

Research Article

Prevalence of Dental Caries Among Young People Living in the Regions with Low Fluoride Levels

Khrystyna Oleksyn*, Mykola Rozhko

Abstract

There were examined 300 first-year/third-year students of the Ivano-Frankivsk National Medical University at the age of 17 to 20 years residing in Ivano-Frankivsk and the regions with low fluoride levels. Clinical examination included their medical history and oral cavity examination using a dental probe and a detection device - the DIAGNOdent. The dependency between the prevalence of tooth decay and the region of residency was found. Initial and superficial dental caries was detected in most students despite the place of residence. Moderate and advanced dental caries predominated in students residing in the regions with low levels of fluoride. Fissure caries was detected most often. The patterns of dental caries prevalence indicate the need for development and implementation of preventive and therapeutic measures to prevent complications.

Keywords

dental caries; prevalence of caries; students; tooth damage

Ivano-Frankivsk National Medical University, Ivano-Frankivsk, Ukraine

*Corresponding author: hrystya15@yahoo.com

Problem statement and analysis of the recent research

Dental caries is the most common disease of mankind. In economically developed countries, its prevalence reaches 95-98%. According to the World Health Organization, the frequency of tooth decay tends to increase, in particular, the incidence among the population of developing countries sharply increases, especially in the areas of intensive urbanization [3]. Due to dental caries, teeth change their anatomical shape, their occlusal surface decreases, the relationships with antagonists change, which results in the deformations and occlusal changes. As a consequence, tooth overload and occlusal trauma occur that are accompanied by clinical (enamel cracks due to chronic microtrauma, pulpitis of traumatic etiology, tooth mobility) and X-ray manifestations (e.g., the destruction of tooth filling or a part of tooth crown, root fracture, extension of periodontal gap) [1, 2, 3, 6, 7].

According to the study of hydrogeochemical water indicators for the content of trace elements in Ivano-Frankivsk and Rivne regions, there is an extremely low concentration of fluoride in drinking water (0 - 0.3 mg/l).

Fluoride deficiency causes dental caries. Clinical and experimental studies have proven that the optimal amount of fluoride (0.5-1 mg) in a person's diet has the anti-cariogenic effect. The mechanism of fluoride action is as follows: when interacting with mineral components of bone tissue and teeth, poorly soluble compounds are formed. Fluoride also contributes to the depositions of calcium phosphate from saliva, which leads to the process of remineralization during the initial stage of caries formation. In addition, fluoride affects enzymatic sys-

tems of dental plaque and salivary bacteria. This biological feature of fluoride served as the basis for the development of effective method for prevention of tooth decay, namely water fluoridation. Long-term consumption of such water decreases the development of dental caries [4, 5].

1. Materials and methods

There were examined 300 first-year/third-year students of the Ivano-Frankivsk National Medical University at the age of 17 to 20 years residing in Ivano-Frankivsk and the regions with low fluoride levels, namely Rivne, Nadvirna district and Verkhovyna district of Ivano-Frankivsk region. There were 190 students from Ivano-Frankivsk (73 boys, 117 girls), 54 students from Rivne (23 boys, 31 girls), 42 students from Nadvirna district (19 boys, 23 girls) and 14 students from Verkhovyna district (5 boys, 9 girls).

Clinical examination included medical history and oral cavity examination using a dental probe and a detection device - the DIAGNOdent. A special dental card was developed for examination. It included: the patient's passport data, medical history (changes in health status during the last year, taking medications, drug and alcohol use, allergic reactions), dental history (gum disease, rash, dry or burning mouth, orthodontic treatment, tooth sensitivity, food impaction, bad taste or bad breath), dental status (the assessment of bite, periodontal state, frenum attachment, the state of mucous membrane, the presence of dental caries, tooth fillings, dental prostheses).

To determine the clinical form of dental caries, two methods were used. The probing method was used as a standard one. The diagnostic method using DIAGNOdent, which func-

tions using laser fluorescence technology allowed us to identify caries in the early stages.

