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Original article

Dependence of the Dental Status of Young Individuals with Different Body Weights on Their Eating Behavior

Maksym Skrypnyk[1], Tatiana Petrushanko[2], Karine Neporada[3], Roman Skrypnyk[4], Vladymyr Petrushanko[2], Igor Skrypnyk[4]

[1]*PhD student at the Department of Therapeutic Dentistry, Poltava State Medical University, Poltava, Ukraine*
[2]*Department of Therapeutic Dentistry, Poltava State Medical University, Poltava, Ukraine*
[3]*Department of Biological and Bioorganic Chemistry, Poltava State Medical University, Poltava, Ukraine*
[4]*Department of Internal Medicine №1, Poltava State Medical University, Poltava, Ukraine*

SUMMARY

Introduction. Obesity is a global problem of modern society. According to the WHO, in 2016, more than 1.9 billion adults are overweight and about 650 million adults are obese. Numerous studies indicate the role of overweight, obesity and metabolic status on periodontal health, however, the mechanism of their development is not fully understood.
Aim. The aim of the study was to explore the mechanism of periodontal disease development in patients with diverse body mass index and the mechanism of extra weight and obesity onset in these patients.
Methods. The study involved 132 Ukrainian males and females, 18 - 22 years old. Body mass index was determined in all patients. Information on life history, illness and family history was collected. The assessment of dental status was conducted by indicating the oral and tongue hygiene indices and periodontal indices. Eating behaviour was assessed using the standardised Dutch eating behaviour questionnaire (DEBG) and the three-factor eating questionnaire (TFEQ R-18). Diet assessment was determined by standardized diet questionnaire.
Results. More than 60% of young people with the 1st and 2nd degree obesity had eating disorders, the most prevalent were disturbance of cognitive restraint and emotional eating components of eating behavior. The prevalence of periodontal disease was significantly higher in obese individuals, up to 87% in patients with the 1st and 2nd degree obesity.
Conclusion. Eating behavior disturbances play a crucial role in the development of obesity in young adults and onset of gingivitis. The cause of non-plaque-induced gingivitis in patients with the 1st and 2nd degree obesity is a impaired general host response to the pathogenic factors of the oral cavity, caused by excess adipose tissue, which led to the development of chronic systemic mild inflammation. That is why these patients need a specific, integrated periodontal treatment.

Keywords: **obesity, periodontitis, gingivitis, eating behavior, emotional eating, dental status**

Corresponding author:
Maksym Skrypnyk
e-mail: maximskrypnik97@gmail.com

INTRODUCTION

According to the WHO epidemiological research, in 2016, more than 1.9 billion adults older than 18 years old were overweight, and about 650 million adults were obese (1). In the period from 1975 to 2016, the prevalence of obesity worldwide almost tripled and has acquired the status of a non-infectious pandemic (1). In the past, the problem of obesity and overweight was typical for high-income countries, but now the number of cases has increased significantly in low- and middle-income countries, especially in cities (1). Overweight and obesity are increasingly being diagnosed in children and adolescents aged 5 - 19 years old and its prevalence rose sharply from 4% in 1975 to just over 18% in 2016 (1).

Obesity and overweight are caused by energy imbalance between calories consumed and expended. An increase in obesity-related conditions such as the consumption of high fat and sugar food, lack of physical activity, eating disorders, increasing urbanization has been recorded worldwide (1). Overweight and obesity are major risk factors for non-communicable diseases, such as cardiovascular disease, diabetes, musculoskeletal disorders, cancers and periodontal disease (1, 2).

There is the study that indicates the influence of overweight, obesity and metabolic status on periodontal health (2).

It is a well-known fact that dental health depends on the individual`s diet, so people who abuse carbohydrate foods, sweets, fast food, snacks have a large number of decayed, missing and filled teeth (DMFT index), which indicates high activity of the carious process (3 - 5). The frequency of consumption of products containing sugar is directly proportional to the intensity of the carious process (6, 7).

