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ORIGINAL ARTICLE

## PREVENTION OF MAIN DENTAL DISEASES IN CHILDREN USING HERBAL TEA «DENTESVITA»

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### ABSTRACT

**Introduction:** Transcarpathian region refers to the climate-geographic zone with a low level of fluoride and iodine in the environment and as shown by the epidemiological survey «very high» according to WHO criteria for the level of intensity of main dental diseases. With the purpose of directing the implementation of the state policy in the field of health care and for the prevention of dental diseases, the industrial release of a functional food product - «DentesVita» enriched with iodine and fluorine - has been adjusted.

**The aim:** Was to study the effectiveness of the use of functional food product - DentesVita for the prevention of dental caries in children.

**Materials and methods:** A comprehensive dental examination of 180 children of 12 years of age has been carried out: 60 of them in each of the climatic and geographical zones of Transcarpathia: plain, foothills and mountains. The intensity of caries according to the DMF index, increase of intensity was determined. A simplified hygiene index (OHI-S) was used to assess the hygienic state of the oral cavity. Carried out research on the mineralization potential of saliva.

**Results:** The growth of caries in children of the main group of the plain zone was 1.8 times smaller, and in the foothills and mountains 1.6 times smaller than the similar rates of control group children ( $p < 0.05$ ). The caries prophylactic effect at that was among schoolchildren in the plain zone: 43.48%, foothill - 38.66%, and mountainous - 23.53%.

**Conclusions:** These studies confirm the effectiveness of using «DentesVita» for the prevention of dental caries in children living in conditions of biogeochemical deficiency of fluorine and iodine on the basis of caries intensity growth indexes, hygienic indexes of the oral cavity and mineralizing ability of oral liquid.

**KEY WORDS:** iodine deficiency and fluoride, dental caries, hygiene, prevalence, herbal tea

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### INTRODUCTION

The level of dental health in children is closely linked to an increase in the relative weight of the risk factors for the formation and progression of diseases of hard and soft tissues of the oral cavity, which is reflected in the structure of the main dental diseases [1]. In particular, in Ukraine the prevalence of dental caries in 6-year-old children is 87.9% with a lesion intensity of 4.6; in 12-year-olds - 72,3% at intensity - 2,75. The frequency of detection of chronic catarrhal gingivitis (CCH) among children and adolescents is on average 70-80%, and in some regions reaches 95-98%. Orthodontic anomalies are registered in more than 60% of those surveyed aged 7-18 years [2,3]. As in most countries of the world, Ukraine has a tendency to increase these indicators [4].

Transcarpathia refers to the climate-geographic zone with a low level of fluoride and iodine in the environment, and as shown by epidemiological surveys «very high» according to WHO criteria, the level of intensity of major dental diseases associated with a deficit in the daily intake of iodine and fluorine [1,5,6].

In order to direct the implementation of state policy in the field of health care and prevention of dental diseases in Transcarpathia, has been adjusted the industrial release of a functional food product - a herbal tea «Dentesvita» enriched with iodine and fluorine.

This functional food product is a mixture of herbal materials: *Surrexit coxis* – 30%, *Chamaemelon flores* – 10%,

*Lucus Veroniceae medicamento* relinquit – 20%, *Rosae medicamento pelyustrb* – 10%, *Caeditur et tilia flores aucuparia* -10%, *Urtica crescet myrtus* -20%, *kalium iodide* -0,0093%, *kalium fluoride*– 0,165%, which creates optimal dietetic conditions for the general strengthening of the body and the prevention of major dental diseases - caries teeth, diseases of periodontal tissues and iodine deficiency diseases. In one glass of herbal tea, the following percentages of daily consumption are required: iodine - 92% for children 3-6 years old, 85% for children 7-12 years old, and 55% for children from 12 years of age and adults; Fluoride - 75% - for children 3-6 years, 50% for children 7-12 years old, and 33% - for children from 12 years and adults. For territories with optimal levels of fluoride in the environment and food, we recommend general health-improving herbal tea “DentesVita” (iodinated), since iodine has a direct impact on the functions of all organs and systems of the body and dental health. General health-improving herbal tea “DentesVita” are useful for children of different age groups, adults and pregnant women living in territories with natural ecologically deficient iodine and fluoride in the environment, in particular the territories of the Carpathian Euroregion (Hungary, Slovakia, Romania, Poland) and Ukraine.

Herbal teas “DentesVita” are not medicines. This patented development of the department of postgraduate dentistry of UzhNU is registered in the state standard of Ukraine TU U

15.8-35347011 - 001: 2011 and TI to them with the positive conclusion of the sanitary and epidemiological examination of the Ministry of Health of Ukraine in the number 05.03.02-06 / 51955 dated May 20, 2011 certificate quality, bar code EAN Association of the Chamber of Commerce «JEEES Ukraine» No. 17048-2 dated July 13, 2011 [7].

