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STRESS-INDUCED IMMUNE-RELATED DISEASE AND HEALTH OUTCOME OF PHARMACY AND DENTISTRY STUDENTS-PILOT STUDY

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ABSTRACT

Stress and its impact on health sciences students were broadly studied. In our knowledge, there was no studies conducted in United Arab Emirates to measure the stress and its effects on the immune responses among Pharmacy and Dentistry students while few studies was conducted on pharmacy students only. The objective of this study was[1] to examine the self-reported perceived stresses among the participants[2] to discuss the health outcomes and immune-related diseases and[3] determine if there is a significant difference between socio-demographic and life style factors regarding health and immune related diseases. A self-reported questionnaire was administrated to a sample of 293 students at Ajman University, Pharmacy and Dentistry students. Data were analyzed by Statistical Package for Social Science (SPSS) version 20. Chi-square and Fisher's exact tests for analyzing question. A number of stressors were associated with general health, as lack of exercise, skipping meals, study year and credit hour load. However no significant difference was found between pharmacy and dentistry programs regarding health outcomes. Considering the immune-related diseases in response to gender, higher proportions of female stated that they caught cold/flu and they had skin/hair problems compared to males. Moreover, it was found that first years were associated with more cold/flu and skin/hair problem compared to final years. However, results will help in increasing the awareness of students by acting as a prior warning to what they might face during their program and how can they reduce the negative stressors and tendency to infections and diseases.

KEYWORDS: Stress; Immune-related; Health-outcomes; Pharmacy; Dentistry; Students.

INTRODUCTION

Stress is actually an emotionally negative state which characterized by a psycho-physiological reaction that leads to generation of a plenty of hormonal and chemical processes in body systems. The outcomes of stress effects mainly have a direct effect on different body systems such as immune, autonomic and cardiovascular system, where if stress was unsustained, may lead to increasing in the blood pressure, sleeping disturbances, stomach pain, anxiety and headaches. [1-3] A lot of previous studies found that exposure to either psychological or physical stress can have a detrimental health outcomes and immune-related diseases for example, increasing the tendency to viral or bacterial infections, hypersensitivity reactions as allergy and contact dermatitis. [4] Because of stress capability in altering diverse aspects of the immune responses such as enhancing the infections susceptibility, stimulating certain inflammatory triggers and hence inflammatory reactions, let the body to be more liable to suffer from upper respiratory tract infections (UTI), and hence and as a result it will cause a person to have more illness and diseases.[2,5,6,7,8,9,10,11,12,13,14] Furthermore, a degree of defensive mechanism disturbance can occurs relying on many factors, as one of them is the stress periods onset.[15, 16] Stress can be divided into two types either temporary and short (acute) or long term and persistent (chronic). In considering acute stress, there were a number of studies showed that the association with increasing white blood cells (WBCs), natural killer (NK) cell cytotoxicity and reduced mitogen's response to mitosis. [11] On the other hand, chronic stress can have other disadvantage effects on the disturbing the cardiovascular function and hence experiencing a coronary artery disease (CAD).[2, 17] Nevertheless, not all stress types are considered hazardous. Some stressful life events and genetic factors shows depression state which is defined as a mood disorder of both suppressing and activating the immune system as a previous studies showed that.[18, 19] Some types of stress has been developed specially with university students and hence utilized by researchers in many studies and experiments.[20- 23] However, stress is varying among students; some may experience stress if they were overcrowded with credit hour load, others if they were far from their families and relatives. Excessive university stress on the student life can lead to depletion in the immune system providers, which hence affects its ability

to deal with such alterations, initiating different immune-related diseases such as tonsillitis, common cold and hair/skin problems. [7, 24, 25, 26] It has been found that by Chen et al., Qureshi et al., persistent stress lowers white blood cells and increases the chance for infections and later on symptoms starts to appear. [27, 28]

