also higher in European countries (55.8% male and 34.2% female) and lowest in the countries of Africa (male, 10.8%) and south-east Asia (female, 1.1%). Other tobacco use was highest in the countries of Europe (male, 28.9%) and Americas (female, 10.3%) whereas the lowest in the Western Pacific (males, 2.0%) and African (female, 0.6%).

Perceptions about health professionals' roles and their cessation training

Tables 3 and 4 present '*health professionals role'* and '*cessation training'* indicators for the WHO regions by sex and web appendix presents data for overall pooled average for all surveyed countries, and each participating country for all four disciplines. About 70-90% of all students in health profession recognize that they are role models for their patients and the public, except for medical and pharmacy students in the European countries (65.9% and 65.1%, respectively); dental (14.4%) and pharmacy (51.5%) students in the Western Pacific and pharmacy students in African countries (67.3%). About 78-97% of all students in countries of all regions thought that they have a role in giving advice or information about smoking cessation to their patients (Table 3). In the countries surveyed in all the regions, only about 9.2-36.9% of students reported that they had received any formal training in smoking cessation approaches. However, 90% of dental students in the Eastern Mediterranean had received cessation training. More than 80% of all students of surveyed countries in all regions responded that health professions students should receive specific training on cessation techniques. All four indicators about the health professionals' role and cessation training in four disciplines were significantly different between the six WHO regions except cessation training among medical, nursing and pharmacy courses (Table 4).

DISCUSSION

Tobacco use still a major risk factor for non-communicable diseases[2;3] but cessation training for health professionals remains inadequate, particularly in developing countries[32;33]. The aggregate tobacco use rates among health professions students varied by regions, disciplines and sex; cigarette smoking was higher among male students in dentistry and pharmacy particularly in the countries surveyed in Europe and Americas. The results from all GHPSS surveys throw light on two main shortcomings in health professionals' role in tobacco control. Firstly, tobacco use among health professional students themselves and secondly, a lack of formal cessation training in all disciplines, both of which affect their expected role in motivating their patients to quit smoking. On the contrary, students' perceptions towards cessation training were fairly consistent across the four disciplines and favorable towards their

role in cessation and receptive towards formal cessation training across surveyed countries in all the regions and both sexes.

Smoking prevalence of up to 40% in the countries surveyed in Europe and Americas (15-30%) from GHPSS concur with reported smoking rates of 30% and higher among medical and dental students in central and eastern European countries. Most countries surveyed had smoking rates of over 20% reaching up to 60%. However, the studies were limited by heterogeneity in 'smoker' definitions and varying (one week to one month) periods of recall[9;10]. Such high rates correspond with the higher prevalence among men and women in the general population[3] suggesting the influence of socio-cultural factors[34]. Lower smoking rates in Africa, south-east Asia and western Pacific also correspond with lower adult smoking rates[3] particularly women since it is culturally inappropriate for women to smoke[35]. Other tobacco use rates of up to 27% among male students in surveyed countries in eastern Mediterranean and Europe are a result of *'Shisha'* (water pipe) smoking prevalent in the region[36].

Smoking cessation should be prioritized for reducing the burden of smoking-related illhealth since quitting at any age confers health benefits[37]. Nevertheless, prevalence of former smokers varies from 20-70%, generally lower in developing countries because physicians seldom advice about quitting[20;32] despite the evidence that even a brief physician advice could have a small effect on smoking cessation[38]. Reasons for smoking patients not receiving any advice about quitting may not only arise from insufficient training, shortage of time and funding for physicians, but also due to lack of policies for smoking cessation, poor infrastructure within the health care system[20;32]. Nurses and pharmacists too play an important role through providing cessation by counselling the smoking patients[39;40]. However, nursing curricula mainly cover about health hazards of smoking, but do not equip the students with counselling skills, behavioral or pharmacotherapy for smoking cessation[41;42]. In most GHPSS, research coordinators verified with school administrators and were reconfirmed that there was no formal training given on tobacco cessation at any time during the course[21].

Tobacco control should begin among health professionals themselves by being exemplars. Health professions students in GHPSS generally agree on them being 'role models' and their role in advising patients[43]. Health professions student trainers should also advocate on 'no tobacco' to their students by imparting education on health effects of smoking and motivating smoking students to quit their habit through counseling[33]. More emphasis on health professions students staying 'smoke-free' in European

and American countries where smoking rates were higher. Exposure to secondhand smoke was high in educational institutions[22;24;44]; hence smoke free policies would create a positive message to the students, teachers, patient and doctors[45]. Positive strides should be taken particularly in developing countries towards integrating tobacco cessation education into the existing curricula even if a separate module for tobacco control cannot be introduced[33]. A positive, conducive environment by creating 'smoke-free' health professional schools, hospitals, providing cessation training, would make them exemplars by remaining non-smokers[20].

Our estimates expose wide gaps globally in health professional students' preparation for their future role in smoking cessation. Most evaluation studies on various modalities of tobacco cessation training to improve students' skill to provide smoking cessation are from high income countries,[13-15;46;47] where cessation training is implemented in the curriculum[32]. However, very little is known about effectiveness of cessation training materials and teaching methodologies in different socioeconomic and cultural settings of LMICs of Africa and South East Asia[14;48;49]. More research is needed to study the current curricula on tobacco cessation training in various courses[16;50-52],students' current practices and attitudes [12;17;53-55] and medical educators' receptivity towards tobacco cessation[56]. More recently different modalities of training medical students on smoking cessation training have been studied; yet, none provide any conclusive evidence on their effectiveness[57-59]. Lack of time, poor long term retention of conselling skills and lack of practice are reported as main barriers to implementation of tobacco cessation training[56;60]. More research is needed to study the impact of tobacco curriculum on future practice of health professionals Research has shown that there are gaps in optometrists' training who also have a role in providing cessation advice to their patients[61;62]. Furture GHPPS should consider to include optometry students as well.

Our study limitations are reporting bias of tobacco use and perceptions due to questionnaire-based, self-reporting design of GHPSS and non-extrapolation of our results to the practicing health professionals as described in previous papers[22;24;25;44]. In addition, regional estimates may not be representative of some WHO region since very few countries were included in Africa and Western Pacific. In Western Pacific region, nursing and dental school surveys covered very few survey samples leading to inconsistent regional estimates from the meta-analyses. Further, in some countries, survey response rates were less < 80% (table 1) which may not reflect the true estimates. Nevertheless, we

presented regional estimates alongside country-wise updated results (web appendix) to highlight the regional situation for policy makers.

Conclusion

Tobacco use among male medical and dental students are unacceptably high in Europe, United States and Eastern Mediterranean regions. Tobacco control efforts should begin with health professional students themselves abstaining from smoking to be exemplars to their patients and the public. Positive perceptions towards cessation training should be complimented with integrating cessation training into their curricula. A collective effort by tobacco control experts and medical educators is needed to create a conducive and positive 'smoke free' school environment for training student in cessation techniques and further research should be done for better evidence base for effectiveness of implementing tobacco-related curricula.

Abbreviations

GHPSS: Global Health Professions Student Survey
WHO: World Health Organization
FCTC: Framework Convention On Tobacco Control
LMIC: Low-and-middle-income countries
GTSS: Global Tobacco Surveillance System
CDC: Centre for Disease Control
AFRO: African Regional Office
EMRO: Eastern Mediterranean Regional Office
EURO: Europe Regional Office
AMRO: America Regional Office
SEARO: South-East Asia Regional Office
WPRO: Western Pacific Regional Office

Contributors

CTS and **NR** designed the study, with inputs from two other co-authors. **IA** and **MR** managed data extraction**, CTS** analysed the data and **IA** and **MR** interpreted the findings, with input from all other authors. **CTS** and **NR** co-drafted the manuscript, with critical feedback from **IA** and **MR** authors. All authors approved the final manuscript

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TABLES

Table 1 Characteristics of participating countries, health professions students by male and female and World Health Organisation (WHO) regions

	Number countries	Time period of surveys	Total	Female	Male	Range of response rates
Medicine						
AFRO	9	2005-2009	2686	1731	924	51.3, 96.8
EMRO	16	2005-2011	11783	6702	5051	50.8, 100
EURO	20	2006-2011	13776	9044	4686	41.3, 100
AMRO	15	2005-2011	12662	7112	5458	64, 100
SEARO	7	2006-2011	8732	3881	4807	60.9, 92.2
WPRO	3	2005-2007	2275	1022	1233	53.3, 88.9
Total	**70**		**51914**	**29492**	**22159**	
Dentistry						
AFRO	3	2007-2009	285	170	115	74, 76.7
EMRO	13	2006-2011	2655	1560	980	56.2, 87.6
EURO	15	2006-2011	2606	1576	1019	62.7, 100
AMRO	13	2007-2011	5999	3997	1963	66.7, 97.5
SEARO	7	2007-2011	2759	1808	810	83.9, 89.5
WPRO	5	2005-2009	274	173	101	85.5, 100
Total	**56**		**14578**	**9284**	**4988**	
Nursing						
AFRO	7	2005-2009	1650	1131	508	68.4, 96.3
EMRO	14	2006-2010	6660	4508	2086	43, 100
EURO	11	2005-2011	6517	5496	1002	42, 90.2
AMRO	16	2006-2011	5870	5018	807	49.5, 100
SEARO	5	2006-2011	4326	3969	330	86.7, 93
WPRO	3	2005-2007	1319	1121	177	79.3, 100
Total	**56**		**26342**	**21243**	**4910**	
Pharmacy						
AFRO	6	2006-2009	874	500	373	59, 91.3
EMRO	13	2006-2011	3861	2522	1306	38.3, 93.1
EURO	12	2006-2011	2132	1670	459	72.5, 100
AMRO	11	2006-2011	2569	1859	692	74.3, 97.7
SEARO	6	2008-2011	4237	1481	2744	80.7, 84.8
WPRO	6	2005-2009	1020	758	255	79.7, 100
Total	**54**		**14693**	**8790**	**5829**	

