

Prevalence of malocclusions in children with infectious mononucleosis

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SUMMARY

Background. According to statistics 85% of children are carriers of Epstein-Barr virus, which is the cause of infectious mononucleosis. Many children with infectious mononucleosis have acute respiratory disease or sore throat flow due to weakened of the immune system. Children with infectious mononucleosis have manifestations of tonsillopharyngitis, adenoiditis. The long course of this pathology contributes to the development of dental caries, diseases of periodontal tissues, mucosa lesions of the oral cavity and malocclusions. The aim of the research was to study the prevalence and features of malocclusions in children with infectious mononucleosis.

Materials and methods. There were examined 226 children aged 6, 9 and 12 years. The main group included 104 children with diagnose of infectious mononucleosis. The control group included 122 children, who were healthy, without any somatic pathology. Malocclusions were determined according to the classifications of Engle E. and Kalvelis D.A.

Results. The results of the study showed that among children of the main group malocclusion were found in $83.85 \pm 2.34\%$ persons, while among healthy children the prevalence of malocclusion was $58.18 \pm 2.48\%$ ($p < 0.05$). It was revealed that with the age the prevalence of malocclusions increases in both study groups, but among children of the main group this dynamic is more pronounced. So, among children with infectious mononucleosis the prevalence of malocclusion increases from 6 to 12-year-old children from $78.94 \pm 2.13\%$ to $88.23 \pm 2.24\%$, i.e. 1.12 times ($p < 0.05$). In children of the control group the prevalence of malocclusions in 6-years-old children was $56.41 \pm 1.98\%$, which is 1.4 times less than in children of the main group ($p < 0.05$), and up to 12 years old it was increased by 1.08 times ($60.97 \pm 2.15\%$, $p > 0.05$), but was lower than in children of the main group, by 44.71% ($p < 0.05$).

Conclusion. Thus, high prevalence of malocclusions is determined in children with mononucleosis, which is increased with the age. The obtained results indicate on need for orthodontic treatment of children with infectious mononucleosis, constant monitoring of the patient by the dentist.

Keywords: infectious mononucleosis, children, malocclusion.

INTRODUCTION

It is known that viruses are the cause of the most acute infectious diseases, which together take more than 4 million lives a year (13). In particular, today there is a tendency of increasing the prevalence of diseases caused by herpesviruses (3). At the same time, according to the data of literature is an increase of the incidence of infectious mononucleosis, one of the causative agents of which is Epstein-Barr virus (EBV virus) of herpesviruses (18). Contamination with EBV

virus is quite high. According to sero-epidemiological studies, almost 95% of the population over the age of 40 have specific antibodies, almost 50% of the population transfer infectious mononucleosis in childhood or adolescence in symptomatic form, the rest of the population in atypical, obliterated or latent forms (4). In different regions of the world, between 16 and 800 people per 100,000 persons get sick each year, and more than 50% of children during the first 10 years of life and 80-90% of adults have virus-specific antibodies as a marker of pre-infection. The contamination level of the adult population of Ukraine makes almost 100%, and of the children it is more than 50% (5).

According to statistics, 85% of children are carriers of Epstein-Barr virus, but it manifests

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itself only when the immune system is weakened. Many children with infectious mononucleosis have acute respiratory disease or sore throat flow, and often paediatricians do not diagnose it (7,15). All children with infectious mononucleosis have manifestations of tonsillopharyngitis, adenoiditis, in the development of which the leading role is played by the activation of opportunistic bacterial microflora, which always densely inhabits the mucous membrane of the oropharynx, against the background of immunodeficiency caused by herpes virus infection. Bacterial opportunistic microflora that colonizes the pharyngeal mucosa is involved in the development of pharyngitis and sore throat in children with infectious mononucleosis. The species composition of pathogens is dominated by microorganisms such as Streptococcus, Staphylococcus, Candida (7, 18).

Pathological changes caused by somatic diseases, including viral aetiology, affect various organs and systems of the child's body and occur, in particular, in the dentofacial area. This is manifested with the development of dental caries, periodontal disease, oral mucosa pathology (1, 11). The long course of pathology of the ENT organs on the background of viral lesions of the body also contributes to the development of malocclusions (2).

