

# Tobacco Use, Knowledge about Smoking-Associated Risks, and Cessation Programs among Dental Students in Germany – ToDent

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## Keywords

Smoking prevention · Dental students · Smoking cessation · Smoking cessation education

## Abstract

**Background:** Professional and consistent smoking prevention and cessation may avoid many smoking-associated deaths worldwide. Dentists can exert a decisive influence on smoking behavior, as most people regularly visit a dentist. However, only if dentists have been trained sufficiently about the consequences of smoking and of smoking cessation methods might they fulfill this task appropriately. **Objectives:** The aim of our study was therefore to examine the prevalence of smokers among dental students in Germany, their attitude toward smoking in general, and their knowledge about tobacco-related diseases and smoking cessation programs. **Methods:** A cross-sectional survey among dental students in Germany was conducted in 2016. Students of the first and tenth semesters were asked to participate in this anonymous survey. The questionnaire included items concerning their own smoking habits, their knowledge about effects of smoking on health, and their attitude toward prevention and cessation in a dental setting. **Results:** Seven

hundred and thirty dental students participated in this survey; 21% of the participating students were smokers. Their knowledge about smoking-related diseases was widespread. Some diseases were rarely known (only in 34% of students) and others were well known (in 99% of the students). Knowledge about health risks of e-cigarettes was low. About 30% of the participating students felt competent to encourage and support patients in cessation strategies; 2 out of 3 students were willing to improve their knowledge in that area. More than 85% confirmed that advice for smoking cessation should be one of the tasks of a dentist. **Conclusions:** Smoking is common among dental students, their knowledge about smoking-related health risks is moderate, and self-perceived smoking cessation skills are poor. More emphasis should be placed on education regarding smoking prevention and cessation methods. © 2020 S. Karger AG, Basel

## Background

Smoking is an essential risk factor for many chronic, noncommunicable diseases and is acknowledged as a leading cause of preventable premature death. According

to the WHO, tobacco kills up to half of its users, >8 million people each year. More than 7 million of those deaths are the result of direct tobacco use, while around 1.2 million are the result of exposure to second-hand smoke [1]. The health hazards of smoking are well known. Smoking has a significant negative effect on almost all organs of the human body, including the oral cavity [2–4]. For several years, some effort has been made to curtail tobacco consumption in Germany (increase of tobacco taxes, warnings on cigarette packages with pictures, campaign for educational advertising about smoking-related health risks, ban on smoking in public places, and development of numerous smoking cessation programs). Indeed, these measures were successful, and a clear trend is visible: especially teenagers between 12 and 17 years are more often “never smokers.” In contrast to that, smoking prevalence in young adults remains high and lies still around 30% in Germany [5]. Therefore, in addition to already existing educational and preventive measures against smoking, additional efforts must urgently be undertaken so that tobacco consumption is avoided and smoking cessation programs are offered to smokers. In respect to tobacco prevention and smoking cessation offers, dentists may reach many smokers, as about 76% of adults and about 66% of young people visit a dentist at least once a year [6]. Since the consequences of smoking are seen very early on teeth, the periodontal tissue, gums, and oral mucosa, dentists have multiple possibilities to identify smokers and to motivate them to quit [7]. For the practice of preventive and constitutional measures as future dentists, their own health behavior plays a significant role. It is therefore important to identify the health behavior of dental students and their attitude toward smoking. However, prior to this study, little was known about their smoking behavior, their attitude toward smoking, and their knowledge about health risks due to smoking and about smoking cessation methods. Therefore, our non-interventional, cross-sectional study investigated the smoking behavior, the knowledge about smoking-related health risks, and the knowledge about smoking cessation programs among German dental students.

## Methods

The “ToDent” trial was conducted from October 2015 to September 2016. The data acquisition for the first-year students took place during the winter semester of 2015/16 and the one for the exam students during the summer semester of 2016.

