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CLINICAL & BASIC RESEARCH

A Study of Stress among Students of Professional Colleges from an Urban area in India

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دراسة عن التوتر بين طلاب الكليات المهنية من منطقة حضرية في الهند

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الملخص: الهدف: أكدت العديد من الدراسات في جميع أنحاء العالم أن الطلاب الذين يتابعون دراسات مهنية مثل الدراسات الطبية و طب الأسنان يتعرضون لإجهاد أعلى. الإجهاد المفرط يمكن أن يؤدي إلى مشاكل نفسية مثل الاكتئاب والقلق. وكان الهدف من هذه الدراسة إلى تقييم الإجهاد بين الطلاب من مختلف الكليات المهنية وارتباطه مع مختلف العوامل الأكاديمية والاجتماعية والصحية. **الطريقة:** أجريت هذه الدراسة المستعرضة في الفترة من سبتمبر 2011 إلى فبراير 2012 بين الطلاب في كليات الطب، طب الأسنان والهندسة في المنطقة الحضرية في المنطقة السنغالية، ماهاراشتر افي الهند باستخدام تقنية مبسطة لأخذ العينات . بلغ حجم العينة 1,200. تم استخدام استبيان ذاتي مدروس قبل جمع البيانات. وقد تم تحليل النتائج باستخدام النسبة المئوية، اختبار كاي مربع، الانحدار اللوجستي الثنائي والانحدار اللوجستي متعدد الحدود. **النتائج:** من بين 1,224 من المستجيبين للاستبيان، 299 (24.4%) عانوا من الإجهاد. بينهم 115 (38.5%) و 102 (34.1%) و 82 (27.4%) من طلاب طب الأسنان، طلاب الطب ثم طلاب الهندسة على التوالي. كان هناك ارتباط ذا دلالة احصائية بين الضغوط ومجال التعليم. ولوحظ التوتر في 187 (27.7%) من الإناث و 112 (20.4%) من الذكور، وكانت العلاقة مع جنس الطالب ذات دلالة احصائية. من خلال تطبيق الانحدار اللوجستي الثنائي، كانت عوامل المجال الطبي والحالة الصحية و نمط الحياة والعوامل الأكاديمية تنبئ بدلالة احصائية عن الإصابة بالإجهاد. **الخلاصة:** تعرض الطلاب من المجالات الثلاثة للإجهاد. كانت العوامل الأكاديمية واحدة من أهم الضغوطات. إدخال ثقافة إدارة الإجهاد في المناهج ممكن أن تكون مفيدة في مكافحة هذه المشكلة.

مفتاح الكلمات: الضغوط النفسية؛ طلاب الطب؛ طلاب طب الأسنان؛ علم الأوبئة؛ والهند.

abstract: ***Objectives:*** Various studies across the globe have emphasised that students undertaking professional courses, such as medical and dental studies, are subjected to higher stress. Excessive stress could lead to psychological problems like depression and anxiety. The objective of the current study was to assess stress among students of various professional colleges and its association with various academic, social and health-related factors. ***Methods***: This cross-sectional study was conducted from September 2011 to February 2012 among students of medical, dental and engineering colleges from the urban area of Sangli district, Maharashtra, India, using a convenience sampling technique. The calculated total sample size was 1,200. A pretested self-administered questionnaire was used for the data collection. Analysis was done using percentage, the chi-square test, binary logistic regression and multinomial logistic regression. ***Results***: Out of the 1,224 respondents, 299 (24.4%) experienced stress. Among them 115 (38.5%), 102 (34.1%) and 82 (27.4%) were dental, medical and engineering students, respectively. There was a statistically significant association between stress and the field of education. Stress was observed in 187 (27.7%) females and 112 (20.4%) males; the association with gender was statistically significant. By applying binary logistic regression, medical studies, health and lifestyle factors, and academic factors were the significant predictors for stress. ***Conclusion***: Students from all the three fields studied were exposed to stress. Academic factors were one of the most important stressors. The introduction of stress management education into the curriculum could prove useful in combatting this problem.

Keywords: Psychological Stress; Students, Medical; Students, Dental; Students, Engineering; Epidemiology; India.

