Attitude, Practice and Knowledge of Undergraduate Medical Students Towards Musculoskeletal Effects of Smoking in Saudi Arabia

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Abstract

Background: Smoking is a chief cause of inevitable death and disability. It is considered a risk factor for prospect fracture by decreasing bone density and has deleterious consequences on bone quality.

Objectives: The aims of this study were to determine the prevalence of tobacco smoking and assess the awareness of musculoskeletal effects of smoking among undergraduate medical and health science students at Makkah region, Kingdom of Saudi Arabia (KSA).

Method: A cross-sectional study was performed, using a questionnaire on a randomly selected number ofstudents at Makkah region medical colleges in KSA. Data analysis was performed by a statistical team using SPSS program (version 16). The means and standard deviations of normally distributed variables were compared using paired t tests and for categorical variables, the X2 test was used. The p-value of less than 0.05 was considered to be statistically significant.

Results: We had 370 participants, 56.6% female, and 31.3% male. Smoking prevalence among medical students reached 71.1% smokers, 39.3% smokers for more than 4 years while 60.7% smoked for less than 4 years and 28.9% did not smoke. 64.1% of medical students believe that smoking will affect bone health, while 13.2% did not believe and 22.7% did not know that there is any relationship.

Conclusion: This study identified that prevalence of smoking among undergraduate medical students at Makkah region is higher than previous reports in KSA. There is a crucial need to endorse multi-disciplinary health education events at different age groups to prevent adolescent students smoking, and to support smoking cessation programs.

Key words: Smoking, cigarette, bone health, fracture, medical students, Saudi Arabia

Introduction

Smoking has been recognized as the greatest significant reason of preventable disease and early mortality [1]. Though various adverse health effects of smoking happen later in the lifespan, smoking leads to complications in adolescent people as well [2]. Every day, roughly 4,800 adolescents smoke their first cigarette; of these, approximately 2000 will changed to smokers [3]. Smoking-related diseases are attributed to smoking period (smoking years) and frequency (cigarettes/day). Furthermore, adult smokers started to smoke or had previously become habituated before 18 years of age [4]. Although many teenagers want to quit smoking, only a small number of them do [5]. Certainly, there has been an intense rise over the past decade in the total of college-age smokers [6]. Numerous researchers have stated that the prevalence of smoking rises from the fundamental to clinical years amongst medical college students, emphasizing the significance of directing anti-smoking activities to the fundamental years [7, 8]. For example, students who enter college as non-smokers are 40% less likely to start smoking if they live in a smoke-free campus [9]. With regard to Arab nations in particular, the World Health Organization has stated broadly distinctive prevalence rates of smoking amongst adolescent people: 18% in Kuwait, 43% in Yemen, 23% in Iraq, 25% in Kingdom of Saudi Arabia (KSA) and Jordan, 7% in Oman, 31% in Syrian Arab Republic and 53% in Lebanon [10]. Nevertheless, the pattern of smoking as well as the cessation rate, particularly amongst college students, is fundamentally unknown in many of these countries, including KSA. One study calculates the prevalence of active smoking amongst male medical students at King Saud University to be roughly 13% [11]. In 2009, Al-Turki et al discovered that the prevalence of smoking ranges from 2.4-52.3% among medical students in Central Saudi Arabia [11]. It is highlighted that nicotine has crucial side effects that may disturb most body systems, forexample, the cardiovascular system, reproductive system, respiratory system, urinary system and also the musculoskeletal system [12]. Some of the side effects that can be caused by nicotine and carbon monoxide are decreasing the tissue oxygenation as well as micro-perfusion, and on the other hand, they also raise the rate of polycythemia and platelet aggregation [13]. Furthermore, the blood viscosity will increase while the total of oxyhemoglobin will be reduced due to carbon monoxide [13]. As a result, nicotine can affect the musculoskeletal system, predominantly bone healing. In 2016, Pearson, Clement, Edwards and Scammell showed that the risk of delayed or nonunion bone healing is 2.2 times greater in smokers. They explored that bone union time would took nearly 27.7 days longer in smokers than non-smokers [14]. Referring to clinical trials and demographic research which has been done throughout the countries, it disclosed that individuals who smoke have poor prognosis for fracture healing [15]. Furthermore, the negative impact of smoking on the bones is that it disturbs mineral density, lumbar disc degeneration and rate of hip fractures [15]. Smoking can lead to osteoporosis, spine and joint arthritis, devastate the cartilages and raise the risk of surgical infection [16].

