

ORAL HEALTH STATUS AMONG TWELVE-YEAR-OLD CHILDREN IN THE DEBAR REGION

Albert MAQELLARA¹, Mira JANKULOVSKA², Aleksandar DIMKOV², Dragica
GLIGOROVA², Dijedona MURTISHI MAQELLARA^{1,3}

¹General Hospital – Debar

²Faculty of Dentistry UKIM, department of Pediatric Dentistry

³Faculty of Medical Sciences UT, department of Patophysiology

*Corresponding author e-mail: maqellaraalbert@gmail.com

Abstract

Introduction: Oral health is a key component of overall health and well-being. The World Health Organization established standardized methods for monitoring oral health in 12-year-old children, a globally accepted indicator age group. Preventive measures such as pit and fissure sealing of permanent molars play a crucial role in reducing dental caries and limiting lesion progression.

Objective: To assess the oral health status of permanent teeth, with special emphasis on first permanent molars, and to evaluate the relationship between fissure sealing and oral health among 12-year-old children. The study also analyzed differences based on gender and place of residence (urban vs. rural).

Material and Methods: The study included 12-year-old children with permanent dentition, categorized by gender and residence. Clinical examinations were performed to assess dental status, including the presence of caries, fillings, extractions, and fissure sealants on first permanent molars. Standard dental instruments and, where necessary, radiographic analysis were used.

Results: A high proportion of first permanent molars were fissure-sealed, with similar distribution between male and female participants. The average number of sealed molars per child was approximately two. A portion of children presented with unerupted first permanent molars, with slightly higher prevalence in males. Preventive measures showed a positive association with better oral health outcomes.

Conclusion: Statistically significant differences in oral health indicators were observed in relation to gender and place of residence ($p < 0.05$). A correlation was found between dental status and preventive measures, emphasizing the importance of early intervention and continuous monitoring of oral health in 12-year-old children.

Keywords: oral health, dental caries, KEP index, fissure filling, cavities, first permanent molars, prevalence, WHO - world health organization.

Introduction

Oral health is essential for overall health and well-being at every stage of life. A healthy mouth enables proper nutrition, supports speech, enhances social interaction, and contributes to self-confidence and aesthetics. Despite advances in modern dentistry, oral diseases remain a significant public health concern, particularly among children.

Dental caries, periodontal diseases, and orthodontic anomalies are among the most prevalent chronic conditions, with strong social and behavioral determinants. Among these, dental caries continues to be a major global health problem, often leading to tooth loss and long-term consequences if not properly managed.

According to the World Health Organization, 12-year-old children are considered a key indicator group for monitoring oral health worldwide. Approximately 60–90% of schoolchildren are affected by dental caries globally. In our country, studies have shown significantly higher caries indices compared to developed countries, indicating a serious public health issue.

Dental caries is a multifactorial disease resulting from an imbalance between demineralization and remineralization processes on the tooth surface. Its development is influenced by factors

such as oral hygiene, diet, fluoride exposure, saliva composition, and socioeconomic conditions.

Occlusal surfaces of permanent molars are particularly susceptible to caries due to the presence of pits and fissures, which favor plaque accumulation and limit the effectiveness of fluoride. For this reason, preventive measures such as fissure sealants are strongly recommended by international dental guidelines.

Fissure sealing creates a physical barrier that protects vulnerable tooth surfaces and prevents the initiation and progression of caries. Scientific evidence confirms that this method significantly reduces caries incidence in permanent teeth among children. Therefore, early preventive interventions and continuous monitoring of oral health in 12-year-old children are essential for improving long-term oral health outcomes.

Body of Manuscript

A cross-sectional study was conducted in 2023 among 12-year-old students from primary schools in the Debar region, including both urban and rural areas. Prior approval was obtained from school authorities, along with written informed consent from parents. Only children with good general health and without systemic conditions affecting dental development were included.