Advances in Knowledge

- *Studies of stress among engineering students are rare, especially in India. The research in this current study addresses the issue.*
- *This study shows that, along with academic factors, health problems and the environment of colleges and hostels can play an important role in the development of stress.*

Application to Patient Care:

- *This research highlights the need to incorporate stress management education in the curriculum, as well as to develop mechanisms for decreasing stress among students in colleges.*
- *Similarly, this study highlights the importance of creating positive environments at colleges and hostels to decrease stress among students.*

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Stress can be defined as 'any challenge to homoeostasis', or to the body's internal sense of balance.[1] It can manifest itself either as *eustress* or as *distress*. *Eustress*, literally translated as 'good stress', is a positive form of stress that motivates an individual to continue working. It is when this stress is no longer tolerable and/or manageable that distress manifests. *Distress*, or 'bad stress', is the point at which the good stress becomes too much to bear or cope with. Some signals that this change has occurred are when tension begins to build, and there is no longer any fun in the challenge or there seems to be no relief or end in sight. This kind of stress is well-known, and may lead to poor decision-making. The general characteristics of a person in distress are: being over-aroused; tense or unable to relax; touchy, easily upset or irritable; easily startled or fidgety, and demonstrating intolerance of any interruption or delay. Excessive stress results in an increased prevalence of psychological problems like depression, anxiety, substance abuse and suicide ideation.[1,2]

Various studies around the globe have emphasised that students studying in medical and dental courses experience higher stress.[3–6] However there are few studies on this topic in India, especially on populations in smaller cities. Engineering students take half-yearly examinations, as compared to the annual examinations taken by medical and dental students. Theoretically, the higher frequency of examinations should lead to a higher prevalence of stress among engineering students. However, there are very few studies on the prevalence of stress among engineering students, especially in India. The present study was undertaken in order to assess the prevalence of stress among students of medical, dental and engineering colleges, and the association of stress with various academic, social and health-related factors, in an urban area from the Sangli district of Western Maharashtra, India.

Methods

A cross-sectional study was conducted in an urban area of the Sangli district of Western Maharashtra, India. The institutional ethical committee approved the study. The estimated sample size was 1,200, and the sampling technique used was convenience sampling. After obtaining ethical clearance, permission to conduct the study was sought from all medical, dental and engineering colleges within the study area. To ensure anonymity, no questions about the names of students or institutions were included in the questionnaire. Overall, two dental colleges, two engineering colleges and one medical college participated in the study. As engineering students outnumbered the medical profession students, to ensure comparability the mechanical division from the engineering college was randomly selected and included in the study. Students from all classes (grades) of each field were involved in the study. The study was conducted between September 2011 and February 2012.

A pre-tested, self-administered questionnaire was used as the study instrument. It was developed with the help of published literature[1,7] and finalised after a pilot study. The questionnaire was divided into three sections. The first section covered sociodemographic factors such as age, gender, educational details, area of upbringing, parents' education and parents' occupation. The second section comprised the short form of the Depression, Anxiety and Stress Scale (DASS-21), which has been validated as a screening tool by many researchers in a variety of sociodemographic conditions.[7–9] The scale of stress calculated by the DASS-21 corresponds closely to the Diagnostic and Statistical Manual of Mental Disorders fourth edition (DSM-IV) symptom criteria for generalised anxiety disorder (GAD), and measures nervous tension, difficulty relaxing and irritability. Based on the score obtained from the DASS-21 guidelines, stress was classified as either absent (normal), mild, moderate or severe.[7,8] The third section consisted of questions designed to identify potential stressors. Possible stressors were divided into three groups, namely academic factors (8 questions), health and lifestyle factors (14 questions), and environmental and social factors (10 questions). Based on the participant's answers, each factor was awarded a maximum of 10, 14 and 10 points, respectively. After a consultation with experts in the field, the cut-off point for each stress factor was decided at 50% or higher. For example, if a respondent scored 5 or more points for academic factors, then academic problems were considered as contributing to the development of stress for this respondent.