The list of countries in each regions are given below as per WHO regional offices. The number of countries surveyed and year of survey varied for each health profession discipline and WHO regions

AFRO – Algeria, Côte d'Ivoire, Ghana, Kenya, Mozambique, Niger, Senegal, Uganda, Zambia

EMRO- Bahrain, Egypt, Gaza Strip West Bank, Islamic Republic of Iran, Iraq, Jordan, Lebanon, Libyan Arab Jamahiriya, Morocco,Oman, Pakistan, Saudi Arabia, Somalia, Sudan, Syrian Arab Republic,Tunisia, Yemen
EURO- Albania, Armenia, Bosnia and Herzegovina,Bulgaria, Croatia,Czech Republic,Georgia,Greece,Italy,Kyrgyzstan,Latvia,Lithuania, Macedonia , Republic of Moldova Poland, Russian Federation,Serbia,Slovakia,Slovenia,Spain,Turkey,Ukraine,
AMRO-Argentina, Barbados, Plurinational State of Bolivia, Brazil, Belize, Chile, Costa Rica,Cuba, Havana, Guatemala, Guyana, Jamaica, Mexico, Panama,Paraguay,Peru, Saint Lucia Suriname, Trinidad and Tobago,Uruguay , Bolivarian Republic of Venezuela
SEARO- Bangladesh, India, Indonesia, Myanmar, Nepal, Sri Lanka, Thailand**WPR-** Cambodia, Fiji, Lao PDR, Mongolia, Papua New Guinea, Philippines, South Korea, Viet Nam,

Table 2: Weighted prevalence rates (95% CI) of tobacco use by male and female and WHO regions among medical, dental, nursing and pharmacy students

	Current smoking			Current other tobacco use		
	Total	**Girls**	**Boys**	**Total**	**Girls**	**Boys**
	Medicine*			**Medicine**		
AFRO	8.2 (6.3,12.5)	5.0 (3.3,8.6)	12.3 (10.6,19.8)	3.9 (3.0,5.1)	2.8 (1.8,4.4)	6.2 (4.6,8.2)
EMRO	9.9 (8.8, 11.4)	2.9 (2.3,4.0)	20.5 (18.2,23.4)	10.2 (9.1,11.4)	4.8 (4.0,5.8)	18.0 (15.2,20.3)
EURO	29.2 (26.9,32.2)	25.2(22.7,26.8)	36.0 (31.7,40.0)†	12.6 (10.8,16.9)	9.1 (7.1,12.3)	18.9 (15.4,24.1)
AMRO	20.3 (17.0,23.8)	18.5 (14.7,22.6)	22.7 (18.4,27.4)†	7.8 (5.8,10.6)	4.3 (2.8,6.9)	11.6 (8.4,16.2)†
SEARO	12.8 (9.6,16.8)	0.3 (0.2,0.5)	18.4 (13.7,24.3)	9.6 (6.3,14.6)	5.9 (2.5,13.0)	11.9 (7.9,17.8)†
WPRO	12.8 (10.9,14.9)	3.1 (2.0,5.4)	20.9 (18.6,23.5)	3.8 (2.9,5.1)	1.4 (1.0,2.2)	5.6 (4.3,7.5)
	Dentistry*			**Dentistry**		
AFRO	6.5 (8.8, 15.3)	2.6 (2.8,8.6)	12.2 (16.4,29.3)	4.8 (2.7,8.6)	4.4 (1.9,9.6)	6.0 (4.0,9.0)
EMRO	13.0 (10.6,15.8)	5.8 (4.0,8.6)	23.8 (19.1,29.5)	14.8 (12.3,17.6)	8.5 (6.3,11.7)	23.4 (19.0,28.7)
EURO	40.2 (37.4,43.1)	35.2 (31.5,39.3)	47.2 (39.6,55.6)†	13.1 (10.9,17.2)	8.5 (6.2,13.8)	21.0 (17.3,26.6)
AMRO	23.1 (19.8,27.3)	21.9 (18.3,26.5)	26.5 (21.5,33.7)†	9.3 (7.2,12.0)	8.4 (6.1,11.8)	10.7 (6.5,18.9)†
SEARO	9.5 (7.1,13.0)	0.1 (0.0,0.1)	23.4 (17.5,31.5)	9.0 (6.3,12.9)	4.6 (2.7,8.8)	16.8 (12.8,21.8)
WPRO	8.4 (3.5,8.9)	7.1 (3.8,4.6)	11.0 (1.9,6.8)†	5.4 (1.8,8.2)	7.3 (4.5,11.0)	2.5 (0.8,1.3)
	Nursing*			**Nursing***		
AFRO	5.2 (4.1,6.7)	1.8 (1.5,4.7)	10.2 (8.4,17.4)	3.1 (2.2,4.5)	2.1 (1.3,3.7)	5.9 (3.7,9.9)
EMRO	12.1 (9.4,11.5)	4.6 (3.8,5.8)	27.7 (21.3,29.1)	23.8 (18.1,22.8)	6.8 (5.6,8.4)	27.2 (20.6,32.0)
EURO	28.3 (24.5,31.6)	27.5 (23.8,31.1)	34.3 (24.2,42.9)†	7.1 (9.3,14.1)	6.8 (8.7,14.0)	10.9 (9.8,23.6)†
AMRO	15.2 (13.4,18.6)	14.3 (12.6,17.8)	20.0 (14.1,27.8)†	6.1 (4.5,9.1)	6.3 (4.7,9.5)	4.8 (1.8,10.8)†
SEARO	3.3 (2.0,5.4)	0.1 (0.1,0.2)	21.8 (13.2,35.1)	4.7 (3.4,6.7)	3.4 (2.1,6.1)	15.2 (9.0,25.1)
WPRO	5.0 (3.7,7.1)	3.2 (2.9,4.6)	15.0 (7.8,31.6)	3.1 (1.6,7.0)	2.2 (1.2,4.1)	15.1 (6.1,33.7)
	Pharmacy*			**Pharmacy***		
AFRO	6.0 (4.4,8.6)	2.5 (1.9,5.5)	10.8 (8.2,15.2)	1.6 (1.2,2.1)	0.6 (0.4,1.0)	3.5 (2.8,4.5)
EMRO	12.4 (10.4,14.9)	3.4 (2.5,4.4)	26.3 (22.3,31.4)	12.7 (10.7,15.2)	6.6 (5.1,8.4)	21.6 (18.1,26.1)
EURO	38.4 (33.9,43.0)	34.2 (29.4,39.3)	55.8 (45.6,65.0)	11.7 (9.4,15.6)	7.3 (5.7,11.4)	28.9 (20.7,39.4)
AMRO	12.8 (10.1,16.1)	9.7 (7.1,13.6)	19.0 (14.0,26.1)†	12.1 (9.4,15.7)	10.3 (7.2,14.5)	16.1 (11.0,23.1)†
SEARO	12.9 (10.5,15.7)	1.1 (0.7,1.4)	21.1(17.4,25.7)	9.8 (8.0,11.8)	7.5 (4.7,11.7)	11.3 (8.6,15.8)†
WPRO	19.9 (14.5,25.8)	14.9 (12.1,23.5)	35.5 (24.4,46.8)	3.5 (2.1,5.8)	2.9 (1.5,5.3)	2.0 (0.6,5.6)†

*for these the comparisons between six WHO regions (chi square test) was significant, p<0.05

† for these comparisons between male and female students (chi square test was not significant, p>0.05

Table 3: Health professional students' views about health professional being 'role models' and their role in advising about smoking cessation by WHO regions