Therefore, the aim of our research was to study the prevalence and feature of malocclusions in children with infectious mononucleosis.

MATERIAL AND METHODS

Study design

The study includes children 226 examined children aged 6, 9 and 12 years. Among them 104 children were being treated from infectious

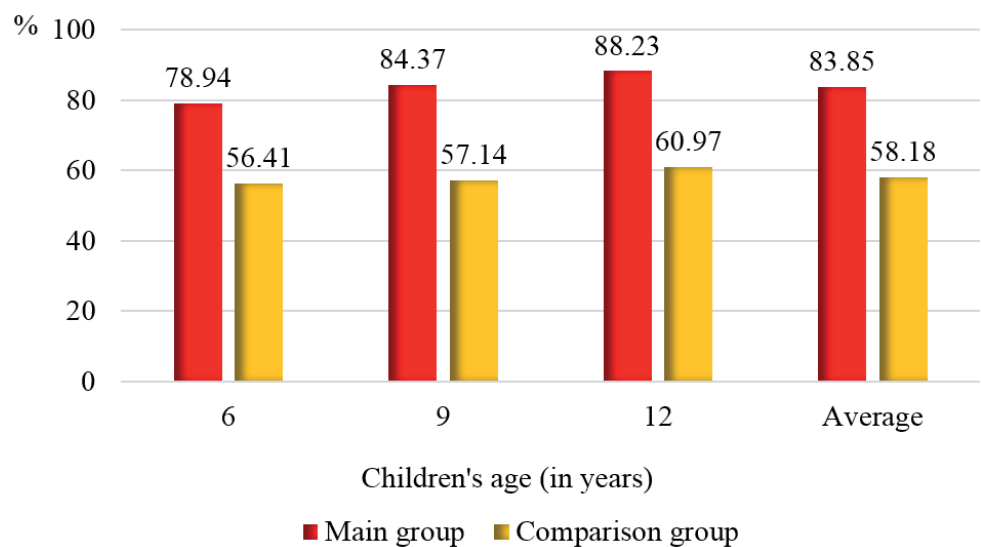


Fig. 1. Prevalence of malocclusions anomalies in the examined children (in %)

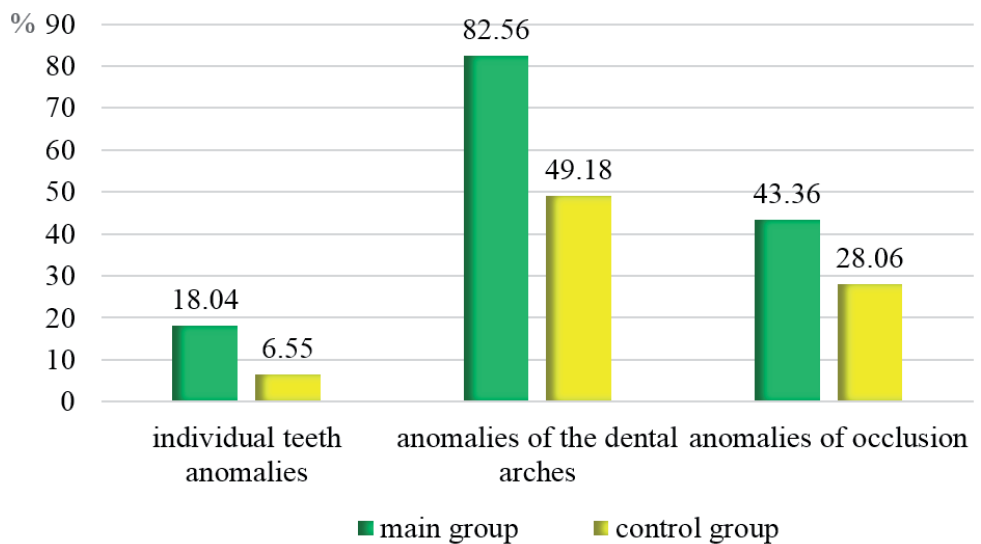


Fig. 2. The structure of orthodontic pathology in the examined children (in %)