Obesity is described as a state of chronic subclinical inflammation, which can lead to the exacerbation of chronic inflammatory diseases, including periodontitis (1, 2, 8). The severity of periodontitis was directly proportional to the degree of obesity. Under conditions of excess visceral and subcutaneous fat, adipocytes secrete into the bloodstream numerous proinflammatory adipocytokines such as TNF-α and IL-6 that stimulate the production of acute inflammatory proteins such as C-reactive protein and disrupt the body's immune response, increasing susceptibility to bacterial infection (8). Under conditions of glutamate-induced obesity, proteinase-inhibitory imbalance developed in the periodontium of rats and activation of oxidative and nitrosative stress was observed (9). It has been clinically confirmed that in patients with the 1st and 2nd degree obesity, the clinical stream of the disease is more acute than in patients with normal BMI (body mass index) (10).

However, the mechanism of periodontal pathology onset in obese individuals remains unclear and requires a detailed study to create an effective strategy for periodontal disease treatment and prevention. This treatment plan should primarily consider the aetiological component and pathogenesis of the disease.

The aim of the study was to explore the mechanism of periodontal disease development in patients with diverse body mass index and the mechanism of extra weight and obesity onset in these patients.

METHODS

The study involved 132 young Ukrainian males and females (18 to 22 years old), all students of Poltava State Medical University. Before the study, we obtained the permission from the Bioethics Commission of Poltava State Medical University (protocol № 197) and written agreement from all participants.

The inclusion criteria were: young patients of both genders with different body mass index (BMI) and a signed agreement of a study participant. The exclusion criteria for selected patients of both genders were: pregnancy, breastfeeding, drug use, alcoholism, mental illness of the patient; participation in another study at least 2 months before inclusion in the following study; active tuberculosis, viral hepatitis, the presence of non-removable orthodontic appliance in the oral cavity.

Body weight, height, waist and hip circumference, BMI were determined in all patients, which was a criterion for division into the groups. According to the BMI, four groups were created: the 1st - 33 people with normal BMI (18.5 - 24.9 kg/m^2), the 2nd - 36 people with excess body weight BMI (25 - 29.9 kg/m^2), the 3rd - 31 persons with I degree obesity and BMI (30 - 34.9 kg/m^2), the 4th - 32 persons with II degree obesity (35-39.9 kg/m^2).

Information about life, illness, and family was also collected.

Initial oral status was detected with index assessment that includes the determination of caries

intensity by DMFT (decay, missing and filled teeth) index (11), oral hygiene determination by Green-Vermillion index (OHI) (12), Papillary Marginal Attachtment Index by Parma (PMA) (13), Approximal Plaque-Index by Lange (API) (14), Complex Periodontal Index by Leus (CPI), Papilla Bleeding Index by Saxer and Muhlemann (PBI) (15) and Winkel Tongue Coating index (WTC) (16), and Schiller-Pisarev (Schiller's Iodine) test.

The periodontal chart was completed for all patients. Periodontal diagnosis was determined due to the classification of Periodontal and Peri-Implant Diseases and Conditions (November 9 - 11, 2017 Chicago) (17).

Nutritional behavior was assessed using standardized DEBQ (Dutch eating behavior questionnaire) (18) and TFEQ-R18 (three-factor eating questionnaire-R18) (19). Both questionnaires provide an opportunity to identify the external (uncontrolled or hunger force), emotional and restrictive (cognitive-restrictive) components of eating disturbance. Estimation of diet was determined using a standardized diet questionnaire, which included information about the number of main meals, intervals between meals, the variety of the diet and other information.

Origin Pro 8.5.1.315 was used for statistical processing. All results were described as average and standard errors. For data analysis, we used a one-factor analysis of variance (one-way ANOVA) for unrelated samples and the Bonferroni corrections for multiple comparisons was done. The difference between groups was considered statistically significant at $p < 0.05$. Correlation relationships were determined using Spearman's rank correlation test.

RESULTS

The average mean and standard error of BMI in the 1st group was 22.69 ± 0.29 kg/m^2, in the 2nd group – 27.84 ± 0.21 kg/m^2, in the 3rd group – 32 ± 0.28 kg/m^2, in the 4th group – 38.18 ± 0.68 kg/m^2.

The average ratio of waist and hip circumference in the patients of the 1st group was 75.67 ± 1.45 cm and 98.33 ± 1.42 cm, respectively, in the 2nd group – 83.3 ± 1.85 cm and 103 ± 2.25 cm, in the 3rd group – 91.82 ± 1.92 cm and 114.58 ± 1.3 cm, in the 4th group – 108.23 ± 2.3 cm and 121.95 ± 2.24 cm, respectively.