The trial protocol was approved by the ethics review committee of the medical faculty of the University of Heidelberg (file number

S-271/2015). All dental students in the first and in the last (usually the 10th) semester at dental faculties at German universities were invited to participate in a survey after obtaining the permission to carry out the study from the dean of the dental medical faculty of the respective university. The survey was performed with a modified questionnaire developed by Raupach et al. [8] for a trial among medical students.

### Questionnaire

The questionnaire (see online suppl. Fig. 1; for all online suppl. material, see [www.karger.com/doi/10.1159/000509611](http://www.karger.com/doi/10.1159/000509611)) consisted mainly of multiple-choice questions; some questions had to be answered with freely formulated answers.

Part A of the questionnaire captured general demographic data of the respondents (sex, age, university, and semester). Part B of the questionnaire evaluated the smoking status of the interviewed person and, as appropriate, inquired the reasons for smoking and the reasons for quitting smoking. Part C gathered information about the student’s knowledge about the harmfulness of smoking and the associated health risks. Part D dealt with knowledge about smoking cessation methods and the general attitude of the students toward smoking.

One question asked about the perceived effectiveness of several smoking cessation methods. Perceived effectiveness of several smoking cessation methods (willpower alone, advice from a general practitioner, nicotine replacement therapy [NRT], antidepressants, partial nicotinic acetylcholine receptor agonists, hypnosis, cessation program, self-help material, and acupuncture) was assessed on a 6-point scale, with the highest item (“very effective”) corresponding to a continuous smoking abstinence rate of 30% after 1 year.

Another question asked how interested the students were in participating in a special course on smoking cessation to help future patients. The question was assessed on a 4-point scale, with the highest item corresponding to “extremely interested” and the lowest to “not interested.” The question “How effective do you think primary preventive measures are for children and teenagers to detain them from starting smoking?” was likewise assessed on a 4-point scale, with the highest item corresponding to “very effective” and the lowest item to “not effective.”

In a final dichotomous question, students were asked whether they felt “competent to counsel a smoker who is seeking help in order to give up smoking.” Only completely filled in questionnaires were used for evaluation and statistical analysis. Those which lacked answers or were incompletely filled in from part B onward were only analyzed for general answers in part A. The primary end point of our study was smoking prevalence among dental students in Germany, defined as the proportion of smokers among the included respondents.

### Statistical Analysis

Statistical analysis of the data was conducted with SAS® version 9.4 by the Institute for Medical Biometry and Computer Science (IMBI) of the University of Heidelberg. The primary evaluation collective for the main target criterion (smoking prevalence) is the overall collective consisting of the respondents who answered the questions completely in all sections. Smoking prevalence among dental students is estimated across both groups of students using point estimators and approximately normally distributed 95% confidence intervals. Secondary Target Criteria

**Table 1.** Situations and reasons for smoking in first-year and exam students

	First semester		Tenth semester	
	%	<i>n</i>	%	<i>n</i>
In company	38.7	43	38.7	12
In case of stress and problems	15.3	17	19.4	6
To relax	13.5	15	19.4	6
Out of boredom	8.1	9		
By habit	11.7	13	12.9	4
Other situations	11.7	13	9.7	3

All secondary end points were analyzed using descriptive statistics methods:

- Comparison of smoking prevalence among students in the first and the last clinical semester
- Smoking prevalence by the type of product smoked (e-cigarette or tobacco consumption)
- More detailed analysis of smoking behavior
- Knowledge of the effects and consequences of tobacco consumption
- Knowledge of tobacco prevention and cessation measures
- The behavior when dealing with smoking patients
- Own self-perceived consulting competence
- Evaluation of the teaching situation on the topic and requests for improvement at all dental facilities in Germany

## Results

Seventeen of the 30 invited universities participated in the survey. These were the dental medical faculties of the following university clinics: Aachen, Berlin, Erlangen, Freiburg, Giessen, Göttingen, Greifswald, Hamburg, Heidelberg, Köln, Leipzig, Mainz, Marburg, München, Münster, Ulm, and Witten/Herdecke. Out of the 1,100 questionnaires that were sent out, 730 students participated (effective response rate = 66.4%).