The academic factors section included information such as whether the student was taking a course by choice; if s/he had failed in any subject;

Table 1: Distribution of stress levels according to the field of education

Field of education	Stress				Total n
	Absent	Mild	Moderate	Severe	
Dental n (%)	286 (71.3)	47 (11.7)	35 (8.7)	33 (8.2)	401
Engineering n (%)	335 (80.3)	38 (9.1)	22 (5.3)	22 (5.3)	417
Medical n (%)	304 (74.9)	38 (9.4)	36 (8.9)	28 (6.9)	406
Total n (%)	925 (75.6)	123 (10.0)	93 (7.6)	83 (6.8)	1,224

self-satisfaction with study efforts; the quality of the educational process at the college; the presence of study-related problems; an overloaded syllabus; satisfaction with the methods of teaching, and whether the participants felt stressed concerning their studies.

The section concerning health and lifestyle factors was designed to measure the participant's perceived present health status, and if there had been any changes. Depression, calculated using the DASS-21, was included as a factor. Other psychological problems were also included such as mood breakdown, examination phobia, frustration and self-care. Health factors that were also assessed were exercise, diet, changes in sleep pattern and substance abuse. The environmental and social factors section comprised questions on the participant's family, economic, social and emotional problems. It also included questions regarding their college and residential environment; relationship with other students; recreational activities, and their own as well as others' expectations regarding academic achievement. Questions regarding whether the students felt a need for stress management education to be included in the curriculum were additionally included in the questionnaire.

Following ethical approval of the study, students were contacted after their lectures. Students from all classes were involved in the study, and care was taken to ensure that no participant was due to take any examinations in the month following the study. The nature and purpose of the study was explained in detail, and willing students over 18 years old were provided with questionnaires and consent forms. The principal investigator was present while the students completed the questionnaire but the teachers of each institution were requested to wait outside. Absolute privacy and a mental comfort zone were maintained for each individual student while answering the questionnaire. Upon completion of the questionnaire, each participant was requested to drop their questionnaire and consent form in separate drop-boxes. A total of three visits (at least one week apart) was made to each institution to ensure the inclusion of all possible participants.

Analysis of the data was done using percentages, chi-square tests, binary logistic regression and multinomial regression. Data from the pilot study were not included in the final analysis.

Table 2: Distribution of stress levels according to gender across the fields of education*

Field of education	Stress	Gender		Total	*P* value
		Female	Male		
Dental n (%)	Absent	177 (67.6)	109 (78.4)	286 (71.3)	
	Present	85 (32.4)	30 (21.6)	115 (28.7)	0.022
	Total	262	139	401	
Engineering n (%)	Absent	180 (77.6)	155 (83.8)	335 (80.3)	
	Present	52 (22.4)	30 (16.2)	82 (19.7)	0.114
	Total	232	185	417	
Medical n (%)	Absent	132 (72.5)	172 (76.8)	304 (74.9)	
	Present	50 (27.5)	52 (23.2)	102 (25.1)	0.325
	Total	182	224	406	
Total n (%)	Absent	489 (72.3)	436 (79.6)	925 (75.6)	
	Present	187 (27.7)	112 (20.4)	299 (24.4)	0.003
	Total	676	548	1224	

df = degrees of freedom.
**The association of stress with field of education was statistically significant (chi-square value = 9.156, degrees of freedom = 2 and P value = 0.01).*

Results

Out of the 1,400 distributed and collected questionnaires, 1,224 were complete and hence used in the final analysis. Overall, there were 401 dental students, 417 engineering students and 406 medical students (studying for a Bachelor of Medicine or a Bachelor of Surgery [MBBS] degree). Out of all the students in the study, 676 (55.23%) were female and 548 (44.77%) were male. Respondents were 18–25 years old (mean ± standard deviation [SD] = 19.87 years ± 1.62 years). A total of 396 (32.3%) of the respondents were from rural areas, while 828 (67.7%) were from the urban area. A total of 939 students (76.7%) were currently residing in hostels while 285 (23.3%) were residing in other places,

Table 3: Association of stress with academic factors, health and lifestyle factors, and environmental and social factors

