

Assessment of oral health behavior and knowledge among dental and medical undergraduates in Chongqing, China

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Abstract. Dental and Medical students are professional health care providers in the future, and their self-awareness and behavior of oral health highly affects their oral health education attitude for the general population. The objectives of this study were to investigate oral health behavior and knowledge of dental and medical undergraduates. The oral health behavior and knowledge of 221 dental undergraduates and 325 medical undergraduates in China were investigated through a questionnaire. With grades increasing, the oral hygiene behaviors and knowledge of undergraduates were gradually improved. Dental undergraduates showed better improvement than medical ones. However, for the higher grade students of two majors, not everyone brushed their teeth twice a day for three minutes each time, or used fluoride toothpaste. Very few people used floss, some undergraduates smoked every day. The proportion of dental undergraduates in the three grades who answered all the oral health questions correctly was 7.69%, 65.08% and 78.75% respectively, and the proportion of medical ones was 8.96%, 12.39% and 33.33% respectively. The dental and medical undergraduates' mastery of oral health knowledge and behavior was undesirable, especially the latter. It is necessary to carry out oral health education for medical undergraduates and even dental undergraduates in various ways from the beginning of freshmen.

Keywords: Oral health, knowledge, behavior, education, dental undergraduate, medical undergraduate, China.

INTRODUCTION

Oral health is an indispensable part of general health, it is reported that oral diseases have strong associations with systemic diseases, and poor oral health can worsen the impact of systemic diseases like diabetes, hypertension, osteoarthritis, osteoporosis, cardiovascular diseases, and cerebrovascular diseases. (Tavares *et al.*, 2014; Jin *et al.*, 2016).

Many studies suggested that the lack of knowledge and awareness of oral health will result in inappropriate oral health behaviors, which are closely related to poor oral health (Nadazdyova *et al.*, 2017; Haghghati and Mofidi, 2006). According to the fourth Chinese Oral Health

Epidemiological Survey, most of the population in China troubled by oral diseases, has bad oral health behaviors and lacks oral health knowledge. For example, the incidence of caries in children aged 3-5 years, children aged 12-15 years, adults aged 35-44 years, adults aged 55-64 years, adults aged 65-74 years were 62.5%, 41.9%, 89%, 95.6% and 98% respectively, whose awareness rates of oral health knowledge were 62.3%, 60.1%, 62.5%, 51% and 47.6% respectively (Xing, 2018). In the face of the people's poor oral health, dentists have the responsibility to do oral health education, guide public oral health behaviors and maintain public oral health, and

the dental students must be adequately prepared to respond to this responsibility.

Considering the close relationship between oral health and general health, the interdisciplinary development of medicine, and clinicians are far more likely to encounter underserved and vulnerable populations than dentist, and the medical professionals should master optimal oral health knowledge and provide the required oral health education for population (Sujatha *et al.*, 2015; Usman *et al.*, 2007). George *et al.* (2019) reviewed nine research studies and suggested that health professionals outside of dentistry could play a key role in promoting maternal oral health, whose scope of practice could expand to provide oral health education, risk assessments and dental referrals through adequate training of professionals. The non-dental health professionals should incorporate oral health into overall patient care, and dental professionals should incorporate primary care and chronic disease management into their practices (Maxey *et al.*, 2017). The collaborative practice between dental professionals and non-dental professionals has become the model of oral preventive health care. Therefore, it is very necessary for dentist and clinicians to work together to address the oral health care, and their oral health knowledge and awareness will affect the implementation of oral health care programs (Rabiei *et al.*, 2012).

The dental and medical students are the provider of the oral health services and education in the future, it is important to study their oral health knowledge, awareness and behavior. Hence, the objective of this study is to comparatively evaluate the oral health knowledge and behavior of dental and medical undergraduates, in order to provide basic data for the oral health education for undergraduates of both majors.

