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Research Article

Correlations between the dental status of permanent first molar and the hygiene status in children of mixed dentition

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Abstract. Objective: Considering the special importance of the permanent first molar (PFM) and its influence on the dento-maxilar apparatus, the objective of this study was to evaluate the odontal status, namely the carious pathology of the six-year-old molar during the mixed dentition, comparatively, between two areas in Western Romania. We also considered it of the utmost importance to evaluate whether the odontal status of the PFM is determined by the state of dental hygiene in order to establish the necessary prophylactic and therapeutic measures. Material and methods: The study is a transversely descriptive one and it was conducted between 2017-2018. The batch consisted of 140 children, ages 6 to 12, coming from both the rural and urban environments. To identify the carious lesions to the PFM, the objective clinical examination was performed by visual inspection and probe exploration, as well as a radiological examination where necessary. The examination also included the assessment of the dental hygiene status by calculating the OHIS index. Results: The study batch (n = 140) consisted of 74 girls and 66 boys, was divided into two age categories, namely 6-9-year-old, which included 76 children and the 9-12-year-old group of 64 children. From the perspective of values and distribution of hygiene index (OHIS), within the studied batch it was predominantly measured an unsatisfactory hygiene, only 39 children being measured in the good and very good hygiene category. Regarding the distribution of the batch by the presence of odontal lesions at the PFM, we notice that 91 of the subjects, representing 65% of the total batch, were diagnosed with lesions at the six-year-old molar. Conclusions: The relatively low percentage of 32.26% of children who received treatment at the six-year-old molars reflects a rather low importance given to the PFM. In rural, isolated areas with limited access to both pediatric dental services and dental health programs, the values reflecting children's hygiene status and treatment for six-year-old molars are much lower than those measured to children from larger city, where prevention and raising awareness programs are carried out starting with kindergarten period.

Key Words: permanent first molar, odontal status, MIH

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Introduction

Permanent first molar is a tooth of particular importance in the evolution of the whole dento-maxillary apparatus, contributing by its occlusal morphology to the improvement of the masticatory efficiency as well as to the elevation and stabilization of the occlusion.

Its role is a major one in establishing neutral occlusal relationships between the anterior determinant in incisor and canine eruption and the posterior determinant, represented by the temporomandibular joint. (Zarnea 1993)

Considered by Kunzel "the problem child of infantile dentistry", the six-year-old molar is the caries most affected tooth out of the permanent teeth, which is explained by its early presence in the arcade at an age when the glucose enrich feeding predominates and the correct dental hygiene skills are not are very well understood. (Cocarla 2000).

McDonald (1992) pointed out a high frequency of occlusal caries on the PFM for all age groups, concluding that occlusal surface of first permanent molar remains the most common site for caries within a short period following its eruption. Hescot and Roland (1993) reported that by the age of six 4.9% of the children already have caries on first permanent molar.

Epidemiological studies conducted in Romania show higher results. Grivu et al (1982) reported high caries prevalence in first permanent molars for Timisoara, namely 33.33% at the age of 7, 72.52% at the age of 8 and 91.66% at the age of 9.

Other studies conducted in South-Eastern Romania revealed a caries experience (measured by DMFT index) of 1.09% and 0.73% for 12 respectively 6-year-old patients. (Nuca et al 2007) In Cluj –Napoca, for same age category, it has been reported a much higher DMFT of 2.30 (1993) respectively 2,95 (Roman et al 2009). Studies in the Western area of Romania regarding the prevalence and types of odontal lesions at the level of the first permanent molar, are very few. Also results in the correlation between the occurrence of these lesions and the state of dental hygiene in children in this region of the country are missing.

Considering the special importance of the PFM and its influence on the dento-maxilar apparatus, the objective of this study was to evaluate the odontal status, i.e. the carious pathology of the six-year-old molar during the mixed dentition, comparatively,

between two areas in Western Romania. We also considered it of the utmost importance to evaluate whether the odontal status of the PFM is determined by the state of dental hygiene in order to establish the necessary prophylactic and therapeutic measures.

Material and method

The study is a transversely descriptive one and it was conducted between 2017-2018.