2. Results and discussion

According to our study, the prevalence of dental caries is quite high. Acute initial caries prevailed in students residing in Verkhovyna district ($7.1\% \pm 6.88$); there were no cases of acute initial caries among students from Rivne region and Nadvirna district (Fig. 1).

When analyzing the prevalence of acute superficial dental caries, we noticed the fluctuations in its incidence from $14.3\% \pm 9.35$ (Verkhovyna district) to $27.8\% \pm 6.10$ (Rivne region) in the regions with low fluoride levels and $10.5\% \pm 2.23$ in Ivano-Frankivsk (Fig. 2).

The highest indicators of acute moderate caries were observed in Rivne region ($42.6\% \pm 6.73$), the lowest ones were found in Ivano-Frankivsk (Fig. 3).

The incidence of acute advanced dental caries ranged from $7.1\% \pm 3.97$ (Nadvirna district) to $11.1\% \pm 4.28$ (Rivne region) in the regions with low fluoride levels, in contrast to Ivano-Frankivsk, where it almost does not occur ($0.5\% \pm 0.52$) (Fig. 4).

Chronic initial dental caries was most often observed in students from Ivano-Frankivsk - $22.1\% \pm 3.01$ (Fig. 5).

The prevalence of chronic superficial dental caries was high in all regions ranging from $21.4\% \pm 10.97$ (Verkhovyna district) to $53.7\% \pm 6.79$ (Rivne region) (Fig. 6).

The analysis of the data showed that the incidence of chronic moderate dental caries among students residing in regions with low fluoride levels ($24.1\% \pm 5.82$), almost doubled the indicators of the students from Ivano-Frankivsk ($13.2\% \pm 2.45$) (Fig. 7).

The degree of tooth damage in students with chronic advanced dental caries was low. In Ivano-Frankivsk and Nadvirna district, it was $1.1\% \pm 0.74$ and $2.4\% \pm 2.35$, respectively as compared to Rivne region and Verkhovyna district where it did not occur at all (Fig. 8).

The data on the location of dental caries on tooth surfaces were of considerable interest (Fig. 9-11). We found that damage to the occlusal surfaces of the buccal teeth was the most intensive and ranged from $35.7\% \pm 12.81$ (Verkhovyna district) to $69.0\% \pm 7.13$ (Nadvirna district) (Fig. 9).

The incidence of dental caries on the aproximal surfaces was the lowest in students from Ivano-Frankivsk ($5.8\% \pm 1.69$); in students from Rivne region, it was the highest and reached $22.2\% \pm 5.66$. Dental caries in the cervical area was observed in students from Rivne region ($1.9\% \pm 1.83$) only (Fig. 11).

In addition, our study found that dental restorations without consideration of occlusal determinants were present in almost all examined students. Their value ranged from $74.1\% \pm 5.96$ (Rivne region) to 100.0% (Verkhovyna district) (Fig. 12).

It should be noted that the presence of extracted teeth was observed in students from Nadvirna district ($19.0\% \pm 6.06$), while in students from Verkhovyna district and Rivne region, all teeth were present (Fig. 13).

3. Conclusions

The prevalence of dental caries depends on the geochemical and environmental conditions of living and the presence of fluoride in drinking water. Dental caries was most often diagnosed in students residing in the regions with low fluoride levels. Regardless of the place of residence, the most affected area of the teeth were occlusal surfaces.

The presence of improper dental restorations was observed in almost all students.

In the future, this will lead to the formation of secondary caries and the appearance of occlusal overloads.

4. Prospects for further research

The study of the influence of dental caries on the development of occlusal disorders is promising.

