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A randomised controlled trial comparing online versus face-to-face smoking cessation course for Malaysian dental officer

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Abstract

Oral health professionals play a vital role in tobacco cessation efforts, but there is a notable gap in their training and skills in this area. Online Smoking Cessation Course was developed by UiTM to benefit the oral health professionals however it has not been evaluated yet. Thus, the aim of this study is to evaluate the effectiveness of online smoking cessation module in comparison with the face-to-face method, in term of the level knowledge. This randomized controlled trial involved 185 new dental officers from four states in Peninsular Malaysia, divided into online and face-to-face (F2F) delivery groups. They were assessed using validated questionnaire, both pre- and post-intervention. The results showed that both the control (F2F) and intervention (online) groups demonstrated significant improvements in knowledge post-training. The control group's average score increased from 6.05 to 7.99, while the intervention group saw an increase from 6.22 to 8.20, with both groups showing statistically significant improvements ($p < 0.001$). This indicates the effectiveness of the smoking cessation course in enhancing knowledge. The study concluded that the online module is suitable for new dental officers, equipping them with knowledge and skills for smoking cessation counselling as it found that online delivery is as effective as F2F training. This suggests that online training could provide a more cost-effective and accessible method for future smoking cessation training, reaching a broader audience.

Keywords: *active learning, dental officer, online learning, smoking cessation*

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Introduction

Smoking remains a critical public health issue worldwide, with its impact being significantly felt both globally and in specific countries like Malaysia. According to the World Health Organization (WHO), more than 8 million people die each year from tobacco use, with over 7 million of these deaths resulting from direct tobacco use (Ritchie & Roser, 2013). Additionally, tobacco is responsible for the deaths of around 1.3 million non-smokers who are exposed to second-hand smoke (World Health Organization, 2023).

Focusing on Malaysia, more than 27,200 deaths annually are attributed to smoking (Focus Malaysia, 2021), This number is particularly alarming considering the relatively small population of Malaysia compared to larger countries. The situation is exacerbated by the high prevalence of smoking in the country, the prevalence of tobacco use among adults remains high, with

about 21.9% of adults smoking as of 2020. The smoking rates are notably higher among men (42.1%) compared to women (0.5%) (Global State of Tobacco Harm Reduction, 2021). These reports indicate that Malaysia is likely to miss the global target for reducing tobacco use prevalence by 30% by 2025 (Focus Malaysia, 2021).

Globally, the burden of smoking-related deaths is expected to rise, with projections suggesting that tobacco-attributable mortality could reach 8.4 million by 2020 (Tam & Lee, 2014). This trend is particularly concerning in developing countries, which account for about 70% of these mortalities due to higher smoking prevalence (Lim *et al.*, 2018). These statistics highlight the urgent need for effective tobacco control and public health strategies to combat the smoking epidemic both globally and in countries like Malaysia.

Internationally, the importance of training in smoking cessation for healthcare students is widely recognized. Programs like "Rx for Change: Clinician-Assisted Tobacco Cessation" offer comprehensive tobacco cessation training to health professionals of all disciplines, focusing on evidence-based knowledge and skills to assist patients in quitting tobacco use (Centers for Disease Control and Prevention, 2021). Additionally, the University of Wisconsin-Center for Tobacco Research and Intervention provides healthcare provider training videos, including training on motivational interviewing to help patients quit smoking (Centers for Disease Control and Prevention, 2021). Furthermore, the University of Arizona offers continuing education and certification programs in nicotine dependence treatment, emphasizing the need for specialized training in this area (Centers for Disease Control and Prevention, 2021).

In Malaysia, the training of healthcare professionals in smoking cessation techniques has been significantly improved by several initiatives. Currently, there are two types of training: face-to-face, which is Smoking Cessation Organizing, Planning and Execution (SCOPE), and mixed, which is Certified Smoking Cessation Service Provider" (CSCSP). The CSCSP program, launched in 2004 by the Malaysian Academy of Pharmacy (MAP) and the Malaysian Pharmacists Society (MPS), targets community pharmacists. This program includes a one-month self-study online, a one-day workshop, and a one-day clinic attachment, aiming to equip healthcare professionals with skills for evidence-based smoking cessation interventions (Commonwealth Pharmacists Association, 2022). Another key initiative is the SCOPE program, developed by the Nicotine Addiction research group at the University of Malaya and accredited by the Ministry of Health. This program involves six thought modules, two skills, and one role-play session and has trained nearly 2500 healthcare providers since its inception in 2015 (Asia Research News, 2017). These efforts are instrumental in supporting Malaysia's commitment to the WHO Framework Convention on Tobacco Control and its goal for a tobacco-free nation by 2040 (Commonwealth Pharmacists Association, 2022).

