Evaluation on Lung Functions after Examination Stress in Student Population

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Authors’ contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

ABSTRACT

Background: Professional degrees are daunting to the learning group because of a modern curriculum that is dramatically different from high school curricula and other educational courses. It is more pronounced among first year students in educational institutions because of rivalry and demands from institution managers, academic staff and parents. Stress causes many detrimental effects in the body.

Aim: The present study planned to evaluate the effect of examination stress on the changes in lung functions among dental college students.

Materials and Methods: 20 normal students were selected and categorised into normal and stressed students. They were assessed for a lung function test using RMS helios 702 Spirometer. The parameters such as FVC, FEV1, FEV1/FVC, PEFR, FEF25-75 were assessed.

Results: It is observed that there was a decrease in the values of FVC, FEV1, FEV1/FVC, PEFR, FEF25-75 in exam stressed students when compared to normal students. The values of FEV1/FVC and FEF25-75 were statistically significant.

Conclusion: Thus, the study concluded an innovative finding that there was an inverse association with depressive symptoms in the pulmonary function test of exam stressed students which was...
shown by a statistically significant decrease in FEV1/FVC and FEF25-75. Exam is really a stressful experience and affects both male and female students. Awareness should be conducted among students about ill effects of stress. Decreased stress, increased lung function results in increased academic performance.

Keywords: Exam stress; innovative finding; lung functions; FEV1/FVC ratio; FEF 25-75.

1. INTRODUCTION

Professional colleges are a learning group that is given more importance in their curriculum. The standard of education is comparatively higher for students compared to high school curricula and other educational courses [1]. So the students are liable to face a lot of issues and this is more pronounced among first year students in educational institutions because of rivalry and demands from institution managers, academic staff and parents. This Stress causes many detrimental effects in the body [2,3]. Apart from all of these stressors, evaluation stress is at the top of the list in professional classes. It is a feeling of anticipation, dread, and anxiety brought on by the idea of an upcoming deadline and apprehensive fear of exam results [4-6].

Dental students are no way different from students in other professional fields such as pharmacy, architecture, agriculture, and so on. Though a moderate amount of stress is important for students to sustain and enhance their day-to-day success and to meet exams with trust, elevated and cumulative stress may be detrimental to the body and mind. The term "stress" was first introduced by Hans Selye in 1936 and, according to him stress is “the body's non-specific response to any demand for change”. Stress is known to be associated with autonomic neurobehavioral and cardiovascular changes [7-9]. In response to any kind of threat, our body is armed with a protective mechanism through neural and hormonal systems. Neural part is operated by the Autonomic Nervous System (ANS) and the hormonal part functions by the pituitary and adrenal axis. The two functions are coordinated as the Hypothalamic Pituitary Adrenal (HPA) axis. ANS provides a quick and short response in the form of "fight-or-flight" nature that makes the body withstand the stress whereas the HPA axis provides a slower and prolonged response with sufficient resources that are needed to withstand the stress [10-12]. A huge syllabus also may contribute to development of stress in undergraduate dental students [13,14]. There is a relationship between mental health and respiratory health which is well recognized [10,15–17] however the exact nature and direction of these complex associations are not known. The stressful stimuli have a short-term and measurable influence especially on the airways [18,19]. The stress research has moved towards refinement and greater focus on the aspects perceived demand on the characteristic situation active, passive coping demands.

Learning capabilities vary among students and each student has their own method of learning [20,21] However, teaching style in a dental college cannot be modified according to individual students’ preference. Examination is another factor which increases mental stress and examination related stress also increases sympathetic nervous system activity in students. [22-24] Our team has extensive knowledge and research experience that translates into high quality publications [25–29].

Despondency, feeling nervous, having a non-interest in all the routine activities are some of the common symptoms of stress. Anxiety and stress are the leading causes of ill health and disability worldwide. More than 22 percent of the total population is suffering from depression worldwide, as per the World Health Organization (WHO) [30] This type of mental illness has been found to be more common among medical students without preponderance between males and females. It can be due to a variety of reasons, such as long and tough syllabuses, tough exams, and long hours of classes, all of which need to be thoughtful [31-33]. One of the reasons that many medical and dental college teachers set up a toughest question paper to increase the standard of learning. So the students in this state feel difficult to clear such difficult tests. Inability to cope with a kind of expected situation, dental students sometimes succumb to poor sleep and depression, anxiety, and Stress. Previous studies reported that examination stress may lead to serious threat to the body disrupting the homeostasis and affects all the physiological systems. But the reports on the influence of examination stress on lung functions are scanty. So the present study planned to evaluate the lung functions between
normal and exam stressed undergraduate first year dental students.

