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THE PREVALENCE OF NON-CARIOUS TOOTH DEFECTS ASSOCIATED WITH INDUSTRIAL EXPOSURE IN RESIDENTS OF PENZA REGION (RUSSIA)

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ABSTRACT — Aim of the study: to assess the level of dental pathology in Penza Region (Russia) and estimate the impact of the industrial environment. Materials and methods: A clinical examination and analysis of the frequency of enamel erosion, fluorosis and hypoplasia, wedge-shaped defect and multiple enamel cracks were carried out among the main professional groups of the region's population — workers of the machine-building and timber processing industries in the Penza region. Results and Discussion. Among the residents of Penza region, the frequency of enamel erosion was 4.0%, pathological tooth wear — 7.1%, wedge-shaped defect — 6.1%, multiple enamel fractures — 11.1%. There is a high frequency of non-carious tooth defects that occur before teething. In patients working in the machine-building industry, a high frequency of pathological tooth wear was noted (24,5%); in workers of the timber processing industry, it was 2 times lower (12,6%), as well as a high frequency of wedge- shaped defects, enamel erosion and multiple enamel cracks — all this was 2–2.5 times higher compared to similar indicators in patients from agricultural populations. However, the prevalence of dental fluorosis and hypoplasia was almost the same as in the agricultural population. Conclusion: Penza region has a high prevalence of dental fluorosis and hypoplasia. At the same time, the influence of industrial environment on the incidence of various types of non-carious dental pathology in workers of machine-building and timber processing industries in Penza region was established.

KEYWORDS — non-carious tooth defects (NCTD); prevalence; intensity; concentration of fluoride.

INTRODUCTION

In addition to caries, a significant place among dental diseases is occupied by non-carious enamel lesions: various types of hypoplasia (systemic, local, focal), imperfect amelogenesis, dentinogenesis, Stanton-Candepon syndrome, as well as fluorosis.

Non-carious lesions of the enamel of the teeth, which have a congenital character, are formed in the antenatal period. The physiological course of pregnancy is of great importance in the biosynthesis of normal enamel and its preservation [6]. The differential diagnosis of enamel abnormalities should be carried out with various forms of dental fluorosis, which also manifests itself as a variety of white, yellowish or brown spots on several or all teeth [5]. Fluorosis is an endemic disease that occurs as a result of an increased content of fluoride in drinking water. The exact mechanism of the occurrence of fluorosis is not yet fully understood. It is believed that fluorosis increases the content of fluoride in saliva and on the surface of enamel. It was shown that the prevalence of fluorosis directly depends on the content of fluoride in drinking water: at a fluoride concentration of 0.8–1.0 mg/l, the prevalence of fluorosis is 10–12%, 1.0–1.5 mg/l — 20-40%, 1.5–2.5 mg/l — 30–40%, over 2.5 mg/l — more than 50% [2]. Thus, the intensity of fluorosis in the population in endemic foci can be different: from mild lesions to significant changes in the teeth. This means that at the same concentration of fluoride in water, the body can react differently to its intake [1].

METHODS

A clinical examination and analysis of the frequency of enamel erosion, fluorosis and hypoplasia, wedge-shaped defect and multiple enamel cracks were carried out among the main professional groups of the region's population-employees of the machine-building and timber processing industries of the Penza region.

In this study, we analyzed dental examination data from 200 subjects aged 25 to 75 years (56 men and 144 women), of which 16 people were aged 21 to 30 years, 40 people — 31 to 40 years, 24 people — 41 to 50 years, 80 people — 51 to 60 years, 24 people — 61 to 70 years, 16 people — 71 to 80 years.

RESULTS

Among the native residents of Penza region (represented by the group of the rural population almost completely, without the share of the alien population), the frequency of enamel erosion was 4.0%, pathological tooth wear was 7.1%, and the wedge-shaped defect was 6.1%. Occurrence of multiple fractures of the enamel was even more common — 11.1%. Attention is drawn to the high frequency of non-carious dental diseases that occur before eruption (the incidence of

dental hypoplasia was 14.1%, dental fluorosis 24.2%) — the region is endemic for fluorosis.

