

Stress and Smoking as Related to Grades Among Medical Students in Saudi Arabia

Ahmed Mohammed Alkhalaf*

Department of Family and Community Medicine, Faculty of Medicine, Al Baha University, Al Baha, Saudi Arabia

*Corresponding Author: Ahmed Mohammed Alkhalaf, Department of Family and Community Medicine, Faculty of Medicine, Al Baha University, Al Baha, Saudi Arabia.

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Abstract

Background: Smoking is a preventable and modifiable risk factor that is associated with perceived stress. Both of these factors, smoking and stress were commonly seen in medical students undergoing vigorous medical education and training. The current study aimed to investigate the effects of smoking and perceived stress reactivity on the academic performance of medical students at Al Baha University, Saudi Arabia.

Methods: The study was conducted on medical students from Al Baha University, Saudi Arabia. With consent from each medical student, the Perceived Stress Reactivity Scale (PSRS) and Perceived Stress Scale 10 (PSS-10) were administered to measure stress, and grade point average (GPA) was obtained from the faculty of medicine administrative office. The current study was approved by Dean of the Faculty of Medicine, Al Baha University.

Results: Of the 185 male medical students, the 34 students who were smokers had lower GPAs (Mean = 2.48) than the 151 non-smokers (Mean = 2.89). A strong and significant positive correlation was observed between smoking and GPA. Additionally, analysis of PSRS also showed strong associations with GPA, such that prolonged reactivity and reactivity to work overload as measured by the PSRS were positively correlated with GPA.

Conclusions: These findings indicate that medical students who smoke cigarettes and experience stress have lower GPAs, which might also predict poorer professional performance after graduation. It is therefore recommended that the faculty of medicine encourage various preventive measures and stress management techniques to facilitate medical students' meeting the challenges of their training to achieve academic excellence.

Keywords: Grade Point Average; Perceived Stress Reactivity Scale; Perceived Stress Scale-10; Medical Students; Smoking; Stress

Background

Smoking is among the most avoidable risk factors for serious health problems and may have substantial negative impact on life expectancy (Danaei, *et al.* 2010, Lantz, *et al.* 2010). According to a recent World Health Organization [1] report, around six million people worldwide die each year as a result of tobacco use. The prevalence of smoking among medical students varies across countries, from 3% in male medical students in the United States to 53% in male medical students in Japan [2]. In Saudi Arabia, the prevalence of smoking among university male medical students is 24% [3], a slightly higher prevalence than the 21% reported of the general population [4].

In addition to smoking, stress is also a very common risk factor that plays a crucial role in the overall development and well-being of an individual. Several factors contribute to the experience of stress, such as social environment, individual personality, family, and educa-

tional background. The intensity of stress and the implications of stress for an individual's general health vary depending on the situation. Stress is prominent in academic life and might affect students' learning ability, academic performance, and even health [5]. A study in the United States reported increased stress levels in undergraduate college students across a variety of majors [6,7]. Many international studies have revealed that students of undergraduate medical and non-medical background have high rates of health-related problems during their studies [8-10]. However, students in medical school are more prone to academic stress than non-medical students, which has been observed to be due to medical school's higher academic burden and limited time to complete the program [5].

Yusoff, *et al.* [11] demonstrated that healthy students develop depression and stress as they start pursuing their medical degrees. Medical education is a tedious study lasting five to six years. During this period, student was exposed to various challenges to groom themselves, build their skills, and develop the attitude necessary to face real-time professional challenges independently. However, these demands of learning and training might sometimes adversely affect the student's physical and mental health, which may consequently lead them to depression, anxiety, and stress [10,12]. This was confirmed in a bi-centric study conducted in Saudi Arabia and Egypt by EL-Gilany, *et al.* [13], who found that stress, anxiety, and depression were highly frequent among medical students.

In general, academic examinations are stress-inducing. Steptoe, *et al.* [14] found that stress associated with academic examinations significantly increased cigarette smoking among the university students. Similarly, many studies have found an association between stress and smoking in adolescents, showing that the accumulation of various stress factors increased risk of smoking through increased impulsivity [15-17].

