

## Academic Stress in Oral Diseases Of Students

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### Abstract

The review is dedicated to the most important research of stress influence in the genesis of oral diseases in students. The aim was to analyze the literature and identify the most relevant publications on this theme. A literature search was performed using the PubMed, the Google scholar and the eLIBRARY.RU 'All Databases', without any restriction of language, publication year, and study design. After evaluation of the titles and abstracts of 2742 articles in PubMed, 39300 articles in Google scholar and 1732 articles in eLIBRARY.RU about stress and oral pathology generation in students, the relevant publications were included. Duplicate articles were removed. After reading the abstracts and the full texts of 315 articles (87 in the PubMed, 221 in the Google scholar and 7 in the eLIBRARY.RU), the information was analyzed and extracted. The current analysis presents that the attention of scientists was more focused on changing the intra-articular relations of the temporomandibular joint and the tone of the masticatory muscles. It is important to investigate the mechanisms of development of oral pathology and ways to improve adaptation of individuals who are cyclically exposed to stress factors. Dental students can be considered as objects with different approaches to oral hygiene, but more or less the same level of stress. All of this proves the need to continue research work in this direction for a deeper study of the processes, the development of which is caused and / or interrelated with the formation of pathological changes in the mucous membranes and lesions of the hard tissues of the teeth.

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### Introduction

Dental diseases are the most common worldwide.

According to WHO, the parameters of oral health are the absence of the following signs: prolonged pain in the maxillofacial region, neoplasia of this region and throat, infections and ulcerative lesions of the oral mucosa, inflammatory-dystrophic changes in the periodontal, demineralization of hard dental tissues, their loss and a number of other diseases leading to disturbances in the mechanical processing of the food lump, articulation, the ability of a person to smile; and at the same time, a person must be both psychologically and socially well <sup>1</sup>.

All deviations from the norm lead to dental diseases.

The causes and extent of their prevalence are being studied by scientists around the world <sup>2, 3, 4, 5, 6, 7</sup> and many others and depend on various factors. To identify the underlying causes, scientists first study and analyze the prevalence of dental diseases by examining different groups (age, ethnic, profession, occupation, social criteria, as well as gender) and other criteria. The purpose of all these studies is to understand and identify the cause and prevalence of various dental diseases, identify risk groups and prevent and / or reduce their growth in the future.

In 2016, WHO conducted the Global Study of the time of diseases around the world. According to the results of the study 3.58 billion people worldwide suffer from oral diseases <sup>8</sup>.

One of the triggers in the pathogenesis of dental diseases is stress, which leads to changes in people's ability to work, which has a significant impact on their health, quality of life

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and the formation of habits. Despite the considerable amount of information devoted to this problem, the role of stress in the mechanisms of development of various pathologies of the maxillofacial region is currently insufficiently studied<sup>9</sup>.

In 1946, physiologist G. Selye introduced and actively began to use the term "stress", designating the formation of a person's general adaptive stress under the influence of certain factors<sup>10</sup>. Then stress was considered as an adaptive response of the body in extreme conditions (high temperatures, illness, injury, etc.) and as something good, with which the body protects itself. Scientific research in the field of medicine and psychology can help people get out of this state with the least physical and spiritual losses. In the modern world, stress is the physiological reaction of the body to the conditions of its existence or the occurrence of problems that affect a person's mood and the level of activity of his organs and systems in general<sup>11</sup>.

There are four types of stress: eustress, distress, lack of positive emotions and overexertion.

Eustress - the most pleasant of the varieties - gives an incentive to complete work, inspires feats, this is an emotional uplift when a person feels his strength and capabilities and, indeed, does the incredible. In ordinary, non-stressful situations, a person is unaware of his capabilities and only with eustress do completely new facets of the human soul and the human body.

The antipode of eustress is distress. In this case, any unusual situation, people or environment lead to negative stress, and a person comes to this stress with lightning speed, after feeling fear, disappointment, jealousy, anger, envy.

Christian Josef Merz and Oliver Tobias Wolf in 2014 published data from their study on a direct relationship between cortisol levels, anxiety when it is necessary to give oral presentation among people in the academic environment and the absence of dependence on their gender and whether or not they take hormonal contraceptives<sup>12</sup>.

The lack of positive emotions is due to the measured course of life, as a result of which there are no good or bad changes in it. Patients describe this condition as "Groundhog day": everything is monotonous, stable, which leads to the appearance of melancholy, apathy and a sense of hopelessness. The next type of stress is overexertion. This is a child of our time and megalopolises, generated by the frantic pace of life, which does not allow rest due to the intense competition of specialists oversaturated large cities. In this state, a set of postulates arises - you have to do everything and there is only one word "must"; I want only the best and the most advanced; desire to constantly "be on the crest of the wave"<sup>13</sup>.

