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DEPENDENCE OF THE PERIODONTAL STATE OF INDIVIDUALS WHO WERE BORN MACROSOMIC ON THEIR HEIGHT-WEIGHT INDEX AT BIRTH

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Abstract. *The problem of long-term consequences of fetal macrosomia (birth weight greater than or equal to 4 kg), among which there are dental disorders, is urgent.*

Objective. *To identify the features of the periodontal state of individuals in the City of Kharkiv and adjascent area (Ukraine) population, born with macrosomia according to their weight-height index at birth. The identification takes into account intrauterine obesity, or intrauterine well-balanced development, or pre-natally formed relative body weight insufficiency.*

A separate objective of this study is to determine qualitative and radio-morphometric indices as markers of the bone mineral density of the jaws in the individuals in the City of Kharkiv and adjascent area population, born macrosomic.

Material and methods. *During 2014–2019, two hundred and nineteen persons with different dental health conditions have been examined using clinical and radiological methods. One hundred and forty individuals between the ages of 11 and 55, who were born with macrosomia, constituted the Main Group, and seventy nine individuals of the same age, whose birth-weight parameters were normal (fetal normosomia), were assigned to the Comparison Group.*

Considering the weight-height parameters at birth, the participants included into the study were divided into subgroups. Considering the age of the participants included into the study, they were also divided into Age Periods.

To indirectly determine the optical density of bone tissue the following two X-ray morphometric indices have been used: the mental index (MI) (A. Taguchi, 1995) and the Panoramic Mandibular Index (PMI) (B. W. Benson, 1991).

In a straightforward manner, the density of the cortical and trabecular jawbone tissue was measured using an Easy Dent 3D Viewer CT scanner. The tomographic studies have been conducted with the cone-beam computer tomographs.

Results. *In macrosomic-at-birth persons with prenatal obesity, in the oral cavity in ontogeny, dystrophic-inflamatory changes arise, with prevalence of a dystrophic component, which are accompanied by destruction of periodontal tissue of different degree of severity, which is manifested by the atrophy of the alveolar processes and the recession of the gums, and which is accompanied by the appearance of wedge-shaped defects. The results of direct and indirect calculations of the optical density of the bone tissue in such persons indicate a significantly reduced density of the cortical layer of the bone tissue of the jaws, as compared to normosomic at birth persons.*

In macrosomic-at-birth persons with a well-balanced intrauterine development, as well as with a relative intrauterine insufficiency of body weight, in the later life, dystrophic-inflammatory changes arise in periodontal tissues with prevalence of an inflammatory component of different degree of severity. In such persons, a significantly reduced density of the trabecular tissue of the jaws has been revealed, as compared to the other participants in the study, in both the Main and Comparison Groups.

Conclusions. *In the course of the intrauterine period, a specific type of metabolism forms, which has a decisive influence on the formation of dental disorders in individuals born with macrosomia.*

Original research

Резюме. *Проблема віддалених наслідків макросомії плода (маса тіла при народженні більша або дорівнює 4 кг), серед яких є стоматологічні порушення, — актуальна.*

Мета роботи. *Виявлення особливостей стану тканин продонта в осіб популяції м.Харкова та прилеглих областей (Україна), народжених із макросомією, враховуючи їх індекс маси тіла при народженні, а саме: внутрішньоутробну надлишкову масу тіла або внутрішньоутробний збалансований розвиток, або внутрішньоутробну відносну недостатність маси тіла.*

Окремою задачею цього дослідження є визначення якісних та радіоморфометричних показників, як маркерів мінеральної щільності кісток щелеп, в учасників дослідження.

Матеріал і методи. *Протягом 2014–2019 років за допомогою клінічних та рентгенологічних методів обстежено 219 осіб із різним станом стоматологічного здоров'я. Сто сорок осіб віком від 11 до 55 років, які народилися з макросомією, становили основну групу, а 79 осіб того ж віку з нормосомією при народженні склали групу порівняння.*

Враховуючи масо-ростові параметри при народженні, учасники, що були включені до дослідження, розподілені на підгрупи. З огляду на вік учасників, вони також були розподілені на вікові періоди.

Для опосередкованого визначення оптичної щільності кісткової тканини використовувались два рентгенологічні морфометричні показники: ментальний індекс (MI) (A. Тагучі, 1995) та Панорамний нижньощелепний індекс (ПНЩІ) (B.W. Benson, 1991). Безпосередньо вимірювали щільність кортикальної та трабекулярної тканини щелепної кістки за допомогою КТ сканера Easy Dent 3D Viewer. Томографічні дослідження проводилися за допомогою конусно-променевих комп'ютерних томографів.

Результати. *В осіб, що народились із макросомією з з надмірною масою тіла, у порожнині рота, в онтогенезі виникають дистрофічно-запальні порушення, з превалюванням дистрофічного компонента (пародонтоз), і супроводжуються деструкцією тканин пародонта різного ступеня вираженості та атрофією альвеолярних відростків, рецесією ясен, супроводжуються появою клиноподібних дефектів. Результати прямого та непрямого обчислення оптичної щільності кісткової тканини у таких осіб порівняно з особами, які народились із нормосомією, свідчать про значно знижену щільність кортикального шару кісткової тканини щелеп. В осіб, які народились із макросомією зі збалансованим розвитком, а також осіб, народжених із відносною внутрішньоутробною недостатністю маси тіла, у подальшому житті в тканинах пародонта виникають дистрофічно-запальні порушення з превалюванням запального компонента (пародонтит). У таких осіб, порівняно з іншими учасниками дослідження, виявлено значно знижену щільність трабекулярної тканини щелеп.*

Висновки. *У ході внутрішньоутробного періоду формується специфічний тип метаболізму, що має вирішальний вплив на формування стоматологічних порушень у осіб, народжених із макросомією.*

Ключевые слова:
макросомия
плода, полость
рта, патология
тканей пародонта,
минеральная
плотность костей.

**ЗАВИСИМОСТЬ СОСТОЯНИЯ ТКАНЕЙ ПАРОДОНТА ЛИЦ,
РОДИВШИХСЯ С МАКРОСОМИЕЙ,
ОТ ИХ ИНДЕКСА МАССЫ ТЕЛА ПРИ РОЖДЕНИИ**
О.В. Гармаш

Резюме. *Проблема отдаленных последствий макросомии плода (масса тела при рождении больше или равна 4 кг), среди которых стоматологические нарушения, актуальна.*

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Цель работы. *Выявление особенностей состояния тканей продонта у лиц популяци г. Харькова и близлежащих областей (Украина), рожденных с макросомией, учитывая их индекс массы тела при рождении, а именно: внутриутробную излишнюю массу тела или внутриутробное сбалансированное развитие, или внутриутробную относительную недостаточность массы тела.*

Отдельной задачей данного исследования является определение качественных и радиоморфометрических показателей в качестве маркеров минеральной плотности костей челюстей у участников исследования.