An epidemiological survey among 3304 school students established the fact that low academic performances and high stress levels were associated with smoking [18]. Various studies in Saudi Arabia [3,4] as well as many international studies have shown that smoking, stress, and the academic performance are very closely related. The relationship amongst these factors supports the high prevalence of stress and smoking habits in medical students. However, studies of the impact of specific stress parameters on academic performance are lacking. To bridge the gaps amongst stress, smoking, and academic performance amongst the most stressed of students, in the present study we aimed to assess various stress parameters and smoking and examine their relationship with academic performance as assessed by grade point average (GPA) of medical students at Al Baha University.

Methods

Study participants: The present study was conducted with medical students at Al Baha University in Saudi Arabia and with permission from the Dean of the Faculty of Medicine. Medical students who were invited to participate in the study were first approached formally and asked whether they wished to take part. During one-on-one interaction with potential participants, transparency was maintained about the aim of the study. Students who were willing to participate in the study were given an informed consent form to review and, if comfortable, sign. Informed consent was obtained from all individual participants included in the study. The study was deemed ethical by the University of Al Baha Human Ethics Committee. Data for the study were collected using a packet of questionnaires in groups of five to 10 participants simultaneously but independently completed after receiving instructions. While answering the questionnaires, students were advised to answer in whatever way most closely described their reactions in general. They were also advised to not skip any item, even if it is hard to find the best answer. After the participants completed the questionnaires, a debriefing form about the study was distributed to the participants.

Measures: To assess the correlation of the stress and smoking with academic performance, the following measures were used:

Perceived Stress Reactivity Scale (PSRS): The PSRS is a useful, reliable, easy-to-administer, and stable measure to assess the perceived stress reactivity [19]. This scale has wide applications, such as in studies of the genetic and environmental influences on stress reactivity, as a screening in therapeutic settings, as a therapeutic outcome measure for interventional studies aiming at stable changes in individual responses to stressful situations, and to control for baseline between-group differences in a variety of stress studies. It is a 23-item questionnaire with one overall scale and five subscales (Appendix 1).

Items	
1- When tasks and duties build up to the extent that they are hard to manage...	I am generally untroubled
	I usually feel a little uneasy
	I normally get quite nervous
2- When I want to relax after a hard day at work...	This is usually quite difficult for me
	I usually succeed
	I generally have no problem at all
3- When I have conflicts with others that may not be immediately resolved...	I generally shrug it off
	It usually affects me a little
	It usually affects me a lot
4- When I make a mistake...	In general, I remain confident
	I sometimes feel unsure about my abilities
	I often have doubts about my abilities
5- When I'm wrongly criticized by others...	I am normally annoyed for a long time
	I am annoyed for just a short time
	In general, I am hardly annoyed at all
6- When I argue with other people...	I usually calm down quickly
	I usually stay upset for some time
	It usually takes me a long time until I calm down
7- When I have little time for a job to be done...	I usually stay calm
	I usually feel uneasy
	I usually get quite agitated
8- When I make a mistake...	I am normally annoyed for a long time
	I am normally annoyed for a while
	I generally get over it easily
9- When I am unsure what to do or say in a social situation...	I generally stay cool
	I often feel warm
	I often begin to sweat
10- When I have spare time after working hard...	It often is difficult for me to unwind and relax
	I usually need some time to unwind properly
	I am usually able to unwind effectively and forget about the problems of the day
11- When I am criticized by others...	important arguments usually come to my mind when it is too late to still make my point
	I often have difficulty finding a good reply
	I usually think of a reply to defend myself
12- When something does not go the way I expected...	I usually stay calm
	I often get uneasy
	I usually get very agitated
13- When I do not attain a goal...	I usually remain annoyed for a long time
	I am usually disappointed, but recover soon
	In general, I am hardly concerned at all
14- When others criticize me...	I generally don't lose confidence at all
	I generally lose a little confidence
	I generally feel very unconfident
15- When I fail at something...	I usually find it hard to accept
	I usually accept it to some degree
	In general, I hardly think about it
16- When there are too many demands on me at the same time...	I generally stay calm and do one thing after the other
	I usually get uneasy
	Usually, even minor interruptions irritate me
17- When others say something incorrect about me...	I usually get quite upset
	I normally get a little bit upset
	In general, I shrug it off
18- When I fail at a task...	I usually feel very uncomfortable
	I usually feel somewhat uncomfortable
	In general, I don't mind
19- When I argue with others...	I usually get very upset
	I usually get a little bit upset
	I usually don't get upset
20- When I am under stress...	I usually can't enjoy my leisure time at all
	I usually have difficulty enjoying my leisure time
	I usually enjoy my leisure time
21- When tasks and duties accumulate to the extent that they are hard to cope with...	My sleep is unaffected
	My sleep is slightly disturbed
	My sleep is very disturbed
22- When I have to speak in front of other people...	I often get very nervous
	I often get somewhat nervous
	In general, I stay calm
23- When I have many tasks and duties to fulfill...	In general, I stay calm
	I usually get impatient
	I often get irritable

Appendix I: The 23-Item Version of the Perceived Stress Reactivity Scale (PSRS).