The batch consisted of 140 children, ages 6 to 12, coming from both the rural and urban environments. For comparison, two different areas in North-Western Romania were selected from two neighboring counties, namely children from rural area, Rosia Montana commune, Alba County, and those coming from the urban area, Oradea city, Bihor County. For the homogeneity of the batch there were selected an equal number of children, respectively 70, from both localities.

The batch inclusion criteria consisted of:

-children having mixed dentition;

-children presenting PFMs at the dental arcade.

The batch exclusion criteria consisted of:

-children of ages out of the 6-12-year-old age interval;

-children not willing to cooperate during the study;

-children for whom the study participation free consent acceptance couldn't be obtained in due time.

The clinical trial of the patients' part of the current study group was done with the written consent of the parents or legal guardian, according to the World Medical Association (WMA) Declaration of Helsinki – Ethical Principles for Medical Research Involving Human Subjects approved by the Ethics Committee of the University of Oradea, Romania.

In the case of children from rural area, the examination was carried out in a classroom of a school in Rosia Montana, Alba County; in the case of urban children, the clinical examination took place in the Clinic of Dental Medicine, Oradea city, in compliance with WHO rules (WHO publication 2013)

To identify the carious lesions to the PFM, the objective clinical examination was performed by visual inspection and probe exploration, as well as a radiological examination where necessary. The examination also included the assessment of the dental hygiene status by calculating the OHIS index.

There were selected six facets corresponding to 6 teeth; 2 teeth from the front region and the other 4 teeth from the rear region. In the front region, there were selected teeth 1.1 and 3.1, and in their absence the counterpart tooth was counted, on the other side of the median line. In the posterior region, 6-year-old molars were selected, respectively 1.6, 2.6, 3.6 and 4.6; in the absence of these, the following erupted tooth was counted, respectively 1.7; and in the case of children under 12 years of age. where there was no 1.7 in the dental formula, the last premolar present in the arcade was considered. For the front teeth previously described, the vestibular surfaces were analyzed; in the case of the rear superior ones, the vestibular surfaces were also analyzed, and in the case of the rear lower teeth the lingual surfaces were considered. With the help of a mouthpiece, the surfaces chosen for the presence of soft deposits were investigated, resulting in the DI-S index (Debrides) and the presence of tartar, resulting in the CI-S index (Calculus). Values of DI-S and CI-S indices may vary between 0 and 3 and their summation gives the OHI-S index, the value of which can be between 0 and 6. (http://www.mah.se/CAPP/Methods-and-Indices)

The OHIS was divided according to its values in several categories such as: good hygiene = OHIS index 0-2, unsatisfactory hygiene = OHIS index between 2-3, poor hygiene = OHIS index between 3 - 6.

The distribution of the study group was monitored according to the environmental factors, gender, age groups, hygiene status, as well as the determination of the frequency and types of odontal lesions of the PFM. The data were assessed comparatively, based on the features of both environments, in order to highlight the possible differences. Data analysis and interpretation of the results were performed through statistical analysis using the MedCalc medical statistics program, version 9.4.2.0. The results of the statistical tests will be represented by the probability of the null hypothesis revealed by the value of the coefficient p. Its value below 0.05 shows a statistically significant difference between the studied parameters.

The categorical variables with values above 20 were analyzed with the chi-square test.

Results

The study batch (n = 140) consisted of 74 girls and 66 boys, was divided into two age categories, namely 6-9-year-old, which included 76 children and the 9-12-year-old group of 64 children (see table 1).

There is a homogeneous distribution of the study group according to the demographic factors.

From the perspective of values and distribution of hygiene index (OHIS), within the studied batch it was predominantly measured an unsatisfactory hygiene, only 39 children being measured in the good and very good hygiene category. If we analyze the hygienic condition according by the environment of origin, we noticed that, with respect to the Rosia Montana children, only 14.29% have a good hygiene status, 60 children having poor hygiene status compared to the Oradea group where 41.43% of subjects are in good hygiene category.

The OHIS index shows statistically significant differences between the children of Rosia Montana and the children from Oradea (p=0.001) (see table 2).

