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Factors Affecting the Academic Performance of Medical, Dental, and Pharmacy Students in Jordan

Shereen M. Aleidi[1], Eman Elayah[1], Dina Zraiqat[1], Roua Abdallah[1], and Montaha AL-Iede[2]

1- Department of Biopharmaceutics and Clinical Pharmacy, School of Pharmacy, The University of Jordan, Amman, Jordan
2- Department of Pediatric Respiratory and Sleep Medicine, School of Medicine, The University of Jordan, Amman, Jordan.

ABSTRACT

Aim: The aim of this study is to investigate factors that can affect academic performance of undergraduate students in medical specialties.

Methods: This is a cross-sectional study conducted at the University of Jordan and Mutah University. An anonymous self-administered online questionnaire was randomly distributed using google form among undergraduate students from faculties of medicine, dentistry, and pharmacy. Students were classified into two groups according to their cumulative grade point average (GPA); group with excellent or very good GPA and group with good or below GPA.

Results: A total of 628 students (78.7% females) filled the study questionnaire. The data analysis revealed that 60% of the students were belong to the excellent or very good GPA group. These students had significantly enough amount of sleep during exams and did not have any difficulty staying awake during day time or waking up in the morning compared to students with good or below GPA (P-value <0.05). Moreover, 21% of the excellent or very good GPA students had studied for more than 6 hours compared to only 13.5% of the good or below GPA students (P-value<0.005). Students with good or below GPA showed higher percentages of smokers (15.5% vs 5.6%, P-value <0.005), part-time workers (15.1% vs 9%, P-value=0.018) and overweight or obese (35.1% vs 24.1, P-value=0.004). The final logistic regression model demonstrated that age, part time employment, smoking, short duration of studying were the independent predictors that significantly associated with achieving good or below GPA (P-value <0.05).

Conclusion: Age, working while studying, smoking, and studying hours and day time sleepiness are the factors that had a negative impact on the students' GPA. Therefore, it is necessary to increase awareness among students regarding the potential effects of these factors on their academic performance.

Keywords: Academic performance, Lifestyle, Health Students, Sleep Pattern, Part-time Employment.

INTRODUCTION

The integrity of learning and memory processes are essential for academic performance, particularly among university students[1]. A student's academic performance is very important and attracts the attention of all those involved in higher education system [2]. Improvement of students' academic achievement and performance has always been one of the main targets of top universities, as it is a desired outcome for worksite health promotion professionals[2,3]. The literature demonstrated that academic performance of students is influenced by different factors[2,3,6,7]. For example, the academic commitments and university lifestyle including new social and competitive

* s.aleidi@ju.edu.jo
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academic environment impact students' personality, studying skills, and sleep pattern which all may affect the academic performance of university students [2,3,6,7]. Medical and other health related students like pharmacy and dental students are unique group of students whose academic commitments affect their academic performance [2,4]. Those students are considered as a group of population whose mostly suffer from study stress and sleep-related problems[5,6]. In a qualitative study that investigated factors influencing high academic achievement of medical students, the management of sleep deprivation was one of important predictors for students' academic success[7]. Sleep has an essential role in maintaining and improving memory, learning process, and overall health[8,9]. The recommended number of sleeping hours needed to promote good health and well-being in adults is at least seven hours per night on a regular basis[10]. Sleeping less than six to seven hours per night is defined as sleep deprivation and it would negatively impact both mental and physical health[11]. It has been implicated that sleep deprivation can interfere with the function of brain structures that are crucial to cognitive processes[12]. Neuroimaging evidence has shown that the most susceptible brain region to the effects of lack of sleep is the prefrontal cortex, which is involved in language, creativity, logical reasoning, and working memory[12]. Several studies from different countries have reported that sleep deprivation[11], poor sleep quality[5,13], and excessive day time sleepiness[4,14] are very common among medial and pharmacy students and have negative impact on their academic performance. Despite the fact that obstructive sleep apnea (OSA), which is a type of sleep disordered breathing, was uncommon among university students, it was associated with poor academic performance[15].

Furthermore, behavioral factors like drinking coffee and caffeinated beverages, taking sedatives, and cigarette smoking are common among university students[16, 17,18]. Most of students drink coffee or caffeinated beverages during exam days to regulate their sleep-awake cycle[16]. However, they eventually develop poor sleep quality and quantity[16]. It has been reported that these behavioral factors can either mediate sleep pattern or directly influence students' academic performance[16, 17,18]. Study skills have also been found to affect students' academic performance. Based on previous research findings, study skills including time managements, taking notes, concentration and memory were found to significantly associate with better academic performance[19]. In addition, the quantity of time spent during studying influenced academic performance, however, this influence was moderated by the study habits used by students [20].