References

- [1] Abolmasov NN. Izbiratel'naya prishlifovka zubov. Smolensk. 2004;8-9, 19, 32. [PMid:14986107]
- [2] Zakharova HYe. Zminy struktury okliuziinoi poverkhni zubnykh riadiv vnaslidok vtraty pershykh postiynykh moliariv. Suchasna stomatolohiia. 2007;3(39):132-137.
- [3] Rozhko MM, Kyrylenko II, Denysenko OH et al. Stomatolohiia: pidruchnyk: Knyha 2. Rozhko MM, editor. Kyiv: VSV "Medytsyna"; c2013. 74-75.
- [4] Rudko HI, Matsiievska OO. Doslidzhennia hidroheokhimichnykh pokaznykiv pidzemnoi hidrosfery zakhidnykh rehioniv Ukrainy na vmist mikroelementiv. Teoriia i praktyka budivnytstva. 2009;655:253.
- [5] Cherepiuk OM. Obhruntuvannia profilaktyky kariiesu tymchasovykh zubiv u ditei Prykarpattia: avtoref. dys. na zdobuttia nauk. stupenia kand. med. nauk.: spets. 14.01.22 "Stomatolohiia". Kyiv; 2018;20:1-2.
- [6] Roberson TM, Heymann HO, Swift EJ. Sturdevant's art and science of operative dentistry. 2012;39-40
- [7] Takehara J, Honda O, Morita M. Association of caries and treatment experiences with subjective symptoms of temporomandibular disorders in female adolescents. J Oral Rehabil. 2004;31(7):623-627. DOI: <https://doi.org/10.1111/j.1365-2842.2004.01270.x>