mononucleosis at Lviv Regional Infectious Disease Clinical Hospital. They were included in the main group, and 122 healthy children were included into the comparison group. The study involved patients aged 12 to 18. The study was reviewed and approved by Biomedical Ethics Committee (No: protocol №2 from 17.02.2020). Malocclusion were determined according to the classifications by Angle E. and Kalvelis D. A. (14). The examination environment, the procedure and the sequence employed during routine dental check-up were maintained throughout the study.

Statistical Analysis

The statistical analysis was performed using Microsoft Excel and Statistics 22.0. All data obtained were subjected to statistical analysis using Student's t test (22).

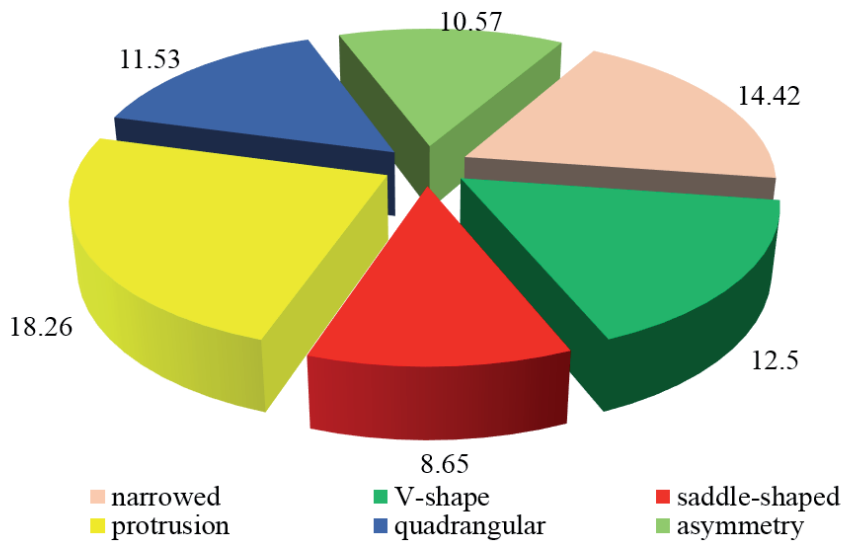


Fig. 3. Anomalies of shape of the dental arches in the examined children (in %)

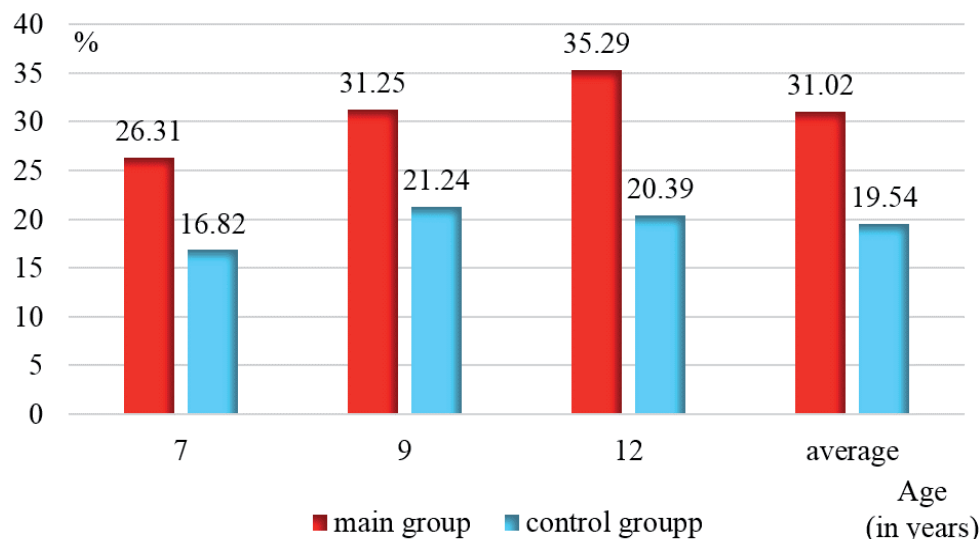


Fig. 4. Frequency of combined malocclusion in the examined children (in %)