Field of Education	Stress	Academic factors			Health and lifestyle factors			Environmental and social factors		
		<50%	>50%	*P* value	<50%	>50%	*P* value	<50%	>50%	*P* value
Dental n (%)	Absent	192 (67.1)	94 (32.9)		258 (90.2)	28 (9.8)		231 (80.8)	55 (19.2)	
	Present	21 (18.3)	94 (81.7)	<0.001	54 (47)	61 (53)	<0.05	59 (51.3)	56 (48.7)	<0.001
	Total	213 (53.1)	188 (46.9)		312 (77.8)	89 (22.2)		290 (72.3)	111 (27.7)	
Engineering n (%)	Absent	233 (69.6)	102 (30.4)		290 (86.6)	45 (13.4)		261 (77.9)	74 (22.1)	
	Present	20 (24.4)	62 (75.6)	<0.001	40 (48.8)	42 (51.2)	<0.05	36 (43.9)	46 (56.1)	<0.001
	Total	253 (60.7)	164 (39.3)		330 (79.1)	87 (20.9)		297 (71.2)	120 (28.8)	
Medical n (%)	Absent	197 (64.8)	107 (35.2)		245 (80.6)	59 (19.4)		221 (72.7)	83 (27.3)	
	Present	25 (24.5)	77 (75.5)	<0.001	42 (41.2)	60 (58.8)	<0.05	50 (49)	52 (51)	<0.001
	Total	222 (54.7)	184 (45.3)		287 (70.7)	119 (29.3)		271 (66.7)	135 (33.3)	
Total n (%)	Absent	622 (67.2)	303 (32.8)		793 (85.7)	132 (14.3)		713 (77.1)	212 (22.9)	
	Present	66 (22.1)	233 (77.9)	<0.001	136 (45.5)	163 (54.5)	<0.05	145 (48.5)	154 (51.5)	<0.001
	Total	688 (56.2)	536 (43.8)		929 (75.9)	295 (24.1)		858 (70.1)	366 (29.9)	

**For all cases, the degrees of freedom = 1.*

for instance with parents, relatives or in rented apartments.

Out of the total respondents, stress was present in 299 (24.42%); of these, mild stress was present in 123 respondents (10%), while 93 (7.6%) had moderate stress and 83 (6.8%) had severe stress [Table 1]. Considering the results according to the participant's field of education, 115 (28.7%) dental students, 82 (19.7%) engineering students and 102 (25.1%) medical students had stress; the association was statistically significant. Concerning gender, stress was present in 187 female respondents (27.7%) as compared to 112 male respondents (20.4%). This association of stress with gender was statistically significant [Table 2]. Although stress was associated with age, a distinctive trend was not observed.

In terms of the participant's residence, 80 students from rural areas (20.2%) had stress as compared to 219 from the urban area (26.4%), and this association of stress with permanent residence was statistically significant. On the other hand, stress was present in 243 students living in hostels (25.9%), while among the students living elsewhere, 56 (19.6%) had stress; an association which was also statistically significant. No significant associations were observed between stress and other sociodemographic factors, such as class or parents' education.

The need to include stress management education in the curriculum was expressed by 248 (59.5%) of the engineering students, 198 (49.4%) dental and 220 (54.2%) medical students; this came to a total of 666 students (54.4%). Potential stressors faced by students were divided into three groups: academic factors, health and lifestyle factors, and environmental and social factors. A total of 188 (46.9%) dental, 164 (39.3%) engineering students and 184 (45.3%) medical students scored above 50% for academic factors; this signifies that 536 respondents (43.8%) had reported scores over the cut-off point.

Table 4: Binary logistic regression for prediction of the most important factor for development of stress

Association of academic factors, health and lifestyle factors, and environmental and social factors with stress							
Parameters	**B**	**SE**	**Wald**	**df**	**Sig**	**Exp (B)**	**95% CI for EXP (B)**
Health and lifestyle factors	0.018	0.006	10.148	1	0.001	1.018	1.007–1.029
Environmental and social factors	0.033	0.004	58.273	1	0.000	1.034	1.025–1.043
Academic factors	0.036	0.005	45.380	1	0.000	1.036	1.026–1.047
Constant	-5.262	0.367	205.261	1	0.000	.005	
Association of sociodemographic factors with stress							
Gender	0.331	0.142	5.429	1	0.020	1.392	1.054–1.838
Medical			7.604	2	0.022		
Dental	0.148	0.166	0.795	1	0.373	1.159	0.837–1.605
Engineering	-0.310	0.174	3.185	1	0.074	0.733	0.522–1.031
Present residence	-0.162	0.112	2.096	1	0.148	0.851	0.683–1.059
Permanent residence	-0.282	0.153	3.403	1	0.065	0.754	0.559–1.018
Constant	-1.116	0.592	3.549	1	0.060	0.328	

B = coefficient of regression; SE = standard error of mean; Wald = wald statistic; df = degree of freedom; Sig = significance; 95% CI for EXP (B) = 95% confidence interval for odds ratio.