Four hundred and eighty-four of the 730 participants were female (66.3%); the median age was 19 years at the beginning of the dental studies and 25 years at the end. In all, 75.1% of the questionnaires were filled in by first-year students ( $n = 548$ ) and 24.9% by the last semester students ( $n = 182$ ). Altogether, 21% ( $n = 111$ ) of the participating first-year students and 19% ( $n = 33$ ) of the exam students identified themselves as smokers; 7% of each group ( $n = 38$  and 12, respectively) described themselves as regular smokers (Fig. 1).

Table 1 shows situations and reasons why first-year and exam students smoke. For both groups, the most

**Table 2.** Reasons to stop smoking among smoking students

	First semester		Tenth semester	
	%	<i>n</i>	%	<i>n</i>
Adverse health effects	30.9	34	27.3	9
Restriction of physical fitness	24.5	27	21.2	7
Costs of cigarettes	11.8	13	15.2	5
Late guiding principles	10.9	12	15.2	5
Negative effects on appearance	13.6	15	15.2	5
Harmful to fellow men	8.2	9	6.1	2

common reason for tobacco consumption was smoking in company, followed by smoking in case of stress and problems, and to relax.

In all, 40% ( $n = 111$ ) of the smoking first-year students and 53% ( $n = 33$ ) of the smoking exam students desired to stop smoking. The reasons for this are similar in both groups and are shown in Table 2. The main reason for most of the smoking students quitting smoking was adverse health effects, followed by reduced physical fitness and awareness of harmful effects of smoking on bystanders.

The question which substance causes tobacco dependency – namely, nicotine – was answered correctly by 84.7% of the first-year students (88.5% of the exam students). The correct amount of chemical compounds (1,000–5,000) in cigarette smoke was known to 13.4% (first semester) and 25.9% (tenth semester) of the students. The main substances of e-cigarettes were widely unknown. Only 0.8% of the first-year students and 0.6% of the exam students were aware of propylene glycol as a main compound. Glycerine and flavoring agents were named by 4.6% of the first-year and 5.2% of the exam students, and by 11.3% of the first-year students and 17.8% of the exam students, respectively.

One part of the questionnaire dealt with the diseases directly caused or indirectly caused by smoking. The students were suggested different diseases and they were asked to choose which ones were caused by smoking. Table 3 shows the percentage of the dental students who correctly labeled tobacco-associated diseases. Whereas the majority of the students knew that smoking causes chronic obstructive pulmonary disease, lung cancer, cardiovascular diseases, periodontitis, wound healing disturbance, and pharyngolaryngeal esophageal cancer, just 34–38% of the students were aware of stomach, kidney, and bladder cancer as consequences of smoking. About half of the students (46.4% of first-year students and

**Table 3.** Percentage of the dental students who could label correctly tobacco-associated diseases

	First semester, % (n)	Tenth semester, % (n)
COPD	88.2 (462)	93.1 (162)
Lung cancer	99 (519)	99.4 (173)
Cardiovascular diseases	82.3 (431)	90.2 (157)
Parodontitis	89.3 (468)	97.1 (169)
Wound healing disturbance	66.8 (350)	94.8 (165)
Pharyngolaryngeal esophageal cancer	89.5 (469)	97.7 (170)
Cancer of stomach, kidney, and bladder	33.6 (176)	37.9 (66)
Susceptibility to infection	46.4 (243)	56.3 (98)
Type 2 diabetes	15.1 (79)	14.4 (25)

COPD, chronic obstructive pulmonary disease.

56.3% of exam students) were aware that smoking causes increased susceptibility to infection, but only 14–15% had knowledge of its causality for type 2 diabetes.

The mortality rate due to smoking (110,000–140,000 in Germany per year) was known among 42.6% of the first-year students and among 42.0% of the exam students.

The harmfulness of e-cigarettes was assessed as similar to tobacco cigarettes by all participating dental students. Just about 30% of the students considered e-cigarettes to be less harmful than tobacco cigarettes (29% and, respectively, 28%). Approximately half of the students assumed that negative effects due to e-cigarettes are similar to those of conventional cigarettes (48% first semester, 47% tenth semester).

