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CONDITIONS OF THE ORAL CAVITY STATUS IN YOUTH WITH ALIMENTARY-CONSTITUTIONAL FORM OF OBESITY

Skrypnyk M., Petrushanko T., Kryvoruchko T., Neporada K.

Ukrainian Medical Stomatological Academy Poltava, Ukraine

Поширеність ожиріння значно зросла, особливо серед молодих людей, що обумовлено певним способом життя, якістю їжі та харчовою поведінкою. Ожиріння призводить до розвитку великого числа супутніх захворювань, таких як артеріальна гіпертонія, серцевий інсульт, артрит та інші захворювання. Ми провели стандартне клінічне обстеження порожнини рота 154 молодих пацієнтів (18-21 року) - всі вони були студентами Української медичної стоматологічної академії. Було встановлено, що більшість пацієнтів з ІМТ > 30 кг/см² мають обтяжену спадковість у сім'ї, в 66,2% випадків у одного з батьків обстеженого з ожирінням було ожиріння, а у 32,43% пацієнтів обоє батьків мали ожиріння, яке значно вище, у порівнянні з людьми із нормальним ІМТ і надмірною вагою. Була висока поширеність захворювань пародонту близько 74% і каріозних уражень зубів - 97,4% серед усіх студентів, незважаючи на вік і контингент обстежених пацієнтів - студенти-медики. У пацієнтів з ІМТ > 30 кг/см² поширеність генералізованих форм гінгівіту і пародонтиту була в три рази вище у порівнянні з особами із нормальним ІМТ. Значення гігієнічних індексів порожнини рота були низькими у всіх дослідних групах, але їх значення були трохи нижче у пацієнтів з нормальним ІМТ в порівнянні з пацієнтами з надлишковою вагою та ожирінням. Поширеність запальних змін в яснах була вище в осіб з ожирінням, усі вони мали легкий ступінь ураження тканин пародонта. Запальні процеси у яснах були найбільш інтенсивними у пацієнтів з другим ступенем ожиріння. За результатами дослідження наявність ожиріння першого та другого ступеня слід розглядати як фактор ризику, що провокує захворювання тканин пародонту. Для осіб з ІМТ > 30 кг/см² при захворюваннях пародонту слід проводити заходи з вторинної профілактики запальних та запально-дистрофічних захворювань пародонту, а у осіб без захворювань пародонту на тлі ожиріння слід проводити первинну профілактику захворювань пародонту.

Ключові слова: захворювання пародонту, ожиріння, профілактика, надмірна вага, пародонтит, карієс, гінгівіт.

Obesity prevalence has significantly increased especially in young adults, which is caused by a particular lifestyle, food quality and dietary behavior. Obesity leads to development of huge array of comorbid conditions such as arterial hypertension, heart stroke, arthritis and other diseases. We conducted standard clinical examination of oral cavity of 154 young patients (18-21 years old) – all of them were students of Ukrainian Medical Stomatological Academy. It has been determined that the majority of patients with BMI >30 kg/cm² have aggravated family heredity, in 66,2% cases one parent of obese students had obesity and 32,43% patients have both parents with obesity that is significantly higher compared with persons with normal BMI and overweight. There was a high prevalence of periodontal diseases about 74% and carious lesions of teeth - 97.4% among young people despite the age and contingent of examined patients - medical students. In patients with BMI >30 kg/cm² prevalence of generalized forms of gingivitis and periodontitis was by three times higher compared with individuals with normal BMI. The values of oral hygienic indexes were poor in all examined groups, but their values were slightly lower in patients with normal BMI than in those with overweight and obesity. The prevalence of inflammatory changes in gums was higher in persons with obesity: all of them had a mild degree of lesions in periodontal tissues. Inflammatory processes in the gums were the most intense in patients with the second degree of obesity. According to the results of the study, the presence of the first and the second degree of obesity should be considered as a risk factor triggering periodontal tissues diseases. For persons with BMI >30 kg/cm² with periodontal disease measures for the secondary prevention of inflammatory and inflammatory dystrophic periodontal diseases should be carried out and in persons without periodontal disease on the background of obesity measures primary prevention should be done.

Key words: periodontal diseases, obesity, prevention, overweight, periodontitis, caries, gingivitis.