Clinical examinations were performed under standard dental conditions using appropriate instruments. The assessment included evaluation of the presence of teeth, caries, restorations, extractions, and fissure sealants on first permanent molars. When necessary, radiographic (orthopantomographic) analysis was used to detect agenesis. The DMFT index was determined using the Klein-Palmer system, while oral hygiene was assessed using the Greene–Vermillion index. Statistical analysis was performed using SPSS 26.0, applying Chi-square and Mann–Whitney tests for group comparisons, and Spearman correlation for associations, with statistical significance set at $p < 0.05$.

The results showed that the majority of 12-year-old children had fissure-sealed first permanent molars, with an average of approximately two sealed teeth per child and no significant differences between genders. Unsealed molars were also frequently observed, again without significant gender differences. A proportion of children presented with unerupted first permanent molars, slightly more common in males, although not statistically significant. Dental caries affecting first permanent molars was present in both genders; however, a significantly higher prevalence was observed among female children ($p < 0.05$). Overall, the findings indicate a considerable presence of both preventive measures and untreated dental conditions, emphasizing the need for continuous monitoring and early preventive strategies to improve oral health outcomes in 12-year-old children.

Among 12-year-old children, dental caries of first permanent molars was present in both genders, with no statistically significant difference between females and males ($p > 0.05$). The average number of carious molars was low, and more than half of the children had no caries (median = 0). Similarly, the number of extracted first permanent molars was very low in both groups, without significant gender differences.

Filled (restored) first permanent molars were observed in a smaller proportion of children, with no statistically significant difference between genders. Overall, the DMFT index values were similar in male and female children, indicating that gender did not have a significant influence on oral health status.

In contrast, place of residence showed a significant impact. Children living in urban areas had a higher prevalence of fissure-sealed first permanent molars compared to those from rural areas ($p < 0.05$). Conversely, unsealed molars were more common among children from rural areas. Dental caries was significantly more prevalent in children from rural areas compared to those from urban areas ($p < 0.001$), with a higher average number of affected teeth. Similarly, filled teeth were more frequently observed in rural children, reflecting a higher burden of disease. The number of extracted teeth remained low and did not differ significantly between urban and rural groups.

The DMFT index was significantly lower in children from urban areas compared to those from rural areas ($p < 0.001$), indicating better oral health status among urban children. Overall, these findings highlight the influence of living environment on oral health, with rural children showing poorer outcomes and a greater need for preventive dental care.

Dental Health of First Permanent Molars – 12-Year-Old Children (Summary)

The study included 236 children aged 12, equally distributed by gender and residence (urban/rural).

Sealants: A total of 482 sealed and 462 unsealed molars were recorded. The most common pattern was 2 sealed and 2 unsealed molars (28.4%).

Caries (tooth decay): Present in 56.4% of children (133) Most commonly 2 carious molars (31.4%) Total: 236 carious teeth

Extractions: Found in 5.1% of children (12) Total: 12 extracted molars

Fillings: Present in 48.7% of children (115) Most commonly 2 filled molars (26.7%) Total: 207 filled teeth

DMF Index (Decayed, Missing, Filled): Mean: 1.95 ± 1.42 Median: 2 Range: 0–4

Urban vs Rural Differences

Sealants: Significantly more common in urban children (91.5%) vs rural (72.0%) ($p = 0.0003$).

Unsealed molars: More frequent in rural children ($p < 0.0001$).

Caries: Higher prevalence in rural children (67.8%) vs urban (44.9%) ($p = 0.0004$)

Mean number higher in rural group ($p = 0.00076$)

Fillings: More frequent in rural children ($p = 0.0002$).

Extractions: No significant difference between groups.

DMF Index: Urban: 1.44 ± 1.4 Rural: 2.47 ± 1.3 Significantly higher in rural children ($p < 0.0001$)

The study included 236 children aged 12, equally distributed by gender and residence (urban/rural).