Faculty of pharmacy and Dentistry study system at Ajman University

The University of Ajman is private university with many disciplines. One of its scientific faculties is Pharmacy and Dentistry. Acceptance grade rate and total credit hours for Dentistry program is higher than that for Pharmacy program. Pharmacy program is a 4 years study of 150 credit hours while Dentistry program is a 5 years study of 199 credit hours. There are few subjects in common between both programs in first years, since each have its own specialty topics. Moreover, in Ajman University, the academic system is credit hours based (study hours per week) that is either total credit hour (all topics) or specialty topics, and the academic year consist of fall semester (16 weeks) and the same is with the spring semester. Stress and its impact on the health sciences students were broadly studied. In our knowledge, there was no studies conducted in UAE to measure the stress and its effects on the immune responses among Pharmacy and Dentistry students while few studies were conducted on pharmacy students only. However, this study can help in increasing the awareness of students towards their university life stress. The purpose of this pilot study was to measure the self-reported perception of stress and the immune-related diseases, and to investigate the relationship between the perceived stress and the immune system response within a sample of medical students. The study objectives were to: (1) asses the perceived stress of the medical students; (2) examine the health state of the participants; (3) demonstrates Immune-related diseases of the study participants; (4) determine if there is a significant difference between socio-demographic and life style factors regarding health and immune related diseases outcomes. However, this study results can help in increasing the awareness of students by acting as a prior warning to what they might face during their program and how can they reduce some of the negative causing factors and tendency to infections and diseases. In addition, it might be very benefit to all those universities who follow the same educational guideline system for both faculties.

MATERIALS AND METHODS

By using the cross-sectional design where a self-administrated questionnaire was distributed by an interviewer to a number of Pharmacy and Dentistry students from second, third, fourth and uppermost fifth year levels of study at the Faculty of Pharmacy and Dentistry, Ajman University, Ajman, UAE. Stress information was revealed by the survey as perceived by the students in the previous fall semester of 2016/2017.

The number of students viewed to participate in this study was 360 students (180 from each program). By getting permission from the doctors of both programs, for handling over the survey forms from assigned participants for the targeted number during the class time and to ease collecting the questionnaire after completion. Some verbal skills has been used in an informed consent to all participants and discussing each question and answering them by myself and my colleges and holding any misunderstanding points. The respondents were 310 (150 of Pharmacy and 160 of Dentistry students). But, thereafter, the number ended with 293 participants (143 of Pharmacy and 150 of Dentistry students) who completely fill the questionnaire. All participants were really thanked for their collaboration with us. Questionnaire has been improved by referring to the available studies and surveys in the literature which used to examine the encountered stress among the academic life of the students, such as Gadzella (1991) student-life stress inventory (SLSI), [29] Insel and Roth (1985) Students Stress Scale [30] and many other references of stress were it has been defined by the researcher Burge, 2009 [31] and Veena et al.,2016. [32] Due to the plurality of nationalities and facilitate the process of answering the questionnaire was translated into Arabic (mother language of participants) and then a distributed to participants. The questionnaire was designed of four major parts. The first part of the questionnaire was about Response and Socio-demographic characteristics of the participants. The second part is daily life factors of the participants such as exercising, smoking, social activities and sleeping hours. The third part was about health-related outcomes among participants. Last part of the questionnaire was Immune-related diseases such as having cold/flu, tonsillitis, any hair or skin disorder that can be noticed by the participant which hence can be an indicator for their the immune system.

All data was analyzed and coded statistically by using SPSS, version 20. Regarding testing the significant difference between Pharmacy and Dentistry student's responses, Chi-square and Fisher's exact tests was used. Results with a p value less than 0.05 were considered significant while less than 0.01 were highly significant. Few numbers of questionnaire forms have not been used or estimated due to lack of some data by failing in answering some questions from the respondents. Further descriptive measures have been used and presented to facilitate analyzing the data such as degrees of freedom (df), percentages and chi-square (X^2).

RESULTS

Response and Socio-demographic characteristics of the participants

This cross sectional study was conducted among medical student of Ajman University to evaluate the health status and the immune related diseases among medical students and to identify the lifestyle and study related factors affecting the health and the immune status of the medical students. The survey was conducted between October

2016 to February 2017. Three hundred and ten questionnaires were distributed among medical students, 293 were returned (response rate = 94.5%). Males constituted 21.8% of sample (n= 64) and 78.2% of respondents were Female (n=229) of the participants. Of medical students 143 (48.8%) were Pharmacy students and 150 (51.2%) were Dentistry students. Overall, 105 (35.8%) participants belonged to the second year, 75 (25.6%) to third year, 102 (34.8%) to fourth year and 11 (3.8 %) to fifth year. The majority (89.1%) of the respondents were not employee, 7.2% employee but not supporting their family and 3.8% employee and supporting their family.