Материал и методы. *В течение 2014–2019 годов с помощью клинических и рентгенологических методов обследовано 219 человек с различным состоянием стоматологического здоровья. Сто сорок человек в возрасте от 11 до 55 лет, которые родились с макросомией, составляли основную группу, а 79 человек того же возраста с нормосомией при рождении составили группу сравнения.*

Учитывая массо-ростовые параметры при рождении, участники, которые были включены в исследование, разделены на подгруппы, а также на возрастные периоды.

Для косвенного определения оптической плотности костной ткани использовались два рентгенологические морфометрические показателя: ментальный индекс (ИМ) (А. Тагучи, 1995) и Панорамный нижнечелюстной индекс (PMI) (B. W. Benson, 1991). Непосредственно измеряли плотность кортикальной и трабекулярной ткани челюстной кости с помощью КТ сканера Easy Dent 3D Viewer. Томографические исследования проводились с помощью конусно-лучевых компьютерных томографов.

Результаты. *У лиц, которые родились с макросомией с избыточной массой тела, в полости рта в онтогенезе возникают дистрофически-воспалительные нарушения, с превалированием дистрофического компонента (пародонтоз) и проявляются деструкцией тканей пародонта различной степени выраженности, атрофией альвеолярных отростков, рецессией десен и сопровождаются появлением клиновидных дефектов. Результаты прямого и косвенного вычисления оптической плотности костной ткани у таких лиц, по сравнению с лицами, которые родились с нормосомией, свидетельствуют о значительно пониженной плотности кортикального слоя костной ткани челюстей.*

У лиц, родившихся с макросомией со сбалансированным развитием, а также лиц, рожденных с относительной внутриутробной недостаточностью массы тела, в дальнейшей жизни в тканях пародонта возникают дистрофически-воспалительные изменения с превалированием воспалительного компонента (пародонтит). У таких лиц, по сравнению с другими участниками исследования, выявлено значительно пониженную плотность трабекулярной ткани челюстей.

Выводы. *Во внутриутробном периоде формируется специфический тип метаболизма, который оказывает решающее влияние на формирование стоматологических нарушений у лиц, родившихся с макросомией.*

Introduction. The high prevalence of periodontal diseases even in children, adolescents and young adults necessitates paying attention to the early diagnosis of dental disorders. [1–4]

The connection of obesity, accompanied by impaired microcirculatory processes and the immune response and, as a consequence, to the appearance of inflammatory-dystrophic diseases of periodontal tissues in 25–55-year-old persons, has been considered in [5–7]. The carbohydrate and lipid metabolism disorders in the case of obesity, complicated by metabolic syndrome, in 26–50-year-old persons were examined by scientists in Ukraine [8], who came to the conclusion that a decrease in the indicators of non-specific immunity and in antioxidant protection in the oral fluid in

such persons causes severe periodontitis. The pathological influence of alimentary-constitutional obesity on the clinical course of periodontal diseases and on the severity of the inflammatory process in 16–18-year-old adolescents was investigated by O. I. Lebid and K. M. Duda [9].

Metabolic osteopathies are the cause of bone disorders. It is known that intrauterine patterns and metabolic disorders, which occur intrauterinally affect all systems and organs of the newborn and are a prerequisite for the formation of many diseases and pathological conditions in ontogeny [10, 11].

The significantly higher percentage of dentofacial anomalies in individuals born with macrosomia [12] (birth weight equal to or greater than 4 kg) causes the pathological changes to be identified. Today, a number of researchers [13] have proven that macrosomic newborns have a significantly reduced bone mineral density. The researchers explain this state of affairs by the reduced motion activity of the fetus due to its too large intrauterine size and point to a certain decrease in the bone mineral density with an increase in the body weight of the newborn [14]. However, we have not found the markers indicating the bone mineral density of the jaws in adults born macrosomic in the available literature. Such information could explain a large number of malocclusions in individuals whose birth-weight parameters were higher than normal.

Therefore, if the macrosomic-at-birth person at the time of the examination is obese or underweight, usually none of the physicians is interested in the birth weight or draws parallels between the general condition at birth and the condition of the oral tissues at the time of the examination. However, the study of such relationships may shed light on some links in the pathogenesis of dental disorders. The information on the effect of intrauterine large body weight on bone density and the occurrence of periodontal diseases in later life is extremely scarce and difficult to obtain and analyze, so we consider it appropriate to investigate this problem.

The purpose of the study is to identify the features of the periodontal state of persons born with macrosomia from their height-weight index at birth. The identification takes into account intrauterine obesity, or intrauterine well-balanced development, or pre-natally formed relative body weight insufficiency.

A separate objective of this study is to determine qualitative and radio-morphometric indices as markers of the bone mineral density of the jaws in individuals of the Kharkiv population and surrounding areas, born macrosomic.

Matearial and Methods. The study has been conducted at the Kharkiv National Medical University University Dental Center during 2014–2019. Clinical and radiological methods were used to examine 219 persons with different dental health conditions. One hundred and forty individuals between the ages of 11 and 55 who were born with macrosomia constituted the Main Group, and seventy nine individuals of the corresponding age, whose birth-weight parameters were normal (fetal normosomia), were assigned to the Comparison Group. The study did not include individuals with obesity or diseases that affect the condition of tissues and organs of the oral cavity. The information on the weight-height parameters at birth of the participants in the study was obtained from the delivery records at the maternity hospitals, the inpatient medical records, the child medical history sheets, the newborn identification bracelet tags and from other medical records stored in the archives of the medical institutions or retained by the participants taking part in the study.

Based on the intrauterine harmonious coefficient, coefficient takes into account the weight-height parameters of the newborn at birth, all participants in the Main Group were divided into four subgroups.

Subgroup I includes long and well-balancely developed at the time of birth individuals. Subgroup II includes persons who, at birth, had a long body length and relatively low body weight. Subgroup III includes persons who, at birth, were of long length and great body weight. Grishchenko VI. and co-authors classified such infants as intrauterinenally accelerated infants with obesity in the background. Subgroup IV includes persons who had an average body length and distincted overweight at birth.

The WHO classification is used as a basis for dividing the study participants by age, but the age period (AP), which coincides with the period of the permanent dentition development, is divided into two additional periods to account for changes in the oral cavity that are common for children in puberty.

The first AP included 11–17-year-old children who at the time of the study had all permanent teeth, with the exception of the third molars. The second AP included 18–24-year-old participants in the study. The 25–44-year-old participants with a completely formed permanent dentition were assigned to the third AP (according to the WHO classification, this age is young). The 45–55-year-old participants were included in the fourth AP. The distribution of the number of participants by groups and subgroups and somatometric indices of participants in the study at the time of birth is shown in Table 1.

The study has been conducted in accordance with the Council of Europe Convention on the Protection of Human Rights and Human Dignity in Respect of the Advances of Biology and Medicine: Convention on Human Rights and Biomedicine (ETS No. 164) of 04.04.1997, and the Declaration of Helsinki World Medical Association (2008). To participate in the study, each participant over the age of 18 has provided informed consent. For participants under the age of 18, the informed consent has been obtained from the parents or guardians.