There are a couple of research studies which been made about the consequence of smoking on the musculoskeletal system, and bone healing process, in Saudi Arabia [16]. Fractures are a chief communal health concern, with estimates of over 3 million fractures yearly at a financial cost of $25.3 billion by the year 2025 in the USA only [17]. Hip fractures provide unreasonable burden on healthcare budgets and accompanying that it is not only an important disease but also causes an increased death rate. Research has revealed that smoking is related to an increase in fracturerisk, predominantly at the hip, and existing smoking status is part of the World Health Organization Fracture Risk Assessment Tool (FRAX®) [18]. There are statistics from four big meta-analyses evaluating fracture risk in smokers. In their analysis, Law and Hackshaw [19] also anticipated hip fracture risk from 19 cohort and case-control studies with a sample size of 133,434 with 3,889 fractures. They found a significantly increased risk of hip fracture in female smokers, with increasing risk as persons aged. Lorentzon et al. studied 1,068 young men (average age 19 years) including 93 active smokers. Smokers had lower areal Bone Mineral Density (BMD) at the spine and hip than nonsmokers. After modification for age, height, weight, calcium intake, and physical activity, smokers had lower cortical bone size at the tibia and thinner cortices at mutually the radius and tibia than nonsmokers. [20] In addition, smokers had lower trabecular volumetric BMD at the tibia but no difference in cortical volumetric BMD.

The objectives of the current study were to determine the prevalence of tobacco smoking and to assess the awareness of musculoskeletal effects of smoking among undergraduate medical and health science students at Makkah region, Kingdom of Saudi Arabia (KSA).

Methods

Design: A descriptive/ analytic cross-sectional study was performed, using a questionnaire on a sample size of 370 male and female students who were randomly selected at Western region medical colleges of Saudi Arabia.

Analysis: Data analysis was performed by statistical team using SPSS program (version 16). The means and standard deviations of normally distributed variables were compared using paired t tests and for categorical variables, the X2 test was used. The p-value of less than 0.05 was considered to be a statistically significant.

Participants: Undergraduate medical students enrolled at Medical colleges in Makkah region who voluntarily responded to participate in the online survey.

Survey Instrument: After obtaining ethical approval from research ethic board committee at our institution, randomly selected consenting participants were asked to fill out a 25 items self-structured online questionnaire. It was first directed to 12 students of our college and pilot tested. Appropriate adjustments were then made before confirming it for the study. The questionnaire contained items to look for information regarding demography,

prevalence, and smoking pattern. Students were assured about the anonymity of their answers. Since knowledge of musculoskeletal effects of smoking evolves as we grow the survey included questions about respondents' sociodemographic, clinical information, education, history and pattern of smoking, and students' knowledge and beliefs of musculoskeletal effects of smoking, bone fractures, bone healing and physical activities. The questionnaire included primarily close-ended questions. Some of the questions allowed more than 1 answer. The questionnaire was settled after a comprehensive appraisal of the related articles and consultation amongst the research team. It was face-validated through discussion with professional collaborators in the field and was moreover objectively validated for comprehensibility.

Implications of results:
Results will be developed into educational awareness planning and interventions for incoming undergraduate students.