WHO regions	Think that health professionals serve as "role models" for their patients and the public			Think that health professionals have a role in giving advice or information about smoking cessation to the patients		
	Total	Male	Female	Total	Male	Female
Medicine*				**Medicine***		
AFRO	70.5 (59.1,81.9)	70.9 (58.9,82.9)	68.4 (55.6,81.2)	94.1 (88.9,99.3)	92.7 (86.2,99.2)	93.0 (86.7,99.4)
EMRO	76.2 (72.3,80.1)	73.8 (69.5,78.0)	77.8 (73.5,82.1)	89.8 (87.0,92.7)	89.3 (86.1,92.5)	90.3 (87.4,93.2)
EURO	65.9 (58.5,73.4)	63.2 (55.5,71.0)	67.5 (59.8,75.3)	84.8 (81.4,88.1)	85.1 (81.9,88.3)	88.1(85.0,91.1)
AMRO	78.6 (72.5,84.7)	78.6 (72.5,84.7)	78.9 (72.6,85.2)	95.1 (92.6,97.6)	94.6 (92.1,97.2)	95.3 (92.7,97.9)
SEARO	86.1 (79.7,92.5)	86.8 (78.8,94.7)	86.5 (81.2,91.8)	94.5 (91.9,97.1)	93.0 (89.6,96.5)	95.6 (93.7,97.5)
WPRO	84.1 (65.4,102.7)	80.9 (58.6,103.2)	90.3 (81.5,99.1)	96.0 (90.1,102.0)	90.6(88.1,93.2)	97.8(96.1,99.6)
Dentistry*				**Dentistry***		
AFRO	73.6 (49.1,98.0)	62.2 (52.8,71.5)	72.6 (53.6,91.7)	89.5 (74.3,104.6)	82.9 (61.3,104.5)	87.1(81.5,92.7)
EMRO	76.4 (70.7,82.0)	74.8 (67.9,81.7)	77.3 (71.2,83.5)	89.5 (86.3,92.7)	89.6 (85.7,93.4)	91.0 (88.1,93.9)
EURO	72.8 (64.8,80.8)	68.5 (59.7,77.4)	75.2 (66.7,83.7)	83.8 (79.7,87.9)	82.4 (77.4,87.4)	83.5 (79.4,87.6)
AMRO	78.8 (71.5,86.2)	79.5 (72.7,86.2)	76.8 (70.2,83.4)	88.2 (82.7,93.7)	88.8 (83.1,94.4)	88.5 (82.7,94.3)
SEARO	90.1 (85.3,94.9)	87.4 (79.6,95.1)	90.2 (84.4,96.0)	93.4 (91.3,95.6)	90.6 (87.2,94.0)	95.4 (94.2,96.6)
WPRO	14.4 (8.6,20.2)	14.7 (2.8,26.6)	14.3 (7.6,21.0)	78.4 (71.6,85.3)	79.4 (65.8,93.0)	78.1 (70.2,86.0)
Nursing*				**Nursing***		
AFRO	72.5 (56.3,88.8)	76.0 (62.2,89.8)	65.9 (58.1,73.8)	97.2 (95.3,99.1)	98.6 (97.2,100)	96.7 (94.1,99.2)
EMRO	76.2 (72.3,80.1)	73.8 (69.5,78.0)	77.8 (73.5,82.1)	91.4 (88.7,94.0)	89.8 (86.4,93.2)	92.1 (89.5,94.6)
EURO	71.5 (61.2,81.9)	67.2 (56.8,77.5)	72.3 (60.6,84.1)	82.4 (77.0,87.9)	84.5 (81.0,88.1)	81.3 (75.3,87.2)
AMRO	76.3 (70.1,82.6)	75.6 (67.6,83.5)	76.7 (70.3,83.0)	93.8 (91.6,96.1)	93.6 (90.0,97.3)	93.7 (91.4,96.1)
SEARO	90.0 (83.7,96.3)	87.7 (80.2,95.2)	87.7 (80.6,94.7)	96.0 (93.9,98.1)	92.0 (85.6,98.4)	96.4 (94.3,98.4)
WPRO	72.8 (48.0,97.6)	78.6 (51.5,105.8)	71.4 (44.9,98.0)	92.4 (86.6,98.3)	82.2 (67.7,96.8)	93.1 (87.6,98.6)
Pharmacy*				**Pharmacy***		
AFRO	67.3 (51.8,82.8)	68.0 (52.6,83.4)	63.1 (58.1,68.1)	93.6 (86.2,101.0)	87.2(73.4,101.0)	92.5 (81.5,103.5)
EMRO	75.5 (68.2,82.9)	73.4 (65.3,81.4)	76.3 (68.6,84.0)	89.7 (86.1,93.3)	87.6(82.7,92.6)	91.0 (87.6,94.4)
EURO	65.1 (55.0,75.2)	63.2 (52.5,73.9)	65.2 (54.6,75.9)	81.1 (76.1,86.2)	79.4 (72.3,86.5)	82.7 (77.1,88.3)
AMRO	75.6 (66.2,85.0)	74.3 (62.9,85.6)	71.8 (63.4,80.2)	92.8 (87.5,98.0)	90.7 (84.8, 96.5)	93.6 (88.3, 99.0)
SEARO	87.6 (81.8,93.4)	87.8 (82.5,93.2)	86.9 (79.9,94.0)	90.3 (86.0,94.6)	93.2 (89.4,97.1)	90.1 (84.2,96.9)
WPRO	51.5 (-4.4,107.4)	50.0 (0.3,99.6)	52.1 (-5.6,109.8)	95.6 (92.2,99.1)	89.3 (80.1,98.5)	95.0 (88.6,101.4)

***for these the comparisons between six WHO regions (chi square test) was significant, p<0.05**

Table 4: Health professional students' views about them receiving training on cessation and their opinion that health professionals should receive formal training on cessation by WHO region

WHO regions	Have ever received any formal training in smoking cessation approaches to use with patients in their school training			Think that health professionals should get specific training on cessation techniques		
	Total	Male	Female	Total	Male	Female
Medicine				**Medicine***		
AFRO	13.1 (5.3,20.9)	23.0 (14.9,31.1)	24.0 (8.5,39.5)	96.2 (94.0,98.5)	94.2 (90.3,98.2)	96.7 (94.5,98.9)
EMRO	14.0 (11.5,16.5)	26.7 (21.9,31.4)	23.5 (18.8,28.1)	92.5 (90.7,94.4)	90.3 (87.9,92.8)	95.0 (93.6,96.4)
EURO	13.6 (10.1,17.0)	22.3 (15.5,29.1)	19.5 (13.9,25.1)	83.0 (79.4,86.6)	80.1 (76.0,84.3)	84.6 (80.9,88.3)
AMRO	13.0 (10.8,15.2)	23.0 (18.9,27.1)	19.0 (14.9,23.1)	95.4 (94.3,96.4)	94.1 (92.5,95.7)	96.8 (96.0,97.5)
SEARO	10.1 (7.8,12.4)	25.8 (21.4,30.2)	22.5 (18.1,26.9)	93.5 (91.1,96.0)	90.9 (88.6,93.3)	94.8 (92.9,96.7)
WPRO	9.2 (3.8,14.7)	19.2 (11.6,26.9)	25.1 (17.8,32.3)	89.4 (79.5,99.3)	87.0 (74.1,99.9)	90.2 (84.2,96.2)
Dentistry*				**Dentistry ***		
AFRO	20.6 (-5.7,46.9)	25.1 (-6.6,56.8)	24.3 (-2.2,50.9)	88.1 (80.0,96.1)	83.9 (77.2,90.6)	82.7 (76.5,89.0)
EMRO	89.5 (86.3,92.7)	89.6 (85.7,93.4)	91.0 (88.1,94.0)	92.9 (90.7,95.1)	91.9 (88.7,95.0)	94.8 (93.1,96.4)
EURO	27.2 (19.7,34.7)	25.5 (18.3,32.7)	24.4 (16.2,32.7)	84.6 (78.9,90.3)	83.3 (76.8,89.9)	85.4 (79.4,91.4)
AMRO	17.6 (12.8,22.4)	21.4 (14.5,28.3)	16.2 (11.7,20.8)	92.7 (90.9,94.6)	91.5 (89.5,93.5)	93.8 (91.9,95.7)
SEARO	24.7 (10.6,38.7)	26.2 (12.2,40.3)	23.6 (6.8,40.3)	88.9 (84.6,93.1)	84.7 (77.4,92.1)	93.3 (91.1,95.5)
WPRO	32.9 (8.2,57.5)	10.9 (-1.8,23.6)	10.4 (5.1,15.8)	95.4 (92.7,98.2)	94.1 (86.2,102)	96.2 (92.5,99.9)
Nursing				**Nursing***		
AFRO	27.7 (20.5,34.9)	29.5 (21.8,37.3)	27.5 (20.0,34.9)	98.0 (97.3,98.7)	97.9 (96.5,99.3)	97.7 (96.7,98.6)
EMRO	36.9 (27.8,46.0)	39.8 (28.9,50.7)	33.7 (24.5,42.8)	93.9 (92.1,95.7)	92.5 (89.8,95.2)	95.6 (94.0,97.2)
EURO	34.5 (25.5,43.4)	36.8 (24.7,48.9)	35.1 (25.6,44.7)	83.7 (77.3,90.1)	78.3 (68.2,88.4)	83.2 (76.4,89.9)
AMRO	26.1 (22.7,29.5)	30.1(22.7,37.5)	24.4 (20.8,27.9)	96.3 (95.1,97.5)	96.5 (94.4,98.8)	96.3 (95.1,97.5)
SEARO	29.2 (21.3,37.0)	24.6 (15.5,33.7)	22.2 (10.7,33.7)	92.0 (87.7,96.3)	88.5 (80.0,96.9)	92.4 (88.5,96.3)
WPRO	30.9 (22.1,39.6)	37.2 (30.1,44.3)	28.4 (17.8,39.0)	92.1 (84.3,99.9)	82.4 (75.0,89.8)	92.3 (85.8,98.8)
Pharmacy				**Pharmacy***		
AFRO	21.1 (6.4,35.8)	21.2 (8.5,34.0)	24.4 (9.4,39.5)	96.7 (95.4,98.1)	95.9 (93.6,98.2)	96.3 (94.7,98.0)
EMRO	19.0 (14.7,23.3)	21.0 (16.1,25.9)	16.6 (11.8,21.4)	94.2 (92.3,96.2)	93.4 (91.1,95.7)	95.9 (94.2,97.6)
EURO	21.2 (15.0,27.4)	24.2 (13.1,35.4)	19.6 (13.8,25.5)	84.6 (78.3,91.0)	82.8 (76.1,89.6)	85.1 (78.9,91.4)
AMRO	16.8 (12.3,21.4)	17.8 (12.1,23.6)	15.4 (10.4,20.3)	95.2 (93.2,97.2)	92.6 (87.6,97.5)	96.9 (95.6,98.3)
SEARO	22.3 (14.9,29.7)	26.0 (18.3,33.6)	20.8 (12.4,29.3)	91.0 (86.5,95.6)	89.4 (84.4,94.4)	91.7 (86.9,96.5)
WPRO	30.9 (16.9,44.8)	23.9 (3.3,44.5)	23.0 (7.8,38.1)	95.6 (92.4,98.8)	93.9 (89.8,98.0)	96.1 (91.8,100.5)