The literature has addressed number of factors that influence the academic performance of university students, such as; stress, mental health, and sleep related disorders[7,13,15,21,22]. However, exploring the impact of other factors such as; student's employment, sleep pattern, health status, study duration, and lifestyle behavior on the academic performance among university students has not been addressed sufficiently. Thus, the aim of this exploratory study was to expand our knowledge about the possible factors that might affect academic performance of undergraduate students in medical specialties.

2. METHODS:

2.1. Study participants

A cross-sectional study was conducted from (March to June) 2018 at two public universities; The University of Jordan in Amman, the capital city of Jordan and Mutah University in Al-Karak, south of Jordan. The participating students were full time undergraduate students. The inclusion criteria: (i) enrolled students from different academic years, (ii) enrolled in a bachelor's degree to one of these programs; medicine, dentistry, and pharmacy, (iii) willingness to participate. An online self- administered questionnaire was adapted from previous studies[14,23] and prepared using google form. It was distributed randomly

using social media such as Facebook and WhatsApp students' groups. The students were informed that the participation is voluntary, and their answers will be confidential. The study was approved by the Institutional Review Board (IRB) at the JUH. The official teaching language at the university of Jordan and Mutah University is English, therefore, the questionnaire was administered in English language. The questionnaire consisted of a total of 22 questions distributed into four main sections. The first section addressed the demographic information and contained 6 questions about age, gender, university, faculty, academic year, and part time employment. The second section addressed student's lifestyle and health status and consisted of 6 questions about smoking, physical activity, caffeine or herbs with sedative effect intake, body mass index (BMI), chronic medical disease, medication intake. The third section addressed sleep pattern and consisted of 6 questions about usual sleep duration, sleep duration during exam days, naps (short sleep during the day), quality of sleep (continues or interrupted), difficulty staying awake during day time, and difficulty waking up in the morning. The last section was about academic performance and consisted of 4 questions about academic achievement, studying hours, time of studying during the day, and academic progress rate (APR). The academic performance was assessed via a cumulative grade point average (GPA) for the last semester prior to the study period and classified into the following five categories: Excellent (GPA ≥ 3.65 out of 4.00), very good (3.00 - 3.64), good (2.5-2.99), accepted (2.0-2.49), and weak (< 2.0). The academic progress rate (APR) which reflects how quickly the student is moving toward graduation related to his/her academic curriculum, was also used to assess the students' academic performance. A pilot study was conducted, in which a sample of 10 students was randomly selected and they were asked to answer the questions in order to assess the validity and reliability of the questionnaire. Students' answers and comments were considered to prepare the final version of the questionnaire.

2.2. Statistical analysis

All data were processed using Microsoft EXCEL programs and the statistical package for social science (SPSS version 20, Chicago, USA software). Descriptive statistics were used to describe demographic characteristics of participants. Percentages and frequencies were used for the categorical variables. Continuous variables were expressed as mean ± Standard deviation (SD). Group differences were studied using bivariate analysis (Chi-square analysis for categorical independent variables). Based on the information obtained from the bivariate analysis, a framework for factors that affect academic performance was developed using logistic regression analysis. All hypothesis testing were two-sided. A *P*-value of <0.05 was considered significant.

3. RESULTS:

3.1. Demographic characteristics and lifestyle of the participating students.

The total number of students who were responded and answered the online questionnaire was 736. No information was available about the number of students who refused to fill the questionnaire. After data entry, 108 were excluded because of missing information. Therefore, data analysis was performed on 628 students. Table 1 shows the demographic characteristics and the life style of students. Majority of students were females (78.7%). The largest percentage of students (57.4%) were among age group (18-21) years and the highest response rate was from the University of Jordan (78.7%). Most students were from the faculty of pharmacy (46.3%) and were in their fifth year (34%). In addition, most of students were not working (88.6%). With regards to the lifestyle and health status; majority of students were non-smoker (90.5%), physically inactive (41.8%), with minimum consumption of caffeine 1 cup/day (35.9%), and medically free (87.0%) with normal weight (Body mass index (BMI) < 25 kg/m^2).