2. MATERIALS AND METHODS

2.1 Study Setting

An analytical study was conducted in February 2021 among 1st year undergraduate dental students at Saveetha Dental College, Vellapanchavadi, Chennai.

2.2 Study Population

The study was conducted in 20 normal healthy male adults in the age group of 17-20 years with matching anthropometric measurements. They were screened for their medical history and physical conditions; the functional status of the respiratory system was assessed by pulmonary function test (PFT) using a spirometer (RMS Helios 702).

Exclusion criteria: Subjects with obesity, suffering from cardiorespiratory problems and subjects under steroidal medication for some reasons were excluded from the study.

2.3 Study Methods

The subjects were categorised into two groups

Group 1: Students involved in cultural activities and not stressed

Group 2: Students undergoing examination and stressed due to scoring of marks in university exams.

The ventilatory functions were assessed using RMS Helios 702 spirometer and the parameters studied were forced vital capacity (FVC), forced expiratory volume in 1st sec.(FEV1), FEV1/FVC ratio,FEV3/FVC ratio, peak expiratory flow rate (PEFR), Forced expiratory flow 25-75 (FEF25-75)

2.4 Statistical Analysis

The values were expressed as mean ± Stdev. The results were analysed using SPSS software (statistical packages of social sciences) version 23 and the statistical test used was independent T- Test. (p<0.05)

3. RESULTS

It is observed that there is a significant decrease in the values of FVC, FEV1, FEV1/FVC, PEFR, FEF25-75 in exam stressed students compared to normal students.

The values of FVC, FEV1 and PEFR are statistically non-significant (p>0.05).
The values of FEV1/FVC and FEF25-75 are statistically significant (p<0.05).

4. DISCUSSION

It is understood that the examination is a stressful experience, and its effect depends on the individual's ability to perceive and respond to it. Students are grouped under two categories. One group of students take the exam as a challenge and also have fun with less stress. Other group of students take the examination as a burden and pressure with more impact of stress. The biggest difference is that the first category understands how to handle it with proper strategy and technique, and the second category does not know or does not try to know how to manage the situation [34,35].

The knowledge of subjects evaluated by performing the examination is the normal practise that any student must face during his or her academic life. Present systems of evaluation are likely to cause discomfort both physically and mentally in the body. Hypothalamic-Pituitary-Adrenal (HPA) axis and sympathetic system are activated during stress [35]. When sympathetic system is activated that causes vasoconstriction, and tachycardia. Because of this, the cardiac output and peripheral resistance increase, which increases both systolic as well as diastolic blood pressure [36-38].This research also revealed a rise in body temperature and respiratory rate at the time of the examination. Examination stress is a kind of psychological stress that causes mild fever [39-41]. The exact mechanism behind this is unknown. In exchange, the elevated body temperature raises the respiratory rate. Increase in temperature at rest increases the pulmonary ventilation and respiratory rate [42-44].

In the present study it is observed that there is considerable fall in PEFR value in exam stressed students when compared to normal students. Similarly in the previous research [45] that as there is an increase in stress level there is significant fall in the PEFR value. The psychosocial variables are strongly related to PEFR, thus suggesting that they play more important roles in bronchial constriction. Stress reduces PEFR through cognitive behaviour pathways or through its direct effect on the
parasympathetic system or combination of both [46,30,47]. Chronic stress induces the release of norepinephrine or related alterations in the alterations in the alpha-adrenergic receptor sensitization may facilitate an adaptation to chronic stress [48-50].

The students under stress could be advised to undertake yoga training as it helps to overcome stress. Similarly in the previous article it is stated that yoga training helps to reduce stress and increases functional vital capacity.