Table 1: Demographic characteristics of the participants

Demographic Variable	Frequency	(%)
Gender:		
Male	**64**	**(21.8%)**
Female	**229**	**(78.2%)**
Major		
Pharmacy	**143**	**(48.8%)**
Dentistry	**150**	**(51.2%)**
Study Year		
2nd year	**105**	**(35.8%)**
3rd year	**75**	**(25.6%)**
4th year	**102**	**(34.8%)**
5th year	**11**	**(3.8%)**
Marital status		
Single	**273**	**(93.2)**
Married	**20**	**(6.8)**
Employment status		
No	**261**	**(89.1%)**
Yes, but not supporting family	**21**	**(7.2%)**
Yes and supporting family	**11**	**(3.8%)**
Accommodation		
With family	**221**	**(75.4%)**
With relatives	**3**	**(1%)**
Alone in private houses	**17**	**(5.8%)**
Student accommodation	**52**	**(17.7%)**

Study related characteristics of the participants

Table 2 shows the study related factors of the medical students. Half of the study participants (50.9%) reported that they have a total of 15–18 credit hours loads in the semester, 38.6% of them having more than 18 credit hours while only 10.6% having less than 15 credit hours. When they asked about their specialty topics credit hours loads 150 (51.2%) indicated having 12–16 credit hours loads, while another 120 (41.0%) indicated having more than 16 credit hours loads and only 23 (7.8%) having more than 16 credit hours. According to the GPA grades, 96 (32.8%) had grades in the range of 3–3.64, 77 (26.3%) had grades in the range of 3.65–4.00, 58 (19.8%) had grades in the range of 2–2.49, whereas 7 (2.4%) had grades in the range of less than 2.

Table 2: Study related characteristics of the participants.

Study related Variable	Frequency	(%)
Total credit hours loads		
<15 credit hours	**31**	**(10.6%)**
15–18 credit hours	**149**	**(50.9%)**
>18 credit hours	**113**	**(38.6%)**
Specialty topics credit hours loads		
<12 credit hours	**23**	**(7.8%)**
12–16 credit hours	**150**	**(51.2%)**
>16 credit hours	**120**	**(41.0%)**
CGPA		
<2.00	**7**	**(2.4%)**
2–2.49	**58**	**(19.8%)**
2.5–2.99	**55**	**(18.8%)**
3–3.64	**96**	**(32.8%)**
3.65–4.00	**77**	**(26.3%)**

Daily life factors of the participants

Table 3 demonstrates the lifestyle factors of the participants. The vast majority of the participants highlighted that they don't have regular exercise and they don't smoke (77.1%), (87.4%) respectively. More than Half (65.5%) of participants reported a lack of three regular healthy meals/day also more than half (58.0%) reported a lack of social activity. About 75.4% of the study participants reported having from 5 to 8 hours sleep, 14.3% reported having less than 5 hours sleep and 10.2% having more than 8 hours.

Table 3: Daily life characteristics of the participants.

Daily life Variable	Frequency	(%)
Regular exercise:		
Yes	**67**	**(22.9%)**
No	**226**	**(77.1%)**
Smoking:		
Yes	**37**	**(12.6%)**
No	**256**	**(87.4%)**
Social activity:		
Yes	**123**	**(42.0%)**
No	**170**	**(58.0%)**
Having three regular meals/day:		
Yes	**101**	**(34.5%)**
No	**192**	**(65.5%)**
Sleeping hours/day:		
Less than 5 h	**42**	**(14.3%)**
From 5 to 8 h	**221**	**(75.4%)**
More than 8 h	**30**	**(10.2%)**

Health-related outcomes among participants

Table 4 shows health outcome of the respondents. The majority of the students (63.8%) indicated that they got ill during the semester from one to three times. Only (21.2%) of the students stated that they did not get ill, while the rest got ill more than three times during that semester. About (64.8%) of the students did not seek medical care and only (28.7%) were hospitalized during that semester. Around half of the students (48.8%) stated that their health during the last 6 months differ than before.

Table 4: Health outcome of the participants.

Health Outcome	Frequency	(%)
Times of getting ill		
None	**62**	**(21.2%)**
One to three times	**187**	**(63.8%)**
More than three times	**44**	**(15%)**
Changes in general health during the last six months		
Yes	**143**	**(48.8%)**
No	**150**	**(51.2%)**
Seeking medical care		
Yes	**103**	**(35.2%)**
No	**190**	**(64.8%)**
Being hospitalized		
Yes	**84**	**(28.7%)**
No	**209**	**(71.3%)**

Immune-related diseases among participants

Table 5 demonstrates Immune-related diseases of the study participants. The majority of the participants (64.5%) stated that they caught cold/flu from one to three times. On the other hand (61.1%) of the students did not have any bacterial infection (like tonsillitis). Moreover, more than half of the participants (56.3%) reported that they don't have breath shortness during the current semester. In addition, (24.6%) of the students had noticed both skin and hair problems whereas, (44.4%) of the students did not notice any hair/skin problems. The rest were divided into almost two groups; one had noticed hair problems only and the other skin problems only.