During the examination of periodontal tissue, the shape, color and the condition of the gum margin, have been taken into account, as well as the presence of edema, bleeding, and clinical attachment loss. The OHI-S (Green — Vermillion, 1969) has been used to determine the hygienic condition of the oral cavity. The determination of inflammation in periodontal tissues has been performed using the papillary-marginal-alveolar (PMA) index modified by Parma (1960); the determination of the gum recession

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<div align="right">Table 1</div>

Age distribution and values of mathematical expectation of weight-height parameters at birth of persons involved in the study

Group, Subgroup	Comparison	Main	Subgroup I	Subgroup II	Subgroup III	Subgroup IV
Number of Persons, Gender, Age Period I	14 (8 b., 6 g.)	26 (16 b ., 10 g.)	7 (4 b, 3 g.)	6 (3 b., 3 g.)	6 (3 b., 3 g.)	7 (6 b., 1 g.)
Age Period II	27 (16 m., 11 w.)	39 (26 m., 13 w.)	10 (8m., 2 w.)	8 (4m., 4 w.)	9 (6m., 3 w.)	12 (8 m., 4 w.)
Age Period III	26 (15 m., 11w.)	50 (30m., 20w.)	12 (8m., 4 w.)	7 (5m., 2 w.)	9 (6m., 3 w.)	22 (10 m., 12w.)
Age Period IV	12 (7 m., 5 w.)	25 (15 m., 10 w.)	4 (2 m., 2 w.)	3 (1m., 2 w.)	5 (3 m., 2 w.)	13 (9 m., 4 w.)
Body weight at birth (kg), Age Period I	3.288	4.175* (p=0.0000)	4.100* (p=0.00024)	4.153* (p=0.00051)	4.357* (p=0.00052)	4.114* (p=0.00024)
Age Period II	3.311	4.28* (p=0.0000)	4.280* (p=0.0000)	4.138* (p=0.00002)	4.478* (p=0.00001)	4.242* (p=0.00000)
Age Period III	3.356	4.292* (p=0.0000)	4.304* (p=0.0000)	4.171* (p=0.00006)	4.611* (p=0.00001)	4.193* (p=0.00000)
Age Period IV	3.413	4.276* (p=0.0000)	4.075* (p=0.00134)	4.033* (p=0.00833)	4.480* (p=0.00139)	4.315* (p=0.00002)
Body Length at Birth (cm), Age Period I	51.86	54.96* (p=0.00124)	55.14* (p=0.00531)	58.67* (p=0.00050)	54.67* (p=0.00760)	51.86
Age Period II	52.15	54.82* (p=0.00017)	55.90* (p=0.00012)	58.13* (p=0.00005)	55.00* (p=0.00042)	51.58
Age Period III	51.85	54.56* (p=0.00001)	56.17* (p=0.00000)	58.29* (p=0.00005)	55.33* (p=0.00008)	52.18
Age Period IV	52.17	53.52	54.40	57.67* (p=0.01304)	54.40	51.77
Heigh-Weight Index at Birth (kg/m³), Age Period I	23.77	25.46	24.46	20.59* (p=0.02092)	26.67* (p=0.00831)	29.58* (p=0.00034)
Age Period II	23.55	26.34* (p=0.00654)	24.50	21.09* (p=0.00951)	26.89* (p=0.00122)	30.94* (p=0.0000)
Age Period III	24.62	26.71* (p=0.00144)	24.29	21.07* (p=0.00081)	27.23* (p=0.00044)	29.61* (p=0.0000)
Age Period IV	24.31	28.23* (p=0.00857)	24.83	21.07* (p=0.04312)	27.79* (p=0.03479)	31.21* (p=0.00022)

* the difference between Main Group and Comparison is statistically significant, at the $p \leq 0.05$ level of significance.

according to Miller (1985); and bleeding according to Sulcus Bleeding Index, Mühlemann-Cowell, (1975). To prevent confusion, the degree of destruction of the tooth supporting structures has been determined not by the depth of the periodontal pocket, but by loss of connective tissue attachment in dentogingival junction with the help of the periodontal probe in accordance with the technique described in [15]. The pathological changes in periodontal tissues have been recorded using the periodontal disease classification (M. F. Danilevsky, 1994). The panoramic radiographs (PR) of the participants in the study were assessed qualitatively in accordance with the technique described in [16].

The following three X-ray morphometric indices have been used to indirectly determine the optical density of bone tissue. The mental index (MI) (A. Taguchi, 1995) or

cortical width of the mandible, which was measured on a line perpendicular to the lower part of the mandible in the middle of the mental foramen [17]; The Panoramic Mandibular Index (PMI) (B. W. Benson, 1991) was calculated as the ratio of the cortical layer of the mandible (MI) to the distance between the middle of the mental foramen and the lower margin of the mandible (L) [17]; the PMI index was chosen because it can be used to calculate the optical density of panoramic images taken with different equipment [17]. The panoramic radiographs (PR) has been obtained with the help of Soredex CRANEX D, NewTom Giano HR or Vatech co. ltd Pax-Uni 3D cone-beam computers. The length measurements have been performed with the E23D 2009 Viewer.

The optical density of the cortical bone has been measured under the mental foramen at the edge of the mandible, and the optical density of the trabecular bone tissue in the projection area of root apexes 45 and 46 with the Easy Dent 3D Viewer program. The tomographic studies have been conducted with the NewTom Giano HR and Vatech co. ltd Pax-Uni 3D cone-beam computers. The thickness of the cortical layer along the edge of the mandible (MIct) and the distance between the middle of the mental foramen and the lower margin of the mandible (Lct) have also been measured.

The mean values of the parameters under study were estimated by using MS Excel 2016 application. The small-group mean difference hypotheses were tested using the nonparametric statistics (Mann-Whitney criterion) applying Statistica 13 software. The percentage of cases in the observations of certain features in groups and subgroups with corresponding confidence intervals with a probability of error $p < 0.05$ was estimated for the binomial distribution of a random variable.

Results of the Study and Their Discussion. The state of oral hygiene (Table 2) among the groups does not differ significantly, and among the subgroups, but in Subgroups III and IV tend to the more better hygienic conditions.

In the first AP, the dental examination has revealed that 24 (92.3% CI: 80.4% — 97.6%) adolescents in the Main Group were diagnosed with periodontal diseases; gingivitis was detected in 22 (85%) adolescents, and generalized periodontitis of the initial degree was found in 2 (8%) idividuals under examination from Subgroups I and II, and the healthy periodontium was revealed in two individuals from Subgroups III and IV. In the Comparison Group, gingivitis was detected in 12 (85.7% CI: 66.1% — 95.3%) individuals.

High values of the PMA index in children with obesity, as compared to children with normal body weight, were found in the study by Kostura V. L. [18]. In our study, the children in Subgroups I and II (with well-balanced pre-natal development and relative insufficiency of body weight) were found to have the higher PMA index on average, but in the presence of pre-natal obesity, the index was at the level of that in the Comparison group.

The high values of the indices presented in Table 2 for the children in the Main Group and the Comparison

Group in this AP are associated with pubertal changes and indicate that preventive measures are needed.