Introduction

Obesity acquires the status of non-infection pandemic disease for the last 40 years. According to WHO worldwide obesity has nearly tripled since 1975. In 2016 more than 1.9 billion adults 18 years and older were overweight. Out of these people over 650 million were obese. 39% of adults aged 18 years and over were overweight in 2016 and 13% were obese [15]. There are many well-known obesity-related diseases such as insulin resistance, type 2 diabetes mellitus, and cardiovascular disease and other. Obesity can induce the development of heart stroke, arterial hypertension, cancer, dis-

eases of musculoskeletal system and diseases of periodontal tissues.

There is periodontal and systemic immune response of overweight hosts to periodontitis. The most relevant linker is systemic inflammation and impaired immune response by which obesity might trigger aberrant periodontal inflammation and exacerbated alveolar bone loss [8]. Through test carried out on laboratory mice with induced obesity researchers explore significant decrease of alveolar bone level and increase of periodontal osteoclast, leukocyte, and macrophage number in obese mice with periodontitis compared with normal weight mice with induced periodontitis [16]. In periodontal tissues of

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monosodium glutamate-induced obesity rats activation of oxidative stress and nitrosative stress alteration and depolymerization of main connective tissues biopolymers were detected compared with rats without obesity [1].

There is a significant association between variety of body mass index (BMI) and waist-hip ratio (WHR) used in the assessment of body composition as indicators of obesity and risk of body fat distribution have an influence on the quality of life for aged individuals [9]. In young adults abdominal obesity is associated with poorer scores of emotional, school and psychosocial abilities and total life quality scores [12]. Due to mentioned above facts, overweight and obesity are not only medical, but global social problems needed to be tackled.

The mechanism of pathological changes development in periodontal tissues are not clear enough and it needs to be studied in depth in order to provide such group of patients with effective etiological and pathogenetic therapy.

The aim of research. The aim of our research was to explore the structure of oral cavity pathology in patients with diverse values of BMI in order to detect diseases comorbid with overweight in oral cavity.

Materials and methods

We conducted standard clinical examination of oral cavity in 154 young patients (18-21 years old) – all of them were students of the Ukrainian Medical Stomatological Academy. All participants were informed about using of their personal information in the material of research and signed a written agreement for further examination. Index assessment of oral status entails the determination of caries intensity by DMFT index [11], estimation of oral hygiene (Green-Vermillion index) [5], periodontal tissues (index Rateitchak) [14], PMA (Parma) [13], CPI (complex periodontal index) (Leus) [3], PBI (Saxer and Muhlemann)[14] and Winkel Tongue Coating index (WTC) [7]. For all examined patients periodontogram was completed. Periodontal diagnose made due to M.F. Danilevsky classification [3], alteration in oral mucosa and lips diseases were classified according to P.T. Maksymenko [10], occlusion pathology was estimated with classification by L.P. Grigoryeva [6].

In all patients, we determine the values of anthropometrical measures: body mass, height, waist and hip measures and hand dynamometry. Severity of obesity was estimated with WHO classification of obesity due to body mass index Kettle (BMI). Values of BMI were the criteria for group distribution: 1) patients with normal weight (BMI – 18,5 – 24,99 kg/cm²) n=31; 2) patients with overweight (BMI - 25 – 29,99 kg/cm²) n=49; 3) patients with the first degree obesity (BMI - 30 – 34,99 kg/cm²) n=34 ; 4) patients with the second degree obesity (BMI - 35 – 39,99 kg/cm²) n=40.

Inclusion and exclusion criteria. Inclusion criteria were patients of both gender aged from 18 to 21, Ukrainian origins, presence of constitutional or acquired forms of obesity in those who were obese.

The exclusion criteria were pregnant or lactating women; patients with endocrine forms of obesity; patients of non-Ukrainian race; presence of non-removable orthodontic appliances.

Statistical methods. SPSS 11.5 software was used for statistical analysis, and data were presented as mean ± standard deviation ($\bar{x} \pm s$). Intra-group comparisons were conducted with a paired-sample t test, and the analysis of the correlation between the indicators was performed by

Pearson's correlation analysis. $P < 0.05$ was considered statistically significant.

