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Knowledge, attitude and practices of water pipe and e-cigarette smoking among undergraduate dental and oral hygiene students at a South African university

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Abstract

Since the 1990s, use of water pipes (WPs) and electronic cigarettes (e-cigs) has become more prevalent among young adults and students across the world. These products are readily available and are believed to be a healthier option compared to conventional cigarettes. Students may also use these products as a means of socializing and alleviating stress. In this study, we determined the prevalence and use of WPs and e-cigs among oral health students at a South African university. In this cross-sectional analytical study, we invited all undergraduate oral health students at a dental university in South Africa to participate. The students were divided into clinical and non-clinical categories, depending on their year of study and completed a self-administered questionnaire. The response rate was 72% (269) and 70% (189) of them were female. The participants were on average 21.8 years (± 2.7) old and 61% were classified as clinical students. Of the participants, 54% used WPs and 22% smoked e-cigs. Using these products was associated with being a male student (WPs: $p = 0.03$ and e-cigs: $p = 0.02$). Sixty percent of participants used WPs and e-cigs to relax and conventional cigarettes was associated with WPs ($p < 0.01$) and e-cigs ($p < 0.01$). Almost all e-cig users (94%) also used a WP regularly. Undergraduate dental and oral hygiene students readily use WPs and e-cigs to relax, despite negative impacts on health.

Keywords: Water pipe, electronic cigarettes, dental students.

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Introduction

Since the 1990s, the use of water pipes (WPs), also known as hookah or hubbly bubbly, has grown among young adults and students across the world (World Health Organization., 2009). In South Africa, almost 60% of young people have used a WP on a regular basis (Combrink et al., 2010; Van der Merwe et al., 2013). Most of these young people started using a WP between the ages of 13 and 15 years, and perceived WPs to be safer than conventional cigarette smoking (Combrink et al., 2010; Van der Merwe et al., 2013). As with cigarette smoke,

WP smoke contains toxins, volatile aldehydes, carbon monoxide and nicotine that can cause cancer, lung disease, cardiovascular disease and dependence (Shihadeh et al., 2012). Depending on the toxicant, WP smoke can contain twice as many chemicals as conventional cigarette smoke, suggesting that even occasional WP users may be exposed to toxic levels of chemicals (Shihadeh et al., 2012). Additionally, many WP users often share a single mouthpiece which may facilitate the spread of other diseases such as tuberculosis and viruses, including herpes and hepatitis (Maziak, Ward, Soweid & Eissenberg, 2004).

Awareness and use of electronic cigarettes (e-cigs) has increased over the last few years, especially among young adults and women (Schraufnagel et al., 2014). This rapid acceptance may be attributed to the marketing ploy that e-cigs are safer than conventional cigarettes (Schraufnagel et al., 2014). Electronic cigarettes almost always contain nicotine and flavorings, which often taste like candy or fruit and are especially attractive to children or adolescents (Schraufnagel et al., 2014). Although e-cigs may contain less tar and carcinogens than conventional cigarettes, there are few long-term studies to confirm any potential positive or negative health effects on people. By 2013, the major multinational tobacco companies had entered the e-cig market, which are now extensively marketed via television, the internet and print advertisements. Tobacco companies claim that e-cigs are healthier than conventional cigarettes, are useful for quitting or reducing the consumption of conventional cigarettes and enable users to “smoke anywhere”, circumventing smoke free laws (Grana, Benowitz & Glantz, 2014).

While some authors have expounded on the benefits of e-cigs, other studies have failed to show superiority of e-cigs over nicotine replacement medicine or placebo for individuals trying to stop smoking (Schraufnagel et al., 2014). Rather, e-cigs may increase the risk of non-smokers developing nicotine dependence and of current smokers maintaining their dependence (Schraufnagel et al., 2014). The harm-reduction premise of e-cigs ignores the deleterious effects of nicotine (Health & Services, 2014). Nicotine is highly addictive and affects many body cells, mediators, and metabolic pathways (Benowitz, 2008; Benowitz, 2010). In-utero exposure to nicotine may influence the later occurrence of conditions such as impaired fertility, type 2 diabetes, obesity, hypertension, neurobehavioral defects, and respiratory dysfunction (Bruin, Gerstein & Holloway, 2010). Nicotine has significant cardiovascular effects and is associated with the development of coronary artery disease, atherosclerosis and aortic aneurysms (Gaemperli, Liga, Bhamra-Ariza & Rimoldi, 2010; Santanam et al., 2012). Currently, WPs and e-cigs are not regulated as tobacco products in South Africa. As such, these products are readily available to young children, and there is a lack of information regarding the content and concentration of ingredients, the addictiveness of the product, and the safety and side effects of the contents.