Table 1. Demographic and life style characteristics of students (N=628)

Characteristics	N (%)	Academic Performance (GPA) N (%)		P value [a]
	All students N=628	Excellent or very good N=377 (60)	Good or below N=251 (40)	
Age				
18-21	361 (57.4)	245 (65.0)	116 (46.2)	*<0.005**
22 or more	267 (42.6)	132 (35.0)	135 (53.8)	
Gender				
Male	134 (21.3)	69 (18.3)	65 (25.9)	*0.023**
Female	494 (78.7)	308 (81.7)	186 (74.1)	
University				
University of Jordan	494 (78.7)	307 (81.4)	187 (74.5)	*0.038**
Mutah University	134 (21.3)	70 (18.6)	64 (25.5)	
Faculty				
Medicine	178 (28.3)	99 (26.3)	79 (31.5)	
Pharmacy	290 (46.3)	189 (50.1)	101 (40.2)	0.051
Dentistry	160 (25.4)	89 (23.6)	71 (28.3)	
Academic year				
First year	73 (11.6)	49 (13.0)	24 (9.6)	
Second year	88 (14.0)	59 (15.6)	29 (11.6)	
Third year	134 (21.3)	84 (22.3)	50 (20.0)	*0.024**
Fourth year	120 (19.1)	76 (20.2)	44 (17.5)	
Fifth year	213 (34.0)	109 (28.9)	104 (41.4)	
Part- time employment				
Yes	72 (11.4)	34 (9.0)	38 (15.1)	*0.018**
No	556 (88.6)	343 (91.0)	213 (84.9)	
Smoking				
Yes	60 (9.5)	21 (5.6)	39 (15.5)	*< 0.005**
No	568 (90.5)	356 (94.4)	212 (84.4)	
Physical activity				
Inactive	263 (41.8)	157 (41.6)	106 (42.2)	
15 minutes/ day	184 (29.4)	113 (30.0)	71 (28.3)	
30 minutes / day	110 (17.5)	67 (17.8)	43 (17.1)	0.897
More than 30 minutes / day	71 (11.3)	40 (10.6)	31 (12.4)	
Caffeine consumption				
Nothing.	167 (26.6)	108 (28.6)	59 (23.5)	
1 cup/day	226 (35.9)	131 (34.7)	95 (37.8)	
2 cup/day	150 (24.0)	87 (23.1)	63 (25.1)	0.700
3 cup/day	56 (8.9)	34 (9.0)	22 (8.8)	
More than 3 cup/day	29 (4.6)	17 (4.5)	12 (4.8)	
Consumption of herbs or drinks with sedative effects				
Yes	300 (47.9)	176 (46.7)	124 (49.4)	0.504
No	328 (52.1)	201 (53.3)	127 (50.6)	

Characteristics	N (%)	Academic Performance (GPA) N (%)		P value [a]
	All students N=628	Excellent or very good N=377 (60)	Good or below N=251 (40)	
Chronic diseases				
Yes	82 (13.0)	45 (11.9)	37 (14.7)	0.307
No	546 (87.0)	332 (88.1)	214 (85.3)	
BMI[b]	22.9 ±4.2	23.4±3.8	23.7±4.5	*<0.005**
Obesity				
Normal (BMI<25)	440 (71.1)	279(74.0)	161(64.1)	*0.004*
Overweight or obese (BM I≥25)	179(28.9)	91(24.1)	88(35.1)	

[a] p values were calculated using Pearson Chi square test, *significant at p value <0.05.
[b] BMI: Body Mass Index (weight/(height)^2)

Students were categorized into two groups according to their GPA; group with excellent or very good GPA (N=377, 60%) and group with good or below GPA (N=251, 40%) (Table 1). There were significant differences (P-value <0.05) between the two groups in the age, gender, university, academic year, part-time employment, smoking status, and BMI. Compared to the students with good or below GPA, students with excellent or very good GPA were younger age (18-21) year and in earlier academic year, majority of them were females, and were from the university of Jordan. In addition, only 9% of the students with excellent or very good GPA were part-time workers compared to students with good or below GPA (15.1%) (P-value=0.018). On the other hand, higher percentages of smoker students (15.5%) and overweight or obese (35.1%) were found in the group of students with good or below GPA compared to those in the group of students with excellent or very good GPA (5.6% and 24.1%, respectively) (P-value <0.005).

The percentages of students according to their GPA were demonstrated in Figure 1. Sixty percent (60%) of students were in the group of students with excellent or very good GPA (Table 1, Figure1). The remaining 40% of students were distributed between good, accepted, and weak GPA categories, which all included in the group of good and below (Figure1).