Received: 15 Aug 2018

Revised: 20 Sept 2018

Accepted: 23 Sept 2018

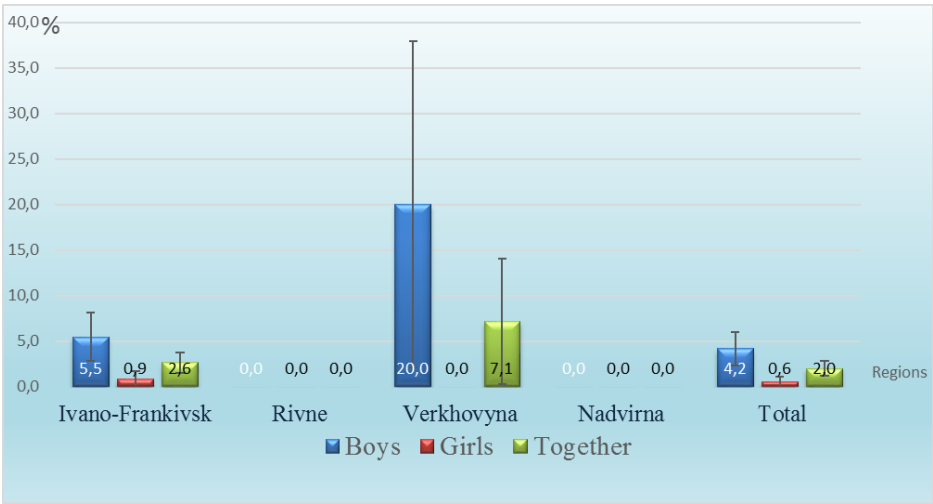


Figure 1. Prevalence of acute initial dental caries

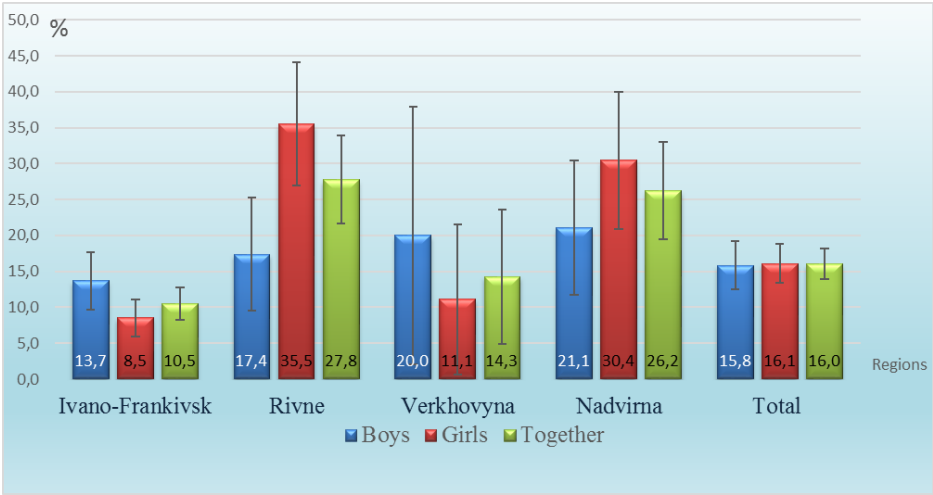


Figure 2. Prevalence of acute initial dental caries