Oral health practitioners who examine and treat dental patients, must offer oral hygiene instructions, nutritional advice and anti-tobacco counseling as part of improving patients' general and oral health knowledge. Oral health practitioners need to provide support and knowledge that will assist and prevent patients from starting to smoke and assist patients who are trying to quit smoking. The support that oral health practitioners provide may be influenced by their own knowledge and attitudes regarding WP and e-cig consumption.

Oral health students are known to be under severe stress during their training (Al-Sowygh, Alfadley, Al-Saif & Al-Wadei, 2013; Gordon et al., 2016; Paudel, Subedi & Shrestha, 2013). The stress that students experience is associated with the high theoretical and clinical work load, clinical treatment of patients, failure of patients to attend their appointments and the required clinical quotas (Bhayat & Madiba, 2017). Students alleviate stress by watching television, socializing, using WPs, conventional cigarettes and recreational drugs (AlSwuailam, AlShehri & Al-Sadhan, 2014; Bhayat & Madiba, 2017; Combrink et al., 2010; World Health Organization., 2009). In this study, we assess the use of WPs and e-cigs among oral health students, who are known to experience severe stress and use stress coping mechanisms (Al-Sowygh et al., 2013; Bhayat & Madiba, 2017; Gordon et al., 2016; Paudel et al., 2013). Once they start practicing, oral health students will have to offer tobacco counselling to their patients on a daily basis. By assessing the knowledge, attitudes and practices of oral health students using WPs and e-cigs, educators may be able to modify the content of their theoretical lectures to improve understanding and perhaps change behavior regarding the consumption of harmful substances. To our knowledge, this is the first study to assess WP and e-cig use among oral health students in South Africa.

Methods

Study design

This was a cross-sectional analytical study conducted at a university in Gauteng Province, South Africa.

Sampling

We invited all undergraduate dental and oral hygiene (OH) students registered at a South African university in 2016 to participate. In total, 372 students registered for the course. The prevalence of tobacco smoking is approximately 17% in Gauteng, South Africa (Reddy, Zuma, Shisana, Jonas & Sewpaul, 2015) and with a confidence interval of 95%, a minimum sample size of 138 was identified.

Data collection tool

We collected data using an English medium, self-administered modified questionnaire that has proven to be both reliable and valid by previous authors

(Bhayat & Madiba, 2017; Van der Merwe et al., 2013). The questionnaire was paper based and distributed to students during lectures. The questionnaire comprised of thirty closed ended questions divided into three sections; student demographics, knowledge, attitude and consumption patterns of WP and of e-cigs.

The consumption of WPs and e-cigs were classified into two groups; never consumed them and currently or previously, in the past one year, consumed the products. Participants who reported consumption were classified into two categories; occasional users (fewer than three times per week) and regular users (four or more times per week).

Participants were classified as either clinical or non-clinical depending on their year of study. Clinical students treated patients and offered tobacco counselling whilst non-clinical students were junior students who were not treating patients, nor offering counselling services. Clinical students included dental students in third, fourth and fifth years and OH students in second and third year. Non-clinical students were defined as dental students in first and second year and first year OH students.

Data analysis

Students' knowledge, attitudes and practices were compared according to gender, age, course of study and clinical status. Data were analysed using Statistical Package for Social Sciences Version 23 (SPSS, Chicago, IL, USA). Quantitative variables were summarized as proportions, frequencies, mean with their standard deviations, range and percentages. We used Chi square tests to identify associations between variables, and results were significant if $p < 0.05$.

Ethical clearance

The University Faculty of Health Sciences Ethics Research committee granted ethical clearance (Reference number: 444/2016). No personal details of the students nor the university were recorded and all information was strictly confidential.

Results

Of 372 registered students, 269 (72%) participated and of these, 70% (189) were female students. Participants were on average 21.8 years (± 2.7 ; 18-33) old, with most (87%) being dental students. Almost two-thirds (61%) of the participants were clinical students. More than half (54%) of the students reported currently using or had used a WP in the past 12 months, while 22% of students reported using an e-cig in the same time period (Table 1). There were no significant differences between occasional and regular users of WPs and e-cigs, therefore we combined these two groups under the term "regular users". Male participants

were associated with using WPs ($p=0.03$) and e-cigs ($p=0.02$). Although less than 10% of respondents reported using conventional cigarettes during the past year on a daily basis, over 90% of them reported to use a WP while 70% of them used e-cigs.