Regarding the distribution of the batch by the presence of odontal lesions at the PFM, we notice that 91 of the subjects,

Table 1: Distribution of batches by Age and Gender

	Age category			Gender category		
	6-9 yo	9-12 yo	P	Boys	Girls	p
Rosia Montana	55.71% (39)	44.29% (31)	0.8	46% (32)	54% (38)	0.8
Oradea	52.86% (37)	47.14% (33)		49% (34)	51% (36)	

Table 2: Distribution of batches by Oral Hygiene Index values

	OHIS interpretation			
	0<=OHIS<2	2<=OHIS<3	3<=OHIS<6	P
Rosia Montana	14.29% (10)	55.71% (39)	30.00% (21)	p = 0.001
Oradea	41.43% (29)	42.86% (30)	15.71% (11)	

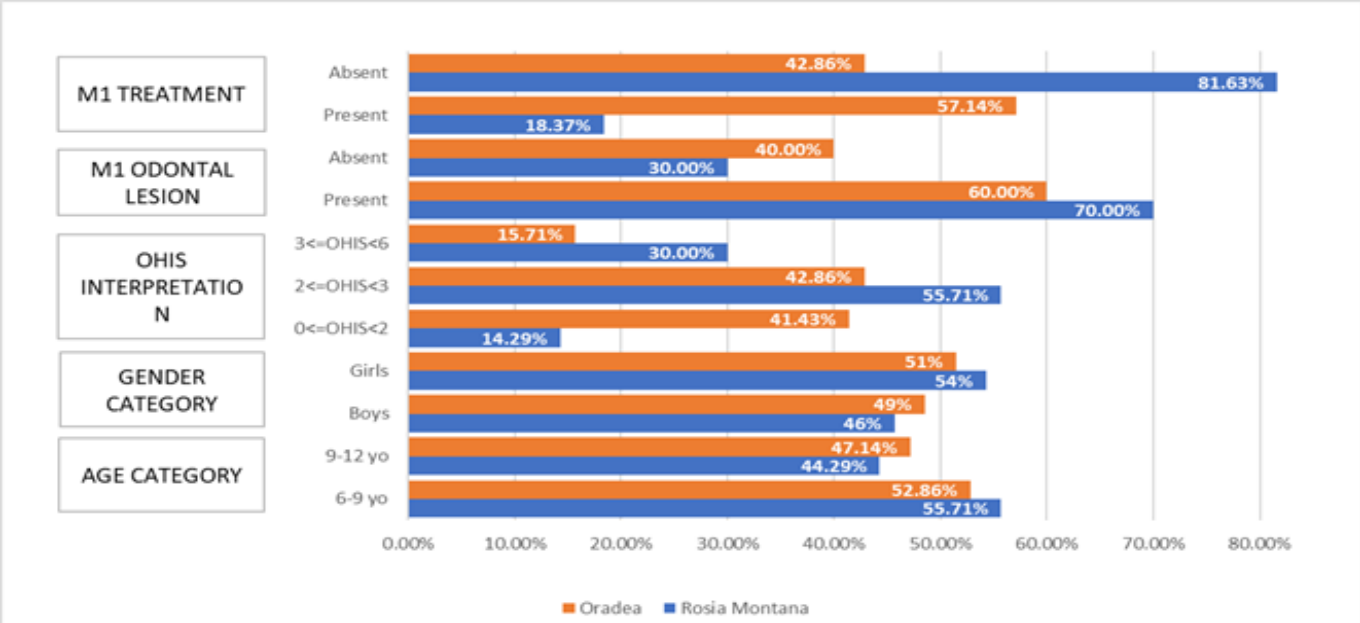

Fig 1: Comparison of batch distribution by age, gender, OHIS index and PFM lesions in Rosia Montana and Oradea batches

Table 3: Distribution of batches by 1st molar lesions approach

	M1 odontal lesion			M1 treatment		
	Present	Absent	P	Present	Absent	p
Rosia Montana	70.00% (49)	30.00% (21)	0.2	18.37% (9)	81.63% (40)	0.001
Oradea	60.00% (42)	40.00% (28)		57.14% (24)	42.86% (18)	