METHODS

Participants

Three grades of dental and medical undergraduates (n=546) came from Chongqing Medical University, who will receive five year undergraduate education, were invited to participate in the questionnaire survey. All the participants provided verbal consent and this study was approved by the Ethical Committee of Affiliated Stomatology Hospital, Chongqing Medical University (Ethics (67) 2019).

Questionnaire

The questionnaire covered demographic information of participants, self-oral health behavior, such as brushing teeth, flossing, smoking, and understanding of oral health knowledge containing 13 questions. Prior to the study, the questionnaire was piloted with 30 participants (15

dental students and 15 medical students), revisions were made accordingly, and after the repeated discussions with experts, the final version of the questionnaire was obtained.

Statistical analysis

IBM SPSS Statistics (version 21.0) was used to analyze the data. Frequencies were calculated for all categorical variables, and Chi-square test was used to compare between dental undergraduates and medical undergraduates, or undergraduates in different grades. A $P < 0.05$ was considered statistically significant.

RESULTS

Demographic characteristics of participants

In this study, 574 questionnaires were distributed and 546 copies (221 dental students and 325 medical students) were collected. The students' grades, majors and gender distribution were all shown in Table 1.

Oral hygiene behavior

As shown in Table 2, for the first-year undergraduates, their brushing behavior and flossing were far from ideal, fewer than 20% of them brushed teeth for more than 3 minutes at a time, only about 20% used fluoridated toothpaste, and very few students ever used floss. The dental undergraduates had better habit of usage of floss than medical undergraduates ($p < 0.05$), but this tiny difference in behavior of freshman made no sense. The oral hygiene behaviors of dental undergraduates were gradually improved with grade growth. From the third grade, the differences of oral health behavior between students of two majors were becoming more and more obvious. However even for fifth-year dental undergraduates who had received oral professional education, not all of them brushed teeth twice a day, 40% of them did not brush teeth for 3 minutes each time, just 76.25% used fluoridated toothpaste, 23.75% had never used dental floss. For medical undergraduates, the improvement of oral health behaviors of higher grades was not as significant as dental undergraduates, 12.92% of fifth-year medical undergraduates did not brush teeth twice a day, only 34.62% brushed teeth for 3 minutes each time, just 26.92% used fluoridated toothpaste and 75.64% had never used floss.

Smoking behavior

As shown in Table 3, a small proportion of undergraduates had habit of smoking, 5% of fifth-year

Table 1. Demographic characteristics of participants in the survey (n)

Grade	Dental students			Medical students		
	Total	Male	Female	Total	Male	Female
First year	78	26	52	134	44	90
Third year	63	20	43	113	47	66
Fifth year	80	36	44	78	14	64
Total	221	82	139	325	105	220

Table 2. Oral hygiene behavior of dental and medical undergraduates (%)

Questions of behavior	first year			third year			fifth year		
	dental students	medical students	<i>P-value</i>	dental students	medical students	<i>P-value</i>	dental students	medical students	<i>P-value</i>
Frequency of daily tooth brushing (\geq twice)	84.62%	76.87%	*	80.95%	76.99%	*	93.75%	87.18%	*
Duration of tooth brushing (\geq 3min)	17.95%	15.67%	*	36.51%	22.12%	**	60.00%	34.62%	**
Use fluoridated toothpaste	20.51%	23.13%	*	46.03%	23.89%	**	76.25%	26.92%	***
Usage of floss			**			***			***
every day	0.00%	0.00%		6.35%	0.88%		11.25%	5.13%	
every week but not every day	0.00%	0.00%		12.70%	0.00%		16.25%	3.85%	
seldom	16.67%	5.22%		36.51%	7.08%		48.75%	15.38%	
never	83.33%	94.78%		44.44%	92.04%		23.75%	75.64%	

*: $p > 0.05$; **: $p < 0.05$; ***: $p < 0.001$

dental undergraduates smoked every day, significantly higher than first-year and third-year undergraduates ($p < 0.05$). The percentage of medical students who smoked daily ranged from 1.28% to 2.24%, and there was no statistical difference between the three grades ($p > 0.05$). These results suggested that the behavior of smoking would not be changed by receiving oral health knowledge.