Table 5: Immune-related diseases of the participants.

Immune Outcome	Frequency	(%)
Times of having flu/cold during the current semester		
None	**88**	**(64.5%)**
One to three times	**189**	**(64.5%)**
Three to five times	**16**	**(5.5%)**
Times of having tonsillitis (bacterial infection) during the current semester		
None	**179**	**(61.1%)**
One to three times	**106**	**(36.2%)**
Three to five times	**8**	**(2.7%)**
Having periods of short breath during the current semester		
Yes	**128**	**(43.7%)**
No	**165**	**(56.3%)**
Changes in skin/or hair during the current semester		
No change	**130**	**(44.4%)**
Only hair	**59**	**(20.15%)**
Only skin	**32**	**(10.9%)**
Yes, both hair and skin	**72**	**(24.6%)**

Comparison between socio-demographic and life style factors regarding health and immune related diseases outcomes

Immune system responses and health outcomes of the students were assessed by indicating the changes in their health (such as having cold/flu, tonsillitis, hair problems, skin problems and getting ill during semester). Analysis run to assess the difference between socio-demographic and daily life factors with respect to health and immune related diseases outcomes using the Chi-square and Fisher's exact tests at an alpha (a) value of 0.05. There are a number of factors that can contribute to a student health as indicated in Table 6. Among these factors, female sex, first study years, having 15≥ credit hours, not having regular healthy meals and not regularly exercise were characterized by higher percentage of getting ill during semester (P <0.001), (P <0.001), (P <0.001), (P <0.001), (P <0.001), (P <0.001) respectively. However no significant difference was found between pharmacy and dentistry programs regarding health outcomes. Considering the immune-related diseases in response to gender a higher proportions of female stated that they caught cold/flu and they have skin/hair problems compared to the males (P <0.001), (P <0.001)respectively. Moreover, it was found that first years were associated with more cold/flu as compared to final years (P <0.001). Regarding the credit hours, the students with 15 credit hours and more during the semester were reported higher cold/flu and skin/hair problem compared to the students with less than 15 credit hours (P <0.001), (P <0.001) respectively. In addition the students who had regularly exercised and those who regularly had meals were associated with less cold/flu and less skin/hair problems (P <0.001), (P <0.001) respectively.

Table 6: Factors associated with Health and immune-related diseases outcome.

	Got ill during semester		Cold/flu		Tonsillitis		Breath shortness		Skin/hair problem	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Gender:										
Male	10(4.3%)	54(87.1%)	64(31.2%)	0	64(56.1%)	0	64(50%)	0	0	64(49.2%)
Female	221(95.7%)	8(12.9%)	141(68.8%)	88(100%)	50(43.9%)	179(100%)	64(50%)	165(100%)	163(100%)	66(50.8%)
	P < 0.001		*p < 0.001*		*p < 0.001*		*p < 0.001*		*p < 0.001*	
Major										
Pharmacy	117(50.6%)	26(41.9%)	101(49.3%)	42(47.7%)	64(56.1%)	79(44.1%)	65(50.8%)	78(47.3%)	86(52.8%)	57(43.8%)
Dentistry	114(49.4%)	36(58.1%)	104(50.7%)	46(52.3%)	50 (43.9%)	100 (55.9%)	63(49.2%)	87(52.7%)	77 (47.2%)	73(56.2%)
	P =0.223		*P = 0.809*		*P =0.045*		*P =0.551*		*P =0.129*	
Study Year										
First years	118(51.1%)	62(100%)	180(87.8%)	0	114(100.0%)	66(36.9%)	128(100.0%)	52(31.5%)	50(30.7%)	130(100%)
Final years	113(48.9%)	0	25(12.2%)	88(100%)	0	113(63.1%)	0	113(68.5%)	113(69.3%)	0
	P < 0.001		*p < 0.001*		*p < 0.001*		*p < 0.001*		*p < 0.001*	
Credit hour load										
<15 credit hours	0	31(50.0%)	31(15.1%)	31(16.4%)	0	0	31(24.2 %%)	0	0	31(23.8%)
15≥ credit hours	231(100.0%)	31(50.0%)	104(84.9%)	158(83.6%)	88(100.0%)	179(100.0%)	97(75.8%)	165(100.0%)	163(100.0%)	99(76.2%)
	P < 0.001		*p < 0.001*		*p < 0.001*		*p < 0.001*		*p < 0.001*	
Regular healthy meals										
Yes	39(16.9%)	62(100.0%)	101(49.3%)	0	95(83.3%)	6(3.4%)	101(78.9%)	0	0	101(77.7%)
No	192(83.1%)	0	104(50.7%)	88(100.0%)	19(16.7%)	173(96.6%)	27(21.1%)	165(100.0%)	163(100.0%)	29(22.3%)
	P < 0.001		*p < 0.001*		*p < 0.001*		*p < 0.001*		*p < 0.001*	
Regular exercise										
Yes	10(4.3%)	57(91.9%)	67(32.7%)	0	67(58.8%)	0	67(52.3%)	0	0	67(51.5%)
No	221(95.7%)	5(8.1%)	138(67.3%)	88(100%)	47(41.2%)	179(100.0%)	61(47.7%)	165(100%)	163(100.0%)	63(48.5%)
	P < 0.001		*p < 0.001*		*p < 0.001*		*p < 0.001*		*p < 0.001*	