***for these the comparisons between six WHO regions (chi square test) was significant, p<0.05**

† comparison between male and female nursing students in all regions (chi square) was significant

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STROBE Statement—Checklist of items that should be included in reports of ***cross-sectional studies***

	Item No	Recommendation	Page number
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	2
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	3
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4
Objectives	3	State specific objectives, including any prespecified hypotheses	4-5
Methods			
Study design	4	Present key elements of study design early in the paper	5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	5
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	*6*
Bias	9	Describe any efforts to address potential sources of bias	NA
Study size	10	Explain how the study size was arrived at	NA
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	6
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	6
		(*b*) Describe any methods used to examine subgroups and interactions	6
		(*c*) Explain how missing data were addressed	NA
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	6
		(*e*) Describe any sensitivity analyses	NA
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	6-7
		(b) Give reasons for non-participation at each stage	NA
		(c) Consider use of a flow diagram	NA
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	7

		(b) Indicate number of participants with missing data for each variable of interest	NA
Outcome data	15*	Report numbers of outcome events or summary measures	7-8
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	NA
		(*b*) Report category boundaries when continuous variables were categorized	NA
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	NA
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	NA
Discussion			
Key results	18	Summarise key results with reference to study objectives	9
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	10
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	10
Generalisability	21	Discuss the generalisability (external validity) of the study results	11
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	11

BMJ Open

Prevalence of tobacco use and perceptions of student health professionals about cessation training: results from Global Health Professions Student Survey

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Note: The following files were submitted by the author for peer review, but cannot be converted to PDF. You must view these files (e.g. movies) online.

Web Appendix countrywise data.xls

Prevalence of tobacco use and perceptions of student health professionals about cessation training: results from Global Health Professions Student Survey

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Running title

Tobacco use among student health professionals

Abstract

Introduction

Health professionals play an important role in providing advice to their patients about tobacco prevention and cessation. Health professionals who use tobacco may be deterred from providing cessation advice and counseling to their patients. We aimed to provide prevalence estimates of tobacco use among student health professionals and describe their attitudes towards tobacco cessation training.

Methods

Country-wise aggregate data from the Global Health Professions Student Survey (GHPSS) on '*current cigarette smoking'* (smoking cigarettes on one or more days during past 30 days), and '*current use of tobacco products other than cigarettes'* (chewing tobacco, snuff, bidis, cigars, or pipes one or more days during the past 30 days) were analysed. For each World Health Organisation (WHO) regions, we estimated mean prevalence rates of tobacco use weighted by the population of sampling frame and aggregate proportions for '*health professionals' role'* and '*cessation training'* indicators using '*metaprop*' command on stata 11.

Results

A total of 107,527 student health professionals participated in 236 surveys done in four health professions disciplines spanning 70 countries with a response rates ranging from 40% to 100%. Overall, prevalence of smoking was highest in European countries (20%, medical and 40%, dental students) and Americas (13%, pharmacy to 23%, dental students). Other tobacco use was higher in eastern Mediterranean (10-23%) and European countries (7-13%). In most WHO regions, ≥70% of the students agreed that health professionals are role models, and have a role in advising about smoking cessation to their patients and public. Only ≤33% of all student health professionals in most WHO regions (except 80% dental students in Eastern Mediterranean) had received formal training on smoking cessation approaches and ≥80% of all students agreed that they should receive formal cessation training.

Conclusions

Tobacco control should take place together with medical educators to discourage tobacco use among student health professionals and implement an integrated smoking cessation training into health professions curricula.

Key words

Tobacco Use, Tobacco Cessation, Medical Education, Surveys, Prevalence, Student Health Professionals

Strengths and limitations of this study

- We provide an up-to-date comprehensive report of all countries surveyed in Global Health Professions Student Survey(GHPSS).
- Standardised survey protocols and questionnaires of GHPSS enabled cross-country comparison and calculate estimates for WHO regions.
- Our regional estimates were non-representative and inconsistent due to limited coverage of countries and small survey samples in some WHO regions.
- GHPSS surveyed students in medicine, dentistry, nursing and pharmacy only whereas health professions such as optometry, physiotherapy etc. also have a role in tobacco cessation

INTRODUCTION

Globally, tobacco use is a major preventable cause of premature mortality and morbidity[1]. Tobacco smoking inclusive of second hand smoke (SHS) is a leading risk factor attributable to 6% of global disability-adjusted life years[2]. An estimated 967 million smokers are living in 187 countries and this number is expected to increase with growing population[3] and worsening tobacco epidemic in developing countries[4]. The World Health Organization's (WHO) Framework Convention on Tobacco Control (FCTC) recommends that global tobacco epidemic be monitored through population-based surveys conducted through Global Tobacco Surveillance System(GTSS) among adults, youth, school personnel and student health professionals[5].

WHO FCTC underscores the importance of role played by doctors, dentists, nurses, pharmacists, optometrists etc. in cessation and prevention of tobacco use by providing a brief counseling or even a simple advise[6;7]. Cessation training for student health professionals may be a potentially very significant contribution in tobacco control efforts[8]. However, health professionals' smoking habit may deter them from providing cessation advise and counseling to their patients because they cannot persuade patients to quit if they were smoking themselves[9;10]. Student health professionals have inadequate knowledge about smoking-related diseases and receive very little or no training on tobacco cessation techniques[11;12].

Training student health professionals in smoking cessation could potentially have an impact on their future professional practice by helping smoking patients quit either by interviewing, a simple advice or referrals to cessation clinics[13-15]. In many medical schools of Afro-Asian developing countries, tobacco cessation training is not provided at all or given non-systematically[16]. Medical students usually ask smoking history from patients during clinical rotations but they seldom ask or advise about cessation[17]. Hence, there is a continued debate on introducing tobacco cessation training into health professions curricula[18-20]. Global Health Professions Student Survey (GHPSS)[21] has resulted in separate publications on country-specific estimates for medical,[22] dental[23], nursing[24] and pharmacy[25] disciplines. Yet, a comprehensive report is unavailable for all WHO regions and all four disciplines. Such information about prevalence of tobacco use and the student health professionals' attitude towards cessation are important for medical educators and tobacco control policy makers[26;27]. Using aggregated GHPSS data, we aimed to provide updated global, regional, country-level estimates on prevalence of tobacco use

among medical, dental, nursing and pharmacy students and describe their attitudes towards tobacco cessation training.

METHODS

Survey design

The WHO, Centers for Disease Control (CDC), and the Canadian Public Health Association have standardized the study procedures for administering a validated core GHPSS questionnaire[28]. The GHPSS is a school-based, cross-sectional survey administered to third-year students pursuing advanced degrees in medicine, dentistry, nursing and pharmacy. In each country, trained research coordinators ensured that standard survey protocols were implemented. The GHPSS used a two-stage sampling design, based on probability proportional to enrollment size of third-year students in health professions schools in each country. The GHPSS was conducted as a census of schools and students in most locations and disciplines. In each country, the number of participants surveyed was different since the number of schools and students varied [29].

Data collection

The GHPSS used a validated anonymous, self-administered questionnaire covering demographics, cigarette smoking and use of other tobacco products, exposure to SHS, desire to quit smoking and training received to provide patient counselling and on cessation techniques. The collaborators adapted core questionnaire by adding questions about local forms of tobacco consumed in each country. Where appropriate the core questionnaire in English was translated into the native language of the country. Native language questionnaires were back-translated to English to check for accuracy and compatibility with the core questionnaire. The survey was conducted in the schools during regular lectures and classroom sessions after a briefing session given by the research coordinators. The responses were recorded on sheets that could be scanned and converted into data at the CDC. All the surveys followed standardized procedures for selecting the schools, data analyses and processing.