Results

Table 1: Prevalence of smoking in medical school

Do you smoke?	Medical school	Mean	N	Std. Deviation
Yes	ISNC	1.33	53	.474
	UQU	1.00	1	.
	KAU	1.55	20	.510
	Farabi	1.50	2	.707
	Taif	1.00	3	.000
	Fakeeh	1.50	2	.707
	BMC	1.40	5	.548
	KSAU-HS	1.50	4	.577
	Other	1.06	18	.236
	Total	1.33	108	.471
No	ISNC	1.74	102	.443
	UQU	1.53	15	.516
	KAU	1.86	59	.345
	Farabi	1.60	5	.548
	Taif	1.81	16	.403
	Fakeeh	1.00	1	.
	BMC	1.88	8	.354
	KSAU-HS	1.50	4	.577
	Other	1.44	52	.502
	Total	1.69	262	.461
Total	ISNC	1.60	154	.492
	UQU	1.50	16	.516
	KAU	1.78	79	.414
	Farabi	1.57	7	.535
	Taif	1.68	19	.478
	Fakeeh	1.33	3	.577
	BMC	1.69	13	.480
	KSAU-HS	1.50	8	.535
	Other	1.34	70	.478
	Total	1.59	369	.493

ISNC: Ibn Sina National College for Medical Studies, UQU: Umm Al-Qura University,
KAU: King Abdulaziz University, Farabi: Al-Farabi college, Taif: Taif university,
Fakeeh: Fakeeh College for Medical Sciences, BMC: Batterjee Medical College,
KSAU-NG: King Saud Bin Abdulaziz University for Health Science

Table 2: Knowledge of smoking effect on bone and general health

Have you ever experienced bone pain ?	Which bone had you fractured ?	Have you ever had bone fracture ?	Mean	N	Std. Deviation
Yes	Forearm	Yes	1.00	1	.
		No	1.00	1	.
		Total	1.25	8	.463
	Fingers	Yes	1.00	1	.
		No	1.48	67	.503
		Total	1.45	71	.501
	Total	Yes	1.00	2	.000
		No	1.47	69	.503
		Total	1.43	79	.498
No	Foot	non	1.63	290	.483
		Total	1.63	290	.483
	Total	non	1.63	290	.483
		Total	1.63	290	.483
Total	Forearm	Yes	1.00	1	.
		No	1.00	1	.
		Total	1.25	8	.463
	Fingers	Yes	1.00	1	.
		No	1.48	67	.503
		Total	1.45	71	.501
	Foot	non	1.63	290	.483
		Total	1.63	290	.483
	Total	Yes	1.00	2	.000
		No	1.47	68	.503
		non	1.63	290	.483
		Total	1.59	369	.493

Table 3: Relation of smoker to general exercising and health activity

Do you smoke?	Do you perform exercise/ physical activities ?	Mean	N	Std. Deviation
Yes	1-2 days	1.37	28	.492
	3-4 days	1.32	25	.476
	5-7 days	1.15	13	.376
	0	1.36	42	.485
	Total	1.33	108	.471
No	1-2 days	1.69	55	.466
	3-4 days	1.68	68	.471
	5-7 days	1.69	35	.471
	0	1.71	104	.455
	Total	1.69	262	.461

Summary of results

The prevalence of smoking in our sample was 71.1% and 28.9% are non-smoker. 39.3% of smokers had smoked for a period of more than 4 years while 60.7% smoked for less than 4 years.

Our results showed that a bulk of students who smoke represents 49.5% and they reported that they smoke cigarettes and 25.3% smoke shisha while 18.7% smoke Dokha (Arabian tobacco product, consisting of dried and finely shredded tobacco flakes mixed with herbs and spices). Nevertheless, 10.3% smoked more than 20 cigarettes per day, 41.1% of smokers smoked 5 cigarettes per day, while the rest, 48.6%, smoked 10 – 20 cigarettes per day.

We found that the majority, 39.3%, of smokers don't want to quit. On the other hand, we found that 36.4% plan to quit smoking, and 24.3% plan to quit after finishing medical school. There are numerous potential explanations for the extraordinary prevalence, including high pressure of medical specialty. Overall, smoking and physical activity seems to be negatively associated, but such simplifications must be made with caution as there may be many causes.