In the second AP, periodontal tissue diseases were found in 37 (94.9% CI: 86.5% — 98.4%) persons (Table 2). The data on the high prevalence of periodontal diseases in this AP coincide with the data in [3, 19].

Pathological conditions of periodontal tissues include gingivitis (30% of individuals), generalized periodontitis of initial stage (35% of individuals), and gum recession with atrophy of the alveolar process (initial stage of periodontosis, according to the M. F. Danilevsky, (1994) classification) in 35% of the Main Group. The cases of periodontosis («low-inflammatory» destruction of the alveolar process) occurred only in persons who had intrauterine overweight (subgroups III and IV). Eleven of 21 individuals, the total number of individuals in the III and IV subgroups in this AP, exhibited gum recessions. In the Comparison Group, periodontal pathology was detected in 24 (85.7% CI: 71.8% — 93.9%) individuals, 50% of whom had gingivitis, and in the 50% had periodontitis of initial stage.

Among the participants of the third AP, which were assigned to the Main Group, diseases of periodontal tissues were registered in 47 (94.0% CI: 86.3% — 97.8%) individuals (Table 2). Fifty five percent of them, had a prevalence of inflammatory component: in 7 (15%) gingivitis 19 (40%) periodontitis; and 21 (45%) had a predominance of destructive component: atrophic processes, recessions accompanied by wedge-shaped defects. Only processes with prevalence of inflammatory component were recorded in subgroups I and II (Fig. 1). In Subgroups III and IV, total number of individuals 31, destructive processes with the «low-inflammatory» component was detected in 21 individuals (Fig. 2). In the Comparison Group, 25 (96.2% CI: 86.8% — 99.1%) individuals had periodontal tissue pathology, 7 (28%) gingivitis and 15 (60%) periodontitis. Three individual (12%) had the «low-inflammatory» destruction of periodontal tissues. It should be noted that two of them were born with a body weight of 3.8 kg, which today does not correspond to the fetal macrosomia, but is still a sufficiently large body weight for the newborn baby.

The persons in the Main Group in the fourth AP had periodontal tissue disease in 100% of cases (Table 2). All persons of Subgroups I and II had prevalence of inflammatory changes in the periodontium (Fig. 1), which were accompanied by hemorrhage and gum edema, and the presence of periodontal pockets. In subgroups III and IV, thirteen individuals out of 18, total number of persons of subgroups III and IV, suffered from the periodontosis («low-inflammatory destruction»), which was accompanied by atrophy of the alveolar process, gum recession, rated as grade 1 or 2 (Fig. 2). The presence of wedge-shaped defects was detected. In the Comparison Group, eleven individuals (91.7% CI: 73.5% — 97.9%) had pathological processes occurring in the periodontium: one (9%) had gingivitis, eight (73%) had 1–3 degree of generalized periodontitis, and two (18%) of the patients had periodontosis.

Anaysis of panoramic radiographs (PR). In order to confirm the above results, the PR of the participants in the

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Table 2

Index assesment of the hygienic state of the oral cavity in Main and Comparison Groups: OHI-S index (Green—Vermillion, 1969), Sulcus Bleeding Index, (Mühlemann-Cowell, 1975), Papillary-Marginal- Alveolar (PMA) index modified by Parma (1960) and the level of clinical attachment loss in persons involved in the study

Group and Subgroup	Comparison	Main	Subgroup I	Subgroup II	Subgroup III	Subgroup IV
OHI-S Green-Vermillion (score), Age Period I	1.74	1.53	1.76	1.72	1.36	1.29
Age Period II	1.63	1.39	1.72	1.60	1.26	1.08* (p=0.02959)
Age Period III	1.69	1.28* (p=0.00384)	1.79	1.71	1.15* (p=0.00526)	0.91* (p=0.00006)
Age Period IV	1.78	1.40	2.13	1.89	1.40	1.03* (p=0.00421)
Mühlemann-Cowell (score) Age Period I	0.89	1.25	1.76* (p=0.01133)	1.61	0.86	0.78
Age Period II	0.82	0.76	1.27	1.04	0.22* (p=0.012710)	0.56
Age Period III	1.00	0.76	1.47	1.52	0.26* (p=0.00644)	0.33* (p=0.00128)
Age Period IV	1.04	0.74	1.66	2.33	0.40	0.23* (p=0.02597)
PMA index (Parma), %, Age Period I	24.82	28.94	35.53	34.53	20.85	24.50
Age Period II	29.80	23.46	35.46	33.91	9.26* (p=0.00736)	17.16
Age Period III	31.55	18.02* (p=0.00362)	35.91	35.01	4.76* (p=0.00051)	8.27* (p=0.00020)
Age Period IV	31.94	20.19	42.58	40.07	20.46	8.61* (p=0.01192)
attachment loss (mm), Age Period I	-	0.23	0.43	0.50	-	-
Age Period II	1.32	2.26* (p=0.01462)	2.20	1.38	2.44	2.75* (p=0.00818)
Age Period III	2.77	3.00	2.75	2.86	3.00	3.18
Age Period IV	3.90	4.92	5.00	5.00	5.20	4.77

* the difference between Main Group and Comparison is statistically significant, at the $p \leq 0.05$ level of significance.

study were selectively evaluated qualitatively and quantitatively. The number of evaluated panoramic radiographs and the averaged index values is shown in Table 3. The PR with defects was not evaluated, namely, the PR where the mental foramen was not visible, the PR of persons undergoing orthodontic treatment, or those with a history of trauma, or other diseases.

The group of specialists in the Department of Therapeutic Dentistry has analised the PR trabecular pattern. They divided all PR under investigation into 3 parts, the first part includes images with sparse trabecular patterns and uneven (vertical) bone resorption, the second part includes images with lighter tone, with dense trabecular patterns and even (horizontal) bone resorption, and the third part includes images with alternating dense and sparse trabeculation. It is known that the dense image of the trabecular bone with small intertrabecular spaces corresponds to the high bone mineral density, while the sparse pattern indicates a low mineral density [20]. It is also known that in presence of thin fenotype of gingiva horizontal resorption and gingival ressetion will occur [21]. And in case of thick gingival fenotype a vertical bony defect with periodontal pocket formation will take place.