Interesting differences in the incidence of major non-carious tooth defects are provided by an analysis of respondents from the major occupational groups of the population – workers of machine-building and woodworking industries. In patients from the machine-building industry, there was a high incidence of pathological tooth wear (24.5%, and in workers of the timber processing industry — 12.6%, 2 times lower), as well as a high incidence of wedge–shaped defects (13.3%), enamel erosion (11.4%) and multiple enamel cracks (20.9%) — all this was 2–2.5 times higher compared to similar indicators in patients from the agricultural population.

However, the prevalence of fluorosis and dental hypoplasia was almost the same as in the agricultural population — 13.3% and 11.4% (even the incidence of fluorosis was slightly lower, which indicates a greater proportion of the non-indigenous population of the region in the group of workers in the engineering industry). In patients from workers of the timber processing industry, a high frequency of many non-carious diseases of the teeth was also noted, but less than in workers of the machine-building industry: in particular, the frequency of occurrence of pathological tooth wear was 12.6%, wedge-shaped defect — 8.0%, enamel erosion — 8.0%, multiple enamel cracks — 14.9%. High prevalence rates of fluorosis (13.8%) and dental hypoplasia (8.0%) were observed.

Overall, it was noted that on the first place in frequency of non-carious tooth defects among the workers of machine-building industry was pathological tooth wear (24,5%) followed by multiple fractures of the enamel (20,9%) and wedge-shaped defect and fluorosis of the teeth (13.3%), and more rarely — the erosion of enamel hypoplasia of the teeth (11.4%). Among the workers of the timber processing industry, multiple enamel cracks (14.9%) and dental fluorosis (13.8%) were most often encountered, less often — pathological tooth wear (12.6%), wedge-shaped defect, enamel erosion, tooth hypoplasia (8.0% each). In respondents employed in agriculture, non-carious pathology was mostly manifested as fluorosis (in 24.2% of respondents in this group) and hypoplasia of teeth (14.1%). Multiple enamel cracks (11.1%), pathological tooth abrasion (7.1%), wedge-shaped defect (6.1%) and enamel erosion (4.0%) were less common.

DISCUSSION

In other words, work in the machine-building industry of the Penza region features the highest incidence frequency of certain types of non-carious tooth defects. In this population pathological tooth wear was 2 times higher than in workers of the timber processing industry and almost 4 times higher than in people employed in agriculture. The wedge-shaped defects and enamel erosion was also 1.5 times higher compared with workers of the timber processing industry and 2 times higher than in respondents employed in agriculture. On the other hand, agricultural populations had a higher incidence of dental fluorosis and hypoplasia, which is associated with a higher proportion of the native population and a smaller proportion of the alien population. The leading role in the frequency of different types of non-carious pathology among workers of the machine-building and wood-processing industries is occupied by pathological tooth wear, wedge-shaped defect and multiple enamel cracks, which proves the influence of industrial hazards.

Analysis of correlation between the frequency of non-carious tooth defects and the seniority of different groups of workers allowed us to determine the dependence of this disease from exposure to occupational factors. Thus, high indicators of strong correlation relationship were noted in the groups of workers from machine-building and timber processing industries in relation to the pathological tooth wear (0.76 and 0.70 points) and the wedge-shaped defect (0.68 and 0.64 points); these indicators were almost 2 times lower for those employed in agriculture (0.37 and 0.30 points). In addition, high values of the correlation with seniority were demonstrated in respondents employed in the machine-building and timber processing industries, specifically in regard to enamel erosion (0.61 and 0.55 points) and multiple enamel cracks (0.79 and 0.76 points). Among agriculture workers, significantly lower values were noted (0.18 and 0.16 points, respectively). It should be noted that such disorders as fluorosis and dental hypoplasia did not show the influence of seniority on the frequency of occurrence: the correlation coefficients in respondents employed in the machine-building and timber processing industries were 0.16 points and 0.17 points, respectively; 0.15 points and 0.11 points. For almost all non-carious tooth defects, low correlation coefficients of work experience were observed in the agricultural population.

CONCLUSION

Thus, the analysis of the regional features in the incidence of non-carious tooth defects in the residents of the Penza region showed the following. The region is endemic for fluorosis, which is why there are high prevalence rates of fluorosis and hypoplasia of teeth. At the same time, the influence of industrial environment on the incidence of various types of non-carious tooth defects in the workers of machine-building and timber processing industries in the Penza region was established.

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