Dental sealants: Total sealed first permanent molars: 482

Children with sealants: Urban: 91.53% Rural: 72.03%

Most common pattern: 2 sealed and 2 unsealed molars (28.39%)

Children from urban areas more often had all 4 molars sealed (38.98%)

DMFT (KEP) index: Overall mean: 1.95 ± 1.42 Urban: 1.44 ± 1.4 Rural: 2.47 ± 1.3

→ Significantly higher in rural children ($p < 0.0001$)

Caries prevalence (structure of DMFT)

Urban: 54.12% carious teeth Rural: 49.48% carious teeth

Fewer carious teeth in urban children (statistically significant)

Filled teeth: Urban: 41.18% Rural: 47.08%

Extracted teeth: Same in both groups: 5.08%

Key correlation:

Strong negative correlation between number of sealed molars and:
DMFT index Carious, extracted, and filled teeth
→ More sealants = better dental health

Conclusion

Urban children have better oral health, with: Lower DMFT index More sealed molars

Rural children show higher caries risk, likely due to:

Reduced access to dental care

Sealants are highly effective in reducing caries in first permanent molars, especially at this age.

Table Figures and Equations

Table 1. Gender distribution among 12-year-old children

Gender	n (%)
Male	118 (50%)
Female	118 (50%)

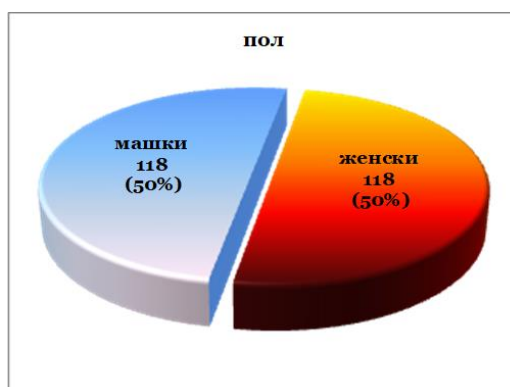


Figure 1. Graphical representation of gender distribution – 12-year-old children

Table 2. Distribution by place of residence among 12-year-old children

Gender	n (%)
Male	118 (50%)
Female	118 (50%)

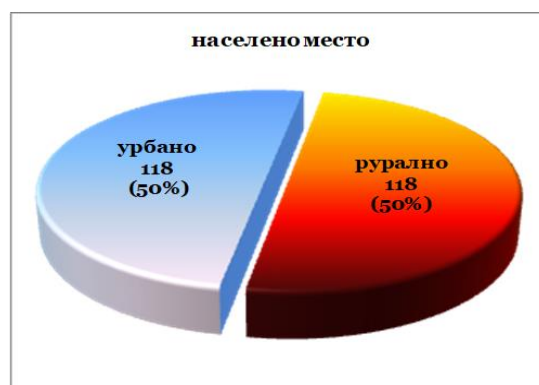


Figure 2. Graphical representation by place of residence distribution – 12-year-old children

Table 3. Distribution of sealed and unsealed first permanent molars among 12-year-old children

Nr. of first permanent molar	Sealed	Unsealed
0	43 (18.22)	60 (25.42)
1	45 (19.07)	21 (8.9)
2	67 (28.39)	67 (28.39)
3	21 (8.9)	45 (19.07)
4	60 (25.42)	43 (18.22)
Total	236	236

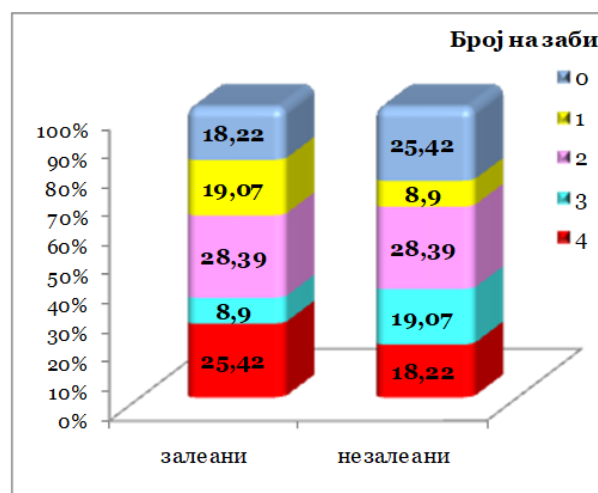


Figure 3. Graphical representation of the distribution of sealed and unsealed first permanent molars – 12-year-old children