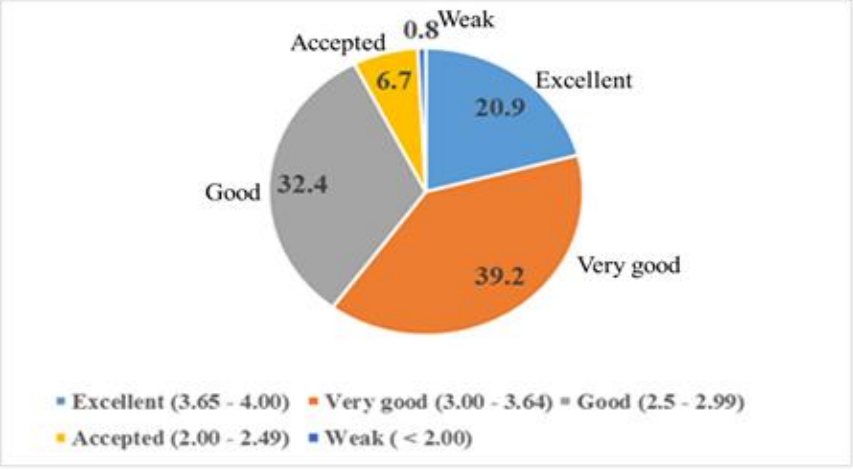

Figure 1: Distribution of participating students according to their GPA

3.2. The sleep pattern of the participating students and its effect on their academic performance.

The sleep pattern including; duration of sleep, napping habits, sleep quality, and sleep-wake up pattern were investigated among participating students. Table 2 presents sleep pattern of all participating students (N=628) and a comparison between the two groups which were previously identified. Approximately, more than half of all students (65.2%) sleep around 6-8 hours during the normal days. However, during exams students' sleep duration was decreased. In addition, among all participating students, 34.5% of them sleep less than 4 hours during exams days and 49.3% sleep around 4-6 hours, while only 16.2% of them sleep more than 6 hours. Additionally, around 56% of all participating students had continuous sleep and around 47% of them do not take a nap during the day. High percentage of students had difficulty wakening up in the morning (68%). Regarding the effect of sleep pattern on the students' academic performance, a comparison between the two students' groups (defined previously) in different sleep pattern parameters was performed and the results were presented in table 2. Students with excellent or very good GPA significantly differed from those with good or below GPA in all of the sleep pattern parameters except for both usual duration of sleep and quality of sleep. Expectedly, students with excellent or very good GPA had enough amount of sleep during exams days compared to the students with good or below GPA, *P*-value< 0.05. Consistently, less students with excellent or very good GPA sleep less than 4 hours during exams time (30.2%) compared to students with good or below GPA (41.0 %), *P*-value < 0.05. In addition, more students with excellent or very good GPA had a 15-30 minutes nap (short sleep during the day) compared to those with good or below GPA (10.3% vs 4.4%), *P*-value < 0.05. Finally, students with excellent or very good GPA did not have any difficulty staying awake during day time or waking up in the morning compared to those with good or below GPA (55.7% vs 43.0%, *P*-value<0.05 and (37.4% vs 24.7%, *P*-value< 0.05, respectively). Taken together, these results suggested that good sleep pattern especially during exams days is associated with better academic performance.

Table 2. Sleep patterns of participating students (N=628)

Sleep Pattern	N (%)	Academic Performance (GPA) N (%)		P value [a]
	All students N=628	Excellent or very good N=377	Good or below N=251	
Usual duration of sleep				
Less than 6 hrs.	120 (19.1)	72 (19.1)	48 (19.1)	0.734
6-8 hrs.	409 (65.2)	249 (66.0)	160 (63.7)	
More than 8 hrs.	99 (15.7)	56 (14.9)	43 (17.1)	
Duration of sleep during exams				
Less than 4 hrs.	217 (34.5)	114 (30.2)	103 (41.0)	*0.019**
4-6 hrs.	309 (49.3)	196 (52.0)	113 (45.0)	
More than 6 hrs.	102 (16.2)	67 (17.8)	35 (13.9)	
Quality of sleep				
Continuous.	409 (56.2)	256 (67.9)	153 (61.0)	0.073
Interrupted.	219 (34.8)	121 (32.1)	98 (39.0)	
Napping during the day				
None	294 (46.9)	179 (47.5)	115 (45.8)	*0.032**
15 mins.	46 (7.3)	28 (7.4)	18 (7.2)	
15-30 mins.	50 (7.9)	39 (10.3)	11 (4.4)	
1 hour.	123 (19.6)	72 (19.1)	51 (20.3)	
More than 1 hour.	115 (18.3)	59 (15.6)	56 (22.3)	

Sleep Pattern	N (%)	Academic Performance (GPA) N (%)		P value [a]
	All students N=628	Excellent or very good N=377	Good or below N=251	
Difficulty staying awake during day time				
Yes	310 (49.4)	167 (44.3)	143 (57.0)	*0.002**
No	318 (50.6)	210 (55.7)	108 (43.0)	
Difficulty waking up in the morning				
Yes	425 (67.7)	236 (62.6)	189 (75.3)	*0.001**
No	203 (32.3)	141 (37.4)	62 (24.7)	

[a] p values were calculated using Pearson Chi square test, * significant at *p*-value <0.05.