The results of the image visual sorting completely confirmed the data obtained in the clinical study and revealed that the persons in Subgroups I and II had the radiological signs of mostly inflammatory destruction (periodontitis), and the persons in Subgroups III and IV had prevailing

Table 3

The number of panoramic radiographs, mathematical expectation X-ray morphometrical indecies, and the number of individuals under study

Group , Subgroup	Comparison	Main	Subgroup I	Subgroup II	Subgroup III	Subgroup IV
Ortopantogram number, Age Period I	7 (4 b., 3 g.)	17 (10 b., 7 g.)	4 (2 b., 2 g.)	3 (1 b., 2 g.)	5 (3 b., 2 g.)	5 (4 b., 1 g.)
Age Period II	16 (10 m., 6w.)	31 (20 m., 11 w.)	6 (4m., 2 w.)	6 (3m., 3 w.)	8 (6 m., 2 w.)	11 (7 m., 4w.)
Age Period III	16 (8 m., 8w.)	32 (20m., 12w.)	9 (6m., 3 w.)	5 (4m., 1 w.)	6 (4m., 2 w.)	12 (6 m., 6w.)
Age Period IV	9 (4 m., 5 w)	17 (9 m., 8 w.)	4 (2 m., 2 w.)	3 (1m., 2 w.)	4 (3m., 1 w.)	6 (3m., 3 ж.)
PMI Index, Age Period I	0.249	0.254	0.224	0.193	0.266	0.301* (p=0.04236)
PMI. Age Period II	0.221	0.254	0.205	0.225	0.278* (p=0.03416)	0.280* (p=0.04526)
L. Age Period II	20.1875	19.59677	20.48333	20.66667	19.575	18.54545
MI. Age Period II	4.425	4.909677	4.166667	4.616667	5.425* (p=0.00586)	5.1* (p=0.03822)
PMI, Age Period III	0.222	0.244* (p=0.00566)	0.243	0.237	0.275* (p=0.02699)	0.296* (p=0.00125)
PMI, Age Period IV	0.245	0.322* (p=0.00321)	0.278	0.271	0.320* (p=0.03075)	0.377* (p=0.00146)
Number of Persons with third molars, Age Period II	15	29	6	5	7	11
Number and Percentage of Persons with RTMs, Age Period II	8 (53.3%)	24 (82.8%)	5(83.3%)	3(60.0%)	7 (100.0%)	9 (81.8%)
Number of Persons, Age Period II	14	26	7	3	4	12
Number and Percentage of Persons with RTMs, Age Period III	2 (14.3%)	12 (46.2%)	3 (42.9%)	1 (33.3%)	2 (50.0%)	6 (50.0%)
Number and Percentage of Persons with RTMs, Age Period II+ Age Period III	10 (34,5%)	36 (65,5%)	8 (61,5%)	4 (50,0%)	9 (81,8%)	15 (68,2%)

* the difference between Main Group and Comparison is statistically significant, at the $p \leq 0.05$ level of significance.

signs indicating «low-inflammatory» destructive processes (periodontosis according to the periodontal disease classification (M. F. Danilevsky, 1994)) in the bone.

The primary adentia in at least one of the third molars on the upper or lower jaw was observed in persons of AP I–III, namely, in twelve (15.0% CI: 8.9% — 23.3%) persons in the Main Group and in nine (23.1% CI: 13.0% — 36.5%) persons in the Comparison Group.

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Fig. 1. The image of the frontal area of the oral cavity of 36-year-old man T., born with macrosomia (Subgroup I). Thick gingival phenotype, prevalence of inflammatory changes in periodontal tissue; Angle Class II malocclusion with deep bite

Fig. 2. The image of the frontal area of the oral cavity of 44-year-old man St., born with macrosomia (Subgroup IV). Thin gingival phenotype, generalized dystrophic changes and gum recession; calculus deposits on the labial surface of the 31 and 41 teeth; V-shaped defects of 13, 23, 24, 25, 34, 35, 36, 44, and 45 teeth; a deviated dental midline; tremas; secondary partial adentia of 43 tooth

Fig. 3. The panoramic radiographic view of the female patient L., at age 40 born with macrosomia (Subgroup IV). Panoramic radiograph shows multiple tooth lesions, radiolucent lesions are observed at #36, 46 root areas. Mandibular front teeth crowding; partial primary adentia 12, 13 teeth, semi-retention of tooth 48 (vertical position); retention and dystopia of tooth 23

The investigation of the panoramic radiographs for AP I persons drew attention to the anomalous arrangement of the dermis of the third molars. We have detected the retained third molars (RTMs) in the Main Group even in AP 4. But since for all 44–55 year-old persons, the past histories are difficult to collect (in relation to third molars), and during the AP I the formation of these teeth is not yet completed [22], the number of persons with RTMs in the lower and upper jaws is calculated only for AP III. It is known that the formation of jaw tissues is completed by 25-year age, but given the information, obtained by other scientists, that 80% of people have third molar roots formed [22] at the age of 20–21, and the fact that the mean age of individuals examined in AP II was 22 years, we have decided to examine this age.

Table 3 summarizes the number and percentage of persons with RTMs in the mandible (taking into account only those cases where third molars were formed). In Comparison Group 10 out of 29 (34.5% CI: 20.7% — 50.8%) and Main Group 36 of 55 (65.5% CI: 53.3% — 76.2%), namely in Subgroup I, eight persons out of 13 (61.5% CI: 38.6% — 80.8%), in subgroup II, four persons out of 8 (50.0% CI: 24.5% — 75.5%), in subgroup III, nine perons out of 11 (81.8% CI: 58.7% — 94.0%), in the subgroup IV, feefteen persons of 22 (68.2% CI: 49.8% — 82.8%).

A significantly higher percentage of persons in the Main Group who had RTMs (Fig. 3–5) with impaired eruption axis is both a sign of lack of space in the dentition [23] and confirmation of our earlier assumption [12] that the mandible was underdeveloped in persons whose birth parameters were higher the norm. From the bibliography, the percentage of retention of third molars is very different. The Russian scientists have found RTMs in 25% of the individuals examined, while the European scientists indicate that RTMs have up to 75% of individuals [22, 24].

The percentage of persons with RTMs in the upper jaws was also calculated using the number of persons who had third molars formed. It was not significantly different among the groups and subgroups, accounting for 29.3% in the Main Group (CI: 19.5% –40.9%) and 27.6% in the Comparison Group (CI: 15.3% — 43.5%). However, in some participants from AP II and AP III in the Main Group, retentions with unusual deviations of the axis of eruption of the teeth (Fig. 1) were found, which may also indicate insufficient space in the dentition.

Due to the fact that the PR visual examination has drawn attention to the disproportionately great thickness of the mandible cortical layer in the many participants in the Main Group (Fig. 4), the cortical layer was measured on PR. In AP II (18–24 year-old persons) all PR were performed on the same tomograph and by the same X-ray laboratory assistant, so it is possible to compare not only bone mineral density on relative scale, which is the PMI index, but also the absolute values of the geometric parameters (L and MI) for this age period (Table 3). From the results in

Fig. 4. The panoramic radiographic view of the male patient P., at age 20, born with macrosomia (Subgroup IV). Retention of tooth 38 (vertical position), retintion of tooth 48 (horizontal position). A thick cortex is seen on panoramic radiograph

Fig. 5. The panoramic radiographic view of the male patient M., at age 30, born with macrosomia (Subgroup II). Panoramic radiograph shows multiple tooth lesions, semi-retention of tooth 38 (mesioangular position). A thin cortex is seen on panoramic radiograph

bone density with the densitometry, namely, seven persons (Subgroup I + Subgroup II, average age of 36.1); from participants of the total Subgroup III + IV were involved eight persons (average age of 36.0); and eight persons (average age of 36.63) from the Comparison Group.