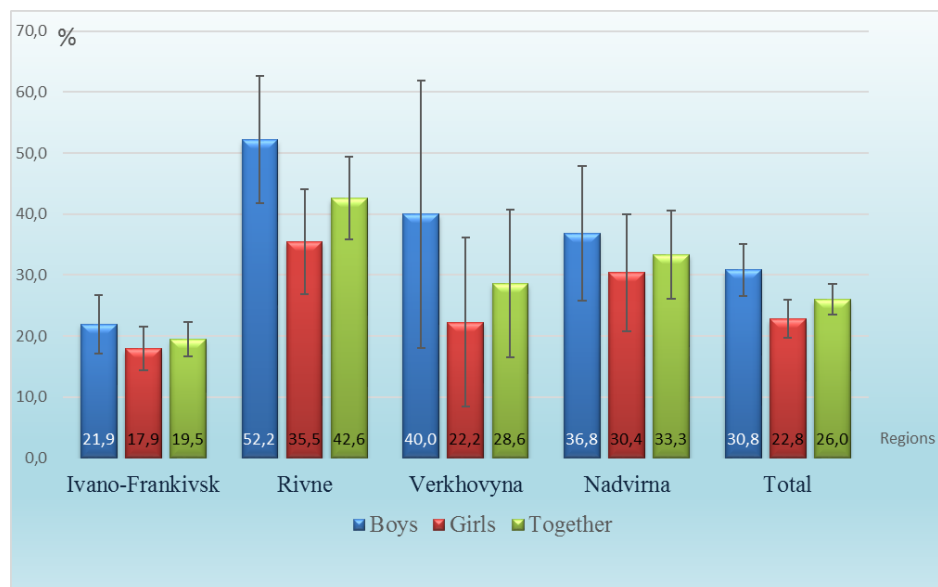


Figure 3. Prevalence of acute moderate dental caries

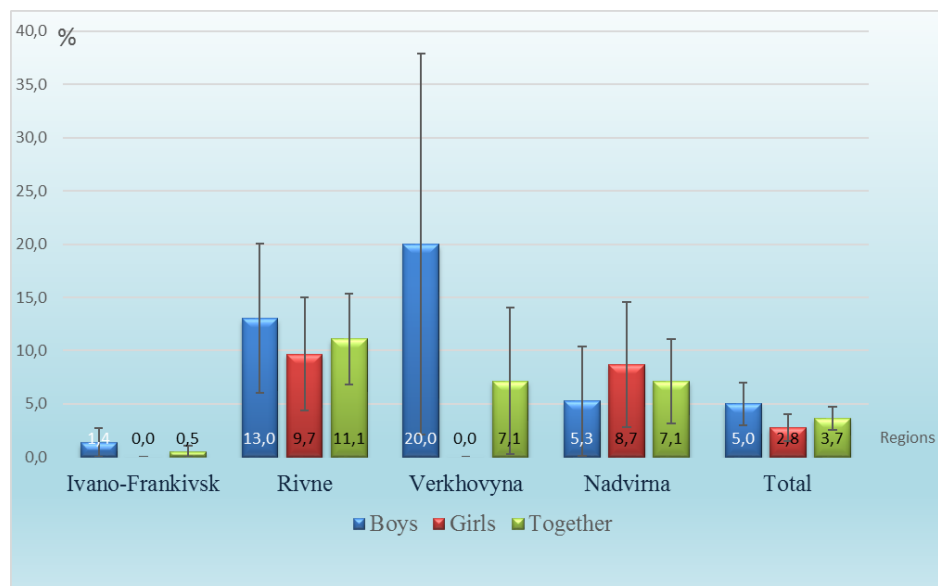


Figure 4. Prevalence of acute advanced dental caries

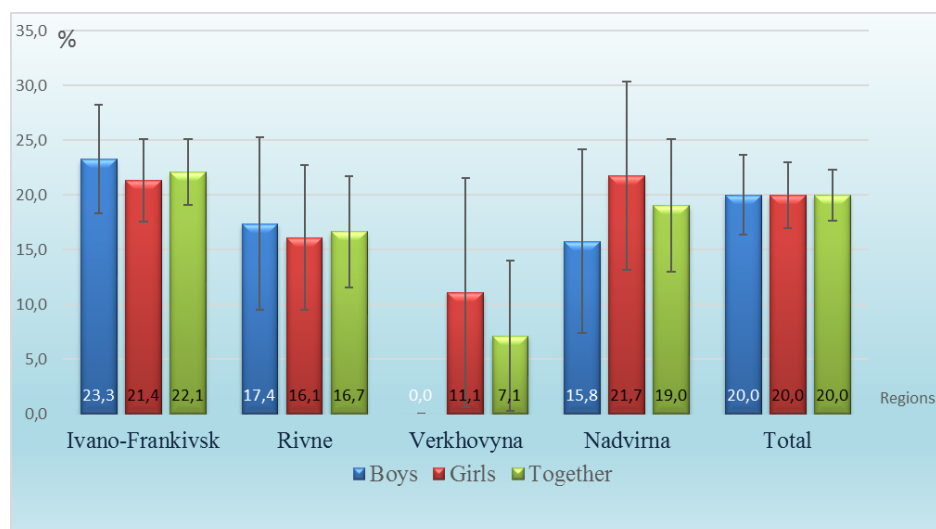


Figure 5. Prevalence of chronic initial dental caries