3.3. The effect of study duration on students' academic performance

The average duration of studying in hours during exams was investigated. Of all students, 39.1% indicated that they study 3 to 6 hours on average during exams days and only 9.1% of them mentioned that they study less than 1 hour (Table 3). Students with excellent or very good GPA significantly studied for longer time than those with good or below GPA, *P*-value<0.005. Of students with excellent or very good GPA 42.4% spent 3-6 hours of studying during exams times, while 39% of students with good or below GPA spent only 1 to 3 hours of studying during exams times. In addition, 21% of students with excellent or very good GPA study more than 6 hours compared to only 13.5% of students with good or below GPA, *P*-value<0.005. Moreover, less students with excellent or very good GPA (6.1%) significantly study less than 1 hour compared to students with good or below GPA (13.5%), *P*-value<0.005. Overall, excellent or very good GPA positively associated with longer duration of study.

Table 3. The effect of study duration on the academic performance of participating students (N=628)

	N (%)	Academic Performance (GPA) N (%)		*P*-value [a]
	All students N=628	Excellent or very good N=377	Good or below N=251	
Duration of studying				
Less than 1 hr.	57 (9.1)	23 (6.1)	34 (13.5)	*<0.005**
1-3 hrs.	213 (33.9)	115 (30.5)	98 (39.0)	
3-6 hrs.	245 (39.1)	160 (42.4)	85 (33.9)	
More than 6 hrs.	113 (18.0)	79 (21.0)	34 (13.5)	

[a] p values were calculated using Pearson Chi square test, *significant at *p*-value <0.05.

The academic progress rate (APR) was investigated as an additional tool to assess the students' academic performance. The distribution of students according to their APR and academic performance are shown in table 4. Most of the students (76.6%) who were participated in the study had normal APR. Comparing students with excellent or very good GPA with students with good or below, we found that significantly higher percentages of excellent or very good GPA students were parallel with other colleagues (81.2%) or advanced in their APR (11.9%). On the other hand, we found significantly higher percentage of students with good or below GPA were behind other colleges in their APR (23.4%). These results confirm that better academic performance positively associated with students' progress toward graduation.

Table 4. Academic progress rate (APR) of participating students (N=628)

	N (%)	Academic Performance (GPA) N (%)		*P*-value[a]
	All students N=628	**Excellent or very good N=377 (60)**	**Good or below N=251 (40)**	
APR				
Parallel with other colleagues	482 (76.6)	306 (81.2)	176 (70.1)	<0.005*
Behind other colleagues	85 (13.7)	26 (6.9)	59 (23.4)	
Advanced	61(9.7)	45(11.9)	16 (6.3)	

[a] p values were calculated using Pearson Chi square test, *significant at *p*-value <0.05.

Finally, variables which were found to significantly affect the students' academic performance in bivariate analysis were entered into final logistic regression model. Results revealed four of pre-identified variables (age (*P*-value <0.005, OR 2.195), part time employment (*P*-value 0.025, OR 1.889), smoking (*P*-value 0.001, OR 2.752), studying for less than one hour (*P*-value <0.005, OR 3.652), and studying for 1-3 hours (*P*-value 0.002, OR 2.323) were significantly associated with achieving good GPA or below (Table 5). A test of the final model against a constant only model was statistically reliable, X2 (degree of freedom of 10)=109.604, *P*-value <0.0005, indicating that the predictors, as a set, reliably distinguished between students having very good or excellent GPA and those having good or below GPA. The variance in the academic performance accounted for by the predictors was 21.7% (Nagelkerke R Square).

Table 5. Logistic regression analysis for factors associated with achieving good or below GPA.