In the 1st group, 63.6% of patients came from big cities, there were 41.6% in the second group, 67.75% in the 3rd group and 62.5% in the 4th group. All the others originally came from the rural areas and small towns. In the third group, 76.5% of representatives were females; in other groups, the number of both genders was the same. Due to allergological anamnesis analysis, 31.81% (n = 42) out of all patients had allergy (predominantly to medicines and food). The highest prevalence of allergy was observed in the 4th group – 43.75% (n = 14). Information about hereditary anamnesis (the prevalence of some diseases in parents of the examined patients) is given in Table 1.

Table 1. *Hereditary anamnesis*

Group	1st	2nd	3rd	4th
Diseases, %				
Obesity in one parent	12.12	44.44	54.83	78.13
Obesity in both parents	3.03	16.66	29.03	37.5
Diabetes mellitus type II	9.1	8.33	12.9	15.63
Cardiovascular diseases	12.12	19.44	19.34	9.38
Allergy	12.12	5.55	0	6.25

In the 1st group 39.4% visited the dentist regularly (twice a year or more), 57.6% in the in the 2nd group, 42.42% in the 3rd group, 75% in the 4th group and other individuals visited the dentist only in the presence of acute pain.

The prevalence of caries in all examined groups was on average 97.7%, which corresponds to the results of a number of epidemiological researchers in Ukrainian population. The intensity of the carious process in the all investigated groups is given in Table 2.

The prevalence of malocclusion was 48.5% in patients in the 1st group, 44.4% in the 2nd group, 54.8% in the 3rd group and 62.5% in the 4th group.

Anomalies of soft tissues development in the oral cavity (truncated frenulum of the tongue, small vestibulum of mouth) were found in 6% of patients in the 1st group, 13.9% in the 2nd group, 12.9% in the 3rd group and 9.4 % in the 4th group.

The prevalence of oral mucosa and lip disease was 22% (n = 29) out of all examined patients. The prevalence of oral mucosa and lips diseases in the 1st group was 18.2% (n = 6), in the 2nd - 25% (n = 9), in the 3rd – 16.13% (n = 5), in the 4th – 28.1% (n = 9). Traumatic lesions were predominant in the 1st and 2nd group, however, in the 3rd and 4th group, 53% (n = 8), out of all oral mucosa lesions, were assigned to chronic recurrent aphthous stomatitis.

Table 2. *Prevalence of dental caries and DMFT index (permanent teeth) – decayed, missing and filled teeth*

Group	Decay	Missing	Filled	DMFT
1st	2.66 ± 0.37	0.1 ± 0.05	3.12 ± 0.3	5.88 ± 0.67
2nd	3.35 ± 0.4	0.24 ± 0.11	3.24 ± 0.49	6.84 ± 0.58
3rd	2.71 ± 0.59	0.53 ± 0.2	3.88 ± 0.88	7.11 ± 1.07
4th	4.25 ± 0.85	0.1 ± 0.06	1.6 ± 0.42	5.96 ± 0.84
	$p_{1-2} > 0.05$	$p_{1-2} > 0.05$	$p_{1-2} > 0.05$	$p_{1-2} > 0.05$
	$p_{1-3} > 0.05$	$p_{1-3} > 0.05$	$p_{1-3} > 0.05$	$p_{1-3} > 0.05$
	$p_{1-4} > 0.05$	$p_{1-4} > 0.05$	$p_{1-4} < 0.05$	$p_{1-4} > 0.05$
	$p_{2-3} > 0.05$	$p_{2-3} > 0.05$	$p_{2-3} > 0.05$	$p_{2-3} > 0.05$
	$p_{2-4} > 0.05$	$p_{2-4} > 0.05$	$p_{2-4} < 0.05$	$p_{2-4} > 0.05$
	$p_{3-4} > 0.05$	$p_{3-4} < 0.05$	$p_{3-4} < 0.05$	$p_{3-4} > 0.05$