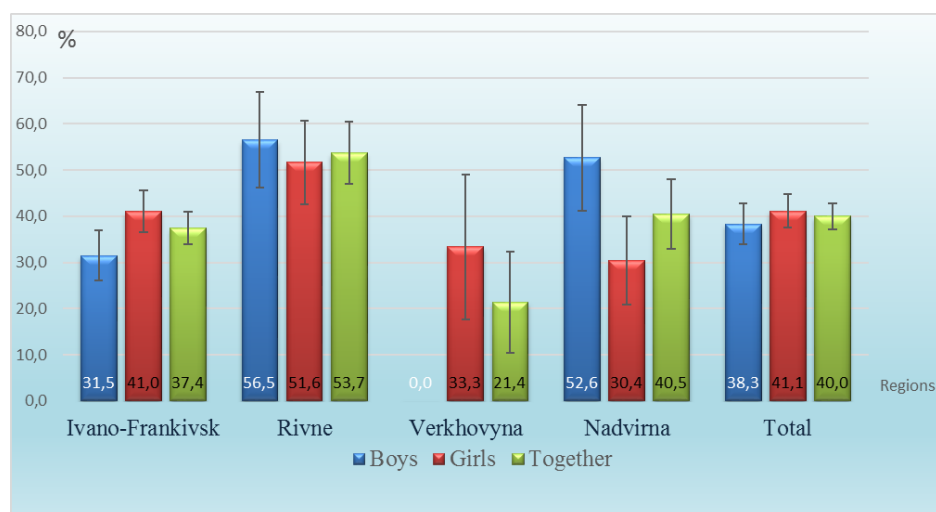


Figure 6. Prevalence of chronic superficial dental caries

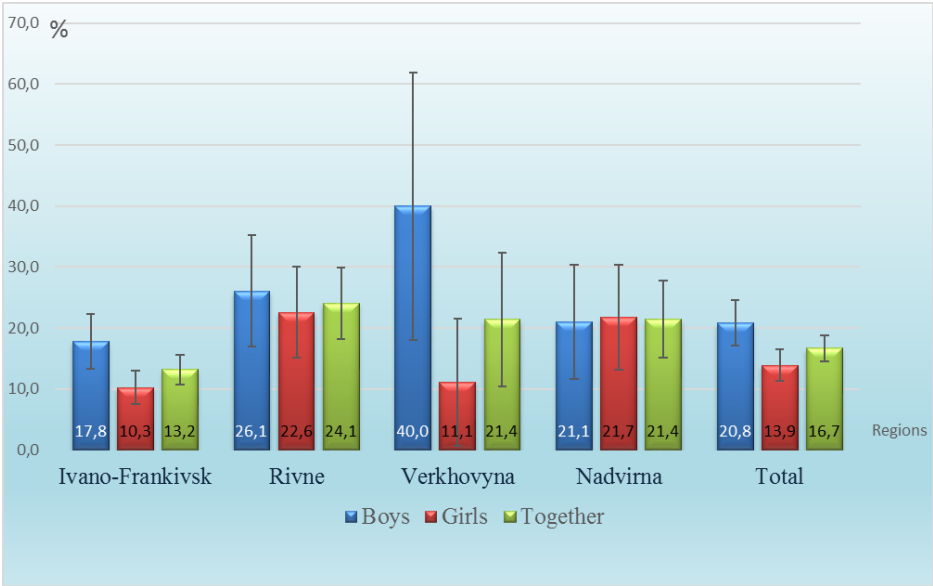


Figure 7. Prevalence of chronic moderate dental caries

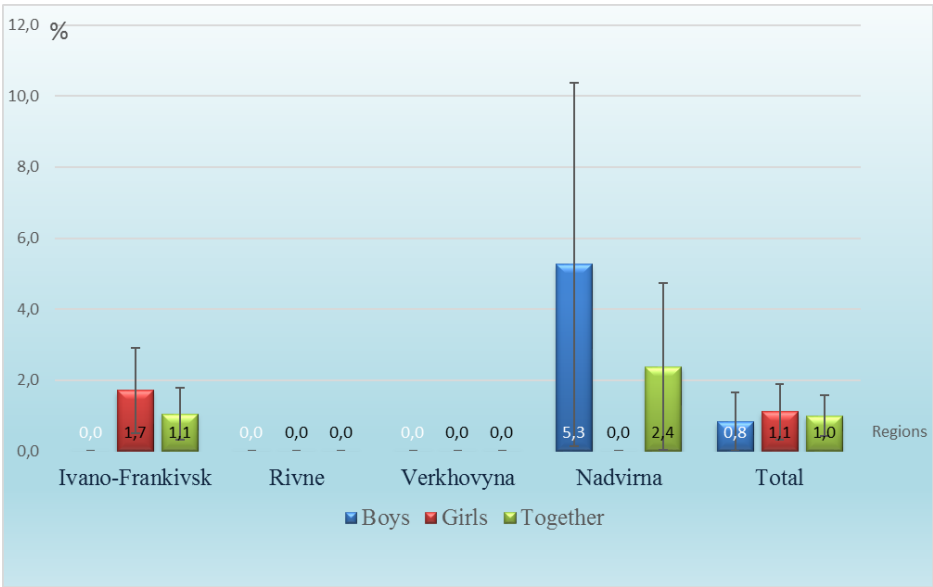