Instructions: This questionnaire asks about your reactions to situations which you may have experienced in the past. Three answers are suggested. Please indicate the answer that most closely describes your own reaction in general. Please don't skip any item, even if it may be hard to find the best answer.

Note. The first answer category of each item is coded 0, the second 1, and the third 2. Items marked with "R" are to be reversed (reverse score 2 original score).

Prolonged Reactivity (PrR): 2R, 10R, 20R, 21;

(21) When tasks and duties accumulate to the extent that they are hard to cope with...

(20) When I am under stress...

(10) When I have spare time after working hard...

(2) When I want to relax after a hard day at work...

Reactivity to Work Overload (RWO): 1, 7, 12, 16, 23;

Reactivity to Social Conflict (RSC): 3, 5R, 6, 17R, 19R;

Reactivity to Failure (RFa): 8R, 13R, 15R, 18R;

Reactivity to Social Evaluation (RSE): 4, 9, 11R, 14, 22R;

Perceived Stress Reactivity total score (PSRS-tot): sum of the five scale scores.

Each PSRS item is based on the participants’ exposure to stress and their typical response to the stress. All items in the questionnaire address different potentially stressful situations in daily life, and scores are made across similar stressors to calculate situation-specific scale scores. High scores indicate elevated perceived stress reactivity. There are five situation-specific PSRS subscales are prolonged reactivity (difficulty relaxing/unwinding after high workload), perceived reactivity to work overload (feeling agitated, nervous, irritated in response to high work load), perceived reactivity to failure (feeling disappointed, annoyed, down in response to failure), perceived reactivity to social conflicts (feeling affected, annoyed, upset in response to social conflict, rejection, criticism), and perceived reactivity to social evaluation (feeling nervous, losing self-confidence in response to social evaluation).

In line with the assumption of relative consistency across all situations, these sub-scales are used to assess stress individually and an overall score of perceived stress reactivity is also calculated.

Perceived Stress Scale (PSS-10): The PSS-10 is a 10-item, global psychological measure used to assess the perception of stress based on feelings and thoughts during the previous month (Appendix 2). The 10 questions on the PSS-10 use a five-point Likert scale ranging from 0 to 4 (0 = never, 1 = almost never, 2 = sometimes, 3 = fairly often, and 4 = very often). PSS-10 scores for the four positively stated items 4, 5, 7, and 8 were calculated by reversing coding the items (0 = 4, 1 = 3, 2 = 2, 3 = 1, and 4 = 0) and then summing across all scale items [20]. The scores range varies from 0 to 40, with higher scores signifying higher stress [21].

1. **In the last month, how often have you been upset because of something that happened unexpectedly?**
 ___0=never ___1=almost never ___2=sometimes ___3=fairly often ___4=very often
2. **In the last month, how often have you felt that you were unable to control the important things in your life?**
 ___0=never ___1=almost never ___2=sometimes ___3=fairly often ___4=very often
3. **In the last month, how often have you felt nervous and “stressed”?**
 ___0=never ___1=almost never ___2=sometimes ___3=fairly often ___4=very often
4. **In the last month, how often have you felt confident about your ability to handle your personal problems?**
 ___0=never ___1=almost never ___2=sometimes ___3=fairly often ___4=very often
5. **In the last month, how often have you felt that things were going your way?**
 ___0=never ___1=almost never ___2=sometimes ___3=fairly often ___4=very often
6. **In the last month, how often have you found that you could not cope with all the things that you had to do?**
 ___0=never ___1=almost never ___2=sometimes ___3=fairly often ___4=very often
7. **In the last month, how often have you been able to control irritations in your life?**
 ___0=never ___1=almost never ___2=sometimes ___3=fairly often ___4=very often
8. **In the last month, how often have you felt that you were on top of things?**
 ___0=never ___1=almost never ___2=sometimes ___3=fairly often ___4=very often
9. **In the last month, how often have you been angered because of things that were outside of your control?**
 ___0=never ___1=almost never ___2=sometimes ___3=fairly often ___4=very often
10. **In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?**
 ___0=never ___1=almost never ___2=sometimes ___3=fairly often ___4=very often

Appendix 2: Perceived Stress Scale- 10 Item.