Table 1: Prevalence of WP and e-cig consumption in relation to gender, course, age and clinical status (N=269) amongst oral health and dental students at a South African university, 2016.

| Category | Current WP consumer | | Current e-cig consumers | |
|-----------------------------|---------------------|------------------|-------------------------|------------------|
| | n (%) | p-value | n (%) | p-value |
| Male (N=80) | 51 (64) | 0.03* | 28(35) | 0.02* |
| Female (N=189) | 95 (50) | | 32 (17) | |
| Age <20 (N=98) | 57 (58) | | 33 (30) | 0.12 |
| Age 21-23 (N=97) | 57 (59) | 0.35 | 18 (19) | |
| Age > 24 (N=65) | 32 (49) | | 9 (14) | |
| Clinical (N=164) | 95 (58) | 0.15 | 31 (19) | 0.09 |
| Non-clinical (N=104) | 51 (49) | | 29 (28) | |
| Conventional smokers (N=25) | 23 (91) | <0.01* | 16 (70) | <0.01* |
| Nonsmokers (N=244) | 125 (51) | | 44 (18) | |
| Total | 146 (54) | | 60 (22) | |

*Statistically significant using Chi-Square test.

Participants who were conventional smokers were more likely to use both WPs and e-cigs ($p<0.01$) compared to non-smokers. Almost all (94%) of the e-cig consumers regularly used a WP ($p<0.01$). Of the participants who used WPs, 73% added tobacco to the WPs, 10% added marijuana and 5% added alcohol.

The reasons, setting and age of initiation for the use of WPs and e-cigs is shown in Table 2. Most participants started using WPs and e-cigs as adolescents at parties and at home. Almost two thirds of the participants who used WPs and e-cigs claimed that they used it to help them relax.

Table 2: Age, setting and reasons for consuming WPs (n=146) and e-cigs (n=61)

| Category | | WP n (%) | e-cigs n (%) |
|-----------------------------|----------------|----------|--------------|
| Age at first use (in years) | 11-15 | 31 (21) | 2 (3) |
| | 16-20 | 87 (60) | 41 (68) |
| | 21-25 | 28 (19) | 17 (30) |
| Setting | Parties | 120 (82) | 28 (47) |
| | Home | 11(8) | 12 (20) |
| | Public place | 8 (5) | 9 (15) |
| Reasons for smoking | Helps to relax | 98 (67) | 36 (61) |
| | Peer pressure | 20 (14) | 11(19) |

Of participants currently using a WP, 21% felt that they would like to stop smoking, while 29% had no intention of stopping. Less than 10% of students who used e-cigs claimed that they were using e-cigs to help them quit conventional smoking.

The attitudes and perceptions of participants regarding the use of WPs and e-cigs are reported in Table 3. Just over half of the participants (57%) perceived WPs to be unsafe while only 36% perceived e-cigs to be unsafe. More students perceived e-cigs to be safer than conventional cigarettes (30%) compared to WPs (14%).

Table 3: Perception and attitudes in relation to WP and e-cigs (N=269)

| Perception | Response | WP n (%) | e-cigs n (%) |
|--|----------|----------|--------------|
| Generally Unsafe | Yes | 152 (57) | 96(36) |
| Safer than cigarette | Yes | 37(14) | 80 (30) |
| Did you receive information during lectures | Yes | 140 (52) | 130 (48) |
| Is it socially acceptable? | Yes | 160 (59) | 138 (51) |
| Would you recommend WP and/or E-cigs to friends? | No | 204(76) | 181(67) |

Only around half of the participants claimed to have received information on WPs and e-cigs during lectures on tobacco cessation. More than half of participants thought these practices were socially acceptable, but more than two thirds would not recommend WPs or e-cigs to their friends or patients.

Discussion

In this study, almost half of oral hygiene and dental health students reported regularly using WPs or e-cigs. Less than 10% of students were conventional smokers. The high use of WPs and e-cigs amongst these students is in line with usage amongst students from other institutions in South Africa, and seems to be driven by the perception that WPs and e-cigs are safer than conventional cigarettes.

In our study, the prevalence of WP consumption (54%) was similar to medical students in Cape Town (66%) and Pretoria (43%) (Senkubuge, Ayo-Yusuf, Louwagie & Okuyemi, 2011; Van der Merwe et al., 2013). The relatively high prevalence of WP use among these students is concerning since these students are role models to their patients and regularly offer counselling on tobacco cessation (Singh & Pottapinjara, 2017). Whilst clinical students regularly provide information and support on quitting conventional cigarette smoking, they do not discuss the use of WPs and e-cigs because they claim that they have not received sufficient information on these substances during their studies. We recommend that students received specific advice and information on WPs and e-cigs, in conjunction with information on conventional tobacco products. This may improve their knowledge and ultimately impact on their behavior.