We found in our study that 60.5% perform exercise, 40.2% of them spend 30 minutes, 25% spend 60 minutes, 19.6% spend 10 minutes and 15.2% spend more than 60 minutes, while 39.5% don't exercise. On the other hand, 42% from those who performed exercise do physical activities 3-4 days a week as a part of their work and 36.6% do 1-2 days a week while 21.4% do it 5-7 days.

On other hand, 68.1% of students know that smoking increases post-surgical wound healing complications risk whereas 31.9% did not know that risk. The main bulk of undergraduate medical students 51.9% do not know that smoking destroys cartilage while 48.1% knew that fact. 54.6% of students know that smoking delays healing of tendons repair while 45.4% of students are not familiar with that fact.

Discussion

Our study offered insight about the prevalence and attitudes in respect to Musculoskeletal effects of smoking in Saudi Arabian medical students from different specialties in Jeddah, Saudi Arabia. The prevalence of smoking in our sample was 71.1% and 28.9% were non-smokers. 39.3% of smokers smoked for a period of more than 4 years while 60.7% smokers for less than 4 years. The prevalence is greater than the prevalence of 27.8% stated in 2014 amongst dental students at King Saud University, KSA [21]. In addition, that number is higher than the 24.8% prevalence amongst undergraduate medical students in the western region of KSA [22] and the 17.6% amongst undergraduate medical students at King Fahad Medical City in Riyadh, KSA [23]. This outcome is also greater than the results of an article conducted between students at a Malaysian college, which stated that the prevalence was 29% [24]. Moreover, our result is higher compared to a study of smoking amongst Jordan University medical students that revealed a total prevalence of 50.2% [25]. Our results showed that the bulk of students who smoke represents 49.5% and they reported that they smoked cigarettes and 25.3% smoked shisha while 18.7% smoked Dokha. Nevertheless, 10.3% smoked more than 20 cigarettes per day, 41.1% of smokers smoked 5 cigarettes per day, while the rest, 48.6%, smoked 10 – 20 cigarettes per day. This outcome varies from the results of the national analysis of the general public in the kingdom that revealed that commencement of smoking was more common at the age of 19 years [26]. At such an age, students are likely to be in university. We found that the majority (39.3%) of smokers don't want to quit. On the other hand, we found that 36.4% have a plan to quit smoking, and 24.3% have a plan to quit after finishing medical school. There are numerous potential explanations for the extraordinary prevalence, including high pressure of medical specialty. Overall, smoking and physical activity seems to be negatively associated, but such simplifications must be made with caution for many causes. Though a bulk of studies advocate a reverse relationship between physical activity and smoking, this relationship seemed to be more attenuated in youths, and multifaceted relations may occur for other people subgroups [27]. We found in our study that 60.5% perform exercise, 40.2% of them spend 30 minutes, 25% spend 60 minutes, 19.6% spend 10 minutes and 15.2% spend more than 60 minutes, while 39.5% do not perform exercise. On the other hand, 42% from those who performed exercise do physical activities 3-4 days a week as a part of their work and 36.6% do it 1-2 days while 21.4% do it 5-7 days. There are hypothetical primary and secondary special effects of smoking on musculoskeletal health and risk of fracture. Primary toxic consequences of smoking on bone may be associated with nicotine special effects [28, 29] or perhaps to toxic compounds in tobacco products like cadmium [30]. Smoking has direct special effects on osteogenesis involving change in the RANK–RANKL–OPG system [31,32], collagen metabolism [33], and bone angiogenesis [34]. Secondary special effects of smoking on bone might result from decreased calcium absorption from intestine [35], sex hormone dysregulation in production [36], cortical and gonadal hormones metabolism alterations [37–39], calciotropic hormones [40] like 25-hydroxy vitamin D [36, 41] plus parathyroid hormone [36]. These consequences may explain the commonly observed decrease in indications of bone formation, such as osteocalcin, among smokers [41, 42]. Smoking also has indirect influence on bone density and fractures risk through reductions in body weight. Body weight tends to be less for smokers than non-smoking individuals, and this weight differentiation may lead to lower bone density and increased fracture risk [43, 44]. Ultimately, smokers might be less physically active, which may decrease bone density [45] and increase risk of fracture [46]. Certain elements such as high BMI [47], and high calcium consumption [48] have been described to attenuate the smoking relationship with bone. Mosely and Finseth, found that smoking had a harmful effect on hand wounds healing. The adversarial effect of smoking

