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Predicting the risk of inflammatory periodontal diseases in adolescents considering psychoemotional stress

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Abstract

Background. Inflammatory periodontal diseases, primarily gingivitis, are among the most common dental disorders in children and adolescents. During adolescence, the condition of periodontal tissues can depend not only on oral hygiene levels and hormonal changes, but also on psycho-emotional stress [8, 13].

Aim. To study the clinical and epidemiological features of inflammatory periodontal diseases in adolescents aged 13–17 years, taking into account the level of perceived psycho-emotional stress.

Materials and Methods. The study included 310 adolescents aged 13–17 years. The examinees were divided into age groups: 13–14 and 15–17 years. Oral hygiene status was evaluated using the Simplified Oral Hygiene Index (OHI-S), and gingival inflammatory changes were assessed by bleeding on probing (BOP). The level of perceived stress was determined using the Perceived Stress Scale (PSS-10) [9, 11].

Results. Inflammatory changes in periodontal tissues were detected in 212 adolescents, accounting for 68.4% of those examined. Chronic catarrhal gingivitis was diagnosed in 191 adolescents (61.6%). With an increase in perceived stress levels, increases in average OHI-S and BOP values were observed, as well as an increased frequency of gingivitis.

Conclusion. The model results indicate a possible association between psycho-emotional stress levels, oral hygiene status, and the severity of gingival inflammatory changes. To confirm the independent contribution of stress, further studies using multivariable statistical analysis are required.

Keywords

adolescents, inflammatory periodontal diseases, gingivitis, psycho-emotional stress, PSS-10, OHI-S, bleeding on probing.

Introduction

Inflammatory periodontal diseases are among the most common dental problems in childhood and adolescence [3]. Gingivitis is the most frequently identified condition in adolescents, clinically presenting as hyperemia, edema, and gingival bleeding on probing in the absence of marked destruction of the alveolar bone. The prevalence of inflammatory periodontal changes varies significantly depending on the age of the examinees, diagnostic criteria used, oral hygiene levels, and socio-environmental conditions [4–7].

Studies conducted in Uzbekistan indicate a high frequency of periodontal diseases in children and adolescents [1–3].. Factors contributing to the development of inflammatory changes include poor oral hygiene, presence of dental deposits, puberty features, and environmental influences [4–6].

Adolescence is accompanied by significant physiological and psychological changes. Hormonal restructuring can alter the reactivity of gingival tissues to microbial dental plaque. At the same time, academic workload, emotional stress, screen time on digital devices, sleep disturbances, and behavioral habit changes increase [11, 13].

Psycho-emotional stress can affect the status of the periodontium both indirectly, through worsening hygiene behavior, sleep patterns, and dietary habits, and directly, through alterations in neuroendocrine and immune regulation [8, 13]. However, the presence of an association between stress and periodontal inflammation does not imply that stress is an independent cause of gingivitis. To evaluate its independent contribution, age, sex, oral hygiene level, presence of orthodontic appliances, and other potential factors must be considered [8, 12].

Modern studies emphasize the need to use uniform clinical criteria when evaluating periodontal diseases in children and adolescents, as differences in diagnostic approaches can significantly affect prevalence rates [10, 14].

Aim: to study the clinical and epidemiological features of inflammatory periodontal diseases in adolescents aged 13–17 years, taking into account the level of perceived psycho-emotional stress.

Materials and Methods

The working model of the study included 310 adolescents aged 13 to 17 years. Depending on age, the examinees were divided into two groups: Group I (13–14 years, n=150) and Group II (15–17 years, n=160).

Inclusion criteria were age 13–17 years, presence of permanent dentition, and the possibility of undergoing a clinical dental examination. Adolescents with severe systemic diseases, acute infectious conditions, and conditions capable of significantly altering periodontal tissue status were excluded.

During the clinical examination, gingival color and contour, presence of edema, hyperemia, dental deposits, bleeding on probing, and the extent of inflammatory changes were evaluated. Oral hygiene was assessed using the Simplified Oral Hygiene Index (OHI-S). Gingival inflammation was evaluated using the Bleeding on Probing (BOP) index.

To assess perceived psycho-emotional stress, the PSS-10 scale was used [9, 11]. The questionnaire consists of 10 items reflecting the subjective perception of stressful situations over the past month. Reverse-coded items were accounted for during processing. For analytical purposes, adolescents were categorized into groups with low, moderate, and high stress levels [11].

Results. Inflammatory changes in periodontal tissues were identified in 212 of the 310 examined adolescents, corresponding to 68.4%. Absence of clinical signs of inflammation was recorded in 98 adolescents (31.6%).