According to Selye's concept, stress goes through three stages: anxiety, resilience and exhaustion<sup>14</sup>. The anxiety stage is characterized by a feeling of fear, excitement. At this stage, catecholamines are released and the body begins "preparing for defense". In the stage of resistance, all adaptation mechanisms are implemented, and the body uses all resources to give a "response" to the stress factor. The body's resistance increases. However, this stage can be realized in this way only if the adaptive assets of a person prevail or are equivalent in strength of the action of the stress agent. If the sanogenetic mechanisms are exhausted, then the stage of exhaustion occurs. The body's resistance decreases, irreversible signs of anxiety appear and progress, somatic and psychological disorders are formed. The body's resistance decreases, irreversible signs of anxiety arise and progress, somatic and psychological disorders are formed. The fight against stress, regardless of the final result, leads to various diseases, including dental ones. Stress destroys the body<sup>15</sup>.

Stress contributes to the occurrence of pathological changes in the oral cavity.

For the first time, a link between stress and ulcerative lesions of the oral and gastric mucosa was discovered by Wilson T.R. and Whittaker D.K.<sup>16</sup> in an experiment on rats, as reflected in their 1969 print work. A Gubel I. was the first specialist to publish a description of psychodynamics in the same year pathologists of the oral cavity<sup>17</sup>. In 1971 Manhold JH, Doyle JL, Weisinger EH. proposed a hypothesis on the pathogenesis of periodontal diseases caused by

social stress, describing its effects on various body tissues<sup>18</sup>. An increase in the number of studies of stress as an etiological factor in oral pathology occurred in the 90s of the XX century.. Green LW, Tryon WW, Marks B, Huryn J. (1986) conducted a number of experiments on animals and humans and were able to correlate the degree of damage to periodontal tissues with the severity of stress caused by changes in life situations<sup>19</sup>.

Minneman MA, Cobb C, Soriano F, Burns S, Schuchman L. (1995) in their study, they found a connection between the personal characteristics of people, the presence of stress in them and the condition of the gums and mucous membranes of their oral cavity<sup>20, 21, 22, 23</sup>.

Under stress, the hormone cortisol is released, an increased level of which contributes to damage to the mucous membrane of the oral cavity, gums, jaw bones and a change in the tone of the masticatory muscles<sup>23, 24</sup>. Cortisol inhibits the absorption of calcium in the intestines, promoting the release of this element from the bone tissue, resulting in the development of osteoporosis, characterized by fragility of bones. The amount of calcium also decreases in the teeth, therefore, conditions are created for the occurrence of caries and non-carious enamel lesions<sup>25</sup>.

B 2013r. Zoila Refulio, Marco Rocafuerte from the University of Lima (Peru) conducted research aimed at identifying the links between stress, salivary cortisol levels and chronic periodontitis. The study involved 70 people without systemic pathologies (25 men and 45 women), non-smokers, aged 30 to 65 years. The relationship between stress, salivary cortisol levels and chronic periodontitis was evaluated. Strong association found between salivary cortisol and chronic periodontitis. After paired comparison of the values, it was found that patients with moderate chronic periodontitis had a higher level of cortisol in saliva than patients with mild chronic periodontitis<sup>26</sup>. In last systematic review of 2020 year observed all research in this trend was proved the presence of the association between psychological stress and periodontitis through analysis of cortisol levels and periodontal clinical parameters<sup>27</sup>.

A. Vasiliou, K. Shankardass (2016) the studies were conducted with the participation of 2,412 participants aged 25 to 64 years, who

lived in the city of Toronto from 2000 to 2012. It was found that in 95% of the subjects there is a relationship between stress and poor oral health. As a result of the studies performed, it was determined that stress can be a common factor in the initiation of both dental and systemic diseases. Stress can contribute to the development of oral diseases in at least two ways. First, people may try to overcome stress in unhealthy ways that contribute to the development of oral diseases (taking psychoactive substances, drugs, alcohol; smoking; poor nutrition and leading a sedentary lifestyle). Secondly, chronic stress is a high load on all organs and systems, leading to their dysfunctions, which triggers pathological processes that worsen the condition in the oral cavity due to a violation of habits associated with maintaining the normal level of its hygiene<sup>28</sup>.