Oral health knowledge

As shown in Table 4, the correct answer rate of 13

questions was increased with growth of grade. Among the six classes, the fifth-year dental students had the highest correct answer rate of 78.75%, followed by the third-year dental students (65.08%), both of which were significantly higher than the medical students of the same grade (33.33% and 12.39% respectively), and there were statistical differences ($p < 0.05$). The correct answer rate of first-year students was less than 10%, and there was no statistical difference between the two majors ($p > 0.05$).

As shown in Table 5, for the first-year students, there was no significant difference between two majors ($p > 0.05$), who had the worst understanding of anti-caries of

Table 3. Smoking behavior among dental and medical undergraduates (%)

Smoking behavior	first year			third year			fifth year		
	dental students	medical students	<i>P-value</i>	dental students	medical students	<i>P-value</i>	dental students	medical students	<i>P-value</i>
every day	0.00%	2.24%		0.00%	1.77%		5.00%	1.28%	
every week	0.00%	0.00%	*	0.00%	0.88%	*	0.00%	0.00%	*
rarely or ever smoking	1.28%	1.49%		4.76%	7.96%		8.75%	8.97%	
never	98.72%	96.27%		95.24%	89.38%		86.25%	89.74%	

*: $p > 0.05$

Table 4. Percentage of dental and medical undergraduates with all correct answers of oral health knowledge (%)

major	grade	total of students(n)	number and percentage of students with all correct answers(n,%)	<i>p-value</i>
dental students	first year*	78	6(7.69%)	
	third year***	63	41(65.08%)	***
	fifth year***	80	63(78.75%)	
medical students	first year	134	12(8.96%)	
	third year	113	14(12.39%)	***
	fifth year	78	26(33.33%)	

Compare between the same major students at the different grade, *** : $p < 0.001$

Compare between dental and medical students at the same grade, first year*: $P > 0.05$; third year *** : $P < 0.001$; fifth year***: $P < 0.001$

pit and fissure sealant among 13 questions, with only about correct answer rate of 20%. Secondly, the correct answer rate of the relationship of bacteria and caries was less than 70%. With growth of grade, the students' mastery of oral dental knowledge was improved, and the dental students showed better knowledge level than medical students. For the fifth-year students, the correct rates of each question of dental students were all higher than 90%, even up to 100%. Medical students had a relatively poor grasp at the relationship between oral health and bleeding gum, sweet food, smoking, fluoride, pit and fissure sealant, and the correct answer rates were all less than 90%.

DISCUSSION

Oral health contributes to morbidity and mortality throughout one's lifespan (Inglehart *et al.*, 2002). The dental and medical students are professional health care providers in the future, and their self-awareness and behavior of oral health highly affects their attitudes for the

general population education and creating of general population's oral awareness (Muthu *et al.*, 2015). Therefore, before dental health professionals play a role as oral health care providers, it is necessary to know the level of their own knowledge, attitude, and behavior toward oral health (Baseer *et al.*, 2012). This study mainly investigated oral health behaviors of dental and medical undergraduates and their mastery of oral health knowledge.

Comparing undergraduates from different grades, we found that the first-year undergraduates' oral health behaviors and knowledge were worse than those of higher undergraduates, and this may be explained by the fact that the first-year students were newly enrolled in university, and hadn't studied the oral professional knowledge. Most of the undergraduates could positively respond to some basic oral health knowledge, approximately 80% of students brushed their teeth at least twice a day, and there was no significant difference when compared with the higher grades, which was slightly lower than results of survey of Yao *et al.* (2019), and much higher than the ratio of approximately 40% of

Table 5. Correct answer rate of oral health knowledge among dental and medical undergraduates (%)