Table 3. *The structure of periodontal disease*

Diagnosis	1st	2nd	3rd	4th
Intact periodontium	45.5% (n = 15)	25% (n = 9)	19.4% (n = 6)	9.4% (n = 3)
Gingivitis associated with biofilm alone	54.5% (n = 18)	75% (n = 27)	13% (n=4)	9.4% (n = 3)
Non–dental plaque-induced gingivitis	0	0	67.74% (n = 21)	81.25% (n = 26)

Table 4. *Index assessment of periodontal status*

Group	1st	2nd		3rd	4th
Index					
OHI	1.17 ± 0.07	0.95 ± 0.07		1.42 ± 0.1	1.4 ± 0.067
$p_{1-2} > 0.05$	$p_{1-3} > 0.05$	$p_{1-4} > 0.05$	$p_{2-3} < 0.05$	$p_{2-4} < 0.05$	$p_{3-4} > 0.05$
API, %	18.2 ± 3.3	9.1 ± 2.8		8.9 ± 1.9	7.1 ± 2.1
$p_{1-2} < 0.05$	$p_{1-3} < 0.05$	$p_{1-4} < 0.05$	$p_{2-3} > 0.05$	$p_{2-4} > 0.05$	$p_{3-4} > 0.05$
PMA, %	11.4 ± 1.36	10.63 ± 1.8		15.4 ± 1.17	15.64 ± 0.8
$p_{1-2} > 0.05$	$p_{1-3} < 0.05$	$p_{1-4} < 0.05$	$p_{2-3} < 0.05$	$p_{2-4} < 0.05$	$p_{3-4} > 0.05$
CPI (Leus)	1,57 ± 0.09	1.69 ± 0.1		1.85 ± 0.09	2.02 ± 0.09
p1-2 > 0.05	p1-3 < 0.05	p1-4 <0.05	p2-3 > 0.05	p2-4 < 0.05	p3-4 >0.05
PBI	2.09 ± 0.35	3.16 ± 0.37		4.26 ± 0.4	3.9 ± 0.34
$p_{1-2} < 0.05$	$p_{1-3} < 0.05$	$p_{1-4} < 0.05$	$p_{2-3} < 0.05$	$p_{2-4} < 0.05$	$p_{3-4} > 0.05$
Schiller's test	1.41 ± 0.05	1.43 ± 0.05		1.67 ± 0.05	1.71 ± 0.05
$p_{1-2} > 0.05$	$p_{1-3} < 0.05$	$p_{1-4} < 0.05$	$p_{2-3} < 0.05$	$p_{2-4} < 0.05$	$p_{3-4} > 0.05$
WTC index	1.56 ± 0,2	1.35 ± 0.17		2.09 ± 0.13	2.56 ± 0.2
$p_{1-2} > 0.05$	$p_{1-3} > 0.05$	$p_{1-4} < 0.05$	$p_{2-3} < 0.05$	$p_{2-4} < 0.05$	$p_{3-4} > 0.05$

Table 5. *Evaluation of eating behavior according to the TFEQ- R18*

TFEQ-R18 Group	Cognitive restraint	Emotional eating	Uncontrolled eating
1st	2.78 ± 0.12 33.3%	1.5 ± 0.1 12.1%	1.7 ± 0.09 6%
2nd	2.49 ± 0.09 41.66%	1.63 ± 0.1 16.7%	1.9 ± 0.08 8.3%
3rd	2.37 ± 0.08 45.2%	1.77 ± 0.1 51.6%	1.79 ± 0.07 29%
4th	2.35 ± 0.06 53%	1.83 ± 0.08 31.1%	1.88 ± 0.08 6%
	$p_{1-2} > 0.05$, $p_{1-3} < 0.05$, $p_{1-4} < 0.05$, $p_{2-3} > 0.05$, $p_{2-4} > 0.05$, $p_{3-4} > 0.05$	$p_{1-2} > 0.05$, $p_{1-3} > 0.05$, $p_{1-4} > 0.05$, $p_{2-3} > 0.05$, $p_{2-4} > 0.05$, $p_{3-4} > 0.05$	$p_{1-2} > 0.05$, $p_{1-3} < 0.05$, $p_{1-4} < 0.05$, $p_{2-3} > 0.05$, $p_{2-4} > 0.05$, $p_{3-4} > 0.05$