Results and discussion

The average students of BMI in the first group of patients was $22,3 \pm 0,2$ kg/cm², in the second group – $27,84 \pm 0,2$ kg/cm², in the 3rd group – $32,3 \pm 0,38$ kg/cm², in the fourth group – $38,54 \pm 0,84$ kg/cm². Among the examined students in the first group 64,5% were residents of large cities, 35,5% were residents of villages and small cities, the second group – 40,8% and 59,2%, the third group – 64,7% and 35,3%, the fourth - 60% and 40% respectively.

Most of the examined with the first and the second degree of obesity severity were female. In the third group, the percentage of women was 76,5%, in the 4th – 55,0%, the ratio between obesity prevalence in women and men in the 1st and 2nd groups was almost the same. Our obtaining data about the prevalence of obesity among people of different sexes is confirmed with the results of some epidemiological studies [4].

According to WHO, one of the criteria of metabolic syndrome is waist value 102 cm and higher for men and 88 cm for women. The excess of these measurements found in 76,5% of the patients of the third group and in 100% of the patients in the fourth group. The average value of waist and hip in patients of the first group was $75,67 \pm 1,45$ cm and $98,33 \pm 1,42$ cm, respectively, in persons of the 2nd group – $83,3 \pm 1,85$ cm and $103 \pm 2,25$ cm, the third one group – $91,82 \pm 1,92$ cm and $114,58 \pm 1,3$ cm, in the fourth group – $108,23 \pm 2,3$ cm and $121,95 \pm 2,24$ cm, respectively. One of the criteria for abdominal obesity is a waist-hip ratio, for men it is $\leq 1,0$, for women $\leq 0,85$ [4]. According to anthropometric data only 6,2% patients in the second group had abdominal obesity, in the third group - 11,77% and 30% in the 4th group had abdominal obesity.

In 32,5% out of all examined patients we observed the presence of allergy mostly to medicines and food products. Prevalence of allergy was the highest in patients with the second degree of obesity up to 40% with prevalence of polyvalent allergy. The presence of allergic reactions in persons with normal body mass was about 22,5%, in persons with overweight (second group) an allergic anamnesis was complicated in 32,6% of patients, allergic reactions on food products were predominant in both groups. In the group with the 1st degree of obesity the presence of allergic reactions was found in 26.5%.

The majority of obese students had aggravated with heredity (Table 1) or there were numerous exogenous factors such as unhealthy lifestyle, lack of food culture in the family and disturbance in diet behavior as evidenced by the higher prevalence of obesity among the parents of patients with obesity. In the fourth group in 35% of patients both parents suffered from obesity and in 75% one of the parents was obese. In the third group, the prevalence of obesity in both parents was up to 29,41% and one of the parents was obese in 55,88%. The prevalence of obesity in parents of examined students in the first and the second group is shown in Table 1. about 15% of parents of patients with the first and the second degree of obesity had Type 2 diabetes mellitus, which is significantly higher than in patients with normal body weight and overweight. The prevalence of cardiovascular system diseases and atopic diseases in the parents of examined patients had no definite liaison with the presence of obesity in examined individuals.

Table 1.
Presence of some diseases in parents of examined patients.

Diseases, %	BMT	18,5-24,99 cm ² /kg	25-29,99 cm ² /kg	30-34,99 cm ² /kg	35-39,99 cm ² /kg
Obesity in one of parents		23,53	48,98	55,88	75
Obesity in both parents		6,45	18,37	29,41	35
Diabetes mellitus type II		8,82	10,2	14,7	15
Cardiovascular diseases		14,7	18,37	17,64	10
Atopic diseases		12,9	6,12	0	5

The parameters of hand dynamometry were as follows: in the first group among men - 47,5 ± 2,2 H, among women - 25,63 ± 1,23 H, in the second group - men - 49,95 ± 2,29 H, women - 29,23 ± 2,1H, in the third group - men 52,5 ± 2,4H, women - 25,84 ± 1,7H, in the fourth group - men 47,7 ± 2,4H, women 26,22 ± 1,56H.

The presence of papular and pustular skin rash was detected in 32,26% of students with normal BMI, in 53,18% of persons with overweight, the highest prevalence of skin rash was in students with 1 degree of obesity - 70, 59%, and 65% persons with second degree of obesity had skin lesions.