Table 4: Correlations between the hygiene status and 1st molar lesions

	Rosia Montana				Oradea			
	N	M1 freq.	% N	p	N	M1 freq.	% N	p
Good oral hygiene	10	3	35.29%	0.3	29	9	23.81%	0.07
Moderate oral hygiene	39	30	84.38%		30	23	65.71%	
Poor oral hygiene	21	16	76.19%		11	11	100.00%	

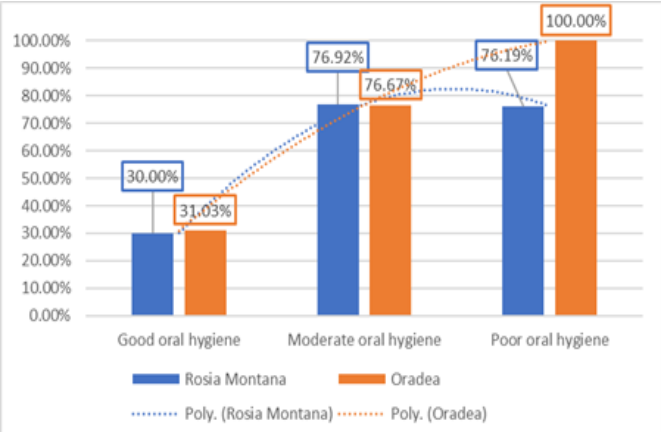

Fig 2: Comparison of Rosia Montana and Oradea batches by correlations of hygiene status and 1st molar lesions and associated trendlines

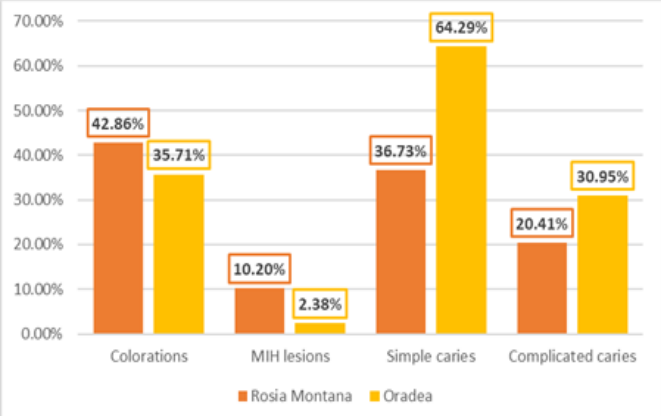

Fig 3: Comparison of Rosia Montana and Oradea batches by various types of 1st molar lesions

representing 65% of the total batch, were diagnosed with lesions at the six-year-old molar.

Analyzing this distribution, separately on the localities, we observed that odontal lesions in children from Rosia Montana batch are more present at the first molar level, than in the children from Oradea.

Of the total number of children in the study group with odontal lesions, 33 children, representing 32.26%, have M1 treatment, of which 9 children are from Rosia Montana and 24 from Oradea (see figure 1).

The presence of treatment at the level of the first permanent molar is statistically significantly lower in children from Rosia Montana in Oradea, $p<0.001$ (see table 3).

Analyzing the correlation between the presence of lesions at the level of the first permanent molar and the hygiene status of the children included in the study, we noticed that most of the odontal injuries are found in the category of unsatisfactory hygiene, namely 84, 38% of Rosia Montana children and 65.71% of the children in Oradea, who have unsatisfactory state of hygiene were diagnosed with odontal lesions at M1 level (see table 4).

The good oral hygiene category was the least represented in terms of odontal lesions at the M1 level.

Regarding the unsatisfactory hygienic category, we noticed that in the case of the RM subjects included in this category, 76.19% show M1 odontal injuries. In the same category of hygiene, all children in Oradea with poor hygiene show M1 lesions (see figure 2).
From the point of view of the types of odontal lesions, analyzing the two subgroups, we can see that MIH prevails in the Rosia Montana children (10.20% of total lesions) and the simple caries prevail in the children from Oradea (64.29% of total lesions). The other categories, namely the coloration and complicated caries, are distributed roughly the same. (see figure 3)