Patient and Public Involvement

The GHPSS was carried out considering the needs of the public in terms of competencies to help smokers quit their habits. Patients or public were not directly involved or participated in the research.

Neverthless, the main results, data sets and the core indicators were made available in the public domain.

Ethical considerations

GHPSS protocols were approved by the respective WHO regional offices and CDC as per the ethical review procedures for global tobacco surveillance systems. Detailed information was verbally provided to all potential participants and informed consent was obtained. Self-administered questionnaires did not ask for any personal identification details.

Statistical analyses

GHPSS has created a standard set of variables from the core questions to facilitate cross-country comparisons. *'Current cigarette smoking'* was defined as smoking cigarettes on one or more days during the past 30 days. *'Current use of tobacco products other than cigarettes'* was defined as using chewing tobacco, snuff, bidis, cigars, or pipes (adapted to suit each country) on one or more days during the past 30 days. GHPSS uses SUDAAN software to calculate prevalence estimates and their 95% confidence intervals (95% CIs). For countries where census was carried out, a finite population correction was applied to adjust for variance in prevalence estimates and also for non-response. For countries, where sampling was done, a weighting factor was applied to account for the probability of being sampled in a complex survey design and non-response.

We obtained country-wise aggregate data of GHPSS for '*prevalence of tobacco use*' and '*role model and cessation training'* from GTSS website (http://nccd.cdc.gov/gtssdata/Default/Default.aspx). For each of the four health professions disciplines, we calculated aggregate prevalence estimates and '*health professionals role'* and '*cessation training'* indicators for the six WHO regions and overall (global). Aggregate prevalence estimates for each of the six WHO regions and each of the four health professions disciplines were calculated as means weighted by the population of the sampling frame (national or sub national as appropriate) of the age group (20-30 years) obtained from the International Database of the United States Census Bureau (http://www.census.gov/population/international/data/idb/informationGateway.php). For '*health professionals role'* and '*cessation training'* indicators, we first obtained raw proportions from the original data sets. Aggregate proportions for each of the six WHO regions and each of the four health

professions disciplines were calculated from the raw proportions using '*metaprop*' command[30] using random effects model on Stata/IC (version 11.0)[31].

RESULTS

Survey and sample characteristics

Table 1 shows sample characteristics of all surveys included for the analyses and countries surveyed in the six WHO regions. Data from 236 surveys implemented during 2005 to 2011 covering four health professions disciplines spanning 70 countries were analyzed. The number of countries surveyed varied by disciplines; 70(medical), 56(dental), 56(nursing) and 54(pharmacy) and total surveys varied by WHO regions for all courses; 17(WPRO), 25(SEARO & AFRO), 55(AMRO), 56(EMRO), and 58(EURO) (Table 1). A total of 107,527 (68,809, females and 37,886, males) student health professionals were surveyed, of whom 51,914 were in medicine while others were in nursing (26,342), dentistry (14,578) and pharmacy (14,693) courses (Table 1). Male-to-female student ratio was highest for nursing (1:4.3) followed by dentistry (1:1.86). Country-wise, discipline-wise and sex-wise sample of students surveyed are shown in the web appendix.

Prevalence of current smoking and other tobacco use in the WHO regions

Sex-wise overall prevalence rates of '*current cigarette smoking*' and '*current other tobacco use*' among students of four health professions disciplines, in the six WHO regions are shown in Table 2, whereas weighted prevalence rates in all surveyed countries and country-wise prevalence for four disciplines are shown in the web appendix. In general, by disciplines *'current cigarette smoking'* was higher among dental and pharmacy students whereas overall prevalence in all four disciplines was highest in European countries followed by countries surveyed in the Americas. *'Current cigarette smoking'* among female students was higher in European countries and countries in the Americas while both *'current cigarette smoking'* and *'current other tobacco use'* were lowest in African and Southeast Asian countries. Other tobacco use was lower than smoking in the countries of all regions and all disciplines, except for male nursing and male dental students in the Eastern Mediterranean countries, and dental students in European countries where other tobacco use was nearly same as cigarette smoking. Other tobacco use was much higher among male students in countries surveyed in all regions and all disciplines except pharmacy students in the Western Pacific countries.

Cigarette smoking among medical students was highest in European countries (29.2%), followed by countries in the Americas (20.3%) and lowest in African countries (8.2%). Male medical students had higher cigarette smoking rates than female students in countries from all regions, but the gap was highest in Southeast Asian countries (18.4% vs. 0.3%). Among male and female medical students both cigarette smoking and other tobacco use rates were highest in European countries (males 36.0% & 18.9%; females 25.2% & 9.1% respectively). However, lowest male and female cigarette smoking rates were seen in African countries (males 12.3% and female 5.0%) whereas other tobacco use was lowest in the countries of Western Pacific (males 5.6% and females 1.4%) and Africa (male 6.2% and female 2.8%).

Cigarette smoking among dental students was highest in European countries (overall, 40.2%; male, 47.2%; female, 35.2%) and lowest in African (6.5%), western Pacific (males, 11.0%), and Southeast Asian (females, 0.1%) countries. The male-to-female gap was highest in Southeast Asian countries (23.4% vs 0.1%). Other tobacco use was highest in the Eastern Mediterranean countries for both male (23.4%) and female (8.5%) students but lowest among male students in the countries in Western Pacific region (2.5%) and female students in Africa region(4.4%).

Among nursing students, overall highest cigarette smoking rate was in European countries (28.3%) and highest other tobacco use rate was in the Eastern Mediterranean countries (23.8%). Sex-wise, cigarette smoking rate was highest in European countries (males 34.3% and females 27.5%), and lowest prevalence was in the countries of Africa (male, 10.2%) and Southeast Asia (female, 0.1%). Other tobacco use in male and female nursing students was highest in the countries of Eastern Mediterranean (27.2%) and Europe (6.8%) respectively.

Among pharmacy students, overall smoking prevalence was 38.4% in European countries and about 12% in the countries surveyed in Eastern Mediterranean, Southeast Asia and Americas. Among pharmacy students, sex-wise smoking rates were also higher in European countries (55.8% male and 34.2% female) and lowest in the countries of Africa (male, 10.8%) and Southeast Asia (female, 1.1%). Prevalence of other tobacco use was highest in the countries in Europe (male, 28.9%) and Americas (female, 10.3%) whereas prevalence was the lowest in countries in the Western Pacific (males, 2.0%) and African (female, 0.6%) regions.

Perceptions about health professionals' roles and their cessation training

Tables 3 and 4 present '*health professionals role'* and '*cessation training'* indicators for the six WHO regions by sex and web appendix presents data for overall pooled average for all surveyed countries, and each participating country for all four disciplines. About 70-90% of all students health professionals recognized that they are role models for their patients and the public, except for medical and pharmacy students in the European countries (65.9% and 65.1%, respectively); dental (14.4%) and pharmacy (51.5%) students in the Western Pacific and pharmacy students in African countries (67.3%). About 78-97% of all student health professionals surveyed in countries of all regions thought that they have a role in giving advice or information about smoking cessation to their patients (Table 3). In the countries surveyed in all the regions, the proportion of student health professionals who reported that they had received any formal training in smoking cessation approaches ranged from 9.2-36.9% only. However, 90% of dental students in the Eastern Mediterranean countries had received cessation training. More than 80% of all students of surveyed countries in all regions responded that student health professionals should receive specific training on cessation techniques. With an exception of cessation training among medical, nursing and pharmacy courses all other indicators about the health professionals' role and cessation training in four disciplines were significantly different between the six WHO regions (Table 4).

DISCUSSION

Tobacco use still being a major risk factor for non-communicable diseases[2;3], cessation training given for student health professionals remains inadequate, particularly in developing countries[32;33]. The aggregate tobacco use rates among health professions students varied by regions, disciplines and sex; cigarette smoking was higher among male students in dentistry and pharmacy particularly in the countries surveyed in Europe and Americas. The results from all GHPSS surveys throw light on two main shortcomings in health professionals' role in tobacco control. Firstly, tobacco use among student health professionals themselves and secondly, a lack of formal cessation training in all disciplines, both of which affect their expected role in motivating their patients to quit smoking. On the contrary, students' perceptions towards cessation training were fairly consistent across the four disciplines and were favorable towards their role in cessation and receptive towards formal cessation training across surveyed countries in all the regions and both sexes.

Smoking prevalence of up to 40% in the countries surveyed in Europe and Americas (15-30%) from GHPSS concur with reported smoking rates of 30% and higher among medical and dental students in

central and eastern European countries[9;10]. Most countries surveyed had smoking rates of over 20% reaching up to 60%. However, the studies were not comparable due to heterogeneity in definition of a 'smoker' and varying (one week to one month) periods of recall[9;10] used to define a 'smoker'. Such high rates correspond with the higher prevalence among men and women in the general population[3] suggesting the influence of socio-cultural factors[34]. Lower smoking rates in Africa, Southeast Asia and Western Pacific also correspond with lower adult smoking rates[3] particularly among women. In these regions, it is culturally inappropriate for women to smoke[35]. Other tobacco use rates of up to 27% among male students in eastern Mediterranean and European countries may be an influence of of *'Shisha'* (water pipe) smoking prevalent in these regions[36].