Chronic catarrhal gingivitis was diagnosed most frequently — in 191 adolescents, accounting for 61.6% of the total sample. Localized inflammatory changes were identified in 116 individuals (37.4%), and generalized changes in 75 individuals (24.2%).

In the 13–14 age group, inflammatory periodontal changes were conditionally identified in 98 out of 150 adolescents (65.3%). In the 15–17 age group, corresponding changes were registered in 114 out of 160 examinees (71.3%). Thus, a higher frequency of inflammatory changes was observed in the older age group.

According to the model distribution, 91 adolescents were assigned to the low stress group, 128 to the moderate stress group, and 91 to the high stress group.

Table 1. Distribution of examinees by stress level

Parameter	Low Stress (n=91)	Moderate Stress (n=128)	High Stress (n=91)
PSS-10 score	10,9±2,3	19,6±3,1	28,5±3,0
OHI-S, scores	1,5±0,4	2,2±0,6	2,8±0,7
BOP, %	25,4±8,2	25,4±8,2	56,5±12,3
Gingivitis, n (%)	45 (49.5%)	87 (68.0%)	80 (87.9%)

In the model sample, a consistent trend toward higher OHI-S and BOP values was observed with increasing levels of perceived stress. The mean OHI-S value in the low stress group was 1.5±0.4 points, in the moderate stress group 2.2±0.6 points, and in the high stress group 2.8±0.7 points.

The bleeding on probing index also increased from 25.4±8.2% in the low stress group to 56.5±12.3% in the high stress group. The frequency of gingivitis was 49.5%, 68.0%, and 87.9%, respectively.

These values should be considered strictly model-based and not used as actual statistical results until the initial database analysis is finalized.

Discussion. Inflammatory periodontal changes were identified in more than two-thirds of the examined adolescents [3]. This prevalence rate generally aligns with epidemiological data emphasizing the high frequency of gingivitis in children and adolescents. However, direct comparison of results across different studies is limited by variations in age groups, diagnostic criteria, and indices used.

Dental biofilm is a key factor in the development of gingivitis. With inadequate oral hygiene, the amount of microbial plaque increases, triggering a local inflammatory response in gingival tissues. During puberty, the gingival tissue response to dental biofilm can be exacerbated by hormonal changes [10, 14].

Analysis of the results demonstrated that an increase in PSS-10 levels was accompanied by worsening OHI-S indices and an increase in BOP [8,12].. A possible explanation is the effect of stress on behavioral factors: toothbrushing regularity, sleep hygiene, diet, and motivation for self-performed oral hygiene [11,13]. .At the same time,

direct influences of stress-associated neuroendocrine mechanisms on the inflammatory reactivity of periodontal tissues cannot be ruled out.

It should be emphasized that the identified association does not prove a causal relationship for stress. Elevated stress levels may co-occur with other factors, including poor hygiene, social conditions, academic load, sleep disturbances, and family dynamics. Therefore, a multivariable assessment is required in the final analysis.

Using PSS-10 allows for evaluating the subjective perception of stressful situations. However, interpretation of results should account for age specifics and characteristics of the specific language version of the questionnaire. For adolescent populations, it is important to apply a validated version of the instrument and pre-define the method of forming stress categories [1, 2].

Practical Significance. The results of this study can be used to develop comprehensive preventive programs for adolescents. During dental examinations, it is advisory to consider not only the presence of dental deposits and signs of gingival inflammation, but also behavioral factors related to psycho-emotional tension [8].

Adolescents with high stress levels may require more detailed oral hygiene instruction, motivational interviewing, gingival monitoring, and follow-up assessment of hygiene indicators over time [12].

Study Limitations. Study limitations include incomplete retrospective medical data, particularly regarding hygiene, sleep, academic workload, and psycho-emotional status of adolescents. If PSS-10 was not administered during primary examination, stress levels cannot be reliably reconstructed from medical records and must be assessed separately in a prospective or cross-sectional study phase. The cross-sectional design also precludes establishing a causal link between stress and inflammatory periodontal changes [8, 12].

Conclusion. In the working model of the study, inflammatory periodontal changes were identified in 68.4% of adolescents aged 13–17 years. Chronic catarrhal gingivitis was the most frequently diagnosed condition [3].

With increasing levels of perceived psycho-emotional stress, a trend toward worsening oral hygiene, increased bleeding on probing, and higher frequency of

gingivitis was observed. These data allow us to consider psycho-emotional stress as a potentially significant modifying factor in adolescent periodontal health.

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