DISCUSSION

As a random numbers of participants enrolled in this study of both pharmacy and dentistry programs, it was found that there are several stress factors encountered the participants and was found to have a negative effects in their immune system as well as their general health with affecting their academic performance. However there was no significant different between pharmacy and dentistry students in both health and immune-related disease outcomes. Furthermore, the majority of both programs got ill during the fall semester and experiencing a skin and/or hair problems as well as there was a high frequency of catching cold or flu among both medical program students. This was consistent with another study carried out by Biondi and Zannino 1997; Cohen et al., 1998; Pedersen et al., 2010; Segerstrom and Miller 2004 where it was found that stress during exams specially, might decreases students immune system which let them more susceptible to infections and catching cold or flu virus. [10, 12, 15, 33] On the other hand, it was found that higher proportions of female stated that they got ill during the fall semester, caught cold/flu and they have skin/hair problems compared to the males where it was in a consistent with a previous study done by Hoeksema in Michigan that how there is a differences between gender in response to different stressors as well as stress reactivity. [34] Moreover, many other researchers stated the same findings of where a significant gender differences regarding stress among medical students was highly noticed, as females were higher rating than males. [35] Furthermore, it was found that first years were associated with more cold/flu and skin/hair problem compared to final years in addition to that participants who had credit hours load with 15 credit hours and more during the semester were reported higher cold/flu and skin/hair problem compared to the students with less than 15 credit hours and this was obvious as well by Dahlin et al., in 2005 as final years had a high rates of worrying regarding their future endurance as well as some of the pedagogical shortcomings while first years students was occupying the highest rate of stress from studies. [35] As there was shown the strong impact of the credit hour load and study level as one of the stress factors that affects students' performances, actually not all stressors are study related, medical students were also under other daily life stress factors that had a clear impacts on their normal social and academic lives and their activities. Comparatively, the vast majority of the participants highlighted that they don't have regular exercise (77.1%) and they don't smoke (87.4%). More than Half (65.5%) of participants reported a lack of three regular meals/day also more than half (58.0%) reported a lack of social activity. Nevertheless, irregular exercising, skipping meals and low social activities can dramatically affect students' performance, their academic life as well as immune system. A study has shown that exercising moderately can positively affect and stimulate the immune system with showing a degree of resistance to infections [36]. Moreover, it has been found in this study and other studies that those who regularly had three meals were associated with less tendency for infection and immune diseases as well as a good health outcomes. [8, 9, 14, 37] Also, a study done by Dowd, et al., highlighted that, most experimental animals that shows a low social activities were more prone to immune diseases and negative outcomes where it was very consistent with this study. [38, 39] Furthermore, a study in Jordan at 2012 among medical students showed that the majority of the participants reported a lack of social activity that had a detrimental effect on their immune system. [40]

CONCLUSION

The strong negative association between academic life stress and immune-related, health outcomes was demonstrated. The high stress on the Faculty of Pharmacy and dentistry students worth our concern but with no significant differences between them. Higher levels of stress were negatively correlated with the students' immune-related diseases. In our point of view,we think it's the first study that identifies both Pharmacy and Dentistry students' immune responses to the different types of academic life stressors that they might be faced with during their faculty study. However, results can help in increasing the awareness of students by acting as a prior warning to what they might face during their program and how can they reduce some of the negative causing factors and tendency to infections and diseases.

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