The self-assessment of the students concerning their future role in smoking prevention and cessation due to their knowledge in this topic was different. Whereas 40% of the students in their first year considered they could give smoking advice as a future dentist, only 24% of the exam students judged themselves as qualified for smoking cessation counseling. Moreover, 5.5% of the first-year students and 39.1% of the exam students were educated in their medical school about smoking advice, tobacco addiction, and cessation. Advice for practical application concerning smoking cessation had been received by 1.5% of the first-year students and 8% of the exam students.

A further part of the questionnaire addressed the estimation of the efficacy of known smoking cessation programs. “Stop smoking by willpower alone” was assessed by 30% of all respondents as very effective. “Counseling interview with the general practitioner” was judged as

moderately effective. A NRT was assessed by 52% of the dental students as very effective. The use of antidepressants for smoking cessation was classified as less to not effective. The intake of a partial nicotinic acetylcholine receptor antagonist was assessed by only 30% of the participating students as effective. On this question, most students abstained from answering. Smoking cessation by means of self-help literature was judged as moderately effective. The effectiveness of acupuncture and hypnosis for stopping smoking was evaluated from very effective up to not effective. A combination of group sessions and NRT was classified as very effective by 50% of the students. More than two-thirds of the students (81%) were very interested in getting much more education on smoking cessation methods.

In another part of the questionnaire, more than half of the asked dental students assessed short advice from the general practitioner or the dentist as not motivating enough for the patient to stop smoking. Nevertheless, more than half of the students thought that dental practice would be the right place to offer smoking cessation advice (56% first semester, 52% tenth semester). More than 70% of the students thought that all health-care workers should be a good role model in regard of tobacco consumption, irrespective of their own private behavior.

The majority of the dental students saw the offer of smoking cessation advice as part of their future profession (73% and, respectively, 82%). The reasons why dentists are suitable persons to provide smoking cessation advice were described differently by the students. The majority of the students stated in a free-text answer that the first consequences of tobacco consumption are seen early in the oral cavity. Some patients would approach their dentist as they detect smoker’s plaques and bad breath by themselves. Reasons why the dental practice is, in the opinion of the students, not suitable for smoking cessation advice are lack of time and knowledge.

Only 7% of the first-year students and 11% of the exam students believed that patients would follow their smoking cessation advice. Approximately 40% assumed that the patients would not stop tobacco consumption. The other students had no opinion on this question and answered with “I don’t know.”

In all, 97 and 98% of the dental students, respectively, rated educational advertising about health effects of smoking and ban of smoking in public spaces as very good or good. Although most of the students supported a ban of smoking in public places, only 40% of them were bothered about smoking in the presence of other people. The vast majority believed that the negative effects of

smoking are not overestimated (98.3% of the students in the first semester and 97.7% of the students in the tenth semester). Moreover, 65% of the students supposed that the negative health effects of smoking are still not elucidated enough, although 35% thought the consequences of smoking are well-known to the general public.

In all, 30% of the participants assumed smoking prevention measures as very efficient and about 40% as slightly effective; 25% rated primary prevention measures against smoking as little or not at all effective and feared that young people will start smoking anyway.

## Discussion

Reducing the prevalence of tobacco smoking is one of the most important strategies for reducing the burden of morbidity and premature death within the next decades [9]. Continuous monitoring of smoking patterns and quitting behavior, as well as data on the effectiveness of smoking cessation methods, is needed to guide tobacco control policies and to develop different smoking cessation offers in clinical practice [10]. Health-care workers can contribute significantly to reduce tobacco consumption – one of the biggest avoidable health risk of our time. However, for adequate and efficient smoking prevention and cessation, specialized professionals are needed. They must be well-trained in smoking cessation methods and must have the willingness to apply this knowledge to the patient. Dentists are well placed to deliver smoking cessation advice to a wide population of otherwise healthy smokers because many people visit a dentist at least once a year.