Variables	*P*-value	Odds ratio (OR)	95% CI for OR
Age (18-21)	***<0.005***	2.195	1.533-3.142
Part- time employment	***0.025***	1.889	1.082-3.297
Smoking	***0.001***	2.752	1.509-5.019
Duration of studying	***<0.005***		
Less than 1 hr.	<0.005	3.652	1.766-7.555
1-3 hrs.	0.002	2.323	1.366-3.949
3-6 hrs.	0.297	1.322	0.782-2.235
Difficulty staying awake during day time	0.067	1.414	0.976-2.048
Difficulty waking up in the morning	0.059	1.472	0.985

4. DISCUSSION

The current study demonstrated a clear association between number of factors and academic performance of undergraduate medical, dental, and pharmacy students in two large public universities in Jordan. The results showed that students with excellent or very good GPA were significantly different from those with good or below GPA in a set of characteristics such as; age, gender, university, academic year, part-time employment, study duration, smoking status, BMI, and sleep pattern.

In this study a significantly high percentage of students among the group of excellent or very good GPA students were younger than those in the group of good or below GPA. This was in line with previous research that investigated differences in academic performance among university students[24]. They found that at the undergraduate level, youngest students do better compared with their oldest colleagues and these findings

were potentially explained by difference in cognitive abilities between students[24]. This is consistent with the findings of current study as the final logistic regression model showed that increasing age was significantly associated with achieving good GPA or below rather than excellent or very good GPA. A plausible explanation for the age differences between students' groups in our study is the increased study load with advancing years among students of health faculties. During late academic years, medical, dental, and pharmacy students will have clinical training besides taught courses, which makes them overwhelmed.

In contrary to the group of good or below GPA students, the majority of students among group of excellent and very good GPA were females. Results of previous studies conducted at university of Jordan, revealed that the cumulative GPAs of undergraduate females[25] and dental graduated female students[26] were significantly higher than those of the male students. Another study conducted at King Saud bin Abdul-Aziz University for health sciences showed that Saudi female students achieved greater scores than male students in most medical science subjects [27]. Our findings and those from previous studies that females do better than males in medical schools are opposing to the public Jordanian stereotypical beliefs and attitudes regarding female academic performance in higher education. According to Khwaileh et al., one of the common traditional stereotypes is that some demanding disciplines such as; medicine, dentistry, and pharmacy that confer very good careers in Jordan are almost males' jobs, while softer disciplines such as; education, languages, and social sciences that do not afford good careers are mainly females' jobs [25]. On the other hand, some studies reported inconsistent results regrading gender effect on the academic performance[1,28]. Nihayah et al., found that males GPA was much higher than females among biomedical Malaysian students[1]. While Faisal et al., reported no significant difference between the academic performance of Pakistani males and females students [28]. These findings suggest a significant impact of gender on academic performance of university students. Of the possible causes behind the gender difference in academic performance is the gender-related health problems. For example, it has been shown that the mental health problems associated with menstruation such as premenstrual dysphoric disorder (PMDD) had a negative impact on female students' academic performance [22].

Furthermore, this study clearly showed that a great portion of Jordan university students were in the excellent or very good GPA group. This could be explained by the higher number of students who participated in the study were from the University of Jordan compared to those from Mutah University. Consistent with age effect on the academic performance, most of the excellent or very good GPA students were at their early academic year.

Nowadays, part-time employment among university students has been rapidly increasing due to mainly financial issues. However, this is not applicable among students of health faculties as this students' population has a high level of stress and study load. Results of the current study revealed that among all participating students, only 11.4% were part-time workers and the majority of these working students were students with good or below GPA. Depending on the final logistic regression model, part-time employment was one of the factors that was significantly associated with good or below GPA. This reflects that working while studying has a negative impact on the academic performance among medical, dental, and pharmacy students. This was in line with Elling et al., work which indicated that employment does negatively affect students' academic performance [29]. They demonstrated that an increase in the amount of worked hours was the most affecting factor [29]. Interestingly, not all of the conducted researches reported a negative impact of the students' employment on the academic performance. For example, some studies have found that students' work does not have a significant

effect on their academic performance [30, 31]. On the other hand, some studies suggested that students' employment has a positive impact on their academic performance, especially those who work in their academic field [32]. This was explained by the fact that students' work may help in building a stronger students' character, teaching the students time-management skills, and providing them with experience outside of the university environments [32].