Table 6. *Evaluation of eating behavior according to the DEBQ*

DEBQ Group	Cognitive restraint	Emotional eating	Uncontrolled eating
1st	2.65 ±0.1 27.3%	1.4 ± 0.11 18.2%	2.33 ± 0.13 3%
2nd	3.07 ±0.14 25%	1.62 ± 0.12 33.3%	2.45 ± 0.09 8.33%
3rd	2.36 ±0.13 51.6%	1.76 ± 0.13 38.7%	2.39 ± 0.13 16.1%
4th	2.33 ±0.15 53%	1.83 ± 0.12 56.3%	2.5 ± 0.09 15.6%
	$p_{1-2} > 0.05$, $p_{1-3} < 0.05$, $p_{1-4} < 0.05$, $p_{2-3} > 0.05$, $p_{2-4} > 0.05$, $p_{3-4} > 0.05$	$p_{1-2} > 0.05$, $p_{1-3} < 0.05$, $p_{1-4} < 0.05$, $p_{2-3} > 0.05$, $p_{2-4} > 0.05$, $p_{3-4} > 0.05$	$p_{1-2} > 0.05$, $p_{1-3} < 0.05$, $p_{1-4} < 0.05$, $p_{2-3} > 0.05$, $p_{2-4} > 0.05$, $p_{3-4} > 0.05$

Table 7. *Evaluation of the diet and nutrition of surveyed patients*

Questions	Answer options	1st (n = 33)	2nd (n = 36)	3rd (n = 31)	4th (n = 32)
Number of meals	2 - 3	48.5%	91.6%	83.87%	84.4%
	4	51.5%	8.6%	16.13%	15.6%
Intervals between meals	3 - 4 hours	42.4%	33.3%	25.8%	21.9%
	4 - 6 hours	42.4%	50%	25.8%	25%
	6 hours	15.2%	16.4%	48.4%	53.1%
Do you have breakfast in the morning?	Yes	81.8%	38.9%	35.5%	28.1%
	No	9.1%	22.2%	42%	28.1
	Sometimes	9.1%	38.9%	22.5%	43.8%
Do you eat warm food?	Yes	54.5%	72.2%	62%	62.5%
	No	12.2%	-	6.5%	9.4%
	Sometimes	3%	27.8%	35.5%	28.1%
Time of the last meal (hours±min)		18.45 ± 14.5	21.10 ± 10	21.25 ± 13	21.42 ± 9
Is your diet rational?	Yes	45.5%	27.8%	38.7%	40.6%
	No	54,5%	72.2%	61.3%	59.4%
Is there a need for dietary correction?	Yes	75.75%	94.5%	71%	78.2%
	No	24.25%	5.5%	29%	21.8%
What foods are missing in your diet?	Fish	57.57%	52.8%	67.75%	68.75%
	Cereals	9.1%	13.9%	3%	9.4%
	Dairy products	57.58%	30.6%	38.7%	31.2%
	Meat	27.27%	11.11%	6.5%	22%
	Vegetables	27.27%	38.9%	25.8%	28%
	Fruits	27.27%	19.5%	29%	28%
What products do you abuse?	Fats	18.2%	22.2%	35.5%	37.5%
	Carbo-hydrates	78.8%	72.2%	67.75%	62.5%
	Sweet drinks	3%	19.5%	22.6%	37.5%

The structure of periodontal disease in the examined patients of all four groups is presented in Table 3. Oral hygienic, bleeding and periodontal index assessment is given in Table 4.

The results of TFEQ-R18 and DEBQ are presented in Table 5 and Table 6 as average and standard errors and below the percentage the number of patients with disturbance of each factor of eating behavior are presented (for cognitive restraint < 2.4, for emotional eating > 1.8, for uncontrolled eating > 2.7). The results of the assessment of diet, nutritional information are given in Table 7.

DISCUSSION

Nowadays, obesity is officially recognized as a non-infectious pandemic. According to the WHO, this disease affects about 30% of adults worldwide, and after the age of 25, 60 - 75% of the population begin to gain weight. The prevalence of periodontal diseases in patients with alimentary-constitutional obesity, were up to 100%. It is extremely important to analyze the periodontal status of young people with different BMI, especially in early stages of obesity development.