RESULTS

The results of the study showed that among examined children with infectious mononucleosis malocclusion were found in 83.85±2.34%, while among healthy children this indicator did not exceed 58.18±2.48% (p<0.05) (Fig. 1). With age, the prevalence of malocclusion increases in the both study groups, but among children of the main group the growth dynamics is more pronounced – from 78.94 ±2.13% among children of 6 years old to 88.23±2.24% among children of 12 years old, i.e. 1.12 times (p<0.05). On the contrary, in children, who were healthy, the prevalence of malocclusion in 6-years-old children was 56.41±1.98%, which is 1.4 times less than in children of the main group (p<0.05), and up to 12 years old increased by 1.08 times (60.97±2.15%, p>0.05), but was lower than in

children of the main group, by 44.71% (p<0.05).

Thus, only 16.15±1.32% of children in the main group did not show signs of malocclusions, in the comparison group such number of children was 2.58 times higher (42.82±2.12%, p<0.05).

When analysing the structure of malocclusion, it was found that among all examined children the most common were revealed the anomalies of the dental arches (in 82.56±2.48% children of the main group and in 49.18±2.75% children of the control group (p<0.05) (Fig. 2). Anomalies of occlusion occurred, on average, in 43.36±2.11% of children of the main group. Among children in the control group the prevalence of this pathology was 1,5 times less (28.06±2.13%, p<0.05). Anomalies of individual teeth were diagnosed in 18.04±1.33% children of the main group and in 6.55±1.08% children of the control group (p<0.05).

Analysing the structure of malocclusion in the age aspect, it was found that the prevalence of anomalies of the dental arches in children with infectious mononucleosis was on the high level in all age groups and ranged from 78.94±3.28% in 6 years old children to 90.62±3.26% in 12 years old children (p>0.05). With age, the prevalence of anomalies of occlusion also is increased: from 6 to 12 years old the prevalence of this pathology increased in 1.18 times (from 39.47±2.65% to 46.87±3.01% of cases) among all examined children of the main group (p>0.05). The prevalence of anomalies of individual teeth increased from 17.95±1.11% among children aged 6 years old to 19.51±1.45% among 12-year-old children of the main group (p>0.05).

Due to the high prevalence of anomalies of the dental arches among children of the main group, we analysed the frequency of different types of this

pathology (Fig. 3). Thus, the structure of anomalies of the dental arches was dominated by protrusion of the upper frontal teeth ($18.26 \pm 2.13\%$). Among the anomalies the various forms of the dental arch a narrowed shape was diagnosed in the most cases ($14.42 \pm 1.48\%$). A V-shape dental arch was observed in $12.50 \pm 1.57\%$ of children, a quadrangular shape occurred in $11.53 \pm 1.86\%$ of children, asymmetry of the dental arch – in $10.57 \pm 1.79\%$ and saddle-shaped – in $8.65 \pm 1.13\%$ of children.

According to study the prevalence of anomalies of occlusion, it was found that in children of the main group distal occlusion is the most common in the sagittal plane ($25.08 \pm 2.34\%$) and open bite in the vertical plane ($24.92 \pm 2.68\%$) (Fig. 5). The anomalies of occlusion in the transverse plane occur in $18.25 \pm 2.13\%$. Deep bite was found in $11.26 \pm 1.98\%$ of children.

When analysing the prevalence of malocclusion, attention was also paid to combined anomalies according to the Kalvelis' classification; the part of such anomalies may indicate the severity of pathology (Fig. 4). It was found that in children of the main group the frequency of combined anomalies was $31.02 \pm 2.38\%$, while among children in the control group in 1.5 times less ($19.54 \pm 2.41\%$, $p < 0.05$). It should be noted that with age the percentage of combined malocclusion increased in both examined groups of children, while the growth dynamics was more noticeable among children of the main group. Thus, the number of children with combined malocclusion of the main group from 6 to 12 years old is increased by 34.13% (from $26.31 \pm 2.56\%$ to $35.29 \pm 2.87\%$, respectively, $p < 0.05$), in children of the control group – by 21.22% (from $16.82 \pm 1.78\%$ to $20.39 \pm 2.31\%$, respectively, $p > 0.05$).