Smoking cessation should be prioritized for reducing the burden of smoking-related illhealth since quitting at any age confers health benefits[37]. Nevertheless, prevalence of former smokers varies from 20-70%, generally lower in developing countries where physicians seldom advice about quitting[20;32] despite the evidence that even a brief physician advice could have a small effect on smoking cessation[38]. Reasons for smoking patients not receiving any advice about quitting may not only arise from insufficient training, shortage of time and funding for physicians, but also due to lack of policies for smoking cessation, poor infrastructure within the health care system[20;32]. Nurses and pharmacists too play an important role through providing cessation by counselling the smoking patients[39;40]. However, nursing curricula mainly cover about health hazards of smoking, but do not equip the students with counselling skills, behavioral or pharmacotherapy for smoking cessation[41;42]. In most GHPSS, research coordinators verified with school administrators and were reconfirmed that there was no formal training given on tobacco cessation at any time during the course[21].

Tobacco control should begin among health professionals themselves by being exemplars. Student health professionals surveyed in GHPSS generally agreed that health professionals should be 'role models' to their patient and acknowledged their role in advising patients on smoking cessation[43]. Teachers of students health professionals should also advocate 'no tobacco' to their students by imparting education on health effects of smoking and motivating smoking students to quit their habit through counseling[33]. More emphasis should be placed on student health professionals staying 'smoke-free' in European and American countries where smoking rates were higher. Exposure to secondhand smoke was high in educational institutions[22;24;44]; hence, 'smoke-free' policies would create a positive message to the students, teachers, patient and doctors[45]. Positive strides should be taken particularly in

developing countries towards integrating tobacco cessation education into the existing curricula even if a separate module for tobacco control cannot be introduced[33]. A positive, conducive environment by creating 'smoke-free' health professions schools and hospitals, providing cessation training would make them exemplars by remaining non-smokers[20].

Our estimates expose wide gaps existing globally in health professional students' preparation for their future role in smoking cessation. Most evaluation studies on various modalities of tobacco cessation training to improve students' skill to provide smoking cessation are from high income countries,[13-15;46;47] where cessation training is implemented in the curriculum[32]. However, very little is known about effectiveness of cessation training materials and teaching methodologies in different socioeconomic and cultural settings of LMICs of Africa and Southeast Asia[14;48;49]. More research is needed to study the content of current curricula on tobacco cessation training in various courses[16;50-52], student health prifessionals' current practices and attitudes [12;17;53-55] and medical educators' receptivity towards tobacco cessation[56]. More recently different modalities of training medical students on smoking cessation training have been studied; yet, none provide any conclusive evidence on their effectiveness[57-59]. Lack of time, poor long term retention of conselling skills and lack of practice are reported as main barriers to implementation of tobacco cessation training[56;60]. More research is needed to study the impact of tobacco curriculum on future practice of health professionals. Research has shown that there are gaps in optometrists' training who also have a role in providing cessation advice to their patients[61;62]. Furture GHPPS should consider to include optometry students as well.

Our study limitations are reporting bias of tobacco use and perceptions due to questionnaire-based, self-reporting design of GHPSS and non-extrapolation of our results to the practicing health professionals as described in previous papers[22;24;25;44]. In addition, regional estimates may not be representative of some WHO regions, mainly in Africa and Western Pacific where very few countries were surveyed in GHPSS. In Western Pacific region, nursing and dental school surveys covered very few survey samples leading to inconsistent regional estimates from the meta-analyses. Further, in some countries, survey response rates were less < 80% (Table 1) which may not reflect the true estimates. Nevertheless, we presented regional estimates alongside country-wise updated results (web appendix) to highlight the regional situation for policy makers.

Conclusion

Tobacco use among male medical and dental students are unacceptably high in Europe, America and Eastern Mediterranean regions. Tobacco control efforts should begin with student health professionals themselves abstaining from smoking to be exemplars to their patients and the public. Positive perceptions towards cessation training should be complimented by integration of cessation training into health professions curricula. A collective effort by tobacco control experts and medical educators is needed to create a conducive and positive 'smoke free' school environment for training student in cessation techniques and further research should be done for better evidence base for effectiveness of implementing tobacco-related curricula.

Abbreviations

GHPSS: Global Health Professions Student Survey
WHO: World Health Organization
FCTC: Framework Convention On Tobacco Control
LMIC: Low-and-middle-income countries
GTSS: Global Tobacco Surveillance System
CDC: Centre for Disease Control
AFRO: African Regional Office
EMRO: Eastern Mediterranean Regional Office
EURO: Europe Regional Office
AMRO: America Regional Office
SEARO: South-East Asia Regional Office
WPRO: Western Pacific Regional Office

Contributors

CTS and **NR** designed the study, with inputs from two other co-authors. **IA** and **MR** managed data extraction**, CTS** analysed the data and **IA** and **MR** interpreted the findings, with input from all other authors. **CTS** and **NR** co-drafted the manuscript, with critical feedback from **IA** and **MR** authors. All authors approved the final manuscript

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TABLES

Table 1 Characteristics of participating countries, student health professionals by male and female and World Health Organisation (WHO) regions

	Number countries	Time period of surveys	Total	Female	Male	Range of response rates (%)
Medicine						
AFRO	9	2005-2009	2686	1731	924	51.3, 96.8
EMRO	16	2005-2011	11783	6702	5051	50.8, 100
EURO	20	2006-2011	13776	9044	4686	41.3, 100
AMRO	15	2005-2011	12662	7112	5458	64, 100
SEARO	7	2006-2011	8732	3881	4807	60.9, 92.2
WPRO	3	2005-2007	2275	1022	1233	53.3, 88.9
Total	**70**		**51914**	**29492**	**22159**	
Dentistry						
AFRO	3	2007-2009	285	170	115	74, 76.7
EMRO	13	2006-2011	2655	1560	980	56.2, 87.6
EURO	15	2006-2011	2606	1576	1019	62.7, 100
AMRO	13	2007-2011	5999	3997	1963	66.7, 97.5
SEARO	7	2007-2011	2759	1808	810	83.9, 89.5
WPRO	5	2005-2009	274	173	101	85.5, 100
Total	**56**		**14578**	**9284**	**4988**	
Nursing						
AFRO	7	2005-2009	1650	1131	508	68.4, 96.3
EMRO	14	2006-2010	6660	4508	2086	43, 100
EURO	11	2005-2011	6517	5496	1002	42, 90.2
AMRO	16	2006-2011	5870	5018	807	49.5, 100
SEARO	5	2006-2011	4326	3969	330	86.7, 93
WPRO	3	2005-2007	1319	1121	177	79.3, 100
Total	**56**		**26342**	**21243**	**4910**	
Pharmacy						
AFRO	6	2006-2009	874	500	373	59, 91.3
EMRO	13	2006-2011	3861	2522	1306	38.3, 93.1
EURO	12	2006-2011	2132	1670	459	72.5, 100
AMRO	11	2006-2011	2569	1859	692	74.3, 97.7
SEARO	6	2008-2011	4237	1481	2744	80.7, 84.8
WPRO	6	2005-2009	1020	758	255	79.7, 100
Total	**54**		**14693**	**8790**	**5829**	

The list of countries in each regions are given below as per WHO regional offices. The number of countries surveyed and year of survey varied for each health profession discipline and WHO regions

AFRO – Algeria, Côte d'Ivoire, Ghana, Kenya, Mozambique, Niger, Senegal, Uganda, Zambia
EMRO- Bahrain, Egypt, Gaza Strip West Bank, Islamic Republic of Iran, Iraq, Jordan, Lebanon, Libyan Arab Jamahiriya, Morocco,Oman, Pakistan, Saudi Arabia, Somalia, Sudan, Syrian Arab Republic,Tunisia, Yemen

EURO- Albania, Armenia, Bosnia and Herzegovina,Bulgaria, Croatia,Czech Republic,Georgia,Greece,Italy,Kyrgyzstan,Latvia,Lithuania, Macedonia , Republic of Moldova Poland, Russian Federation,Serbia,Slovakia,Slovenia,Spain,Turkey,Ukraine,
AMRO-Argentina, Barbados, Plurinational State of Bolivia, Brazil, Belize, Chile, Costa Rica,Cuba, Havana, Guatemala, Guyana, Jamaica, Mexico, Panama,Paraguay,Peru, Saint Lucia Suriname, Trinidad and Tobago,Uruguay , Bolivarian Republic of Venezuela
SEARO- Bangladesh, India, Indonesia, Myanmar, Nepal, Sri Lanka, Thailand**WPR-** Cambodia, Fiji, Lao PDR, Mongolia, Papua New Guinea, Philippines, South Korea, Viet Nam,

Table 2: Weighted prevalence rates (95% CI) of tobacco use by male and female and WHO regions among medical, dental, nursing and pharmacy students

