

Dental Status of Children with Cerebral Palsy in the Republic of North Ossetia-Alania

Kabisova M.D.

Department of Stomatology No. 1,
North Ossetian State Medical Academy of the Ministry of
Health of the Russian Federation,
Vladikavkaz, Russia

Alborova E.V.

Department of Stomatology,
I.M. Sechenov First Moscow State Medical University of
the Ministry of Health of the Russian Federation,
Moscow, Russia

Khumarov Z.F.

Department of Stomatology No. 1,
North Ossetian State Medical Academy of the Ministry of
Health of the Russian Federation,
Vladikavkaz, Russia

Sotieva Z.K.

Department of Stomatology No. 3,
North Ossetian State Medical Academy of the Ministry of
Health of the Russian Federation,
Vladikavkaz, Russia

Khetagurov S.K.

Department of Stomatology No. 1,
North Ossetian State Medical Academy of the Ministry of
Health of the Russian Federation,
Vladikavkaz, Russia
kafo@ya.ru

Dzgoeva M.G.

Department of Stomatology No. 1,
North Ossetian State Medical Academy of the Ministry of
Health of the Russian Federation,
Vladikavkaz, Russia

Dzgoeva D.K.

Department of Stomatology No. 3,
North Ossetian State Medical Academy of the Ministry of Health of the Russian Federation,
Vladikavkaz, Russia

Abstract – The infantile cerebral palsy (ICP) is one of the most critical pathologies resulting in disability. Considering that the Republic of North Ossetia-Alania is industrially developed mountain territory with high pollution level in some locations and a region with insufficient content of iodine in its biosphere, the incidence rate of cerebral palsy is quite high. The purpose of the study was to define the dental status of children with cerebral palsy who were born in the Republic of North Ossetia-Alania. 35 children aged from 10 to 12 years having various forms of cerebral palsy undergoing treatment in Phoenix Republican Rehabilitation Center for Disabled Children were examined. All children were divided into 3 groups. The first group was comprised of 19 children suffering from hyperkinetic and atopic-astatic forms of cerebral palsy, which are able to take care of themselves. The second group included 16 children suffering from spastic and hemiplegic forms of cerebral palsy, which are not able to take care of themselves. The third group (control) consisted of 15 healthy children. The index of caries intensity and prevalence, condition of parodontium tissue, prevalence of dentofacial anomalies and needs in dental treatment was assessed. **Results:** it was found that dental caries and its complications occur in 97 % cases. Dental caries occurs 4.5 times more often at children with hyperkinetic and atopic-astatic forms of cerebral palsy than at healthy children, and 4.7 times more often at children with spastic and hemiplegic forms of cerebral palsy.

Key words – dental status, children, cerebral palsy, Alania

I. INTRODUCTION

Disability as a problem draws the increasing attention of both doctors and scientists, and the population in general. Modern society seeks to be ever more open, the ideas of inclusive urban environment are actively popularized. Paradoxical as it may sound, but due to achievements of modern medicine the percentage of child disability constantly increases [1]. It is caused by the fact that modern perinatology is able to ensure the survival even to those newborns who in the middle of the past century were doomed to death. Statistics demonstrates that the main reasons for child disability are nervous system diseases, and in particular, about 39 % are cases of cerebral palsy (CP) [2].

On average over 2012–2018 the number of disabled people in the territory of the Russian Federation has been annually increased by 144 thousand people (or by 1.2 %).

Analyzing the available statistical data [3] it is possible to conclude that the prevalence of child disability in the world in general is characterized by both the growth of the absolute number of disabled children and its indicators at various

intensity of this process throughout the entire known period. In particular years the disability indicator since birth decreases in the territory of the Russian Federation [4], but nevertheless in the long-term perspective it is still rising. Over the past 12 years the main health disorders within the structure of child disability include mental and behavioral disorders, where the leading position is held by intellectual retardation of varying severity (47.5 %) [4].

Scientists of different regions of the planet study the etiology of cerebral palsy [5], and at present it is considered that this disease is caused by a range of different factors. In particular, there is a clear relation between thyroid pathology of pregnant women and cerebral palsy risk of a foetus. Industrial pollution of the territory of residence is another important factor [6].

There is a clear dependence between cerebral palsy and various structural disorders of osseous tissue, including disorders related to amelogenesis and dentinogenesis, osteoporosis, arrested development of facial skeleton [7]. Abnormalities of normal cerebral nerves lead to speech disorders, problems of swallowing, sucking thus resulting in dentition disorders [8] and abnormality of occlusion.