The presence of bad habits (smoking) was noted in 29% of people with normal weight, their age of smoking was 2,4 ± 0,54 years, the number of cigarettes per day was 5,4 ± 0,8 sig/day. In the group with overweight the percentage of smokers was 32,65%, the duration of smoking – 2,3 ± 0,56 years, the intensity of smoking was 5,88 ± 0,76 sig/day. In the third group, the percentage of smokers was 29.41%, the duration of smoking 2,6 ± 0,74 years, the intensity – 5,4 ± 1,05 sig/day. In persons with

the second degree of obesity the percentage of smokers was up to 30%, the duration of smoking was 2,3 ± 0,42 years, the frequency was 10,8 ± 2,1 sig/day. The initial age of regular smoking for vast majority was between 17 and 18 years, which is associated with stress factors like graduation at school and entering to university. There was no difference between sex of smokers.

Regular checking-up at dentist (twice a year and more often) did 41,9% of patients in the first group, 57,1% in the second group, 41,2% in the third groups and 75% in the fourth group. 45,2% of patients of the first group, 28,6% in the second group made checking-up at dentist once a year, 47,1% in the third group and 25% in the fourth group visit. Not regularly (with a presence of acute pain) to the dentist went 13% patients with normal BMI, 14,3% in the second group, 11,7% patients of the third group.

The prevalence of caries in examined groups was on average 97,4%, which corresponds to the results of a number of researchers. The intensity of the carious process in the investigated groups is given in Table 2.

Table 2.
Prevalence of dental caries in patients with diverse BMI value. DMFT (permanent teeth) – decayed, missing and filled teeth.

Group	Decay	Missing	Filled	Mean DMFT
IBM 18,5-24,99 kg/cm ²	2,66±0,37	0,1±0,05	3,12±0,3	5,88±0,67
IBM 25 –29,99 kg/cm ²	3,35±0,4	0,24±0,11	3,24±0,49	6,84±0,58
IBM 30 – 34,99 kg/cm ²	2,71±0,59	0,53±0,2	3,88±0,88	7,11±1,07
IBM 35 – 39,99 kg/cm ²	4,25±0,85	0,1±0,06	1,6±0,42	5,96±0,84
Total	3,47±0,33	0,26±0,08	3,01±0,35	6,74±0,43
	p ₁₋₂ >0,05 p ₁₋₃ >0,05 p ₁₋₄ >0,05 p ₂₋₃ >0,05 p ₂₋₄ >0,05 p ₃₋₄ >0,05	p ₁₋₂ >0,05 p ₁₋₃ >0,05 p ₁₋₄ >0,05 p ₂₋₃ >0,05 p ₂₋₄ >0,05 p ₃₋₄ <0,05	p ₁₋₂ >0,05 p ₁₋₃ >0,05 p ₁₋₄ <0,05 p ₂₋₃ >0,05 p ₂₋₄ <0,05 p ₃₋₄ <0,05	p ₁₋₂ >0,05 p ₁₋₃ >0,05 p ₁₋₄ >0,05 p ₂₋₃ >0,05 p ₂₋₄ >0,05 p ₃₋₄ >0,05

Note: p₁₋₂ - the level of significance is obtained when comparing groups of patients with normal weight and overweight patients;
p₁₋₃ - the level of significance is obtained when comparing groups patients with normal weight and patients with the first degree obesity;
p₁₋₄ - the level of significance is obtained when comparing groups patients with normal weight and patients with the second degree obesity;
p₂₋₃ - the level of significance is obtained when comparing groups of overweight patients and patients with the first degree obesity;
p₂₋₄ - the level of significance is obtained when comparing groups of overweight patients and patients with the second degree obesity;
p₃₋₄ - the level of significance is obtained when comparing groups patients with the first degree obesity and patients with the second degree obesity.

The prevalence of malocclusion was found in 48,1% patients in the first group, 43% in the second group, 53% in the third group and 60% in the fourth group.

Anomalies of soft tissues development in oral cavity (truncated frenulum of the tongue, small vestibulum of mouth) were found in 6,45% students in the first group,

12,24% of the second group, 11.76% of the third group and 10% in the fourth group.

The prevalence of periodontal diseases was up to 74%, chronic generalized catarrhal gingivitis and chronic localized catarrhal gingivitis were predominant forms of diseases. Chronic generalized periodontitis was diag-

nosed only in 4,55% of all cases (all - representatives of the third and the fourth group). The prevalence of periodontal disease with BMI is shown in Fig. 1. The frequency of pathological lesions in periodontal tissues increased with the rise of the BMI value, as well as the prevalence of generalized forms of periodontal diseases.