As the Table 4 shows, the macrosomic-at-birth individuals, whose pre-natal period passed on the background of medium or relatively low height-weight index (combined group I + II), had a significantly reduced trabecular bone tissue optical density (ODT). That is, in combination with the results of the clinical examination described above, the reduction in optical density of trabecular bone tissue is the explanation of mainly inflammatory processes in the periodontium.

As can be seen from Table 4, the optical density of the cortical layer (ODC) is significantly smaller in individuals in the Combined Group III + IV, who have a larger thickness of the cortical layer. That is, in individuals with pre-natal overweight (obesity) in the past history, a compensatory thickening of a spongy cortical layer occur, along with an unreliable decrease in the density of the trabecular component of the jaw bone as compared to Control Group.

Table 3, it follows that the averaged values of the thickness of the mandible cortical layer are greater than in the Subgroups I and II individuals (Fig. 5), and significantly greater than in the Comparison Group in individuals, Subgroups III and IV, that is, the cortical jawbone is thicker in persons born with intrauterine overweight.

Also, for all PR, we calculated PMI, as is shown in Table 3, which shows that this index is higher for Subgroups III and IV even in the AP I. Therefore, this index could not indicate the prevalence of resorption processes upon the bone remodeling processes. And given the data obtained in the clinical study and the results of MI calculations, the index indicates a compensatory thickening, more pronounced in persons of Subgroups III and IV, of the mandible cortical layer.

An age-related aspect is also interesting, an increase in the value of PMI in Subgroups I, II and the Comparison Group due to the reduction of the distance between the margin of the mandible and the mental foramen, and in individuals in Subgroups III and IV, due to the thickening of the cortical layer.

Therefore, the results of our study indicate that the PMI index is informative, but its application requires additional conditions (e. g., an accurate definition of the MI index).

Densitometry. Because the densitometry is a more complicated procedure than the obtaining of the PR, this method has only been used in the studies that have been done on medical grounds to determine the bone density. From the study participants in the Main Group aged 25–55, fifteen persons were involved in determining the

It is known that the optical density of the mandible compact layer in inflammatory diseases of the mandible is virtually unchangable quantity. Our study has shown that in non-inflammatory destructive processes in periodontal tissues occurring in ontogeny in macrosomic-at-birth individuals, who were born with signs of intrauterine obesity, a decrease in the density and thickening of the cortical layer of bone tissue occur. These phenomena are observed even in young people. The information istablished can explain the tendency for «low-inflammatory» destruction of jaw bone in such individuals. Also, given that the cortical component in the mandible occupy more than 50% of its volume, a significantly altered density of the mandible is definitely associated with a large percentage of malocclusions in such individuals [9].

The data in Table 4 shows a factor by which the cortical part of the mandible is denser than the trabecular, therefore, despite the reduced density of the cortical part of the jaw, the density of its trabecular part in persons of Subgroup III + IV is not significantly different from the Comparison Group. The ratio of Optical density of the lower jaw cortical bone/Optical density of the lower jaw trabecular bone ratio

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<div align="right">Table 4</div>

**Mathematical expection of the optical density of lower jaw bone tissue in
persons involved in the study**

Group , Subgroup	Comparison (n-8 (5 m., 3w.))	Main (n-15 (9 m., 6 w.))	Subgroup I+II (n-7 (4 m., 3 w.))	Subgroup III+ IV (n-8 (5w., 3 w.))
ODC of the lower jaw (rel. units)	2196.625	1734.867 *(p=0.02014)	1885.714	1602.875 * (p=0.02086)
ODT of the lower jaw (rel. units)	843.625	546.000 *(p=0.00262)	391.857 * (p=0.00548)	680.857 † (p=0.02789)
ODC of the lower jaw / ODT of the lower jaw Ratio	2.74	4.35	6.61 * (p=0.02086)	2.37 † (p=0.00119)
MIct (mm)	3.3	3.76	3.23	4.23 * (p=0.00076) † (p=0.00118)
Lct (mm)	13.963	14.333	14.429	14.250
MIct / L ct ratio	0.24	0.26	0.23	0.30 *(p=0.00865) † (p=0.00381)

* the difference between Main Group and Comparison is statistically significant, at the $p \leq 0.05$ level of significance.
† the difference between Subgroup I+II and Subgroup III+ IV is statistically significant, at the $p \leq 0.05$ level of significance.

given in Table 4 provides us with another confirmation that the processes of jaw bone remodeling go mainly through osteosclerotic changes in such individuals.

The data on the thickness of the cotrical layer of the lower jaw (MIct) and the distance between the middle of the mental foramen and the lower margin of the mandible (Lct) obtained from the tomographic images and ratio, are shown in the last three raws in Table 4, confirm the similar data we have obtained by measuring PR. These mesurements also confirm that in persons born with macrosomia with intrauterine obesity (Subgroup III + IV) the mandibular cortical layer is significantly thicker as compared to Subgroup I + II and in Main Group persons. It should be noted that the computer tomography and X-ray method are independent.

Conclusions

1. Along with the known exogenous and endogenous factors that cause periodontal tissue diseases, the course of the intrauterine period forms a specific type of metabolism and has a decisive influence on the formation of dental disorders in individuals born with macrosomia.

2. According to the results of clinical dental examination obtained in our study, it follows that metabolic disorders in the pre-natal period, namely, pre-natal overweight in persons born with macrosomia, cause dystrophic-inflammatory changes in the oral cavity in ontogeny, with prevalence of an dystrophic component, which are accompanied by destruction of periodontal tissue of a different degree of severity and are manifested by atrophy of the alveolar processes, recession of the gums, and accompanied by the appearance of wedge-shaped defects.

3. The results of direct and indirect calculations of the optical density of the bone tissue indicate a significantly reduced density of the cortical layer of the bone tissue of the jaws and confirm the clinical data on the prevalence of «low-inflammatory» destructive processes in the overwhelming number of macrosomic-at-birt individuals with intrauterine overweight.

4. The intrauterine well-balanced development, as well as a relative intrauterine insufficiency of body weight in macrosomic-at-birth individuals in the later life is mainly result in dystrophic-inflammatory changes of periodontal tissues with prevalence of an inflammatory component of different degree of severity and in a significantly reduced optical density of the trabecular tissue.

5. A significantly higher percentage of individuals in the Main Group, as compared to the Comparison Group, who had retained third molars with a deviated axis of eruption serves to confirm the underdevelopment of the mandible in persons whose birth parameters were higher than normal.

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Список літератури

1. Al-Ghutaime H, Riba H, Al-Kahtani S, Al-Duhaimi S. Common Periodontal Diseases of Children and Adolescents. Int J Dent. 2014; 850674. Doi: 10.1155/2014/850674.

2. Хоменко ЛО, Остапко ОІ, Біденко НВ. Сучасний погляд на класифікацію захворювань пародонта у дітей. Профілактична та дитяча стоматологія. 2009; (1): 6–11. Режим доступу: http://nbuv.gov.ua/UJRN/ptdc_2009_1_5.