## THE AIM

The purpose was to study the effectiveness of the use of a functional food product - a general health-improving herbal tea "DentesVita" for the prevention of dental caries in children living in conditions of biogeochemical deficiency of fluorine and iodine on the basis of indicators of growth of caries intensity, hygienic indexes of the oral cavity and mineralizing ability of oral fluid.

## MATERIALS AND METHODS

In order to evaluate the effectiveness of using the functional food product - general health-improving herbal tea «DentesVita», a comprehensive dental examination of 180 children of 12 years of age was carried out: 60 of them in each of the climatic and geographical zones of Transcarpathia: plain, foothills and mountains. The number of main and control groups was 30 children in each of the climatic-geographical zones. For the endogenous prevention of dental caries the «DentesVita» herbal tea was used for 30 days, twice a year (in autumn and spring) for 2 years. The assessment of clinical efficacy was carried out 6, 12, 18 and 24 months from the beginning of the study. A comprehensive dental examination of children was conducted in accordance with WHO recommendations [8].

The intensity of caries according to the DFM index, intensity increase in percent was determined. A simplified hygiene index was used to assess the oral hygiene state (OHI-S Green J.C., Vermillion J.K., 1964). Investigation of the mineralizing potential of saliva (Leus P. A., 1976), Sayfulin H. M. (1992)). The statistical processing of the results was carried out in Microsoft Excel 2010.

## RESULTS AND DISCUSSION

According to the results of the study, in the children of the main group living in the plain zone after 12 months of application of the «DentesVita», the growth of the caries of the teeth was  $0.45 \pm 0.11$  caries tooth, and in the control group -  $0.59 \pm 0.09$  teeth ( $p > 0.05$ ). The reduction of dental caries at this stage was 13.79%. 24 months after the start of the study, the growth of caries in the main group of children was  $0.91 \pm 0.08$  and was significantly lower ( $p < 0.01$ ) for a similar index of children in the control group  $1.61 \pm 0.08$ . The caries prophylactic effect (CPE) in the children of the main group was 43.48%. In children of the main and control groups in the foothills zone, the importance of the DFM index before the start of preventive measures was at approximately the same levels and amounted to  $4.62 \pm 0.03$  and  $4.65 \pm 0.04$  tooth, respectively.

Already after 6 months, the use of the «DentesVita» in children of the main group DFM index was 21.43%, and

the growth of caries of teeth was equal to  $0.14 \pm 0.03$  caries tooth. In the control group of children, the growth of caries of teeth at this stage of the study was  $0.2 \pm 0.04$  caries tooth. The maximum CPE in the main group of children in the foothills was observed after 2 years of application of the proposed algorithm and was 38.66%; the index of growth of the caries of permanent teeth in schoolchildren of this group was  $1.19 \pm 0.06$  caries tooth.

In the control group, 24 months after the start of the study, the growth rate of the caries was  $1.94 \pm 0.09$  caries tooth and was significantly higher than in the children of the main group ( $p < 0.001$ ). In children of the main group of the mountain zone, the growth of caries of teeth in 12 months was  $0.39 \pm 0.12$  caries tooth, the value of the similar index of children in the control group was  $0.51 \pm 0.14$  ( $p > 0.05$ ). CPE in children of the main group at the same time was 23.53%.

After 24 months of observation, the growth of caries of teeth in children of the main group was  $0.99 \pm 0.13$  caries tooth, which is 1.6 times less than the value of the similar indicator in children of the control group ( $1.6 \pm 0.14$ ) ( $p < 0.01$ ). Throughout the entire period of the use of the herbal tea «DentesVita», the reduction of caries in children of the main group gradually increased reaching its maximum after 24 months, at the same time making 36.88%. Thus, the CPE achieved in children of major groups, which in various climatic-geographical zones ranged from 36.88 to 43.48%, which may indicate its effectiveness.

The dynamics of the effect of herbal tea on the oral hygiene status of children was traced using the OHI-S index. The values of hygiene indices in children of the main and control groups living in the plain zone prior to the application of preventive measures were treated as unsatisfactory and amounted to  $1.79 \pm 0.12$  and  $1.77 \pm 0.13$  points, respectively (Table 1). After 12 months of application of herbal tea in the main group of children hygiene index decreased 1.4 times from baseline ( $p < 0.05$ ) and amounted to  $1.32 \pm 0.15$  points, which corresponded to a satisfactory level of hygiene. In the control group children, the OHI-S index in the given time period was higher than in the children of the main group and averaged  $1.67 \pm 0.13$  points, however, this difference was unreliable ( $p > 0.05$ ). The values of the indexes of oral hygiene in the children of the main group after 18 and 24 months of observations showed a dynamism to increase and comprised  $1.42 \pm 0.17$  and  $1.6 \pm 0.14$  points, respectively, but did not reach the level prior to the start of the survey. In the control group children in the 24-month period, the OHI-S exceeded 1.2 times the initial data of  $2.04 \pm 0.14$  points and was interpreted as high.