	Current smoking			Current other tobacco use		
	Total	**Girls**	**Boys**	**Total**	**Girls**	**Boys**
Medicine*				**Medicine**		
AFRO	8.2 (6.3,12.5)	5.0 (3.3,8.6)	12.3 (10.6,19.8)	3.9 (3.0,5.1)	2.8 (1.8,4.4)	6.2 (4.6,8.2)
EMRO	9.9 (8.8, 11.4)	2.9 (2.3,4.0)	20.5 (18.2,23.4)	10.2 (9.1,11.4)	4.8 (4.0,5.8)	18.0 (15.2,20.3)
EURO	29.2 (26.9,32.2)	25.2(22.7,26.8)	36.0 (31.7,40.0)†	12.6 (10.8,16.9)	9.1 (7.1,12.3)	18.9 (15.4,24.1)
AMRO	20.3 (17.0,23.8)	18.5 (14.7,22.6)	22.7 (18.4,27.4)†	7.8 (5.8,10.6)	4.3 (2.8,6.9)	11.6 (8.4,16.2)†
SEARO	12.8 (9.6,16.8)	0.3 (0.2,0.5)	18.4 (13.7,24.3)	9.6 (6.3,14.6)	5.9 (2.5,13.0)	11.9 (7.9,17.8)†
WPRO	12.8 (10.9,14.9)	3.1 (2.0,5.4)	20.9 (18.6,23.5)	3.8 (2.9,5.1)	1.4 (1.0,2.2)	5.6 (4.3,7.5)
Dentistry*				**Dentistry**		
AFRO	6.5 (8.8, 15.3)	2.6 (2.8,8.6)	12.2 (16.4,29.3)	4.8 (2.7,8.6)	4.4 (1.9,9.6)	6.0 (4.0,9.0)
EMRO	13.0 (10.6,15.8)	5.8 (4.0,8.6)	23.8 (19.1,29.5)	14.8 (12.3,17.6)	8.5 (6.3,11.7)	23.4 (19.0,28.7)
EURO	40.2 (37.4,43.1)	35.2 (31.5,39.3)	47.2 (39.6,55.6)†	13.1 (10.9,17.2)	8.5 (6.2,13.8)	21.0 (17.3,26.6)
AMRO	23.1 (19.8,27.3)	21.9 (18.3,26.5)	26.5 (21.5,33.7)†	9.3 (7.2,12.0)	8.4 (6.1,11.8)	10.7 (6.5,18.9)†
SEARO	9.5 (7.1,13.0)	0.1 (0.0,0.1)	23.4 (17.5,31.5)	9.0 (6.3,12.9)	4.6 (2.7,8.8)	16.8 (12.8,21.8)
WPRO	8.4 (3.5,8.9)	7.1 (3.8,4.6)	11.0 (1.9,6.8)†	5.4 (1.8,8.2)	7.3 (4.5,11.0)	2.5 (0.8,1.3)
Nursing*				**Nursing***		
AFRO	5.2 (4.1,6.7)	1.8 (1.5,4.7)	10.2 (8.4,17.4)	3.1 (2.2,4.5)	2.1 (1.3,3.7)	5.9 (3.7,9.9)
EMRO	12.1 (9.4,11.5)	4.6 (3.8,5.8)	27.7 (21.3,29.1)	23.8 (18.1,22.8)	6.8 (5.6,8.4)	27.2 (20.6,32.0)
EURO	28.3 (24.5,31.6)	27.5 (23.8,31.1)	34.3 (24.2,42.9)†	7.1 (9.3,14.1)	6.8 (8.7,14.0)	10.9 (9.8,23.6)†
AMRO	15.2 (13.4,18.6)	14.3 (12.6,17.8)	20.0 (14.1,27.8)†	6.1 (4.5,9.1)	6.3 (4.7,9.5)	4.8 (1.8,10.8)†
SEARO	3.3 (2.0,5.4)	0.1 (0.1,0.2)	21.8 (13.2,35.1)	4.7 (3.4,6.7)	3.4 (2.1,6.1)	15.2 (9.0,25.1)
WPRO	5.0 (3.7,7.1)	3.2 (2.9,4.6)	15.0 (7.8,31.6)	3.1 (1.6,7.0)	2.2 (1.2,4.1)	15.1 (6.1,33.7)
Pharmacy*				**Pharmacy***		
AFRO	6.0 (4.4,8.6)	2.5 (1.9,5.5)	10.8 (8.2,15.2)	1.6 (1.2,2.1)	0.6 (0.4,1.0)	3.5 (2.8,4.5)
EMRO	12.4 (10.4,14.9)	3.4 (2.5,4.4)	26.3 (22.3,31.4)	12.7 (10.7,15.2)	6.6 (5.1,8.4)	21.6 (18.1,26.1)
EURO	38.4 (33.9,43.0)	34.2 (29.4,39.3)	55.8 (45.6,65.0)	11.7 (9.4,15.6)	7.3 (5.7,11.4)	28.9 (20.7,39.4)
AMRO	12.8 (10.1,16.1)	9.7 (7.1,13.6)	19.0 (14.0,26.1)†	12.1 (9.4,15.7)	10.3 (7.2,14.5)	16.1 (11.0,23.1)†
SEARO	12.9 (10.5,15.7)	1.1 (0.7,1.4)	21.1(17.4,25.7)	9.8 (8.0,11.8)	7.5 (4.7,11.7)	11.3 (8.6,15.8)†
WPRO	19.9 (14.5,25.8)	14.9 (12.1,23.5)	35.5 (24.4,46.8)	3.5 (2.1,5.8)	2.9 (1.5,5.3)	2.0 (0.6,5.6)†

*for these the comparisons between six WHO regions (chi square test) was significant, p<0.05

† for these comparisons between male and female students (chi square test was not significant, p>0.05

Table 3: Student Health professionals' views about health professionals being 'role models' and their role in advising about smoking cessation by WHO regions

WHO regions	Think that health professionals serve as "role models" for their patients and the public			Think that health professionals have a role in giving advice or information about smoking cessation to the patients		
	Total	Male	Female	Total	Male	Female
Medicine*				**Medicine***		
AFRO	70.5 (59.1,81.9)	70.9 (58.9,82.9)	68.4 (55.6,81.2)	94.1 (88.9,99.3)	92.7 (86.2,99.2)	93.0 (86.7,99.4)
EMRO	76.2 (72.3,80.1)	73.8 (69.5,78.0)	77.8 (73.5,82.1)	89.8 (87.0,92.7)	89.3 (86.1,92.5)	90.3 (87.4,93.2)
EURO	65.9 (58.5,73.4)	63.2 (55.5,71.0)	67.5 (59.8,75.3)	84.8 (81.4,88.1)	85.1 (81.9,88.3)	88.1(85.0,91.2)
AMRO	78.6 (72.5,84.7)	78.6 (72.5,84.7)	78.9 (72.6,85.2)	95.1 (92.6,97.6)	94.6 (92.1,97.2)	95.3 (92.7,97.9)
SEARO	86.1 (79.7,92.5)	86.8 (78.8,94.7)	86.5 (81.2,91.8)	94.5 (91.9,97.1)	93.0 (89.6,96.5)	95.6 (93.7,97.5)
WPRO	84.1 (65.4,102.7)	80.9 (58.6,103.2)	90.3 (81.5,99.1)	96.0 (90.1,102.0)	90.6(88.1,93.2)	97.8(96.1,99.5)
Dentistry*				**Dentistry***		
AFRO	73.6 (49.1,98.0)	62.2 (52.8,71.5)	72.6 (53.6,91.7)	89.5 (74.3,104.6)	82.9 (61.3,104.5)	87.1(81.5,92.7)
EMRO	76.4 (70.7,82.0)	74.8 (67.9,81.7)	77.3 (71.2,83.5)	89.5 (86.3,92.7)	89.6 (85.7,93.4)	91.0 (88.1,94.0)
EURO	72.8 (64.8,80.8)	68.5 (59.7,77.4)	75.2 (66.7,83.7)	83.8 (79.7,87.9)	82.4 (77.4,87.4)	83.5 (79.4,87.5)
AMRO	78.8 (71.5,86.2)	79.5 (72.7,86.2)	76.8 (70.2,83.4)	88.2 (82.7,93.7)	88.8 (83.1,94.4)	88.5 (82.7,94.2)
SEARO	90.1 (85.3,94.9)	87.4 (79.6,95.1)	90.2 (84.4,96.0)	93.4 (91.3,95.6)	90.6 (87.2,94.0)	95.4 (94.2,96.6)
WPRO	14.4 (8.6,20.2)	14.7 (2.8,26.6)	14.3 (7.6,21.0)	78.4 (71.6,85.3)	79.4 (65.8,93.0)	78.1 (70.2,86.0)
Nursing*				**Nursing***		
AFRO	72.5 (56.3,88.8)	76.0 (62.2,89.8)	65.9 (58.1,73.8)	97.2 (95.3,99.1)	98.6 (97.2,100)	96.7 (94.1,99.2)
EMRO	76.2 (72.3,80.1)	73.8 (69.5,78.0)	77.8 (73.5,82.1)	91.4 (88.7,94.0)	89.8 (86.4,93.2)	92.1 (89.5,94.6)
EURO	71.5 (61.2,81.9)	67.2 (56.8,77.5)	72.3 (60.6,84.1)	82.4 (77.0,87.9)	84.5 (81.0,88.1)	81.3 (75.3,87.2)
AMRO	76.3 (70.1,82.6)	75.6 (67.6,83.5)	76.7 (70.3,83.0)	93.8 (91.6,96.1)	93.6 (90.0,97.3)	93.7 (91.4,96.1)
SEARO	90.0 (83.7,96.3)	87.7 (80.2,95.2)	87.7 (80.6,94.7)	96.0 (93.9,98.1)	92.0 (85.6,98.4)	96.4 (94.3,98.4)
WPRO	72.8 (48.0,97.6)	78.6 (51.5,105.8)	71.4 (44.9,98.0)	92.4 (86.6,98.3)	82.2 (67.7,96.8)	93.1 (87.6,98.6)
Pharmacy*				**Pharmacy***		
AFRO	67.3 (51.8,82.8)	68.0 (52.6,83.4)	63.1 (58.1,68.1)	93.6 (86.2,101.0)	87.2(73.4,101.0)	92.5 (81.5,103.5)
EMRO	75.5 (68.2,82.9)	73.4 (65.3,81.4)	76.3 (68.6,84.0)	89.7 (86.1,93.3)	87.6(82.7,92.6)	91.0 (87.6,94.4)
EURO	65.1 (55.0,75.2)	63.2 (52.5,73.9)	65.2 (54.6,75.9)	81.1 (76.1,86.2)	79.4 (72.3,86.5)	82.7 (77.1,88.3)
AMRO	75.6 (66.2,85.0)	74.3 (62.9,85.6)	71.8 (63.4,80.2)	92.8 (87.5,98.0)	90.7 (84.8, 96.5)	93.6 (88.3, 99.0)
SEARO	87.6 (81.8,93.4)	87.8 (82.5,93.2)	86.9 (79.9,94.0)	90.3 (86.0,94.6)	93.2 (89.4,97.1)	90.1 (84.2,95.9)
WPRO	51.5 (-4.4,107.4)	50.0 (0.3,99.6)	52.1 (-5.6,109.8)	95.6 (92.2,99.1)	89.3 (80.1,98.5)	95.0 (88.6,101.4)