One of the WHO 2020 criteria for metabolic syndrome is a waist circumference of 102 cm and higher for men and 88 cm for women (1). In the 3rd group in 80.65% of patients waist circumference values exceeded 102 cm in men and 88 cm in women, and in the 4th group the waist circumference values of all patients were higher that the aforementioned measurements. However, in patients in the 1st and 2nd group, waist circumference values were less than 102 cm in men and less than 88 cm in women.

A criterion for abdominal obesity is a waist-hip ratio; for men it is ≥ 1,0, and ≥ 0,85 for women (1). According to the obtained results in the 3rd group, 16.2% of patients had an increased waist-hip ratio and 37.5% of patients in the 4th group had abdominal obesity.

The higher prevalence of allergies, mainly to food and drugs, was detected in 43.75% of patients in the 4th group, which may indicate greater sensitization of patients with the II degree obesity. Other scientists also indicated the association of obesity and atopic diseases, but reliable mechanism of sensitisation in obese individuals is still not clear (20).

The high prevalence of obesity in one or both patient`s parents in the 3rd and 4th group (Table 1) indicates that these families have disturbed eating behaviour. The eating behaviour of parents is an example for children to follow. Thus, unconsciously, a stereotype is formed in the children's mind that overweight and obesity are a variant of the norm (21). Moreover, despite the fact that all examined patients were medical students, they did not mention anything wrong with being obese.

Patients with the I and II degree obesity have a significantly higher number of pustular skin lesions, caused by eating disorders. Carbohydrates abuse in these groups increases the glycemic index due to the consumption of food that has a significant glycemic load. It is proved that the severity of pustular skin lesions directly depends on the number of consumed carbohydrates. Another cause of pustular rash may be a diet-induced hyperinsulinemia in response to hyperglycaemia, which leads to an imbalance of IGF-1 and androgens, increasing the severity of pustular skin lesion (22).

Seventy-five percent of patients in the 4th group visit a dentist regularly (2 or more times a year), due to complaints of bleeding gums, dental hyperaesthesia. Patients from the 1st, 2nd and 3rd group underwent regular check-ups rarely.

The prevalence of caries was 97.7% among all surveyed, which corresponds to the prevalence of caries in this age group for the Ukrainian population. We did not find a relationship between the intensity of the carious process, which is assessed by the value of the DMFT index and the value of BMI (Table 2).

However, the proportion of untreated caries D (decay) was the highest in patients of the 4th group, indicating a more active course of caries in this group; mostly, it was class II and V cavities by the Black classification. The high intensity of caries in obese individuals may indicate a constant cariogenic situation in the oral cavity, which leads to imbalance

Figure 1. *Intact periodontium, patient G. 21 years old, 1st group*

Fifure 2. *Associated with biofilm alone gingivitis, patient A. 20 years old, 2nd group*

Figure 3. *Non–dental plaque-induced gingivitis, before and after diagnostic probing, patient A., 4th group*

between the processes of re- and demineralisation, with a domination of demineralization (23, 24).

The percentage of occlusal anomalies was the highest up to 62.5% in patients of the 4th group. Traumatic lesions in the oral mucosa were predominant in the 1st and 2nd group, however, in the 3rd and 4th group, 53% (n = 8) of all oral mucosa lesions were assigned to chronic recurrent aphthous stomatitis, which can be a sigh of undiagnosed enterocolitis (10).

The highest number of patients with intact periodontium (Figure 1) was registered in the 1st and 2nd group. However, in another patients from these groups, gingivitis associated with biofilm alone was diagnosed (Figure 2) (Table. 3). In the 3rd and 4th group, non–dental plaque-induced gingivitis was a predominant disease (Figure 3), and the severity of the disease did not correspond to local status. Thus, clinical changes in periodontal tissues were caused by impaired inflammatory response of the host immunity against the pathogen - dental biofilm, as all patients of this group had 1st and 2nd degree obesity.

In all groups, the level of oral hygiene was assessed as satisfactory, and due to the values of OHI index, they were in the range (0.7 - 1.6). The API index was unsatisfactory in all groups, which indi-

cates that all patients do not pay enough attention to the hygiene of the interproximal surfaces, which leads to the development of class II and III, according to Black classification.