Questions of oral health knowledge	first year			third year			fifth year		
	dental students	medical students	<i>P-value</i>	dental students	medical students	<i>P-value</i>	dental students	medical students	<i>P-value</i>
Bleeding gums are normal when brushing teeth	73.08%	73.88%	*	88.89%	69.91%	**	95.00%	82.05%	**
Bacteria can cause gingivitis	87.18%	89.55%	*	93.65%	91.15%	*	97.50%	97.44%	*
Brushing teeth can not prevent gum inflammation	92.31%	95.52%	*	88.89%	92.04%	*	96.25%	91.03%	*
Bacteria is the cause of caries	69.23%	67.91%	*	100.00%	83.19%	**	97.50%	91.03%	*
Sweet food is related to caries	83.33%	77.61%	*	93.65%	80.53%	**	93.75%	87.18%	*
Fluoride can protect teeth	74.36%	65.67%	*	100.00%	60.18%	***	100.00%	80.77%	***
Pit and fissure sealant can protect teeth	21.79%	23.88%	*	98.41%	38.94%	***	100.00%	75.64%	***
Oral disease influences general health	89.74%	90.30%	*	98.41%	93.81%	*	98.75%	100.00%	*
Smoking is the risk factor of oral cancer	79.49%	76.12%	*	100.00%	80.53%	***	100.00%	89.74%	**
Oral health is very important for people's life	98.72%	98.51%	*	98.41%	98.23%	*	97.50%	100.00%	*
Regular oral checking is very necessary	93.59%	88.06%	*	93.65%	86.73%	*	96.25%	93.59%	*

Table 5. Cntd

Protect teeth by yourself first	100.00%	97.76%	*	98.41%	97.35%	*	98.75%	98.72%	*
Regular cleaning teeth benefits for teeth and periodontal health	98.72%	97.01%	*	95.24%	98.23%	*	98.75%	97.44%	*

*: $p > 0.05$; **: $p < 0.05$; ***: $p < 0.001$

adults revealed in the fourth national survey of China (Xing, 2018), and higher than those of adults in studies from other countries. For example, Kumar *et al.* (2010) reported that only 56.4% of dental students brushed their teeth twice daily and 38.5% of medical students brushed their teeth twice daily from some university in India. Naseem *et al.* (2017), reported that 55.9% of medical students from some colleges of medicine in Pakistani brushed their teeth two times a day. Above results indicated that, to some extent, the brushing behavior of the new generation in China was better than their elders and was improving. The relationship of oral disease and general disease, importance of oral health for people's life, necessity of regular oral checking and cleaning teeth, the correct answer rates of each of these relative questions among fifth-year students were all up to 90%.

However, only approximately 20% of first-year undergraduates certainly knew that they were using fluoridated toothpaste, and it is possible that some of them did not know about fluoridated toothpaste, or did not pay attention to its anti-caries effects which have been confirmed by many studies (Carey, 2014; Walsh *et al.*, 2019). More than 80% of the first-year undergraduates brushed teeth for less than three minutes each time. Even, it was inconceivable that the percentage of undergraduates who used dental floss daily or weekly was zero, and only 16.67% of dental undergraduates ever used floss compared to 5.22% of medical undergraduates. All these results indicated that dental and medical undergraduates should receive oral health education from the beginning of freshman year. The early oral health skill education is very important to improve students' self-oral health consciousness and study of the dental professional knowledge in the later stage.

With grade growth, the undergraduates' behaviors and mastery of knowledge were improved, and the dental undergraduates showed a better behavior and knowledge level than medical undergraduates. This was due to the fact that the senior students had received a certain amount of oral professional knowledge. The third-year

dental undergraduates in this study had received some oral disease-related basic courses, such as "Introduction to stomatology", "Oral anatomy and physiology" and "Oral pathology". The fifth-year dental undergraduates had received one year of professional courses in the fourth year of university. For medical students, the fifth-year undergraduates had received the oral health knowledge introduction from "Stomatology Science".