3. Петрушанко ТА, Череда ВВ, Лобань ГА. Динамика бакте-

риальной обсемененности десневой борозды при лечении катарального гингивита у лиц молодого возраста. Young Scientist. 2014;1(4):169–71. Режим доступу: http://molodyvcheny.in.ua/files/journal/2014/1-1/37.pdf.

4. Siddharth M, Singla A, Kaur S. Periodontal Diseases In Children And Adolescents -A Review. Journal of Oral Health & Research. 2013; 4(1): 18–23. Available from: https://www.researchgate.net/publication/296700194.

5. Хабибова НН, Вахидова МА, Жабборова ФУ. Эффективность комплексной терапии генерализованного пародонтита у больных с ожирением. Наука молодых (Eruditio Juvenium). 2016;(2):114–23. Режим доступу: https://cyberleninka.ru/article/n/effektivnost-kompleksnoy-terapii-generalizovannogo-parodontita-u-bolnyh-s-ozhireniem.

6. Martinez-Herrera M, Silvestre-Rangil J, Silvestre FJ. Association between obesity and periodontal disease. A systematic review of epidemiological studies and controlled clinical trials. Med Oral Patol Oral Cir Bucal. 2017; 22(6): e708–15. Doi: 10.4317/medoral.21786.

7. Suvan JE, Finer N, D'Aiuto F. Periodontal complications with obesity. Periodontol 2000. 2018;78(1):98–128. Doi: 10.1111/prd.12239.

8. Глазунов ОА, Меладзе ІН, Глазунова СО. Особливості перебігу генералізованого пародонтиту у осіб з ожирінням, ускладненим метаболічним синдромом. Інновації в стоматології. 2016; (4): 40–4. Режим доступу: https://cyberleninka.ru/article/n/osoblivosti-perebigu-generalizovanogo-parodontitu-u-osib-z-ozhirinnyam-uskladnenim-metabolichnim-sindromom/viewer.

9. Лебідь ОІ, Дуда КМ. Особливості клінічних проявів ураження тканин пародонта у підлітків на тлі аліментарно-конституціонального ожиріння. Клінічна стоматологія. 2017; (3): 57–62. Doi: 10.11603/2311-9624.2017.3.8026.

10. Gu S, X An, Fang L, Zhang X, Zhang C, Wang J, et al. Risk factors and long-term health consequences of macrosomia: a prospective study in Jiangsu Province, China. J Biomed Res, 2012 26(4): 235–40. Doi: 10.7555/JBR.26.20120037.

11. Rinaudo P, Wang E. Fetal Programming and Metabolic Syndrome. Annu Rev Physiol. 2012; 74: 107–30. Doi: 10.1146/annurev-physiol-020911-153245.

12. Garmash OV. Oral health abnormalities in children born with macrosomia established during mixed dentition period. Wiad Lek. 2019;72(5 cz 1): 823–31. https://www.ncbi.nlm.nih.gov/pubmed/31175780.

13. Littner Y, Mandel D, Mimouni FB, et al. Decreased bone ultrasound velocity in large-for-gestational-age infants. J Perinatol. 2004;24(1): 21–3. Doi: 10.1038/sj.jp.7211013.

14. Schushan-Eisen I, Cohen M, Leibovitch L, et al. Bone Density Among Infants of Gestational Diabetic Mothers and Macrosomic Neonates Maternal and Child Health Journal. 2015; 19 (3): 578–82. Doi: 10.1007/s10995-014-1541-9.

15. Крайнов СВ, Михальченко ВФ, Яковлев АТ, Попова АН, Алеханова ИФ. «Глубина пародонтального кармана» или «величина потери прикрепления», какой параметр выбрать в геронтостоматологии? Проблемы стоматологии. 2017; 13(4), 9–14. Doi: 10.18481/2077-7566-2017-13-4-9-14.

16. Lindh C, Horner K, Jonasson G, Olsson P, Rohlin M, Jacobs R, et al. The use of visual assessment of dental radiographs for identifying women at risk of having osteoporosis: the OSTEODENT project. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2008; 106(2): 285–93. Doi: 10.1016/j.tripleo.2007.09.008.

17. Bajoria AA, Ml A, Kamath G, Babshet M, Patil P, Sukhija P. Evaluation of Radiomorphometric Indices in Panoramic Radiograph – A Screening Tool. Open Dent J. 2015; (9):303–10. Doi: 10.2174/1874210601509010303.

18. Костура ВЛ. Індексна оцінка стану тканин пародонта у дітей з надмірною масою тіла. Вісник проблем біології і

медицини. 2018; 142(1), 360–3. Doi: 10.29254/2077-4214-2018-1-1-142-360-363.

19. Шварцнау ЕГ, Ковач ИВ. Состояние твердых тканей зубов и пародонта у студентов медицинских учебных заведений. Современная стоматология. 2015; (3): 9–12. Режим доступу: http://nbuv.gov.ua/UJRN/ss_2015_3_4.

20. Geraets W, Jonasson G, Hakeberg M. Predicting fractures using trabecular patterns on panoramic radiographs. Clin Oral Investig. 2018; 22(1):377–84. Doi: 10.1007/s00784-017-2122-2.

21. Olsson M, Lindhe J. Periodontal characteristics in individuals with varying form of the upper central incisors. J Clin Periodontol. 1991; 18(1): 78–82. Doi: 10.1111/j.1600-051x.1991.tb01124.x.

22. Стадницкая НП, Рогинский ВВ, Стебелькова МА. Особенности формирования и развития зачатков третьих моляров. Стоматология детского возраста и профилактика. 2003; (3-4): 83–6.

23. Бондаренко НН, Балахонцева ЕВ. Измерение оптической плотности костной ткани альвеолярного отростка челюстей при заболеваниях пародонта с помощью трёхмерной компьютерной томографии. Казанский медицинский журнал. 2012; 93(4): 660–2. Doi: 10.17816/KMJ1566.

24. Santosh P. Impacted Mandibular Third Molars: Review of Literature and a Proposal of a Combined Clinical and Radiological Classification. Ann Med Health Sci Res. 2015 Jul-Aug; 5(4): 229–34. Doi: 10.4103/2141-9248.160177.

References

1. Al-Ghutaime H, Riba H, Al-Kahtani S, Al-Duhaimi S. Common Periodontal Diseases of Children and Adolescents. Int J Dent. 2014; 850674. Doi: 10.1155/2014/850674.

2. Khomenko LO, Ostapko OI, Bidenko NV. Suchasnyi pohliad na klasyfikatsiiu zakhvoriuvan parodontu u ditei. [A Modern Estimation of Classifications of Periodontal Diseases in Children]. Profilaktychna ta dytiacha stomatolohiia. 2009; (1): 6–11. Ukrainian. Available from: http://nbuv.gov.ua/UJRN/ptdc_2009_1_5.

3. Petrushanko TA, Chereda VV, Loban GA. Dinamika bakterial'noj obsemennosti desnevoj borozdy pri lechenii kataral'nogo gingivita u lic molodogo vozrasta. [Bacterial colonization's dynamics of the gingival sulcus at catarrhal gingivit's treatment at persons of young age]. Young Scientist. 2014; 1(4): 169–71. Ukrainian. Available from: http://molodyvcheny.in.ua/files/journal/2014/1-1/37.pdf.