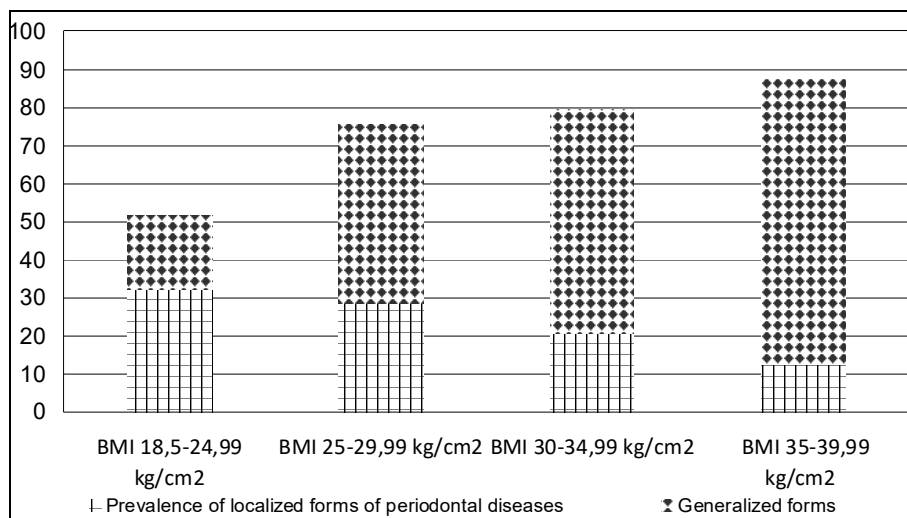


Fig. 1. Prevalence of generalized and localized forms of periodontal diseases among youth with diverse BMI values, is shown in percentage.

Index assessment of periodontal status is presented in Table 3.

Table 3. Values of oral hygiene indexes in patients with diverse BMI.

Index \ Group (BMI)	18,5-24,99 kg/cm ² (n=31)	25-29,99 kg/cm ² (n=49)	30-34,99 kg/cm ² (n=34)	35-39,99 kg/cm ² (n=40)
OHI	0,54±0,11	1,34±0,07	1,42±0,12	1,4±0,11
	p ₁₋₂ < 0,001	p ₁₋₃ < 0,001	p ₁₋₄ < 0,001	p ₂₋₃ > 0,05
API, % (Rateitchak)	16,53±2,3	11,4±3,2	6,67±1,2	10,7±3,1
	p ₁₋₂ > 0,05	p ₁₋₃ < 0,001	p ₁₋₄ > 0,001	p ₂₋₃ > 0,05
PMA, %	6,1±1,5	10,3±1,3	14,7±1,64	16,8±1,5
	p ₁₋₂ < 0,05	p ₁₋₃ < 0,001	p ₁₋₄ < 0,001	p ₂₋₃ < 0,05
CPI (Leus)	1,38±0,15	1,52±0,11	1,7±0,1	1,66±0,15
	p ₁₋₂ > 0,05	p ₁₋₃ > 0,05	p ₁₋₄ > 0,05	p ₂₋₃ > 0,05
PBI, % (Saxer, Muhlemann)	6,4±0,9	15,6±2,4	15,7±2,3	22,9±2,6
	p ₁₋₂ < 0,001	p ₁₋₃ < 0,001	p ₁₋₄ < 0,001	p ₂₋₃ > 0,05
WTC index	3,04±0,32	3,29±0,35	3,65±0,66	3,5±0,47
	p ₁₋₂ > 0,05	p ₁₋₃ > 0,05	p ₁₋₄ > 0,05	p ₂₋₃ > 0,05

Note: p₁₋₂ - the level of significance is obtained when comparing groups of patients with normal weight and overweight patients;
 p₁₋₃ - the level of significance is obtained when comparing groups patients with normal weight and patients with the first degree obesity;
 p₁₋₄ - the level of significance is obtained when comparing groups patients with normal weight and patients with the second degree obesity;
 p₂₋₃ - the level of significance is obtained when comparing groups of overweight patients and patients with the first degree obesity;
 p₂₋₄ - the level of significance is obtained when comparing groups of overweight patients and patients with the second degree obesity;
 p₃₋₄ - the level of significance is obtained when comparing groups patients with the first degree obesity and patients with the second degree obesity.