For medical undergraduates in higher grades, their use of fluoridated toothpaste was not significantly improved, only 26.92% fifth-year medical undergraduates used fluoridated toothpaste, which was significantly less than 76.25% of dental undergraduates. Though oral health behaviors of dental undergraduates were better than medical undergraduates, but both of them did not reach the desired level. More undergraduates of fifth-year used dental floss compared with lower grade undergraduates, but only 11.25% of dental undergraduates and 5.13% of medical undergraduates used dental floss daily, and only 16.25% and 3.85% respectively used dental floss weekly. Although the results were not optimistic, the percentage was higher than the results reported in the fourth national survey of China (Xing, 2018). Madan *et al.* (2014), reported that most of dentists in India felt that dental floss is an essential oral hygiene aid along with the toothbrush, and agreed or strongly agreed that the routine use of dental floss is necessary. However, the new generation of China did not actively adopt this oral self-care method, even for dental students who had mastered more oral health knowledge.

The correct answer rates of each question of fifth-year dental undergraduates were all higher than 90%, even up to 100%. The proportion of third-year and fifth-year dental undergraduates who answered all 13 questions correctly was up to 65.08% and 78.75% respectively, which were significantly higher than that of first-year dental undergraduates, and higher than that of the same grade of medical undergraduates. There was no doubt that it was related with the fact that dental undergraduates received more dental professional training than medical

undergraduates. Out of the 13 questions, medical undergraduates had a relative poor mastery of pit and fissure sealing (PFS). PFS used on occlusal tooth surfaces was introduced in the 1960s for protecting pits and fissures from dental caries and its anti-caries effectiveness has been demonstrated in many studies (Llodra *et al.*, 1993; Ripa, 1993). Many countries have executed it as one of the national oral health programs to promote oral health of children. For example, South Korea executed the free PFS program mainly for rural areas during the period of 2002–2007 promoted by the Ministry of Health and Welfare and PFS began to be covered by the National Health Insurance (NHI) from December 2009 (Lee *et al.*, 2008). Since 2008, free PFS for 7-9 years old children has been implemented as annual national oral health invention measure in all provinces of China. However, only 75.64% fifth-year medical undergraduates knew that PFS could protect teeth, and the percentage was even lower for the lower grades.

Meanwhile, medical undergraduates' understanding of fluoride also did not reach the satisfactory level. Among the three grades of medical students from lower grade to higher grade, 65.67%, 60.18% and 80.77% of them knew that fluoride could protect teeth, and this unsatisfactory level was also found in behavior survey of fluoridated toothpaste. Considering their pivotal role in collaborating with dental doctors in oral health care work in the future, as well as the improvement of their own oral health care behaviors, it is necessary to take some measures to enhance their oral health knowledge.

About smoking, we found a small number of undergraduates smoked, and 2.23% of first-year medical undergraduates smoked daily, and this behavior was not improved along with accumulation of knowledge. 5% of fifth-year dental undergraduates smoked daily, which statistically higher than first-year and third-year dental undergraduates, and this result may be related to the stronger study pressure and employment pressure for higher grades undergraduates. This unhealthy behavior would seriously affect their oral and general health. Above results indicated that it is necessary to furtherly strengthen the oral health training and knowledge promotion for undergraduates, including higher grade undergraduates, and even for dental undergraduates. It is even necessary to understand the exact causes of these bad behaviors and take effective interventions.

CONCLUSION

According to results of the survey, it was found that undergraduates' mastery of some oral health knowledge and their oral health behavior was not ideal, even though for dental undergraduates. It is necessary to provide early oral health education for dental and medical undergraduates, and the basic oral health knowledge education and oral health behavior guidance should be

strengthened for them at every grade. For the dental undergraduates, in addition to paying attention to professional skills training, it is needed to strengthen the training about awareness and ability of oral health care. For the medical undergraduates, in addition to compulsory courses on oral health, it is necessary to provide them with multiple ways to acquire oral health knowledge, such as electives, lectures, and online learning and so on.

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