The difference across the three educational fields was not statistically significant. However, a higher percentage of dental and medical students reported scores above the 50% cut-off point for academic factors as compared to engineering students. Scores of above 50% for health and lifestyle factors were reported by 295 respondents (24.1%), of which there were 89 (22.2%) dental, 87 (20.9%) engineering and 119 (29.3%) medical students. A higher percentage of medical students reported problems as compared to the others, and this difference was statistically significant. Environmental and social factors were reported by 366 repondents (29.9%); among these, there were 111 (27.7%) dental students, 120 (28.8%) engineering students and 135 (33.3%) medical students. Although a higher percentage of medical students reported scores above 50% for environmental and social factors, the difference was not statistically significant.

Stress was present in 299 respondents; out of these, 233 (77.9%) had a score above the 50% cut-off mark for academic factors, which was a statistically significant association. While considering the distribution according to the three fields of education, scores of above 50% for academic factors coexisted with stress in 94 (81.7%) dental, 62 (75.6%) engineering and 77 (75.5%) medical students, which are statistically significant associations for each of the three fields. The coexistence of scores over the cut-off value for health and lifestyle factors, as well as environmental and social factors, with stress was observed in 163 (54.5%) and 154 (51.5%) respondents, repectively. The statistically signifiant association was present in both cases. A total of 61 (53%) dental, 42 (51.2%) engineering and 60 (58.8%) medical students had stress along with scores of above 50% for health and lifestyle factors, which was statistically significant. Similarly, 56 (48.7%) dental, 46 (56.1%) engineering and 52 (51%) medical students had a coexistence of stress and scores above the cut-off percentage for environmental and social factors. [Table 3]

Upon further analysis using binary logistic regression, gender, academic factors, and environmental and social factors were observed to be the most important predictors for the development of stress [Table 4]. Furthermore, by applying multinomial logistic regression, it was observed that the development of severe stress was chiefly dependent on academic factors. [Table 5]

Discussion

In the current study, stress was observed in 24.4% of the respondents, and moderate to severe stress was present in 14.4%. Considering the field of education, stress was present in 28.7% of dental students, 19.7% of engineering students and 25.1% of medical

Table 5: Multinomial logistic regression for the association of grades of stress with academic factors, health and lifestyle factors, and environmental and social factors

Parameter estimates								
Stress grades*		**B**	**S.E.**	**Wald**	**df**	**Sig.**	**Exp (B)**	**95% C.I.**
Moderate	Intercept	-3.497	0.769	20.667	1	0		
	Health and lifestyle factors	0.025	0.010	5.996	1	0.014	1.025	1.005–1.046
	Academic factors	**0.038**	**0.011**	**13.068**	**1**	**0**	**1.039**	**1.018–1.060**
	Environmental and social factors	-0.005	0.008	0.403	1	0.525	0.995	0.980–1.011
Severe	Intercept	-3.807	0.810	22.070	1	0		
	Health and lifestyle factors	0.006	0.011	0.325	1	0.569	1.006	0.985–1.027
	Academic factors	**0.057**	**0.012**	**23.916**	**1**	**0**	**1.059**	**1.035–1.083**
	Environmental and social factors	-0.009	0.008	1.183	1	0.277	0.991	0.975–1.007

** = mild category of stress; B = coefficient of regression; SE = standard error of mean; Wald = wald statistic; df = degree of freedom; Sig = significance; 95% CI for EXP (B) = 95% confidence interval for odds ratio.*

students. In a study of medical students in Mumbai, India, Supe observed the presence of perceived stress in 73% of students.[6] The observed prevalence of stress in medical students by Abdulghani et al. in Saudi Arabia was 63.8%.[10] In a study conducted on dental students by Abu-Ghazaleh *et al*. in Jordan, stress was observed in 70% of the respondents.[11] Much lower stress levels were observed in the current study, a finding which could be attributed to geographical and social variations. Additionally, it is important to note that Supe considered perceived stress in the study subjects,[6] whereas Abdulghani *et al*. applied the Kessler Psychological Distress Scale (K10) inventory, which measures non-specific psychological distress,[10] and Abu-Ghazaleh *et al*. applied the 12-item general health questionnaire (GHQ-12), which is intended to screen for general psychiatric morbidity.[11] In the current study, the scale used was the DASS-21, which measures stress in a way which is quite similar to the DSM-IV diagnosis of GAD.[7] These different screening methods used to determine stress may have contributed to the differences in the observed prevalence of stress.