Some scientists note much lower level of dental health of children with cerebral palsy [9]. Besides it is noted that there is a direct relation between the development of dentofacial system and posture of a child [10]. The influence of a posture and muscular activity, myodynamic balance of a muscular frame of upper extremities on development and growth of jaws is also emphasized.

In various regions of the Russian Federation the frequency of cerebral palsy varies from 1.7 to 3.1 cases per 1 thousand newborns [11]. According to statistical data, 2.2 cases of cerebral palsy per 1 thousand newborns were registered in 2012 in the Republic of North Ossetia-Alania, and at present this number makes 3.7 cases. The majority of cerebral palsy cases refer to citizens of Vladikavkaz. At present, 425 children up to 18 years old with revealed cerebral palsy are registered with the Phoenix Republican Rehabilitation Center for Disabled Children.

We revealed that there are little studies on the features of occurrence and course of cerebral palsy in the territory the Republic of North Ossetia-Alania. Considering the fact that the Republic of North Ossetia-Alania is the region with insufficient iodine content in biosphere, fluorine content in water is 2–3 times less than the norm, and certain urban areas have high level of industrial pollution, including with salts of heavy metals, there is a need for more complete information on the dental status and features of dental help to children with cerebral palsy.

II. PROBLEM STATEMENT

To define the dental status of children with cerebral palsy born in the Republic of North Ossetia-Alania.

III. MATERIALS AND METHODS

The study covered 65 children from 10 to 12 years old with various forms of cerebral palsy treated at the Phoenix Republican Rehabilitation Center for Disabled Children. The control group of healthy children studying in Gymnasium No.

5 in Vladikavkaz also participated in the study. All children were divided into 3 groups.

The first group was comprised of 19 children suffering from hyperkinetic and atopic-astatic forms of cerebral palsy, which are able to take care of themselves. Hyperkinetic cerebral palsy is characterized by hyperkinesis (involuntary movements), which may include paresis and paralysis [12]. Low muscle tone and high tendon and periosteal reflexes are typical for atopic-astatic form.

The second group included 16 children suffering from spastic and hemiplegic forms of cerebral palsy, which are not able to take care of themselves. Spastic diplegia is characterized by lower spastic paraparesis covering two extremities, nervous obstruction and weakened muscle activity. The hemiplegic form represents absence or restriction of any voluntary movement, which typically occurs in upper extremities.

The third group (control) consisted of 15 healthy children studying in Gymnasium No. 5.

The specified groups were exposed to the assessment of Green-Vermillion (OHI-S) index, Silness-Loe index, (GI), calculation of intensity and prevalence of dental caries via cf, CFE/cf, assessment of hygienic condition of oral cavity by means of Yu.A. Fedorov-V.V. Volodkina’s index (1971). The numerical value of Schiller-Pisarev test (iodic number of Svrakov, 1963) was measured to identify inflammatory responses of parodontium. Complex dental plaque index (DPI) was also assessed (P.A. Leus, 1988). Besides, the presence of dental prostheses in oral cavity and their state, as well as orthopedic treatment needs were checked.

The presence of objectively defined dentofacial anomalies were defined to assess the dentition development: tremas, diastemas, teeth crowding, type of dental occlusion.

The medical histories were recorded into a special form on the basis of the WHO dental epidemiological inspection (2013).

Statistical data were processed via Statistica 6.0 software.

IV. RESULTS AND DISCUSSION

The analysis of obtained data resulted in the following outcomes.

It was noted that the patients of the first group have increased OHI-S index (1.8±0.14) in comparison with the control group. The indicators of the second group were very high (2.7±0.04), which indicates bad hygiene. The index in the control group was equal to 1.04±0.02. Table 1 shows the distribution of the OHI-S index.

TABLE I. SIMPLE GREEN-VERMILLION INDEX (OHI-S).

OHI-S	First group n=26	Second group n=24	Control group n=15
Low (<0.6)	0 (%)	0 (%)	35 (%)
Medium (0.7-1.6)	27 (%)	5 (%)	65 (%)
High (1.7-2.5)	55 (%)	60 (%)	0 (%)
Very high (>2.6)	18 (%)	35 (%)	0 (%)

The data presented in the table confirm low and very low level of hygiene of children with cerebral palsy in comparison

with children from the control group. At the same time the situation is much better in the first group of children with hyperkinetic form of cerebral palsy, which are able to take care of themselves compared to the second group where children are not able to take care of themselves due to weak hand muscle activity or its total absence.