4. Siddharth M, Singla A, Kaur S. Periodontal Diseases In Children And Adolescents -A Review. Journal of Oral Health & Research. 2013; 4(1): 18–23. Available from: https://www.researchgate.net/publication/296700194.

5. Habibiova NN, Vakhidova MA, Zhabborova FU. Jeffektivnost' kompleksnoj terapii generalizovannogo parodontita u bol'nyh s ozhireniem. [Efficiency of complex therapy of the generalized periodontal disease in patients with obesity]. Nauka molodykh (Eruditio Juvenium). 2016; (2): 114–23. Russian. Available from: https://cyberleninka.ru/article/n/effektivnost-kompleksnoy-terapii-generalizovannogo-parodontita-u-bolnyh-s-ozhireniem.

6. Martinez-Herrera M, Silvestre-Rangil J, Silvestre FJ. Association between obesity and periodontal disease. A systematic review of epidemiological studies and controlled clinical trials. Med Oral Patol Oral Cir Bucal. 2017; 22(6): e708–15. Doi: 10.4317/medoral.21786.

7. Suvan JE, Finer N, D'Aiuto F. Periodontal complications with obesity. Periodontol 2000. 2018;78(1):98–128. Doi: 10.1111/prd.12239.

8. Glazunov OA, Meladze IN, Glazunova SA. Osoblyvosti perebihu heneralizovanoho parodontytu u osib z ozhyrinniam, uskladnenym metabolichnym syndromom. [Peculiarities of clinic of generalized periodontitis in patients with obesity complicated metabolic syndrome]. Innovatsii v stomatolohii. 2016; (4): 40–4.

Оригінальні дослідження

Ukrainian. Available from: https://cyberleninka.ru/article/n/os-oblivosti-perebigu-generalizovanogo-parodontitu-u-osib-z-ozhir-innyam-uskladnenim-metabolichnim-sindromom/viewer.

9. Lebid OI, Duda KM. Osoblyvosti klinichnykh proiaviv urazhennia tkanyn parodonta u pidlitkiv na tli alimentarno-konstytut-sionalnoho ozhyrinnia. [Features of clinical manifestations of perodontal tissue damage in adolescents on the area of alimentary-constitutional obesity]. Klinichna stomatolohiia. 2017; (3): 57–62. Ukrainian. Doi: 10.11603/2311-9624.2017.3.8026.

10. Gu S, X An, Fang L, Zhang X, Zhang C, Wang J, et al. Risk factors and long-term health consequences of macrosomia: a prospective study in Jiangsu Province, China. J Biomed Res, 2012 26(4): 235–40. Doi: 10.7555/JBR.26.20120037.

11. Rinaudo P, Wang E. Fetal Programming and Metabolic Syndrome. Annu Rev Physiol. 2012; 74: 107–30. Doi: 10.1146/annurev-physiol-020911-153245.

12. Garmash OV. Oral health abnormalities in children born with macrosomia established during mixed dentition period. Wiad Lek. 2019;72(5 cz 1): 823–31. https://www.ncbi.nlm.nih.gov/pubmed/31175780.

13. Littner Y, Mandel D, Mimouni FB et al. Decreased bone ultrasound velocity in large-for-gestational-age infants. J Perinatol. 2004;24(1): 21–3. Doi: 10.1038/sj.jp.7211013.

14. Schushan-Eisen I, Cohen M, Leibovitch L, et al. Bone Density Among Infants of Gestational Diabetic Mothers and Macrosomic Neonates Maternal and Child Health Journal. 2015; 19(3): 578–82. Doi: 10.1007/s10995-014-1541-9.

15. Krajnov SV, Mihalchenko VF, Yakovlev AT, Popova AN, Alehanova IF. «Glubina parodontal'nogo karmana» ili «velichina poteri prikreplenija», kakoj parametr vybrat' v gerontostomatologii? [Depth of the periodontal pockets» or «attachment loss», which parameter to select in gerontostomatology?] Problemy stomatologii. 2017; 13(4), 9–14. Russian. Doi: 10.18481/2077-7566-2017-13-4-9-14.

16. Lindh C, Horner K, Jonasson G, Olsson P, Rohlin M, Jacobs R, et al. The use of visual assessment of dental radiographs for identifying women at risk of having osteoporosis: the OSTEODENT project. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2008; 106(2): 285–93. Doi: 10.1016/j.tripleo.2007.09.008.

17. Bajoria AA, Ml A, Kamath G, Babshet M, Patil P, Sukhija P. Evaluation of Radiomorphometric Indices in Panoramic Radiograph – A Screening Tool. Open Dent J. 2015; (9):303–10. Doi: 10.2174/1874210601509010303.

18. Kostura VL. Indeksna ocinka stanu tkanin parodonta u ditej z nadmirnoju masoju tila. [Index assessment of the state of periodontal tissues in overweight children]. Visnyk problem biolohii i medytsyny. 2018; 142(1), 360–3. Ukrainian. Doi 10.29254/2077-4214-2018-1-1-142-360-363.

19. Shvartsnau E, Kovach I. Sostojanie tverdyh tkanej zubov i parodonta u studentov medicinskih uchebnyh zavedenij. [Condition of hard tissue of teeth and periodontal tissue in medical students]. Sovremennaya stomatologiya 2015; (3): 9–12. Russian. Available from: http://nbuv.gov.ua/UJRN/ss_2015_3_4.

20. Geraets W, Jonasson G, Hakeberg M. Predicting fractures using trabecular patterns on panoramic radiographs. Clin Oral Investig. 2018; 22(1):377–84. Doi: 10.1007/s00784-017-2122-2.

21. Olsson M, Lindhe J. Periodontal characteristics in individuals with varying form of the upper central incisors. J Clin Periodontol. 1991; 18(1): 78–82. Doi: 10.1111/j.1600-051x.1991.tb01124.x.

22. Stadnickaja NP. Roginskij VV, Stebel'kova MA. Osobennosti formirovanija i razvitija zachatkov tret'ih moljarov. [Features of formation and development of germs of third molars]. Stomatologija detskogo vozrasta i profilaktika. 2003; 3(4): 83–6. Russian.

23. Bondarenko NN, Balakhontseva EV. Izmerenie opticheskoj plotnosti kostnoj tkani al'veoljarnogo otrostka cheljustej pri zabolevanijah parodonta s pomoshh'ju trjohmernoj komp'juternoj tomografii. [Measurements of the optical density of the alveolar prosses bone tissue of the jaws during periodontal diseases with the use of three-dimentional computer tomography]. Kazanskiy meditsinskiy zhurnal. 2012; 93(4): 660–2. Russian. Doi: 10.17816/KMJ1566.

24. Santosh P. Impacted Mandibular Third Molars: Review of Literature and a Proposal of a Combined Clinical and Radiological Classification Ann Med Health Sci Res. 2015 Jul-Aug; 5(4): 229–34. Doi: 10.4103/2141-9248.160177.

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