DISCUSSION

This study was carried out to estimate the prevalence and feature of malocclusions in children with infectious mononucleosis. The results showed high level of malocclusion frequency in children with infectious mononucleosis. When analysing the structure of malocclusion in children with this somatic pathology, it was found that anomalies of the dental arches occurs more often.

Infectious mononucleosis is considered as a clinical syndrome in a patient with primary Epstein-Barr virus infection with the following the latent course of the infection throughout life. The virus resides in B-lymphocytes and epithelial cells of the oral cavity, which determines its spread. Symptoms of mononucleosis may recur as a sign reactivation, such reactivation may result to monoclonal, uncon-

trolled lymphoproliferation. The most persistent symptom of the disease - an increase in lymph nodes and tonsils can be observed for a long time after the first period of illness (10).

Stopping the clinical manifestations of the disease is not accompanied by liberation from the causative agent, which in the future persists in the body of the host for life. At therefore, the periods of hidden (latent) flow are replaced by reactivations (20, 21).

As a result of the meta-analysis, it was established that the characteristic manifestation of reactivation is chronic Epstein-Barr virus infection is an interstitial development pneumonia, which is practically not registered in persons with primary acute infection. Identified fact is of particular relevance in the period of the pandemic spread of COVID-19 and can lie in the basis of a milder clinical course of infection caused by SARS-CoV-2 in children compared to by adults (17).

Children with chronic Epstein-Barr virus infection usually have aggravated premorbid background, suffer from chronic tonsillitis, chronic adenoiditis; they have various variants of the lymphoproliferative syndrome are formed, a moderately pronounced intoxication syndrome, asthenia, there may be subfebrile condition; this category of patients has frequent recurrent diseases, which is explained by the immunosuppressive effect of EBV. Persistence of Epstein – Barr virus leads to suppression of cellular immunity, decreased production of interferons and nonspecific protection factors, which contributes to reactivation of persistent infection, most often without mononucleosis-like syndrome, and the appearance of atypical mononuclears in blood with the formation of lymphoproliferative, intoxication, asthenovegetative syndrome, long-term subfebrile condition, which dictates the need for immunocorrective therapy (9).

According to the data (16), it was revealed sufficiently high prevalence of chronic tonsillitis in children, especially younger ones of school age, when the immune system is being formed in general and at the local level, and the presence of concomitant dental caries has a negative effect on the function of palatine tonsils as an additional source of chronic inflammation.

Thus, a long-term violation of nasal breathing due to the pathology of upper airways affects not only the development of the upper jaw, but also the lower, which is accompanied by the development of malocclusion. In this regard, study of the prevalence of malocclusion in patients with combined pathology, in particular, of the pathology of upper airways and disorders of nasal breathing and choosing an effective orthodontic method of complex treatment of patients is relevant.

We found very little information in the literature about the relationship between infectious mononucleosis and the occurrence of malocclusion. But according to many investigations after infectious mononucleosis chronic tonsillitis and nasal breathing disturb the patient for a long time that can lead to malocclusion formation. Our study confirmed that in children with infectious mononucleosis malocclusion are formed more often comparing to the healthy children.

CONCLUSIONS

1. High prevalence of malocclusion is determined in children with infectious mononucleosis.

2. As a result of assessing the differences between different age groups, it was found that the prevalence of various forms is increased with age.

3. Among the nosologically forms of malocclusions, anomalies of the dental arches predominate, which is obviously due to the peculiarities of the underlying disease.

4. The obtained results indicate the need for orthodontic treatment of children with mononucleosis, consultations with dentists along with the treatment of the underlying disease.

CONFLICT OF INTERESTS

All authors declare no conflict of interests.

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