The assessment of intensity and prevalence of dental caries and the CFE index gave the following results. In the first group the prevalence of dental caries made 91 %, which is quite high, in the second group the prevalence was 97 % and in the control group the prevalence of dental caries was 46 % thus making the average value. Such situation is quite typical taking into account the obtained data on the hygiene level of children with cerebral palsy. The dental caries of some children of the second group was progressive with damage of almost all teeth, which confirms systemic nature of the disease. Some teeth represented the remained roots deprived of enamel, which requires immediate surgical treatment to avoid subsequent dental complications. It is obvious that such situation needs coordinated actions of different medical professionals [13].

The assessment of the CFE index demonstrates the regularity with more complex condition of children of the second group. If to estimate the CFE index across all groups, we get the following results. The average CFE index in the first group was high and equaled 5.4. In the second group the index equaled 6.7, which is considered very high level. In the control group the index on average equaled 1.7, which is low for children. Table 2 shows more detailed interpretation of obtained figures.

TABLE II. DENTAL CARIES INTENSITY

Dental caries intensity	First group n=26	Second group n=24	Control group n=15
Very low (<1.1)	2.7 (%)	0 (%)	26.1 (%)
Low (1.2-2.6)	8.3 (%)	4.1 (%)	64.6 (%)
Moderate (2.7-4.4)	15.9 (%)	16.5 (%)	9.3 (%)
High (4.5-6.4)	63.7 (%)	65.2 (%)	0 (%)
Very high (>6.5)	9.4 (%)	18.3 (%)	0 (%)

It is clear that in the first and second group the intensity of dental caries is characterized as high and very high, which is not observed in the control group. Such high cariological indicators demonstrate that this population group needs serious systematic approach to the issue of improving their oral cavity [14].

The structure of the CFE index where the C index prevails is indicative, and in the second group the E index is essential, which is a negative factor for children (Figure 1).

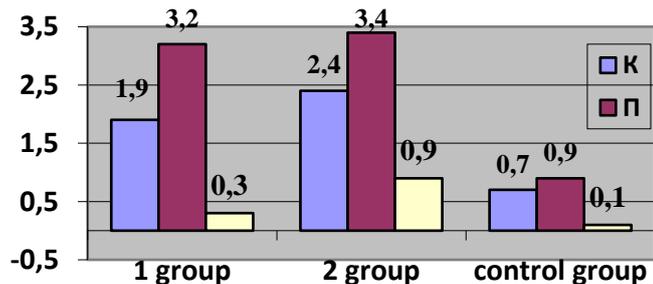


Fig. 1. Structure of CFE index

The assessment of complex dental plaque index (CFE) (P.A. Leus, 1988) made it possible to establish that the children of the first and second groups more often had light and moderate level of parodontium damage. The children of the control group had no parodontium. Moreover, severe forms of parodontium were not revealed in any group.

The study of various dentofacial anomalies revealed that in the first group 11 % of children had diastemas, in the second group – 15 %. In the control group diastemas were defined in 9 % of cases. Besides, other dentofacial anomalies, such as teeth crowding, were found in 15 % of cases in the first group and 17 % – in the second. Low attachment of a frenum on the upper jaw was noted in 11 % of cases in the control group and in 13 and 14 % of cases – in the first and second group respectively. Teeth malposition was revealed in 7 % of cases in the first group and in 16 % of cases in the second group. Abnormality of occlusion in the first group made 23 % and in the second group – 33 %. In the control group the abnormality of occlusion was also noted, but much more rarely – 11 %. In certain cases there were such pathologies as microdentism – 2 % and supplementary tooth – 1 %.

V. CONCLUSION

The received results show unsatisfactory dental status of children with cerebral palsy. In particular, children with hyperkinetic and atopic-astatic cerebral palsy have carious teeth 4.5 times more often than healthy children, while children with spastic and hemiplegic forms – 4.7 times more often.

The above requires close cooperation of dental practitioners with subject matter expert, as well as coordinated work following a common plan. The study shows that children with moderate and severe forms of cerebral palsy belong to the risk group regarding almost all forms of dental incidence.

Clear relations between indicators of hygiene of oral cavity, dental incidence and severity of movement disorders at children with cerebral palsy are defined thus indicating a certain symptom complex caused by endogenous processes typical for cerebral palsy and leading to some disorders of normal dentition function.

The study is not complete, but the obtained data seem sufficient to understand the urgent need for specialized dental offices in rehabilitation centers for children with cerebral palsy and special dental educational programs for this group, including parents and medical staff of rehabilitation centers.

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