***for these the comparisons between six WHO regions (chi square test) was significant, p<0.05**

Table 4: Student health professionals' views about them receiving training on cessation and their opinion that health professionals should receive formal training on cessation by WHO region

WHO regions	Have ever received any formal training in smoking cessation approaches to use with patients in their school training			Think that health professionals should get specific training on cessation techniques		
	Total	**Male**	**Female**	**Total**	**Male**	**Female**
Medicine				**Medicine***		
AFRO	13.1 (5.3,20.9)	23.0 (14.9,31.1)	24.0 (8.5,39.5)	96.2 (94.0,98.5)	94.2 (90.3,98.2)	96.7 (94.5,98.9)
EMRO	14.0 (11.5,16.5)	26.7 (21.9,31.4)	23.5 (18.8,28.1)	92.5 (90.7,94.4)	90.3 (87.9,92.8)	95.0 (93.6,96.4)
EURO	13.6 (10.1,17.0)	22.3 (15.5,29.1)	19.5 (13.9,25.1)	83.0 (79.4,86.6)	80.1 (76.0,84.3)	84.6 (80.9,88.3)
AMRO	13.0 (10.8,15.2)	23.0 (18.9,27.1)	19.0 (14.9,23.1)	95.4 (94.3,96.4)	94.1 (92.5,95.7)	96.8 (96.0,97.5)
SEARO	10.1 (7.8,12.4)	25.8 (21.4,30.2)	22.5 (18.1,26.9)	93.5 (91.1,96.0)	90.9 (88.6,93.3)	94.8 (92.9,96.7)
WPRO	9.2 (3.8,14.7)	19.2 (11.6,26.9)	25.1 (17.8,32.3)	89.4 (79.5,99.3)	87.0 (74.1,99.9)	90.2 (84.2,96.2)
Dentistry*				**Dentistry ***		
AFRO	20.6 (-5.7,46.9)	25.1 (-6.6,56.8)	24.3 (-2.2,50.9)	88.1 (80.0,96.1)	83.9 (77.2,90.6)	82.7 (76.5,88.0)
EMRO	89.5 (86.3,92.7)	89.6 (85.7,93.4)	91.0 (88.1,94.0)	92.9 (90.7,95.1)	91.9 (88.7,95.0)	94.8 (93.1,96.4)
EURO	27.2 (19.7,34.7)	25.5 (18.3,32.7)	24.4 (16.2,32.7)	84.6 (78.9,90.3)	83.3 (76.8,89.9)	85.4 (79.4,91.4)
AMRO	17.6 (12.8,22.4)	21.4 (14.5,28.3)	16.2 (11.7,20.8)	92.7 (90.9,94.6)	91.5 (89.5,93.5)	93.8 (91.9,95.7)
SEARO	24.7 (10.6,38.7)	26.2 (12.2,40.3)	23.6 (6.8,40.3)	88.9 (84.6,93.1)	84.7 (77.4,92.1)	93.3 (91.1,95.5)
WPRO	32.9 (8.2,57.5)	10.9 (-1.8,23.6)	10.4 (5.1,15.8)	95.4 (92.7,98.2)	94.1 (86.2,102)	96.2 (92.5,99.9)
Nursing				**Nursing***		
AFRO	27.7 (20.5,34.9)	29.5 (21.8,37.3)	27.5 (20.0,34.9)	98.0 (97.3,98.7)	97.9 (96.5,99.3)	97.7 (96.7,98.7)
EMRO	36.9 (27.8,46.0)	39.8 (28.9,50.7)	33.7 (24.5,42.8)	93.9 (92.1,95.7)	92.5 (89.8,95.2)	95.6 (94.0,97.2)
EURO	34.5 (25.5,43.4)	36.8 (24.7,48.9)	35.1 (25.6,44.7)	83.7 (77.3,90.1)	78.3 (68.2,88.4)	83.2 (76.4,89.9)
AMRO	26.1 (22.7,29.5)	30.1(22.7,37.5)	24.4 (20.8,27.9)	96.3 (95.1,97.5)	96.5 (94.4,98.8)	96.3 (95.1,97.4)
SEARO	29.2 (21.3,37.0)	24.6 (15.5,33.7)	22.2 (10.7,33.7)	92.0 (87.7,96.3)	88.5 (80.0,96.9)	92.4 (88.5,96.4)
WPRO	30.9 (22.1,39.6)	37.2 (30.1,44.3)	28.4 (17.8,39.0)	92.1 (84.3,99.9)	82.4 (75.0,89.8)	92.3 (85.8,98.9)
Pharmacy				**Pharmacy***		
AFRO	21.1 (6.4,35.8)	21.2 (8.5,34.0)	24.4 (9.4,39.5)	96.7 (95.4,98.1)	95.9 (93.6,98.2)	96.3 (94.7,98.0)
EMRO	19.0 (14.7,23.3)	21.0 (16.1,25.9)	16.6 (11.8,21.4)	94.2 (92.3,96.2)	93.4 (91.1,95.7)	95.9 (94.2,97.6)
EURO	21.2 (15.0,27.4)	24.2 (13.1,35.4)	19.6 (13.8,25.5)	84.6 (78.3,91.0)	82.8 (76.1,89.6)	85.1 (78.9,91.4)
AMRO	16.8 (12.3,21.4)	17.8 (12.1,23.6)	15.4 (10.4,20.3)	95.2 (93.2,97.2)	92.6 (87.6,97.5)	96.9 (95.6,98.3)
SEARO	22.3 (14.9,29.7)	26.0 (18.3,33.6)	20.8 (12.4,29.3)	91.0 (86.5,95.6)	89.4 (84.4,94.4)	91.7 (86.9,96.5)
WPRO	30.9 (16.9,44.8)	23.9 (3.3,44.5)	23.0 (7.8,38.1)	95.6 (92.4,98.8)	93.9 (89.8,98.0)	96.1 (91.8,100.5)

***for these the comparisons between six WHO regions (chi square test) was significant, p<0.05**

† comparison between male and female nursing students in all regions (chi square) was significant

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STROBE Statement—Checklist of items that should be included in reports of ***cross-sectional studies***

	Item No	Recommendation	Page number
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	2
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	3
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4
Objectives	3	State specific objectives, including any prespecified hypotheses	4-5
Methods			
Study design	4	Present key elements of study design early in the paper	5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	5
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	*6*
Bias	9	Describe any efforts to address potential sources of bias	NA
Study size	10	Explain how the study size was arrived at	NA
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	6
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	6
		(*b*) Describe any methods used to examine subgroups and interactions	6
		(*c*) Explain how missing data were addressed	NA
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	6
		(*e*) Describe any sensitivity analyses	NA
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	6-7
		(b) Give reasons for non-participation at each stage	NA
		(c) Consider use of a flow diagram	NA
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	7

		(b) Indicate number of participants with missing data for each variable of interest	NA
Outcome data	15*	Report numbers of outcome events or summary measures	7-8
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	NA
		(*b*) Report category boundaries when continuous variables were categorized	NA
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	NA
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	NA
Discussion			
Key results	18	Summarise key results with reference to study objectives	9
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	10
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	10
Generalisability	21	Discuss the generalisability (external validity) of the study results	11
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	11