Interestingly, our results revealed that smoking was more common among good or below GPA students and was an independent predictor of a lower academic performance. This agreed with results from a previous study conducted in the north of Jordan which demonstrated a significant association between the lower academic attainment and the increased prevalence of smoking among university students[18]. In addition, Bahammam et al., showed that non-smoker students did better in their academic profile than smoker students [4]. This suggests a need for an increased emphasis on effective smoke cessation programs among university students and raise awareness of the adverse health as well as negative academic effects of smoking. Moreover, the results of this study showed that students with good or below GPA were significantly more obese or overweight and had higher BMI compared to the students with excellent or very good GPA. Similarly, Bahammam et al., reported a higher obesity prevalence among average students rather than excellent ones [4]. This points out to the question whether obesity has any direct association with lower academic performance or an indirect impact by affecting, for example, sleep pattern and quality. An answer for this question has come from more than one studies which demonstrated a significant negative correlation between either BMI or obesity related sleep problems and academic performance[15,33]. For instance, Khassawneh et al., showed that obstructive sleep apnea (OSA), which is type of sleep disordered breathing mostly affected obese students, was associated with poor academic performance among Jordanian university students[15]. Regarding sleep pattern and its effect on students' academic performance, our results showed that students with excellent or very good GPA had enough amount of sleep the night prior to examination. This was associated with better academic performance, as most of excellent or very good GPA students sleep between 4-6 hours or more than 6 hours. In addition, taking a nap during the daytime was associated with better academic performance. These results go hand to hand with the findings of many previous studies that have addressed a positive association between sleep quality and quantity and academic performance among medical and pharmacy students[4,5,6,14,34]. Although the results of this study demonstrated a statistically significant difference in sleep duration between excellent or very good GPA and good or below GPA students, sleep duration was not significantly associated with academic performance in the final logistic regression model. Interestingly, this was similar to what has been reported by other studies [1,13]. However, based on the scientific facts that discuss the effect of sleep on cognitive performance, more sleeping hours would result in better academic performance[6]. It has been shown that sleep has a key role in promoting learning and memory consolidation [35]. It is necessary to form synapse between selected dendritic branches which contribute to memory storage of learned information [35]. Therefore, enough sleep would help students to achieve a better concentration and memorization of information [6, 35]. The lower GPA of the short sleeper students may have been resulted from decreased ability to concentrate on education-related activities. In addition, the results revealed a statistically significant difference between excellent or very good GPA and good or below GPA students' groups in terms of sleep inadequacies reflected by the difficulty staying awake during day time and difficulty waking up in the morning. These two parameters were associated with lower academic performance. These results are in accordance with Mirghani and his colleagues' research which has found a

significant negative impact of daytime sleepiness on the academic performance of Sudanese medical students [36]. Besides, another study showed a negative effect of daytime sleepiness on learning, memory, performance, and students' participation in extracurricular activities [37]. Moreover, different studies reported that daytime sleepiness is a significant problem among university students and associated with sleep disorders and work while studying[14,15]. Veldi et al., in their study demonstrated a relationship between daytime sleepiness and sleep quality, workload, and increased BMI [14]. Based on the results of our study, a significantly higher percentage of good or below GPA students (who suffered from daytime sleepiness) were overweight or obese and were part-time workers. These findings indicate an association between both workload and BMI and lower academic performance. These results are supported by Veldi et al., work [14]. Overall, this body of evidence about worse consequences of daytime sleepiness on academic performance highlights the need perhaps to enhance awareness among students and teaching staff members regarding good sleep quality and factors affecting sleep hygiene such as; work while studying and obesity. Finally, longer duration of study was associated with better academic performance. Results of the final logistic regression model indicated that both studying for less than one hour and studying for 1-3 hours were significantly associated with achieving good GPA or below. Consistently, it has been reported in the literature that students with high GPAs studied for longer hours with high motivation rate for studying compared to those with low GPAs [2,38]. This highlight the importance of study duration and the study skills and their impact on the students' academic performance.

Even though this study presents interesting and meaningful results and has many strengths, it has some limitations that should be mentioned. In regard to its strengths; this study included a relatively high number of students from different medical disciplines (medicine, dentistry, and pharmacy) from two different geographical locations. We approached students from The University of Jordan (located in the center of Jordan) and Mutah University (located in the south of Jordan) to reflect different students' teaching, studying, and living environments. In addition, the participation rate was satisfactory as a high number of students from different academic years responded and filled the online questionnaire. On the other hand, this study has some limitations. For example, GPA was measured by students self-reporting depending on the students' memory of past semester, which raises the possibility that students might not have accurately reported their GPA. Getting an official report of the GPAs from the administrative unit could remove this possibility of human error. Moreover, the questionnaire did not include a valid assessment tool for sleep quality and quantity and relied only on students' answers. Using a standardized, reliable, and valid scale like the Pittsburgh sleep quality index is required for future studies to accurately measure the quality and pattern of sleep in adults. Causality between factors and academic performance could not be determined due to the cross-sectional design of this study. Finally, other confounding factors such as; studying skills, learning style, student's intellectual ability, and stress were not examined in this study. These factors could have a significant impact on academic performance. It has been shown that university students experienced many stressors from different sources in their academic life [21]. These sources could be related to social, academic, and financial issues[21]. Future studies are recommended to provide further examination and investigation of these factors and stressors and also to suggest valuable interventions to enhance students' overall academic performance