Figure 8. Prevalence of chronic advanced dental caries

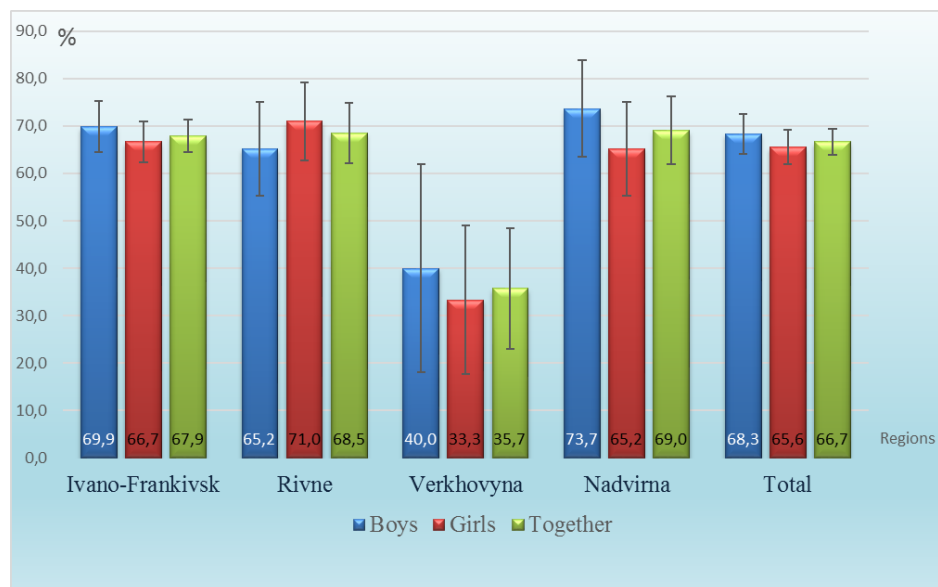


Figure 9. Prevalence of dental caries on the occlusal surface

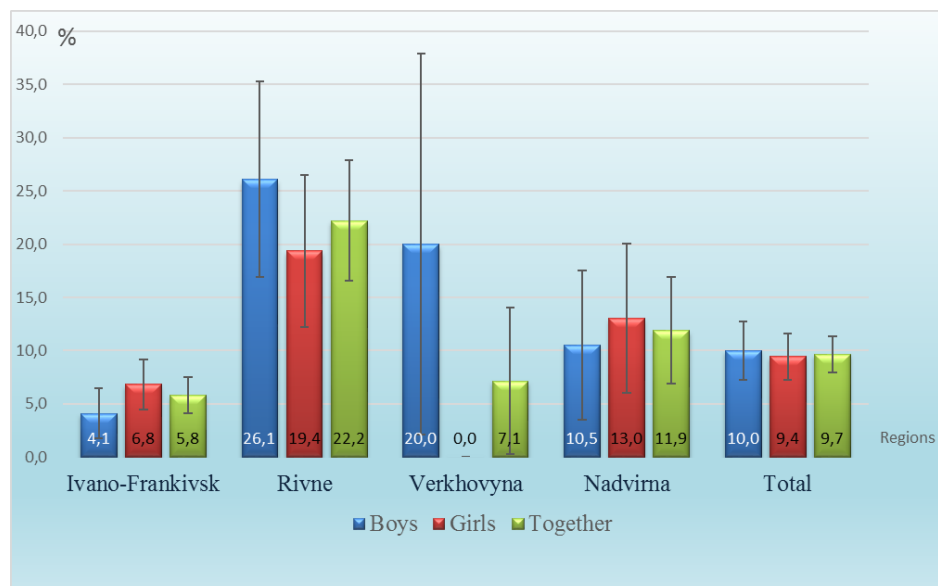


Figure 10. Prevalence of dental caries on the approximal surfaces