Stress is a risk factor for developing systemic diseases such as diabetes, osteoporosis, and cardiovascular diseases. These diseases are usually accompanied by periodontal disease, gingivitis and periodontitis<sup>29, 30</sup>.

In addition, stress leads to immunosuppression, making a person more susceptible to various infections. Regardless of what caused the stress, the response of the immune system depends on its stage and age. Acute, short-term stress has a stimulating effect, and chronic stress leads to a decrease in the activity of immunocompetent organs. That is, short-term acute positive stress strengthens the immune system, and long-term negative stress depresses it, provoking a person's tendency to various diseases. This process develops due to constant fluctuations in the level of glucocorticoids during chronic stress, which leads to a decrease in the activity of cells of the immune system<sup>31</sup>. At the same time, doctors are increasingly using saliva as a marker for determining psychological stress. Geetha C Kiran and Bernard Ajay Reginald conducted a similar study on 3 groups of students (30 people each) to study the role of saliva peroxidase (SPOx) in psychological stress in people with and without aphthous lesions of the oral mucosa. A link was found between the level of stress, the amount of saliva peroxidase and the presence of mucosal lesions of people with different levels of stress. With a pronounced level of stress, there is a low level of enzymes and aphthous lesions of

the mucosa, and, conversely, with a low level of stress, the amount of salivary peroxidase is high, no aphthous lesions of the mucosa are observed<sup>32</sup>.

All people are susceptible to stress and its consequences, but there is one special category of people - students - who are under almost constant stress<sup>33, 34</sup>. As a rule, these are boys and girls who lead a certain lifestyle.

Scott, Elizabeth (2015) believe that students are a vulnerable part of society to stress. Especially those who live on campus dorms. For the first time, young people are getting out of control of their parents or guardians, therefore they face organizational and everyday difficulties, the need to set life priorities in overcoming them. This causes instability of the psycho-emotional state, the level of academic performance and causes stress.<sup>35, 36</sup>

Reddy K. J, Menon K. R, Thattil A.<sup>37</sup> conducted research to identify the level of academic stress affecting students and the reasons that contribute to it. They were analyzed by gender and stream differences the development of a common academic stress. The data obtained were divided into four academic areas: Commerce, Humanities, Science, and Management; and subjected to appropriate statistical analysis.

The total number of participants was 336. The average sample value for the total academic stress score was 53,46. Using the average value, it was found that 48.80% of students have medium and high levels of stress.

The total number of men and women was 162 and 174 with an average score of 53.01 and 53.87, respectively. According to the results obtained by the authors, there was no significant difference in the revealed general academic stress experienced by men and women. High stress levels have been reported of medical and engineering students. Analyzing the data, the researchers concluded that the development of academic stress is a global problem with a devastating impact on the mental health and well-being of students<sup>37</sup>.

A-Rong Heo, In-Suk Park, Kwui- Sook Song investigated the effects of stress on students at Chungcheongnam College and found that stress during the peer relationship phase had a positive effect on oral health as it improved

oral health. And stress associated with material resources, that is, negative stress, had a negative effect on the state of the oral cavity - oral hygiene and care were poorly performed<sup>38</sup>.

Novgorodtseva I.V., Musikhina S.E., Pyankova V.O. studied the causes and clinical signs of educational stress experienced by medical students. The study involved 205 second-year students aged 18-25 years. As a result of the research, it was revealed that the level of such stress increased in the majority of students in the last three months of study, which was justified by anxiety about the results of the upcoming examination session. Among the biological signs of the manifestation of educational stress, the most often recorded were increased heart rate, stiffness and muscle tremors. For boys test excitement indicator was slightly increased (7,7 points). The girls were more worried than normal (9.5 points). The average rate of examination excitement among medical students in general was also increased and amounted to 8.6 points on a 10-point scale<sup>39</sup>.

Joanna Elżbieta Owczarek and co-authors conducted a study between stress and anxiety levels and changes in chewing muscle tone in dental students. The study included 113 students. Of these, 52 students were enrolled in the 1st year (the average age was 20 years); 61 students were in the final 5th year (the average age was 23.6 years). It turned out that the higher the course of training, the higher the level of psychoemotional arousal and expected anxiety and muscle tone of chewing muscles of future dentists<sup>40</sup>.

Shevlyakova L. A., conducted research among University students in the city of Tver. It was found that the prevalence of caries in students - 91.8%, the intensity of the carious process 5,31%. Every second student has non-carious lesions of dental hard tissues (56,44 ± 2,36 %). Pathology of the oral mucosa and soft tissues was found in 1/3 (30,70 ± 2,19 %). Signs of periodontal tissue diseases were recorded in 97.49 ± 0.78% of students, with an intensity of 3.88 ± 0.06 segment. Oral hygiene was satisfactory. A good level of oral hygiene was 1.6 times more likely to be determined by medical students than by humanities<sup>41</sup>.