Table 4. Distribution of carious, extracted, and filled first permanent molars among 12-year-old children

Nr.of first permanent molar	Carious	Extracted	Filled
0	103 (43.64)	224 (94.92)	121 (51.27)
1	49 (20.76)	6 (2.54)	41 (17.37)
2	74 (31.36)	6 (2.54)	63 (26.69)
3	1 (0.42)	/	4 (1.69)
4	9 (3.81)	/	7 (2.97)
total	236	236	236

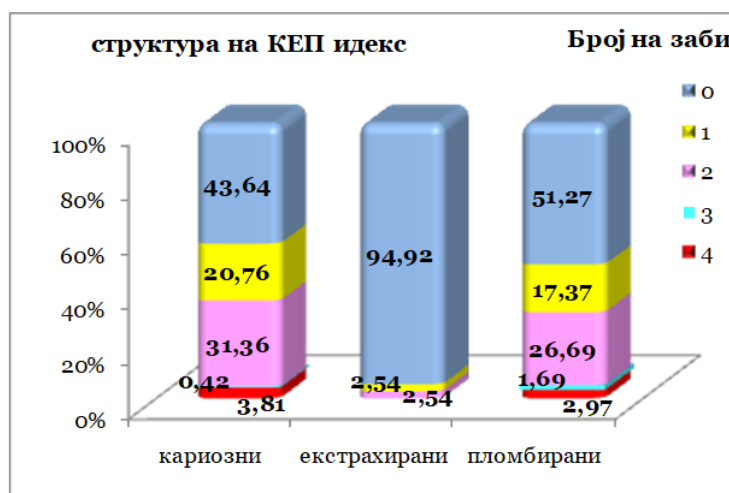


Figure 4. DMFT (KEP) index – 12-year-old children

Table 5. DMFT (KEP) index among 12-year-old children

DMFT (KEP)	Statistic parameters
Mean ± SD	1.95±1.42
Min – Max	0 – 4
Median (IQR)	2 (0-3)

Conclusions

1. At the age of 12, 74.48% of children had sealed first permanent molars, with no significant difference between genders (74.41% girls and 74.55% boys). The average number of sealed first permanent molars was 2 in both sexes.
2. Place of residence had a significant impact on dental health in 12-year-old children. Children from urban areas had significantly lower DMFT (KEP) index values compared to children from rural areas.
3. The mean DMFT index was 1.44 ± 1.4 in urban children and 2.47 ± 1.3 in rural children. Median values were 2 for urban and above 3 for rural children, confirming worse oral health in rural areas.
4. Carious first permanent molars were significantly more frequent in rural children (67.8%) compared to urban children (44.92%), indicating a clear statistical difference based on place of residence.
5. Urban children had a higher proportion of filled (restored) first permanent molars compared to rural children, although this difference was not statistically significant.
6. The distribution of extracted first permanent molars was similar in both groups. Urban children most often had one extracted tooth, while rural children most often had two, with no statistically significant difference.
7. There was a statistically significant negative correlation between the number of sealed first permanent molars and DMFT index components (caries, extracted, filled teeth). An increase in sealed teeth was associated with a decrease in DMFT values.
8. Overall, urban 12-year-old children demonstrated better oral health status, higher prevalence of sealants, and lower DMFT values compared to rural children, highlighting the importance of preventive dental care access.

Nomenclature

DMFT (KEP) – Decayed, Missing, and Filled Teeth index (carious, extracted, and filled teeth index) used to assess dental caries experience in permanent dentition.

D (C) – Decayed teeth (carious permanent teeth).

M (E) – Missing/Extracted teeth due to caries or other causes.

F (P) – Filled/Restored teeth.

DMFT Index (KEP Index) – The sum of D + M + F components, representing the overall caries experience in permanent teeth.