Discussion

The present study investigated dental health status of First permanent molar among school children population from Western part of Romania, in conjuction with dental hygiene status. We addressed exclusively to the PFM because it occupied a strategic role in the whole dento-maxillary apparatus by its early eruption, establishing both the occlusion key and the second elevation of the occlusion and contributing to the stabilization of occlusal relationships in the vertical plane.
The relief of the six-year-old molar is very accentuated, and it shows tall cusps, deep and retentive fissures and cracks. (Firu 1983) Due to this aspect and the fact that it is the first permanent tooth that erupts, it is the most vulnerable to caries.
In this study, 65% of the tooth subjects were diagnosed with lesions at the six-year-old molar, with predominantly children in the Rosia Montana. Our results are similar to those obtained by other authors, who reported a M1 61.60% caries in 6-year-old children in Mexico. (Casanova et al 2005)
Researches done in Saudi Arabia and Japan on dental health status at M1 revealed similar results of 67% M1 caries prevalence in 9-year-old children and 50% prevalence of M1 caries amongst 11-12-year-old children. (Khalid et al 2012; Hata et al 1990)
In the Republic of Moldova, an epidemiological study of odontal pathology in children aged 6 years, reports a much lower value of caries' frequency to M1 of 29.61%. (Prelipceanu et al 2010)
The studies conducted in our country regarding the pathology of the six-year-old molar show far lower values of the prevalence of caries, such as 41.18% in Pitesti, 33% in Cluj, 22.01 in Targu Mures. (Chirca et al 2015; Moga et al 2010; Beresescu et al 2012)
Another study of the prevalence of caries on an extended lot of the Rosia Montana mining area shows an average DMFT of 5.1. (Todor et al 2014)
The fact that in our study, odontal injuries are more common in children in Rosia Montana (70%), can be explained by the fact that these children come from a rural area isolated from the point of view of accessibility to dental medical services and programs for the prevention and prevention of dental caries. Luca et al. (1998) report a 77.67% frequency of occlusal caries on the first permanent molar in children aged 6 to 9 years old living in a rural area, in Eastern part of Romania.
The low addressability to the dental services of children in Rosia Montana is also demonstrated by the presence of these treatments at M1, consequently only 9 children representing 18.37% benefited from a six-year molar treatment compared to the subjects of Oradea who received treatment represented 57.14% of total subgroup.
Analyzing the correlation between the presence of lesions at the level of the first permanent molar and the hygiene status of the children included in the study, we observed that in the category of unsatisfactory hygiene where, despite the fact we have more children of this category in the Rosia Montana subgroup than in Oradea, they suffered odontal lesions in 76,19 % of cases compared with Oradea subgroup, where we measured 100% M1 odontal lesions.
Concerning the types of odontal injuries diagnosed in the children in the study group, 10,20% MIH was measured in the children from Rosia Montana compared to those in Oradea who showed MIH in 2,38% of the cases. The percentage of MIH in Rosia Monatana is very high compared to the results of a study in the South-Eastern Romania resulting in MIH values of 5.23% in Patarlagele, 3.08% in Fetesti and 0.71% in Slatina. (Stanciu et al 2011)
For children in Oradea, the percentage of simple cares at M1, of 64.29%, is double that the corresponding one measured in children from Rosia Montana, namely 36.73%.

Conclusions

The examination of the status of PFM denotes the high prevalence of pathological lesions, being measured to the majority of the subjects included in the studied group.
The relatively low percentage children who received treatment at the six year old molars reflects a rather low importance given to the PFM.
In rural, isolated areas, with limited access to both pediatric dental services and dental health programs, the values reflecting children's hygiene status and treatment for six-year-old molars are much lower than those from a children from large city, where programs for prevention and awareness of dental health are carried out from kindergarten.
Totally inconsistent with the above, the simple and complicated caries of PFM are less common among children in Rosia Montana, but MIH has a high frequency in these children.
The knowledge of the odontal status of M1 allows the planning, ranking and determination of the priorities of the dental assistance, in order to prevent the damage of FPMs or the diagnosis in the reversible, early stages.

Abbreviations:
-DMFT – decay missing filling tooth
-PFM – permanent first molar
-MIH – hypomineralization
-M1 – permanent first molar

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