on fracture healing has been the base of much clinical research, and there is a strong relationship with cardiac and pulmonary diseases [49–54]. On other hand, 68.1% of students know that smoking increases post-surgical wound healing complications risk whereas 31.9% do not know that risk. The main bulk of undergraduate medical students 51.9% do not know that smoking destroys cartilage while 48.1% know that fact. 54.6% of students know that smoking delays healing of tendons repair while 45.4% do not. Research results have suggested that nicotine and related substances in cigarettes can also impair the regeneration of wound healing and soft tissues after fracture, thus decreasing the quality of postoperative consequences and delaying wound healing [55–57]. Our study shows that 59.5% of students know that smoking is a risk factor for osteoporosis while 50.5% do not know. 64.1% of students believe that smoking will affect bone health while 13.2% do not believe that and 22.7% do not know that there is a relationship. Regarding bone fractures, 78.6% did not experience bone fracture while 21.4% did and the commonest fracture was in the arm with 30.4%. There are over a million bone fractures each year in the United Kingdom, and 5–10% are stated not to heal adequately. Thus it is critical that the orthopedic surgeon is aware of the risk factors that could potentially impair bone healing, in order to avoid them whenever possible when managing fractures. There are several theories as to how smoking can influence the healing process of bone fractures and incorporate a reduced blood supply to the injury site, high levels of reactive oxygen species (ROSs) in circulation, low levels of vitamins and antioxidants and the attenuating consequence nicotine has on synthase of endothelial nitric oxide. Bone health is affected by cigarette smoke, and is well known to augment osteoporosis and osteonecrosis of femur in both genders. [58] Whatever the mechanism, this information suggests that the fractures risk is higher for smokers and those who have a smoking history than it is for individuals of the same demographic and BMD who don't or did not smoke ever in their life. Nevertheless, a big number of stronger independent fracture risk factors have been recognized in previous reports. These include fracture history, prolonged use of corticosteroids, significant family history of fracture, secondary osteoporosis, and perhaps the biochemical indicators of bone turnover. These risk factors can be readily used for measuring risk of fracture in the community and their relationships to smoking will need to be determined [59].

Limitations

The study was built on self-reported information hence elicit bias cannot be ruled out. Also, some undergraduate medical students may not disclose their smoking status, nevertheless they were told that their data would be kept confidential.

Conclusion

This study has shown that the prevalence of smoking among health sciences students at Makkah region is higher than the prevalence of smoking reported by other studies in KSA. As the number of smokers globally continues to increase, we must assume an increased disease burden attributable to smoking, including an increased number of osteoporotic fractures. There is a demand to encourage multi-disciplinary health education activities at different age groups to prevent young medical students from smoking, and to assist smoking cessation programs.

Recommendation

1. Campaigns should be developed to raise public awareness of the benefits of cessation and available therapeutic options, including addressing misconceptions about the safety and effectiveness of treatments.
2. Educate the students and provide their parents with the necessary knowledge to educate their children on the danger they face.
3. Focus on the application of the basic principles, the most important of which are:

a. Implementing and activating the smoking prevention law within public and public institutions and buildings, and allocating limited sections for smokers in restaurants and cafes.

b. Increase the health warning on smoking boxes to include at least one third of the box space and add the warning image.

4. Work to provide specialist smoking cessation services within free health centers.
5. Pay attention to the high prevalence of smoking Shisha and work on preventing its promotion, and in particular promote the claim that it is less harmful than cigarette.

Conflict of Interest

Authors have no conflict of interest.

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