Higher CPI indices in the 3rd and 4th group indicate a higher intensity of gingivitis and a higher risk of periodontitis development. In contrast, the values of PBI, PMA and Schiller test were 2 times higher than in patients of the 1st group and 1.5 times higher than in patients of the 2nd group (Table 4), which indicates a higher intensity and prevalence of inflammation in obese individuals, compared with those who have normal BMI. The obtained data attest that the local status does not correspond to the clinical manifestation of gingivitis, which is caused by an impaired inflammatory reaction of the host to the pathogen. Thus, patients of the 1st, 2nd, 3rd and 4th group have approximately the same satisfactory level of oral hygiene, according to OHI, but they have different clinical manifestation of gingivitis. In patients with III and IV degree obesity, gingivitis was more severe. Excess of visceral and subcutaneous fat in obese patients modify inflammatory host response to dental biofilm due to the presence of chronic systemic inflammation. Clinically, it manifests as a non–dental plaque-induced gingivitis (19).

The WTC index was more than 1.5 times higher in obese patients compared with patients with normal BMI, which indicates the presence of chronic diseases of the gastrointestinal tract (chronic gastritis, gallbladder dyskinesia, etc.).

Disturbance of cognitive restraint, emotional eating, uncontrolled eating components of eating behaviour was predominant in patients of the 3rd and 4th group (Table 5, 6). In our opinion, eating behavior disturbance has led to the development of obesity in patients of the 3rd and 4th group. However the crucial role in the onset of obesity in patients with the I and II degree obesity is caused by disturbance of cognitive restraint and emotional eating components. Uncontrolled eating component was within normal limits in all examined patients. According to the results, we can assume that patients in the 3rd and 4th group tend to "eat" feelings of stress, anxiety, loneliness, fear and have weak willpower and lack of motivation to lose weight, therefore, they cannot control themselves in overeating.

The obtained results of the DEBQ and TFEQ-R18 food behaviour questionnaires were similar in all study parameters. That is why we can recommend the use of only one of them - TFEQ-R18 as it includes twice fewer questions than DEBQ, which saves time during completing the questionnaire.

Much more overweight and obese individuals in 2nd, 3th, 4th group have 2 - 3 meals a day, and have longer time interval between each meal (about 6 hours), compared to people with normal BMI. Eighty percent of patients in the 1st group with normal BMI eat breakfast in the morning, compared with obese and overweight patients who do not eat breakfast at all or often skip breakfast. Most overweight and obese patients postpone the last meal after 9 p.m., compared with patients with normal body weight. I and II degree obesity patients are ten times more likely to abuse sugary drinks and twice likelier to eat fat foods than those with normal BMI.

A high correlation was found in patients of the 1st group between emotional eating component DEBQ and uncontrolled eating component DEBQ (r = 0.67). There is a high correlation between OHI and CPI (r = 0.57), which indicates a direct relationship between the level of oral hygiene and the degree of clinical changes in the gingiva.

The 2nd group of patients showed a strong correlations between OHI and PMI (r = 0.62), OHI and CPI (r = 0.6), OHI and Schiller's Iodine test (r = 0.73), OHI and PBI (r = 0.56), API and CPI (r = -0.54), which indicates a direct relationship between the local status of oral hygiene and the severity of the disease, which is typical of gingivitis associated with biofilm alone.

In the 3rd group, there was a strong correlation between OHI and DMFT (r = 0.5), OHI and PBI (r = 0.51). The following index values demonstrate that patients of the 3rd group have worse oral hygiene compared with the I and II group, do not brush their teeth regularly, which leads to the formation of dental plaque and subsequent demineralization of the tooth hard tissues.

In the 4th group, strong correlations were found between CPI and hip ratio (r = 0.53), indicating a relationship between the amount of excess adipose tissue and the severity of periodontal disease. Strong correlations were found between the indicators of hygienic indices and the severity of gingivitis in the examined patients: OHI and CPI (r = 0.58), API and CPI (r = -0.66), API and PBI (r = -0.57). It can be concluded that patients in the 4th group neglect interdental hygiene while performing individual oral hygiene at home. Despite the fact that 80% of the 4th group individuals regularly (2 times a year or more) undergo professional oral hygiene

treatment, it was demonstrated that they cannot maintain oral hygiene at a proper level after receiving professional oral hygiene treatment.