In this study, participants used WPs and e-cigs as a coping mechanism to deal with stress (Braun et al., 2012; Combrink et al., 2010; Primack et al., 2008). Similar to other studies (Combrink et al., 2010; Van der Merwe et al., 2013), most students reported using WPs and e-cigs at parties. Use of illicit substances

at parties is often driven by peer pressure, concomitant use of alcohol and the need to relax. While the norm was to use tobacco in the WP, participants in this study reported using marijuana (10%) and alcohol-based products (5%) in combination with tobacco. Marijuana is considered a gateway drug (Kandel, 1975), and may lead to experimenting with other illegal recreational drugs, negatively impacting on the professional and personal lives of students (Puryer & Wignall, 2016). Studies report that WP users are more likely to be users of other products like cigarettes, smokeless tobacco and marijuana (Federal Drug Administration, 2016; Braun et al., 2012; Gadalla et al., 2003). To avoid the long term negative impacts of recreational drug use, we need to understand the demographic characteristics of users and the progression of drug use.

In this study, male students reported using both WPs and e-cigs significantly more than female students, similar to other studies (Braun, Glassman, Wohlgend, Whewell & Reindl, 2012; Gadalla et al., 2003; Senkubuge et al., 2011). Almost all of the WP and e-cig users started smoking during their adolescent years, when they face immense stress and vulnerability (Gordon et al., 2016; Senkubuge et al., 2011). Adolescents should be taught to cope with stressors by identifying stressors and use stress management techniques in high school and university. Another public health concern is that WPs and e-cigs are readily available to adolescents. In South Africa, the sale and consumption of these products are not regulated. The South African government need to act decisively and be proactive in dealing with this scourge. Governments should introduce legislature controlling consumption, composition and access to WPs and e-cigs, as is already in place for conventional tobacco products. Proper regulation and control has reduced the consumption of traditional tobacco products (Levy, Chaloupka & Gitchell, 2004; Thomas et al., 2008), and may reduce the sale and consumption of WPs and e-cigs by adolescents too. Use of WPs and e-cigs by adolescents also raises the issue of tobacco counselling for young children at primary and high school level.

Unlike other studies, in which respondents perceived WPs and e-cigs to be safer than conventional cigarettes (Combrink et al., 2010; Van der Merwe et al., 2013), students in this study considered WPs and e-cigs to be more unsafe than conventional cigarettes and less than 20% reported that they would recommend either WPs or e-cigs to friends. This proportion was considerably lower than the 84% of health students at the University of Cape Town, South Africa (Van der Merwe et al., 2013). In this study, although just over half of students were using WPs and e-cigs, they were seemingly aware of the dangers and would not recommend it to others. Most of the students in our study, who used WPs or e-cigs, reported that they were not using it as an aid to quit smoking. This is probably due to the low proportion of students who were smoking conventional cigarettes. More than a quarter (27% and 34%) of participants claimed to have received prior health information about the consequences of e-cigs and WP

usage. This is concerning as these students should have received lectures on both WPs and e-cigs during their training. We recommend that the curriculum content should be re-examined and possibly amended to remain relevant and up to date.

Conclusions

The prevalence of using WPs and e-cigs was relatively high, with male students more likely to use compared to female students. Many students started using these products in secondary school. Few to none of the students were taught about the dangers of using WPs and e-cigs during the course of their studies. Students did not regard WPs and e-cigs as aids to quit smoking.

Limitations

This study is limited by the cross-sectional study design, and causality cannot be inferred. The self-administered nature of the questionnaire means that students may have responded in a favourable manner to the use of WPs and e-cigs due to their knowledge and not their true usage patterns. Response acquiescence is common in questionnaires that tend to determine habits that are considered taboo or have negative connotations. Despite the limitations, the current study provided useful information that may inform the design of interventions for the reduction of tobacco product use among oral health students and the design of the curriculum. There is a need to identify stressors and to design appropriate coping mechanisms for students.

Recommendations and health policy implications

The American Federal Drug Administration (FDA, 2016) started regulating WP, e-cigs and other tobacco products because of the dangers these products pose to young people. We recommend that South Africa follows suite and regulates all tobacco products including WPs and e-cigs. Currently, the new Control of Tobacco Products and Electronic Delivery System Bill (2018), which has been approved by the Cabinet of the Republic of South Africa and supported by the WHO, addresses these concerns and we recommend that this Bill is accepted into the Tobacco Control Act. This would reduce adolescents' access to these products and increase the awareness of the negative health impacts associated with their use. We recommend that adolescents receive tobacco counselling as most students in this study started using WPs and e-cigs at secondary school. The oral health curriculum should include information on the consumption of WPs and e-cigs.

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