Online training offers flexibility and accessibility, allowing healthcare professionals to learn at their own pace and convenience. This method often includes interactive modules, webinars, and virtual simulations, providing a comprehensive understanding of smoking cessation strategies. Research indicates that online training can be as effective as face-to-face training in improving knowledge and skills related to smoking cessation. For instance, a study by Saulle *et al.* (2013) found that online modules significantly enhanced the ability of dental professionals to provide smoking cessation counseling, with participants reporting increased confidence and competency in their skills.

On the other hand, face-to-face training provides a more interactive and personal learning experience. This method often involves workshops, seminars, and role-playing scenarios that allow for immediate feedback and hands-on practice. Face-to-face training fosters a collaborative learning environment, which can enhance motivation

and engagement. A study by Carson *et al.* (2012) highlighted that face-to-face training sessions resulted in higher satisfaction and perceived effectiveness among participants compared to online training. Direct interaction with trainers and peers in face-to-face settings can also facilitate the development of practical skills and the application of theoretical knowledge in real-life scenarios.

Oral health professionals play a vital role in tobacco cessation efforts, but there is a notable gap in their training and skills in this area. The FDI World Dental Federation emphasizes that oral health practitioners should ideally deliver the 5A's of tobacco cessation in which the health personnel need to ask about tobacco use, advise to quit, assess quitting motives, assist in quitting, and arrange follow-up contacts to quit smoking. At a minimum, they should deliver the 3A's approach, which includes asking about tobacco use, giving advice to quit, and acting by referring to tobacco cessation clinics or services. This approach aligns with the WHO Framework Convention on Tobacco Control Article 14 guidelines, which recommend that oral health practitioners deliver brief tobacco interventions as part of their routine services in primary care (FDI World Dental Federation, 2021).

In Malaysia, the oral health team also are in a unique position to influence young adults and adolescents as many of them were in frequent contact with the dental team during the annual school dental check-up programme as well as the school-based smoking cessation programme, namely, Kesihatan Oral Tanpa Asap Rokok (KOTAK) programme. In addition, the immediate effects of smoking on the mouth, such as staining of teeth and halitosis, may be a concern for many people and, therefore, practical motivating factors to quit. Furthermore, smoking cessation advice provided by general practitioners has been shown to be effective in systematic reviews of many randomized controlled trials (Omaña-Cepeda *et al.*, 2016).

To further empower the dental team and increase competency in smoking cessation, in December 2013 at the Malaysian Dental Deans' Council meeting, smoking cessation became part of the Minimum Competency Exit requirement for Malaysian undergraduate dental curricula, embedded in the Preventive Dentistry module (Tobacco Control, 2014). For the first time, this commits all dental schools in Malaysia to have a minimum level of tobacco control training. However, such training is only available for undergraduate dental students in Malaysia, and according to the latest available annual report from MDC, in 2022, 314 new registrants were from foreign institutions, which constituted 41.98% of total registrants of that year (Malaysian Dental council, 2022). All newly graduated dentists must serve a compulsory year with the MOH and were required to provide quit-smoking advice to schoolchildren for the KOTAK programme.

Thus, there is a need for smoking cessation training that is accessible to all new registrants from foreign institutions to ensure that they have the basic knowledge of smoking cessation to fill their job requirements in the Ministry of Health.

As a prominent dental institution, Universiti Teknologi MARA (UiTM) has been offering smoking cessation training to postgraduate students since the year 2020. In keeping pace with technological advancement while utilising the new norms post-pandemic period, the researchers have extended the efforts by introducing the online version of the smoking cessation module in 2022, designed to benefit oral healthcare professionals. Thus, the aim of this study is to evaluate the effectiveness of the online smoking cessation module in comparison with the face-to-face method, in terms of the level of knowledge.

Materials and Methods

This study employed a Randomized Control Trial (RCT) method using a 2 (F2F delivery as control group and, online delivery as intervention group) × 2 (pre-test, post-test) mixed design to compare outcomes of different smoking cessation training delivery modes. This study received approval from the Research Ethics

Committee (REC), Research Management Centre, UiTM, (ref: REC/06/2021 (MR/426)), and the National Medical Research Register (NMRR) (ref: NMRR ID-23-00921-V0Q (IIR)).