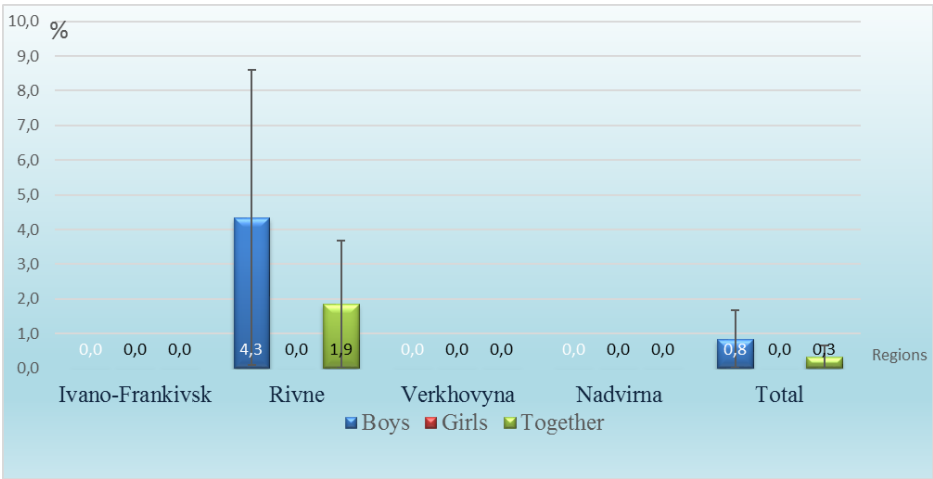


Figure 11. Prevalence of dental caries in the cervical areas

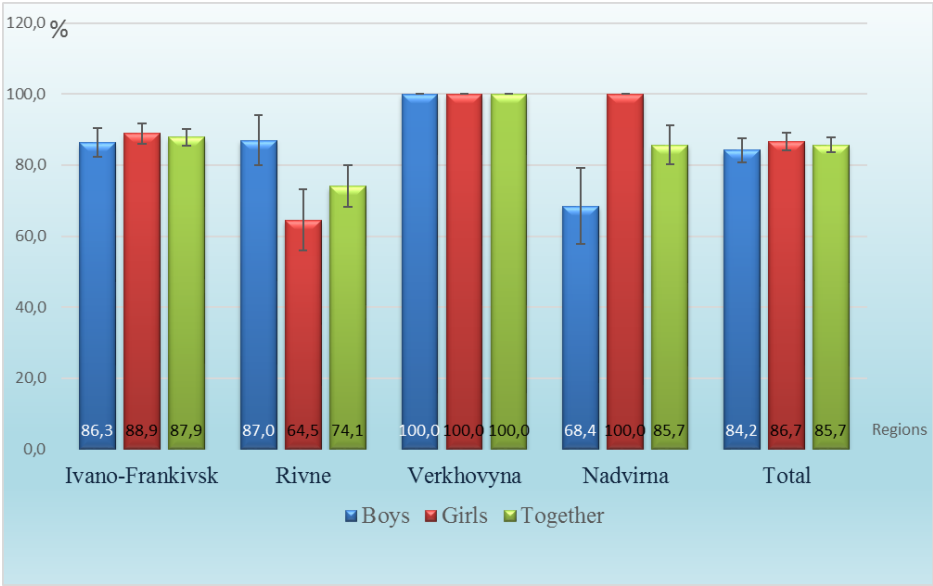


Figure 12. Presence of improper dental restorations

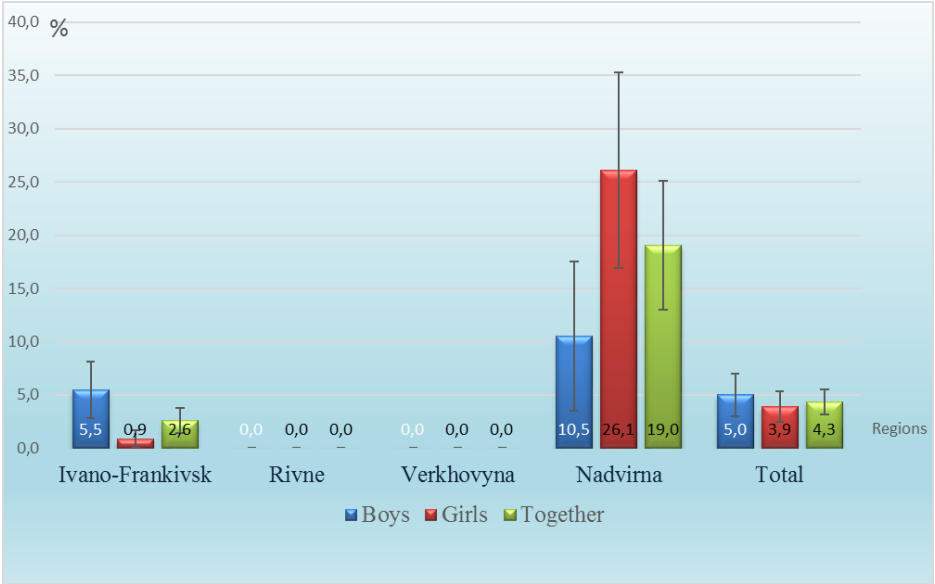


Figure 13. Presence of extracted teeth