First Permanent Molars (FPMs) – The first permanent teeth to erupt in the oral cavity, highly susceptible to dental caries.

Fissure Sealants – Preventive resin-based materials applied to pits and fissures of teeth to prevent dental caries development.

Urban Area – A residential area with higher population density and better access to dental health services.

Rural Area – A non-urban residential area with limited access to dental care and preventive services.

Prevalence – The proportion of individuals affected by a specific condition at a given time.

Incidence – The number of new cases of a disease occurring in a defined period.

Mean ($\pm$ SD) – Arithmetic average value with standard deviation.

Median – The middle value in a data set arranged in ascending or descending order.

p-value – Statistical indicator of significance; values below 0.05 indicate statistical significance.

Spearman's Correlation Coefficient (R) – A non-parametric measure of the strength and direction of association between two variables.

References

- [1] Wilson et al. 2018. Dental caries experience among 12-year-old schoolchildren in rural and urban areas. *Journal of Dental Research and Public Health*.
- [2] Martinez A., Lopez F., Garcia M. 2019. Oral health disparities and DMFT index in adolescents from urban and rural populations. *Community Dentistry and Oral Epidemiology*.
- [3] Kim S.H., Lee J.Y., Park H.S. 2020. Dental caries prevalence and fissure sealant effectiveness in Korean schoolchildren aged 12 years. *International Journal of Paediatric Dentistry*.
- [4] Smith J., Brown P., Taylor R. 2017. Oral health status and DMFT index differences in rural schoolchildren. *European Archives of Paediatric Dentistry*.
- [5] Garcia M., Rodriguez L., Perez J. 2016. Socioeconomic factors influencing dental caries in Spanish adolescents. *Journal of Public Health Dentistry*.
- [6] Lee J.H., Kim Y.K., Choi S. 2021. Access to dental care and its impact on DMFT index in urban and rural adolescents. *BMC Oral Health*.
- [7] Brown P., Wilson T., Green D. 2015. Dental caries patterns and preventive strategies in UK schoolchildren. *British Dental Journal*.
- [8] Lopez F., Martinez A., Sanchez R. 2018. Influence of residence area on oral health status in children. *Community Dental Health*.
- [9] Patel R., Shah M., Kumar N. 2019. Prevalence of dental caries and fissure sealants in Indian schoolchildren. *Journal of Indian Society of Pedodontics*.
- [10] Wang Y., Zhang L., Chen X. 2020. Distribution of DMFT components in Chinese children from rural and urban areas. *Chinese Journal of Dental Research*.
- [11] Thompson R., Evans J., Miller K. 2017. Association between fissure sealants and reduction of dental caries in permanent molars. *Caries Research*.

- [12] Martinez A., Gomez R., Lopez F. 2016. Preventive dentistry and DMFT variations among adolescents. *International Journal of Dental Hygiene*.
- [13] Smith J., Taylor R., Brown P. 2014. Impact of rural residence on oral health status in school-aged children. *Public Health Reports*.
- [14] Kim S.H., Park H.S., Lee J.Y. 2019. Socioeconomic inequalities and dental caries in permanent molars. *Journal of Dental Sciences*.
- [15] Lopez F., Garcia M., Martinez A. 2020. Preventive dental care and DMFT index in adolescent populations. *European Journal of Oral Sciences*.
- [16] Garcia M., Perez J., Rodriguez L. 2017. Urban–rural differences in oral health and dental caries prevalence. *Community Dentistry and Oral Epidemiology*.
- [17] Crown P., Green D., Wilson T. 2018. DMFT index trends in 12-year-old children in developed countries. *International Dental Journal*.
- [18] Lee J.H., Kim Y.K., Park S. 2020. Effectiveness of fissure sealants in preventing occlusal caries in permanent molars. *Pediatric Dentistry Journal*.
- [19] Wilson T., Smith J., Brown P. 2016. Gender differences in dental caries prevalence among school-aged children. *Journal of Clinical Pediatric Dentistry*.