A total of 185 new dental officers were recruited from four states representing 4 regions in Peninsular Malaysia. Participant inclusion criteria were: (1) new dental officers who serve within one to three years in government; and (2) have not joined any training on smoking cessation in Malaysia namely CSCSP or SCOPE. The name list of the new dental officers was obtained from the specified states (Kedah, Perak, Terengganu, Negeri Sembilan). They were randomly divided into two groups, each containing an equal number of participants, using simple randomization techniques via a computerized random list generator. The first 24 individuals were selected for the intervention group, while the subsequent 24 were chosen for the control group. Finally, the selected participants were contacted and invited to join this study by the State's Oral Health Division (Bahagian Kesihatan Pergigian, Jabatan Kesihatan Negeri).

The participants in the online group were allocated a specific place and time identical to the face-to-face (F2F) group, spanning two days from 8 am to 4 pm. This component of the program was conducted in the computer lab. Meanwhile, the online or intervention group completed the module accessible through the UiTM Massive Open Online Course Platform (MOOC). In contrast, the F2F control group received their training in a seminar room. This training was provided by a Dental Public Health Specialist or a dental officer possessing at least a master's degree in dental public health and skilled in conducting smoking cessation counselling. The educational modules provided to both the control and intervention groups are composed of the same materials. These materials include slide presentations designed to visually convey key information, explanatory videos that offer detailed discussions of the topics, and a variety of reading materials to supplement learning. This uniformity ensures that any differences observed between the groups can be attributed to the intervention itself rather than variations in the educational content. The timing and duration of the program for the online group were also made similar to those of the control group. Participant blinding in this study was not possible. Participants accessing the online course were only able to access the content of the module from 8 am to 4 pm on both days of the programme.

All participants completed a questionnaire from a previous study on "Training Malaysian Pharmacy Undergraduates with Knowledge and Skills on Smoking Cessation." This questionnaire had been previously validated (Saraswathi Simansalam *et al.*, 2015). Surveys were administered at two-time points: immediately before training (pre-test) and immediately after training (post-test). It was conducted by distributing the questionnaire in person to ensure a 100% response rate. A pilot study was conducted prior to the main research phase, involving postgraduate students from Universiti Teknologi MARA (UiTM).

The questionnaires used were not translated as the participants of this study were all fluent in English. Participants were asked fourteen multiple-choice questions pertaining to the module's content to assess their knowledge level. Each participant had to select the best answer for each question. One mark was awarded for each correct answer, while no marks were given for incorrect answers. Importantly, there was no deduction of marks for wrong answers. The total points accumulated by each participant were summed up and then divided by the total number of questions, which was 14, to assess knowledge. This result was subsequently converted into a percentage to determine each participant's score. Those scoring more than 50% were considered to have good knowledge, while those scoring 50% or less were deemed to have less satisfactory knowledge.

Data was analysed using the software package SPSS (v.27) Paired t-tests were used to analyse knowledge scores before and after the intervention, and chi-square tests

determined the change in the proportion of students scoring above 50%.

Results

The preintervention and postintervention survey instruments were completed by 185 participants, yielding a 96.4% overall response rate, of which 93 were in the control group and 92 were in the intervention group. The mean age and its standard deviation for participants were 26.5(1.47). The majority of the participants were female, 78.4% (n=145) while male was 21.6% (n=40).

In Table 1, there was significant improvement in preintervention to postintervention mean knowledge scores among all participants, with slightly higher improvement among the intervention group, who received the training via online method.

Table 1. Changes in knowledge levels between physical (control) and online (intervention) groups by mean scores (n= 185).

Variable	Pre-course Score (Mean ± SD)	Post-course Score (Mean ± SD)	Mean of score diff. (95% CI)	t statistic (df)	p-value
Knowledge	6.14 ± 1.71	8.09 ±1.64	1.957 (1.66, 2.25)	12.98 (184)	<0.001
Physical (n=93)	6.05 ± 1.66	7.99 ± 1.61	1.94 (1.55, 2.32)	9.92 (92)	<0.001
Online (n=92)	6.22 ± 1.77	8.20 ± 1.68	1.98 (1.52, 2.44)	8.55 (91)	<0.001

Note: Paired t-test; SD = Standard Deviation; 95% CI = 95% Confidence Interval; df = Degrees of Freedom.

Table 2. Association between physical (control) and online (intervention) group with pre course knowledge score.

Variables	n	**Knowledge Score** Poor n (%)	Good n (%)	**X^2 statistic (df)**	**P-value[a]**
Mode of Delivery				0.13 (1)	0.718
Physical	93	54 (58.1%)	39 (41.9%)		
Online	92	51 (55.4%)	41 (44.6%)		

Note: [a]Chi-square test for independence; *df* = Degrees of Freedom.

Table 3. Association between physical (control) and online (intervention) group with post course knowledge score.