In conclusion, the current study reports significant findings regarding important factors that affected academic performance of undergraduate students in different medical specialties in Jordan. Age, working while studying, smoking, and studying hours were the most significant factors that had a negative impact on the students' academic

performance. Day time sleepiness measured by difficulty waking up in the morning and difficulty staying awake during the day had also a negative impact on the students' academic performance. Considering these factors, academic staff members as well as other administrative authorities at universities should take active role to increase awareness among students regarding the potential effects of these factors on their academic performance. In addition, it is necessarily to design and implement appropriate programs to improve academic success and life style among university students. These programs should focus on teaching students different skills to handle academic burden such as; how to deal with stress, good time management, and good sleep hygiene. Although the current study findings are a meaningful step in enhancing the higher education in Jordan, future research is required to examine whether or not the associations that were observed in this cross-sectional study represent causal relationships.

Compliance with Ethical Standards

Conflict of interest: The authors declare that they have no conflict of interest.

Ethical approval: All procedures performed in this study was in accordance with ethical standards of the Institutional Review Board of the University of Jordan and Mutah University.

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العوامل المؤثرة على التحصيل الأكاديمي لدى طلاب الطب وطب الأسنان والصيدلة في الاردن

شيرين محمد العيدي[1] ، ايمان عليه [1]، دينا زريقات[1] ، رؤى عبدالله[1]، منتهى العيدي[2]

1- قسم الصيدله الحيويه والسريريه ، كليه الصيدله ، الجامعه الاردنيه، عمان ، الاردن
2- قسم طب الجهاز التنفسي وامراض النوم، كليه الطب، الجامعه الاردنيه، عمان ، الاردن

ملخص

تم إجراء هذه الدراسة لتحديد العوامل التي قد تؤثر على التحصيل الدراسي للطلاب في مجال الطب وطب الأسنان والصيدلة في جامعتين حكوميتين كبيرتين في الأردن.

منهج البحث : اجريت هذه الدراسة على مجموعة من طلاب الجامعة الأردنية في عمان وجامعة مؤتة في الكرك (ن = 628) تم توزيع استبيان عشوائياً عبر الإنترنت باستخدام جوجل ومنصات التواصل الأجتماعي. تم تصنيف الطلاب إلى مجموعتين وفقًا لمعدلاتهم التراكمية: مجموعة الطلبة الذين تقديرهم إمتياز أو جيد جداً ومجموعة الطلبة الذين تقديرهم جيد أو أقل من ذلك.

النتائج : كشف تحليل البيانات أن (60 ٪) من الطلاب كانوا ينتمون إلى مجموعة الطلبة الذين تقديرهم إمتياز أو جيد جداً. أن هذه المجموعة من الطلبة ينامون ساعات كافية أثناء الإمتحانات ولم يكن لديهم أي صعوبة في البقاء مستيقظين خلال النهار أو الإستيقاظ في الصباح مقارنة مع الطلبة الذين تقديرهم جيد أو أقل من ذلك. علاوة على ذلك فان نسبه (21%) من الطلبة الذين تقديرهم إمتياز أو جيد جداً يدرسون أكثر من(6) ساعات مقارنة مع (13.5%) فقط من الطلبة الذين تقديرهم جيد أو أقل من ذلك. بالمقارنة مع مجموعة الطلبة الذين تقديرهم إمتياز أو جيد جداً فإن مجموعة الطلبة الذين تقديرهم جيد أو أقل من ذلك شملت نسبة أكبر من المدخنين (15.5% مقابل 5.6%) ومن الذين يعملون بعمل جزئي (15.1% مقابل 9 %) ونسبة أكبر أيضاً من الطلبة ذوو الوزن الزائد أو ممن يعانون من السمنة (35.1% مقابل 24.1%). كشف التحليل الأحصائي أن العمر والعمل بدوام جزئي والتدخين وقصر ساعات الدراسة هم أكثر العوامل التي تؤثر سلباً على تقدير الطلبة ومعدلاتهم التراكمية.

الإستنتاج : إنه من الضروري أن نزيد الوعي بين الطلاب فيما يتعلق بالاثار المترتبة لهذه العوامل على تحصيلهم العلمي و أدائهم الدراسي.

الكلمات الدالة: التحصيل الدراسي، نمط الحياة، صحة الطلاب، نمط النوم، العمل بدوام جزئي.

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