The study of Zubkova A. A. and Baron M. A. (2017) included students who studied at the 1st year of the dental faculty of the Kursk state

medical University. The average age of students was  $18.63 \pm 1.5$  years, of which the average age of boys was  $18.67 \pm 1$  years, and of girls  $18.59 \pm 2$  years. Signs of complete oral health were recorded only in 5 people, which amounted to 6% of the total number of those examined. Despite the high prevalence of caries (94%), its intensity was only 17.3%. Number of carious teeth (Caries = 5,25) exceeded the number of treated cavities (Filling = 3,85), and the rate of extracted permanent teeth was small (Extracted = 0,05). Most of the students considered themselves to be practically healthy (94%). Non-carious lesions of the teeth were detected in 13.65% of the examined, of which: hyperesthesia in 7.4%, wedge-shaped defect in 2.5%, pathological abrasion in 1.25%, fluorosis in 1.25%, enamel hypoplasia also in 1, 25% of students. Diseases of the oral mucosa were recorded in 6.1% of the examined, periodontal diseases in 2.5% of students, TMJ diseases in 2.5% of young people. 37,5 % students denied the presence of bad habits, played sports, their psycho-emotional state was assessed as calm. 49 % of young people, the psycho-emotional state was defined as unstable, they also played sports and did not note the presence of bad habits. 12.5 % of those included in the study were assigned to the group of people who were in a permanent state of stress. These students admitted that they have bad habits, did not play sports<sup>42</sup>.

Averina A.O. and Fedoseeva V.I. also studied the influence of stress and stress factors on the health of students. They confirmed that today the life of young people is full of emergencies and stressful situations. One of them is an acute lack of time and lack of sleep. It is these reasons that underlie disorders that lead to the loss of physical and mental health<sup>43</sup>.

In the studies of Kuznetsova N.S., Kabirova M.F., Kuznetsova N.I., close links were found between the level of stress and the prevalence of diseases of hard tissues of teeth of carious and non-carious origin, as well as the presence of inflammatory periodontal diseases and diseases of the oral mucosa. In young people experiencing stress, significant differences were found in almost all parameters of dental status from those observed in other study groups<sup>44</sup>.

In her research, Daurova F.Yu. (2013) for

the first time determined the level of stress of foreign dental students at the stage of adaptation and acclimatization to the city of Moscow. Based on the analysis of correlations, a direct relationship was found between the level of stress and the intensity of inflammatory periodontal diseases. The factors of specific and non-specific immune defense of the oral cavity were also evaluated. The weakening of the local immune response was determined in foreign dental students 2-5 months after the start of training. In addition, during the 1st year of study, a decrease in the concentration of calcium and phosphate ions in mixed saliva was found, as well as a deficiency of several trace elements. In 63% of cases, the formation of chronic stress revealed stagnant phenomena in periodontal tissues. As a result of the correlation analysis, a direct dependence of the intensity of periodontal diseases on the level of stress was determined<sup>45</sup>.

Thus, the results obtained in clinical studies conducted by scientists in different countries show the importance of stress in the pathogenesis of dental diseases in various categories of people. There are still not many scientific works aimed at finding the relationship between the level of stress and the severity of oral pathology, especially of young people<sup>32, 38, 40, 44-48</sup>. Based on the analysis of scientific works published over the past 60 years in this direction, it was revealed that the attention of scientists was more focused on changing the intra-articular relations of the temporomandibular joint and the tone of the masticatory muscles. The most studied group of young patients is the student group.

## Conclusions

The severity of stress and changes in the oral cavity that develop under its influence are especially interesting to study with dental students, since, as a rule, their basic knowledge of oral care is higher than that of all other students of their age. In this regard, it is important to understand the mechanisms of development of oral pathology and ways to improve adaptation of individuals who are cyclically exposed to stress factors, it is important to carry out on subjects with different approaches to oral hygiene, but more or less the

same level of stress. This proves the need to continue research work in this direction for a deeper study of the processes, the development of which is caused and / or interrelated with the formation of pathological changes in the mucous membranes and lesions of the hard tissues of the teeth.

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All authors have contributed equally for this manuscript.

### Declaration of Interest

The authors declare that there is no conflict of interests regarding the publication of this paper.

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