Instructions: The questions in this scale ask you about your feelings and thoughts during the last month. In each case, please indicate with a check how often you felt or thought a certain way.

Grade point average (GPA): Academic achievement is generally defined as an accomplishment at school, college, or university; in class; in a laboratory, library, or project work, and is evaluated through conducting examinations or continuous assessment measured as GPA [22]. At Al Baha University, the GPAs of the medical students are calculated on a four-point scale (A+: 4; A: 3.75; B+: 3.5; B: 3.0; C+: 2.5; C: 2.0; D+: 1.5; D: 1.0; E/F: 0.0); the student’s GPAs were obtained from the faculties’ administration office.

Smoking assessment: To assess the relationship between smoking and academic performance, each participant was asked about his smoking habit. This was scaled as 1 (Yes) if the participant is a smoker, or 2 (No) if the participant was non-smoker. Percentage of smokers and non-smoker and their overall GPAs were calculated.

Statistical analysis: Descriptive statistics were calculated to compute the number and percentage of participants with smoking and non-smoking habits, and mean and standard deviation (SD) were calculated for the selected stress and GPA measures. Further Pearson’s correlations were used to evaluate the relationship of stress and smoking with GPA, and the coefficient values were considered to be significance only if $p \leq 0.05$ (two-tailed).

Results

A total of 185 male medical students provided consent to participate in the study. The students range in the age between 19 and 25 years with a mean age of 21.6 (SD = 1.7) years. The percentage of students who self-reported to be smokers was 19% (n = 34). The percentage of participants from Year 2 to Year 6, their characteristics, and the overall mean PSRS, PSS-10, and GPA are presented in table 1. The mean GPA of smokers and non-smokers are represented in table 2. The analyses show non-smokers had a higher mean GPA compared to smokers. Furthermore, when GPA was analysed with respect to study year, the students from 2nd and 3rd year who are non-smokers have considerably high GPAs. The results also reveal a significant positive correlation between smoking and the GPA ($p < 0.01$), which indicates that students with smoking habits had lower GPAs (Table 2).

Characteristics	Study Year					Mean (SD)
	Year 2	Year 3	Year 4	Year 5	Year 6	
Male, N (%)	43 (23.2)	37 (20.0)	44 (23.8)	28 (15.1)	33 (17.8)	185 (100)
Smoking Status						
Smokers	0	0	16	4	14	34 (19%) 1.84 (42)
Non-smokers	43	37	28	24	19	151 (81%)
Grade point average (GPA)	3.08	2.94	2.62	2.82	2.60	2.81 (0.58)
Prolonged Reactivity (PrR)	1.01	1.04	0.89	0.90	0.78	0.93 (0.39)
Reactivity to Work Overload (RWO)	0.63	0.62	0.86	1.07	0.76	0.77 (0.39)
Reactivity to Social Conflicts (RSC)	0.94	0.94	1.06	1.00	0.86	0.96 (0.33)
Reactivity to Failure (RFa)	1.12	1.13	1.31	1.16	1.14	1.18 (0.34)
Reactivity to Social Evaluation (RSE)	1.12	1.13	1.31	1.16	1.14	0.84 (0.34)
PSRS total Mean	0.81	0.84	0.90	0.93	0.71	0.94 (0.23)
Perceived Stress Scale (PSS-10)	1.99	1.95	1.95	1.86	1.83	1.92

Table 1: Overall and year-wise percentage of smokers and mean values of stress measures and GPA.

Characteristics	Study Year					GPA Mean (SD)
	Year 2	Year 3	Year 4	Year 5	Year 6	
Smoker (n = 34)	0	0	16	4	14	2.48 (.53)
Non-smokers (n = 151)	43	37	28	24	19	2.89 (.57)
GPA	3.08	2.94	2.62	2.82	2.60	2.81 (.58)

Table 2: Distribution of smokers and non-smokers relative to GPA.