Variables	**n**	**Knowledge Score** **Poor n (%)**	**Good n (%)**	**X^2 statistic (df)**	**P-value[a]**
Mode of Delivery				0.14 (1)	0.705
Physical	93	15 (16.1%)	78 (83.9%)		
Online	92	13 (14.1%)	41 (85.9%)		

Note: [a]Chi-square test for independence; *df* = Degrees of Freedom.

The results from two separate Chi-square tests for independence which tabulated in the table 2 and 3 indicate that there are no significant differences in the prevalence (proportion) of pre and post-course knowledge scores between control and

intervention groups. Even though, the number of participants who scored above 50% for the knowledge component improved from 80 at preintervention to 119 at postintervention. The first test revealed that the pre-course knowledge scores were not significantly different, with $\chi2(1) = 0.13$ and a p-value of 0.718. Similarly, the second test showed that the post-course knowledge scores were also not significantly different, as evidenced by $\chi2(1) = 0.14$ and a p-value of 0.705. Consequently, these findings suggest that there is no significant association between the mode of delivery and the knowledge scores both before and after the course.

Discussion

Various studies have compared the effectiveness of online and face-to-face methods in smoking cessation education and counselling, with mixed results. A study conducted at a German medical school compared e-learning with role-playing in medical education for smoking cessation counselling. It found that while practical skills scores were slightly higher in the face-to-face group for certain aspects, both approaches were equally effective in increasing theoretical knowledge, suggesting that both methods could be combined for effective teaching (Lauerer *et al*., 2021).

Our findings indicated that dental officers' knowledge pertaining to smoking cessation improved following the smoking cessation online training intervention. This is consistent with the recent studies which have demonstrated the effectiveness of online training programs in enhancing the knowledge and skills of healthcare professionals in smoking cessation interventions. This is consistent with the findings of Brown and Janke, who reported significant improvement for knowledge scores, (from preintervention of 36.3% to 84.5% at postintervention) following a web-based training (Brown & Janke, 2013). Martínez *et al.* (2019) conducted a study involving 127 clinicians and found significant improvements in the implementation of the assist and arrange follow-up components of smoking cessation interventions post-training (Cristina Martínez *et al.*, 2019). Similarly, a study by McDermott, West, Brose, and McEwen (2012) highlighted that online training led to a notable increase in knowledge among practitioners, with correct responses rising from 64.4% to 77.7% (McDermott *et al*., 2012). Furthermore, research by Company, Guillen, Martínez, and Fernández (2018) emphasized the effectiveness of an online tobacco cessation training program in increasing smoking cessation knowledge, attitudes, self-confidence, and performance interventions among health professionals in low- and middle-income Latin American and Caribbean countries (Martínez *et al*., 2018). Pardavila-Belio *et al.* (2018) also underscored the benefits of an online health sciences training program for brief smoking intervention in four European countries, focusing on enhancing health professionals' knowledge and skills (Pardavila-Belio *et al.*, 2023). Finally, a study by Etter (2005) compared two Internet-based, computer-tailored smoking cessation programs, shedding light on the efficacy of different online training methodologies (Etter, 2005). These studies collectively affirm the positive impact of online training programs on the preparedness and effectiveness of healthcare providers in smoking cessation interventions.

The positive impact of online smoking cessation training on participants' knowledge levels can be attributed to several factors. One major factor is the flexibility and self-paced nature of online learning, which allows participants to access training materials at their convenience and spend additional time on challenging topics (Hrastinski, 2008). This flexibility is complemented by the ability to review content multiple times, reinforcing understanding and retention (Clark & Mayer, 2016). Interactive elements such as quizzes and simulations, along with immediate feedback, enhance engagement and help learners correct mistakes quickly, leading to better learning outcomes (Shute, 2008; Sitzmann, 2011). These aspects of

online learning make it more effective in increasing knowledge compared to traditional physical training.

Additionally, online training provides continuous access to a wide range of resources, fostering a deeper understanding of smoking cessation (Means *et al.*, 2010). The availability of diverse materials, such as articles and videos, allows for comprehensive learning. Personalized learning paths further enhance effectiveness by catering to individual needs and learning styles (Dabbagh & Kitsantas, 2012). The cost-effectiveness of online training also plays a significant role, as it enables broader access and the efficient use of resources, thus reaching a wider audience (Zhang *et al.*, 2004). Overall, these factors contribute to the success of online smoking cessation training in improving participants' knowledge and supporting their efforts to help patients quit smoking.

Conclusion

The Smoking Cessation Course for Healthcare Professional that was available on MOOC UiTM platform, an online module developed for healthcare professionals, was found suitable in equipping new dental officers with knowledge on smoking cessation topics. It also found that online delivery is as effective as F2F training. This suggests that online training could provide a more cost-effective and accessible method for future smoking cessation training, reaching a broader audience.

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