Table 1. Demographic characteristics of studied subjects

<table>
<thead>
<tr>
<th>Sl.no.</th>
<th>Variable</th>
<th>Normal Students</th>
<th>Exam stressed Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Age in years</td>
<td>18.3 ± 0.68</td>
<td>19 ± 0.82</td>
</tr>
<tr>
<td>2</td>
<td>Height in cms</td>
<td>170 ± 11.92</td>
<td>169 ± 11.53</td>
</tr>
<tr>
<td>3</td>
<td>Weight in kgs</td>
<td>62.1 ± 11.66</td>
<td>66 ± 12.59</td>
</tr>
</tbody>
</table>

Table 2. Mean spirometric values between normal and exam stressed students

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Parameters</th>
<th>Normal Subjects</th>
<th>Exam Stressed Subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>FVC</td>
<td>3.209 ± 0.51</td>
<td>1.99 ± 0.417</td>
</tr>
<tr>
<td>2</td>
<td>FEV1</td>
<td>2.75 ± 0.604</td>
<td>1.78 ± 0.66</td>
</tr>
<tr>
<td>3</td>
<td>FEV1/FVC</td>
<td>98.47 ± 3.28</td>
<td>89.61 ± 6.243</td>
</tr>
<tr>
<td>4</td>
<td>PEFR</td>
<td>5.59 ± 0.948</td>
<td>5.07 ± 1.677</td>
</tr>
<tr>
<td>5</td>
<td>FEF25-75</td>
<td>3.57 ± 0.955</td>
<td>3.073 ± 0.438</td>
</tr>
</tbody>
</table>

Values are expressed as mean ± STEV

Fig. 1. Depicts the bar graph showing the comparison of FVC (l/min) between normal and exam stressed 1st year dental students. The X-axis represents the normal and stressed students and the Y axis represents FVC. It is observed that there is a decrease in FVC in exam stressed students compared to normal students. The value is statistically non-significant. (P=0.475)
Fig. 2. Depicts the bar graph showing the comparison of FEV1 (l/min) between normal and exam stressed 1st year dental students. X axis represents the normal and exam stressed students and Y axis represents FEV1. It is observed that there is a decrease in FEV1 value in exam stressed students compared to normal students. The value is statistically non-significant (P=0.606).

Fig. 3. Depicts the bar graph showing the comparison of the ratio Forced Expiratory Volume (FEV1) by Functional Vital Capacity (FVC) between normal and exam stressed 1st year dental students. X axis represents the normal and exam stressed students and Y axis represents the FEV1/FVC ratio. It is observed that there is a decrease in FEV1/FVC ratio value in exam stressed students compared to normal students. The value is statistically significant (P = 0.000).
Fig. 4. Depicts the bar graph showing the comparison of Peak Expiratory Flow Rate (PEFR - l/min) between normal and exam stressed 1st year dental students. X axis represents the normal and exam stressed students and Y axis represents the PEFR. It is observed that there is a decrease in PEFR value in exam stressed students compared to normal students. The value is statistically non-significant. (P=0.428)

Fig. 5. Depicts the bar graph showing the comparison of Forced Expiratory Flow (FEF25-75 (l/min)) between normal and exam stressed 1st year dental students. X axis represents normal and exam stressed students and the Y axis represents FEF25-75. It is observed that there is a decrease in FEF25-75 value in exam stressed students compared to normal students. The value is statistically significant (P value 0.05)
The study creates awareness and knowledge among students about the decrease in lung function due to increased exam stress. Limitations of the study is that the number of individuals involved for the study is less in number which may be the reason for non significant values. These may be rectified in the future study in the same line with more number of subjects into consideration.

5. CONCLUSION

Thus, the study concluded an innovative finding that there was an inverse association with depressive symptoms in the pulmonary function test of exam stressed students which was shown by a statistically significant decrease in FEV1/FVC and FEF25-75. Stress has many detrimental effects on our bodily functions, especially lung functions. Stress has severe effects on asthmatic patients. This study flashes light on examination stress of the student population prone to go for unhealthy coping strategies. Much awareness should be created about the ill effects of stress. Counseling should be done for students who are under high exam stress, to decrease their stress level and thereby increase their academic performance. There should be a change in exam pattern that decreases the stress level of the students.

CONSENT

Informed consent was obtained from all the subjects after explaining the experimental procedure.

ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

FUNDING

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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