In the current study, gender was found to be one of the most important factors in the development of stress, with the results indicating a female predominance; a similar trend was observed by Abdulghani *et al*. and Abu-Ghazaleh *et al*.[10,11] In the current study, stress was highest among the dental students, followed by medical students and then engineering students. Thus, higher stress was observed in healthcare education branches as compared to the engineering branch. In a similar fashion Al-Dabal *et al*. observed a greater prevalence of stress in medical students in comparison with non-medical students in Saudi Arabia.[4] Barikani identified economic and accommodation-related problems as probable stressors among Iranian medical students;[12] consistent with those findings, environmental and social factors were identified as important stressors in this study.

In the study conducted on medical students from Mumbai, Supe observed the association of stress with the class or semester of the respondents, and also observed that stress was independent of current residence.[6] In the current study, there was no association of stress with the respondent's class or semester; however, the respondent's current residence was a highly significant factor as students living in hostels were more prone to stress. This may be due to the fact that a non-metropolitan lifestyle, and the nearby presence of a family support system, could be a positive method of coping with stress for students living with parents or relatives. Similarly, the condition of hostels might be unsatisfactory, leading to higher stress among those living there.

Academic factors were one of the most important stressors in the participants of the current study, and these could be attributed to the development of stress and could also determine the severity of stress. The respondents from all three fields of education reported academic issues. Researchers such as Al-Dabal *et al*., Abu-Ghazaleh *et al*. and Behere *et al*. have studied the importance of various academic factors in the development of stress.[4,11,13] Hence, the results observed in the current study are in accordance with the findings of these researchers.

Across the three fields of education, there was no statistically significant difference in the presence of environmental and social factors, which play an important role in the development of stress.

In a study by Agolla *et al*. on undergraduate university students in Botswana, social problems, like inadequate resources, and environmental problems, such as overcrowding in lecture halls, were important stressors.[14] Thus, the current study's observations agree with the observations of other researchers.

There is a tendency for medical students to diagnose themselves with diseases they are studying; this phenomenon is reported by some authors as the 'medical school syndrome'.[15] This 'syndrome' could possibly explain the reason for higher percentages of medical students reporting being affected by health and lifestyle factors in the current study, in comparison to the dental and engineering students.

There are some limitations to this study. This study was based on results from a self-administered questionnaire, hence reporting bias cannot be totally eliminated. There was limited geographical coverage since the study was conducted in a single urban area. Compounding factors, such as the participants' current emotional state or personality, may be present. Similarly, the difference in stress levels at different times, during pre-examination, examination and post-examination periods, was not considered in this study.

Conclusion

Students from all three fields of education are exposed to stress; however, it seems that engineering students are less prone to the development of stress compared to medical and dental students. Further research needs to be done to study the differences in the academic environments of these fields, the role of a half-yearly examination pattern and the impact of these factors on the development of stress. Academic, environmental, social and health problems all play an important role in the development of stress. Academic factors are the most important stressors; hence the need for specific and targeted measures to decrease substantially the burden of stress on the students. Teaching techniques and college environments should be adapted to the needs of the students. The productive utilisation of existing student welfare systems, development of more 'student-friendly' environments and regular periodic extracurricular activities with universal participation can prove to be useful stress-busters. Similarly, students living in hostels were observed to be prone to develop stress; thus, a periodic review of hostels, with feedback from the students, should be conducted and the complaints of students should be promptly addressed. The majority of students were in favour of stress management education being included in the curriculum, and hence steps should be taken for its incorporation. Health is a major concern of students, and therefore the promotion of healthy dietary and lifestyle habits should be encouraged. Additionally, teachers, parents and even students themselves should be aware that undue expectations about academic achievement can lead to stress. Finally, regular study habits and adequate preparation can help students to avoid stress.

DECLARATION

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