CONCLUSION

More than 60% of patients with I and II degree obesity had disturbance of eating behavior. Mostly, disturbance of cognitive restraint and emotional eating components were found. The prevalence of periodontal disease among obese individuals was about 87%. In the structure of the disease, non–dental plaque-induced gingivitis dominated in obese individuals.

The index of oral hygiene in all examined patients was mostly satisfactory, but the severity of gingivitis in obese individuals did not correspond to the local status, which shows that the cause of gingivitis in obese patients is an impaired host response to the pathogen, caused by excess adipose tissue, which led to the development of chronic systemic low intensity inflammation.

In our opinion, the predominance of non–dental plaque-induced gingivitis in the structure of periodontal disease among obese individuals start in the young age of all examined patients. They have a high adaptive potential, however, without proper treatment and depletion of adaptive mechanisms, it may lead to the onset of severe course of periodontitis in these patients.

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Zavisnost dentalnog statusa mlađih osoba sa različitom težinom od navika u ishrani

Maksym Skrypnyk[1], Tatiana Petrushanko[2], Karine Neporada[3], Roman Skrypnyk[4], Vladymyr Petrushanko[2], Igor Skrypnyk[4]

[1]*Student doktorskih studija na Departmanu za terapeutsku stomatologiju, Državni medicinski univerzitet u Poltavi, Poltava, Ukrajina*
[2]*Departman za terapeutsku stomatologiju, Dražavni medicinski univerzitet u Poltavi, Poltava, Ukrajina*
[3]*Departman za biološku i bioorgansku hemiju, Dražavni medicinski univerzitet u Poltavi, Poltava, Ukrajina*
[4]*Departman za internu medicinu №1, Dražavni medicinski univerzitet u Poltavi, Poltava, Ukrajina*

SAŽETAK

Uvod. Gojaznost je globalni problem modernog društva. Prema Svetskoj zdravstvenoj organizaciji, više od 1,9 miliona odraslih ima prekomernu težinu, a 650 miliona odraslih je gojazno. Brojne studije ukazuju na ulogu prekomerne težine, gojaznosti i metaboličkog statusa na periodontalno zdravlje. Ipak, mehanizam njihovog razvoja nije do kraja razjašnjen.
Cilj. Cilj ove studije bilo je istraživanje mehanizma razvoja parodontalne bolesti kod bolesnika sa različitim indeksom telesne mase i mehanizmom pojave prekomerne kilaže i gojaznosti kod ovih bolesnika.
Metode. Studija je uključila 132 osobe muškog i ženskog pola iz Ukrajine, starosti od 18 do 22 godina. Kod svih bolesnika određen je indeks telesne mase. Prikupljeni podaci uključili su ličnu anamnezu, porodičnu anamnezu i podatke o bolesti. Procena dentalnog statusa urađena je pomoću indeksa za oralnu higijenu i higijenu jezika, kao i parodontalnih indeksa. Navike u ishrani procenjivane su pomoću Holandskog upitnika o ponašanju u ishrani (*DEBG* – eng.) i upitnika o ishrani sa tri faktora (*TFEQ R-18* – eng.). Procena ishrane urađena je standar dizovanim upitnikom o ishrani.
Rezultati. Više od 60% mlađih osoba sa prvim i drugim stepenom gojaznosti imalo je poremećaje u ishrani, od kojih su najčešći bili poremećaj kognitivnog ograničenja i emocionalne komponente ponašanja u ishrani. Prevalencija parodontalne bolesti bila je značajno viša kod gojaznih osoba, do 87% bolesnika sa prvim i drugim stepenom gojaznosti imalo je parodontalne bolesti.
Zaključak. Poremećaji ponašanja u ishrani imaju ključnu ulogu u razvoju gojaznosti kod mlađih osoba i nastanku gingivitisa. Uzrok gingivitisa koji nije izazvan pojavom plaka kod bolesnika sa prvim i drugim stepenom gojaznosti je poremećen opšti odgovor domaćina na patološke faktore usne duplje, koji je uzrokovan viškom masnog tkiva, što dovodi do razvoja hronične, sistemske, blage inflamacije. Iz tog razloga ovim bolesnicima potrebno je specifično, integrisano parodontalno lečenje.

Ključne reči: **gojaznost, periodontitis, gingivitis, ponašanje u ishrani, emocionalno prejedanje, dentalni status**