The prevalence of oral mucosa and lips diseases was 22,07 %. The prevalence of oral mucosa and lips diseases in the first group was 19,35%, in the second - 24,49%, in the third - 17,64%, in the 4th - 25,0%. Among patients of the first and the second groups, traumatic lesions of mucosa dominate in the 3-rd and 4-th group with a high frequently of chronic recurrent aphthous stomatitis up to - 40%, which is evidenced by the presence of undiagnosed enterocolitis according to [2].

Conclusions

Thus, there is a significant prevalence of obesity among young females compared with male gender. The vast majority of all obese patients with BMI >30kg/cm² in 62,2% cases were residents of large cities. In our opinion the fact is caused by a particular lifestyle - hypodynamia, irregular diet and the presence of strong social risk factors for the development of emotional stress compared with residents of rural area. It has been determined that the majority of patients with BMI >30 kg/cm² have a heavy family heredity, in 66,2% cases one parent of

obese students had obesity and 32,43% patients have both parents with obesity that is significantly higher compared with persons with normal BMI and overweight. All patients had aggravated allergic history, the presence of allergic reactions was detected in 32,5% of all students, the highest prevalence was in individuals with BMI 35-40 kg/cm² - 40%. Papular and pustular skin rash was detected in the 3rd and the 4th group in 2 and 2.3 times frequently than in patients with normal BMI.

There is a high prevalence of periodontal diseases about 74% and carious lesions of teeth - 97.4% among young people despite the age and contingent of examined patients - medical students. This indicates the absence of effective primary and secondary prevention measures of dental pathology on the state, group and individual levels.

We did not find any link between the intensity of the carious process and the BMI. Although the highest value of the component of the DMFT-D index (non-filling carious cavities) was in the fourth group up to $-4,25 \pm 0,85$ which, in our opinion, indicates that there is no motivation in the dental health care in patients with the 2 degree of obesity. The prevalence of mucous lesions was the highest in persons with the 2 degree of obesity - 25%, with a domination of chronic recurrent aphthous stomatitis, which indicates the presence of digestive system organs disease in this group of individuals. The tongue hygiene indicator was clearly correlated with the value of BMI of patients. The tongue was the most coated in individuals with the second degree of obesity. Coating on the tongue is a sign of a presence of digestive system pathology in this group of individuals.

The presence of malocclusion was the highest in individuals of the fourth group, and was up to 60%. In the structure of morbidity, chronic generalized catarrhal gingivitis was prevalent - 44,8%; the share of chronic generalized periodontitis was 4,55%, all individuals of the 3th and the 4th groups. We found a direct correlation between the prevalence of periodontal disease and the BMI in patients, as well as the increase of percentage of generalized forms of periodontal diseases. The values of oral hygienic indexes were poor in all examined groups, but their values were slightly lower in patients with normal BMI than in those with overweight and obesity. The prevalence of inflammatory changes in the gums was higher in persons of the 3th and the 4th groups PMA = $14,5 \pm 1,8$ and $16,8 \pm 1,5$ %, respectively. All persons with overweight and obesity had a mild degree of lesions in periodontal tissues with a CPI > 1,5, compared with individuals with normal weight where the CPI value was $0,54 \pm 0,11$. Inflammatory processes in the gums were the most intense in patients with the second degree of obesity, where the PBI was $22,9 \pm 2,8$ %, that is by 1,5 times higher than in the second and third group and by 4 times higher than in the first group.

In our opinion, the development of inflammatory changes in the gums in patients with the second degree of obesity is not caused by local factors. The key role in development of inflammation process is systemic - proin-

flammatory adipocytocins that are secreted into blood by adipose tissue in excess. We would like to sum up that systemic factors play a crucial role in the development of periodontal tissues alteration in obese individuals, because there is no significance between local factors in all group of individuals where dental deposits quantity was the same. Overweight leads to the disturbance of compensatory and adaptive processes in the whole body by forming chronic systemic mild inflammation in the body.

According to the results of the study, the presence of the first and the second degree of obesity should be considered as a risk factor triggering periodontal tissues diseases. For persons with BMI >30 kg/cm² with periodontal disease measures for the secondary prevention of inflammatory and inflammatory dystrophic periodontal diseases should be carried out and in persons without periodontal disease against the background of obesity, measures of primary prevention should be done.

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