In the group of children in the foothills, which was used herbal tea in 12 months of follow-up, the state of oral hygiene was characterized as satisfactory with the value of the OHI-S index of  $1.35 \pm 0.19$  balls, whereas in the control group children, for the specified time, the value of this index was  $1.65 \pm 0.11$  points, which corresponded to poor oral hygiene.

After 24 months, in the children of the main group, the hygienic index tended to grow and was  $1.72 \pm 0.15$  points, however, it did not reach the level before the introduction

**Table I.** Dynamics of the indicator OHI-S in children as a result of preventive measures (points).

Terms of examination	Plain area		Foothills zone		Mountain zone	
	MG	CG	MG	CG	MG	CG
Before preventive measures	1,79 ± 0,12	1,77 ± 0,13	1,84 ± 0,14	1,82 ± 0,16	2,41 ± 0,11	2,42 ± 0,17
After 6 months	1,38 ± 0,12	1,54 ± 0,14	1,32 ± 0,16	1,59 ± 0,17	1,43 ± 0,12	1,51 ± 0,12
After 12 months	1,32 ± 0,15	1,67 ± 0,13	1,35 ± 0,19	1,65 ± 0,11	1,59 ± 0,13	2,04 ± 0,11
After 18 months	1,42 ± 0,17	1,72 ± 0,15	1,49 ± 0,15	1,84 ± 0,16	1,77 ± 0,16	2,31 ± 0,15
After 24 months	1,6 ± 0,14	2,04 ± 0,14	1,72 ± 0,15	2,03 ± 0,19	2,13 ± 0,13	2,57 ± 0,18

Note: MG - main group, CG - control group; the reliability of the difference between the indicators of the children of the main and control groups before and after the preventive measures – ( $p \leq 0,05$ ).

**Table II.** Dynamics of indicators of mineralizing potential of saliva of children under the influence of preventive measures.

Climatogeographic zones	Main group		Control group	
	Prior to taking preventive measures	After carrying out preventive measures	Prior to taking preventive measures	After carrying out preventive measures
Plain	2,56 ± 0,15	3,63 ± 0,17	2,58 ± 0,15	2,38 ± 0,16
Foothills	2,58 ± 0,16	3,52 ± 0,15	2,56 ± 0,16	2,22 ± 0,13
Mountainous	2,29 ± 0,15	3,43 ± 0,17	2,28 ± 0,15	2,11 ± 0,14
Average value	2,47 ± 0,09	3,53 ± 0,1	2,47 ± 0,09	2,24 ± 0,08

Note: the reliability of the difference between the indicators of the children of the main and control groups before and after the preventive measures - ( $p \leq 0,05$ ).

of the herbal tea at  $1.84 \pm 0.14$  points. In the control group children, after 2 years, the OHI-S index was  $2.03 \pm 0.19$  points, which exceeded the baseline -  $1.82 \pm 0.16$  points, indicating a deterioration in the hygienic state of the oral cavity. It should be noted that there was no significant difference between the indexes of hygienic indices in children of control and experimental groups of the foothill zone at any stage of the observation ( $p > 0.05$ ). The hygienic state of the oral cavity in children of the main group of the mountain zone in the interval from 6 to 12 months was interpreted as satisfactory with the value of OHI-S indicators from  $1.43 \pm 0.17$  to  $1.59 \pm 0.13$  points, which was significantly lower in comparison with a baseline of  $2.41 \pm 0.11$  points ( $p < 0.05$ ). After 2 years of observation, the oral hygiene level in children in this group worsened and amounted to  $2.13 \pm 0.13$  points, however, not reaching the initial degree. In the control group, 6 months after the start of the study, the index of hygiene was  $1.51 \pm 0.12$  points, which corresponded to its average level, after 12 months, the OHI-S increased by 1.4 times, correspondingly, to  $2.04 \pm 0.11$  points and was evaluated as an unsatisfactory state of oral hygiene. After 2 years, the value of the hygienic index in children increased to  $2.57 \pm 0.18$  points and exceeded its initial level of  $2.42 \pm 0.17$  points, indicating a deterioration of the hygienic state of the oral cavity ( $p > 0.05$ ).