For further insights in this topic, we examined the smoking behavior, the state of knowledge regarding smoking-associated risks, and the attitude toward smoking among dental students in Germany. Data from 17 universities and 698 students were analyzed. Altogether, 20% of the participating dental students were smokers. Dental students showed a clear knowledge deficit in regard to smoking-induced diseases. At the end of their study of dentistry, only one quarter of the students felt competent to offer and conduct an adequate smoking cessation therapy. This is despite the fact that there was a great interest for the majority of the students on lectures and tutorials about smoking prevention and cessation. Most of the students thought that a dentist should offer smoking cessation advice and that the dental practice is a suitable setting, as dentists may recognize the consequences of tobacco consumption in the oral cavity early. Barriers against the provision of smoking cessation ad-

vice in dental offices are mainly lack of knowledge, lack of skills, and lack of time.

Even though about 40% of the students stated they had received information during their studies, there was no significant difference between the number of smokers in the first versus the tenth semester. In addition, the survey results showed that the knowledge of smoking and associated consequences was no higher in the exam students than in the first-year students, suggesting that the information received was not very effective.

Very similar results are shown in other studies among medical students: the majority of students do not feel competent to counsel smokers at the end of their medical training. These findings indicate that during medical education, skills related to smoking prevention and cessation are acquired to only a very limited degree [8, 11, 12].

Already in 2004, a study from the UK elucidated that medical schools in the UK teach far too little on smoking prevention and cessation [13]. Whether the situation in UK medical schools has improved since then is shown by a study from 2013, to which all UK medical schools were invited [14]. Here, health effects of smoking were addressed in more than 90% of all curricula, and factual knowledge on nicotine addiction and withdrawal symptoms was covered in 50% of curricula. Only 1 in 3 medical schools offered practical skills training and 50% of schools did not address smoking in summative assessments.

A number of teaching interventions for smoking cessation have been developed to improve knowledge and skills among medical students [15, 16]. A prospective intervention study evaluated a novel teaching module designed for structured smoking cessation training for medical students [17]. The intervention was feasible, short, and aligned to the needs of the German health-care system. It demonstrated a sustained learning outcome in terms of knowledge, skills, and attitudes toward smoking prevention and cessation among the students. The authors of this study hypothesized that a rollout of this intervention in medical schools might have the potential to substantially improve medical students' knowledge, skills, and attitudes in relation to smoking cessation counseling. Another study showed that a 4-h smoking cessation counseling workshop for medical students was highly effective in improving students' knowledge, skills, and attitudes toward smoking counseling, as well as providing them with additional clinical competencies [18]. Similar results could be seen in a prospective intervention study with dental students [19].

As our study was conducted from October 2015 until September 2016, results of novel teaching modules that

have been published after completion of our analysis [17–19] were very likely yet unknown to the dental students. In addition to the learned smoking cessation counseling aspect, a physician's own smoking status is likely to modify attitudes toward smoking patients and influence the management of counseling for smoking cessation [20–22]. The published studies demonstrate that nonsmoking physicians are more likely to advise patients to stop smoking than smoking physicians. Moreover, more nonsmoking physicians feel that smoking cessation interventions are necessary than do smoking physicians.

## Conclusion

Our study demonstrates that smoking is common among dental students, while their knowledge about smoking-related health risks is moderate and smoking cessation skills are poor. As a consequence, the curricula in medical and dental schools should implement effective educational programs regarding smoking prevention and cessation methods.

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## Statement of Ethics

The trial protocol was approved by the ethical review committee of the medical faculty of the University of Heidelberg (file number S-271/2015).

## Conflict of Interest Statement

T.R. has received honoraria from Pfizer, Novartis, GlaxoSmith-Kline, Astra Zeneca, and Roche as a speaker in activities related to continuing medical education. He has also received financial support for investigator-initiated trials from Pfizer and Johnson & Johnson. All other authors state that there is no conflict of interest.

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## Author Contributions

C. Bauer-Kemény wrote the study protocol, raised the money, supervised the implementation of the study, and wrote the article. I. Lis conducted the trial and carried out the evaluation. T. Raupach and M. Kreuter scientifically advised the study and revised the manuscript.

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