To assess the stress levels in medical students, mean PSRS and PSS-10 were measured and observed to be 0.94 and 1.92, respectively, and their overall GPA was 2.81 (SD = 0.58; Table 1). Additionally, correlation analysis of PSRS and GPA revealed a significant correlation between GPA and PSRS subscales PrR and RWO, and with total PSRS. However, a negative but non-significant correlation was observed between PSS-10 and GPA, which indicates that though the parameters are negatively related the relationship did not reach significance (Table 3).

	GPA	p-value
Smoking	0.218**	.003
Prolonged Reactivity (PrR)	0.166*	.024
Reactivity to Work Overload (RWO)	0.145*	.050
Reactivity to Social Conflicts (RSC)	0.141	.056
Reactivity to Failure (RFa)	0.101	.172
Reactivity to Social Evaluation (RSE)	-0.015	.842
Perceived Stress Reactivity Scale (PSRS), Mean	0.170*	.021
Perceived Stress Scale	-0.137	.062

Table 3: Pearson’s correlation between smoking and perceived stress subscales with GPA.

**Correlation is significant at the 0.01 level (2-tailed); *Correlation is significant at the 0.05 level (2 -tailed).

In order to assess the relationship between smoking and stress levels, a correlation analysis was performed and revealed a negative association of PSRS (r = -0.11; p = 0.877) and PSS-10 (r = -0.074; p = 0.318) with smoking. A significant positive correlation (r = 0.38; p = 0.00) between PSRS total and PSS-10 was found, which indicates that if PSRS total increases, PSS-10 also increases significantly, indirectly supporting the notion of an effect of PSS-10 on GPA.

Discussion

Many previous studies have reported that smoking, stress, anxiety or depression were frequent among the medical students [3,10,12]. The present study revealed a strong association of smoking with GPA in medical students. Students with smoking habits had lower GPAs (2.48; n = 34) compared to non-smokers (2.89; n = 151), and a significant positive correlation between smoking and GPA (p < 0.01) was evident. This result is consistent with the finding of Pennanen., *et al.* [23] that students with smoking habits are unsuccessful at school compared to non-smoking students. Additionally, Pennanen., *et al.* [23] found that development of the smoking habit was associated with worsening of academic achievement over time. Another study found that students who smoked tobacco experienced impaired cognitive functions, inattentiveness, distractibility, poorer memory, difficulty manipulating information, and poorer school achievement [24]. In the present study, smoking is significantly associated with GPA which may be attributed by the medical students who are in later years of their education.

Medical education and training are stressful curriculum and several studies have revealed that medical students have high levels of stress [7,25]. According to Cohen, *et al.* [26], psychosocial stress is an important risk factor for mental and physical health and stress may affect academic performance in students [27]. On the other hand, it is well established that stress is significantly correlated with smoking [14,28]. In the present study, stress levels in the medical students were measured using the PSRS and PSS-10. The PSRS is a scale based on a participant exposure to stress and their typical response to the stressor [19]. Stress reactivity is an individual response that is thought to be both stable and variable. Each person is characterized by a specific range of values within which the parameter can vary [29]. The PSS-10 assesses perceived stressful experiences or stress responses over the previous month and also a reliable tool to measure levels of perceived stress [21].

Academic stress is negatively associated with students' performance [30]. A study of medical students also reported that levels of stress were negatively related to their academic performance before and during medical school [31]. On the contrary, the analysis in the present study observed a significant positive correlation ($p < 0.05$) of GPA with PSRS-PrR (0.166; $p = 0.024$) and PSRS-RWO (0.145; $p = 0.50$), indicating that as these subtypes of stress increase, GPA increases as well. These findings suggest strategies for coping with stress may have a significant impact on medical students' self-efficacy and ultimately on their performance (and grades). This idea is corroborated by a previous study of dental students that showed that students who perceived moderate levels of stress during the examination reported fair to average grades [32-34].

Conclusion

The outcomes from the present study cannot be generalised to all the students because the study was conducted in specific group of student population with limited sample size and based on entirely on students' responses. These findings can be supported by conducting similar studies in larger populations of students, including students in other majors, women, and students in other cultures. Future research might also control for factors such as socioeconomic status and examine not just whether or not students smoke cigarettes, but the number of cigarettes they smoke per day, and perhaps their alcohol use. Future studies might also delve into examination of improved coping skills for students, and whether habits such as smoking and experiences of negative stress can be reduced if students develop healthy coping strategies.

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Conflict of Interest

The authors declare that they have no conflict of interest.

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