The effectiveness of the proposed functional food product - “DentesVita” is also evidenced by the positive dynamics of the mineralizing ability of saliva in children of the main groups of all climatological and geographical zones. Before the study in children of experimental groups were dominated crystals of 2 type, the proportion of which was in the plain zone of  $56.67 \pm 5.25\%$ , foothill -  $51.11 \pm 5.3\%$  and mountainous -  $52.22 \pm 5.3\%$ . After 2 years of application of therapeutic and prophylactic measures

in children of the main groups, there was a significant increase compared with the initial level of increase in the number of type I crystals in the plain zone at 2.8 times from  $(16.66 \pm 3.95)\%$  to  $(46.67 \pm 5, 29)\%$ , in the foothills - 2.1 times from  $(21.11 \pm 4.33)\%$  to  $(43.33 \pm 5.25)\%$  and in the mountains - 3.7 times from  $(12.22 \pm 3, 47)\%$  to  $(45.56 \pm 5.28)\%$ , which indicates an improvement in the mineralizing function of the oral liquid ( $p < 0.001$ ). Along with this, there was a statistically significant decrease in the proportion of crystals of type III, the percentage of which in schoolchildren in the plain zone was  $13.33 \pm 3.6\%$ , in the foothills -  $15.56 \pm 3.84\%$ , and in the mountains -  $17.78 \pm 4.05\%$  ( $p < 0.05$ ). In children of all control groups after 24 months of study, there was a decrease in the mineralization capacity of mixed saliva, which was manifested by a 1.4-fold decrease in the number of I-type crystals and a 1.3-fold increase in the number of samples of mixed saliva with type III compared to baseline ( $p > 0.05$ ).

Indicators of mineralization potential of saliva (MPS) in children of the main groups to the preventive measures were interpreted as satisfactory and equal to  $2.56 \pm 0.15$  points in the plain zone, in the foothills -  $2.58 \pm 0.16$  points and in the mountains -  $2.29 \pm 0.15$  (Table 2). After 2 years of application of the proposed «DentesVita» among the children of these groups, it was found that in comparison with the initial level of growth of the MPS in children of plain and foothill zones in 1.4 times, mountainous - in 1.5 times, which corresponded to its high level ( $p < 0.05$ ).

In children of the control groups of all climatic and geographical zones after 24 months of study observed a tendency to decrease the MPS in the plain zone was  $2.38 \pm 0.16$  points, in the foothills -  $2.22 \pm 0.13$  points, in the mountains -  $2, 11 \pm 0.14$  points. The obtained results testify to the positive influence of «DentesVita», which was manifested in increasing the mineralizing potential of oral liquid

in children of major groups by an average of 30% in relation to the baseline ( $p < 0.05$ ). Green J. C., Vermillion J. K., 1964).

Caries of teeth are still a social problem in many countries around the world [4]. Through epidemiological studies conducted in index groups among children and adults, it is possible to monitor progress and take appropriate measures. The research conducted by Rodakovskiy and co-authors shows similar results of high values of caries intensity among 12-year-old children of the Podlask region (Poland), which corresponds to the results of this study [9].

The results obtained by us coincide with the data of similar studies conducted in Georgia on the correlation between environmental risk factors and the emergence of caries in young people [10].

Data on the prevalence and intensity of dental caries show their combination with a high incidence of poor oral hygiene, as evidenced by studies in recent years, including Kaminsky A. and collaborators in this direction [11].

## CONCLUSIONS

As a result of the two-year application of the proposed herbal tea «DentesVita», the growth of caries in children of the main group of the plain zone was 1.8 times smaller, and in the foothills and mountains 1.6 times smaller than the similar rates of control group children ( $p < 0.05$ ).

At the same time, CPE of children in the plain zone was 43.48%, in the foothills - 38.66% and 23.53% of the mountains. Positive influence of preventive actions is also observed in improving the level of hygiene of the oral cavity of children after 24 months of its introduction. This is evidenced by a 1.3 times lower value of OHI-S in persons of the main group of the plain zone ( $p < 0.05$ ) and by 1.2 times the lower OHI-S values in the persons of the main groups of foothills and mountainous areas in relation to the indicators of the hygienic index in children of control groups ( $p < 0.05$ ). The prophylactic effectiveness of the proposed complex is confirmed by statistically significant increases in the mineralizing potential of oral liquid in children of major groups by 1.5 times in the plains and 1.6 times in the foothills and mountainous areas as compared to the MPS of the control group children ( $p < 0.05$ ).

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*According to the order of the Authorship.*

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### Conflict of interest:

*The Authors declare no conflict of interest.*

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