

Prevalence of dento-maxillary anomalies in correlation with demographic factors in a population of children from Rosia Montana mining area

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Abstract. Objectives: The current article aims to measure the prevalence of dento-maxillary anomalies within a population of children (with ages varying from 6 to 14 years old) from mining area of Rosia Montana as well as to assess the possible correlation between demographic factors (age, gender, ethnicity) and the presence of anomalies. Material and method: The study was conducted on a group of 291 children from the area with ages ranging from 7 to 14 years old (representing 33.92% of the total number of possible subjects from Rosia Montana mining area), during the phase of mixed dentition and the early stages of permanent dentition. The children were selected from schools from the mining area, both from rural and urban environments. They were examined into the medical facilities available in the area. All the personal data were collected based on the written approval of parents and will stay strictly confidential by the Romanian law and medical deontological practices. Results: About 92% of the subjects presented dento-maxillary anomalies. The results were similar if considering the gender distribution, whilst considering the age distribution of subjects the presence of anomalies varied from 84% to 100%; for ethnicity distribution of anomalies, the majority or Romanian subjects presented 94% anomalies, while Romany subjects presented 83% anomalies. Considering the 3 types of Angle malocclusions the highest percentage was for Angle Class I, respectively 61%, followed by Angle Class II/1 Angle (18%) and Angle Class II/2 (15%), while the smallest value was for Angle Class III (7%). The two categories of Angle Class II represented 33%, which was approximately half of the value for Angle Class I. Conclusion: The prevalence of dento-maxillary anomalies within the studied batch presented an average value of 92% which was significant higher than the values available within the specialized literature from Romania (values ranging from approx. 45% to 75%). This could be subject to separate in-deep studies to understand the causal.

Key Words: dento-maxillary, anomaly, Angle class, Rosia Montana, mining.

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Introduction

The pathogenesis of the dento-maxillary apparatus includes dento-maxillary anomalies as a significant anomaly. These are considered deviations to the normal evolution of the dento-maxillary apparatus, being conditioned by various general and particular factors presenting a multifarious etiopathogenetic mechanism (Schapira 1973).

Dento-maxillary anomalies could generate periodontal diseases as well as the mastication, phonation and physiognomic functions (Mtaya et al 2009). Due to the widespread amongst the population and to the fact that could pose a significant social integration obstacle, the dento-maxillary anomalies have become public health issue which require the determination of the mass expansion level (the prevalence) (Kenealy et al 1989; Dorobat et al 2011).

It has been determined a tendency of increasing prevalence of dento-maxillary anomalies (Dorobat et al 2011).

The studies conducted in Europe regarding dento-maxillary anomalies present frequencies ranging from 37 to 47% such as:

following Tiominen et al 47% in Finland; following Korkhaus it is 43% in Germany; following Burgersdijk et al. it is 45% in Denmark; following Espeland it is 37% in Norway (Emrich et al 1965; Trifan 2014). In China a study found 93% of children with malocclusions (Lew et al 1993). In USA for the age group of 8 to 11 years old the prevalence of dento-maxillary anomalies is 20-55% depending on the type of anomaly (Proffit 2012). In Russia it was found a prevalence of dento-maxillary anomalies of 24% in case of temporary dentition, 49% in case of mixed dentition and 35% for permanent dentition. For Republic of Moldova it was established a prevalence of 25.2% of dento-maxillary anomalies for 16 to 17 years old adolescents (Trifan 2014). In our country the studies conducted on different children from different areas present an increasing tendency in dento-maxillary prevalence such as: following Schapira it is 52%; following Cocârță and collaborators it is 50-60%; following Firu it is 75%; following Câmpeanu M. it is 46.7%; following Boboc it is 40%; following Scânteii, Dorobăț and collaborators it is 73.6-76.9% (Boboc 1971, Dorobat et al 2011; Trifan 2014).

Still there are few if any exhaustive studies with a significant number of subjects from a geographical area of our country. Conducting such a study could be of high importance from theoretical and practical stand point as it could be fundamental for assessing the dental health status of a population as well as the possible evolutions (Dorobat *et al* 2011).

The aim of this study was to identify the prevalence of dento-maxillary anomalies and to establish a correlation between dento-maxillary anomalies and demographic factors.

Material and method

It was established as study area the mining area of Roşia Montană (Roşia Montană village, Bucium village and the town of Abrud) situated in Central Western Romania, Alba County, with a population of 9640 individuals (as of population census conducted in 2011 (Directia regionala de statistica Alba; <http://www.re-censamantromania.ro/rezultate-2/>), out of which 858 individuals were individuals with ages ranging from 7 to 14 years old. The selection of this specific area was done considering the existing medical studies on the population from this area which presented significant prevalence of various diseases. Thus ischemic heart and high blood pressure presented a significant increase compared with data available for Alba County and Romania; furthermore cerebrovascular diseases and chronic lung diseases presented prevalence values two times or even three times higher compared with same data (http://en.rmgc.ro/Content/uploads/uploads_eia_en/cap%204.8%20-%20baseline%20report/Health%20Baseline%20Report.pdf).

Yet no specific references could be found in relation with dental health in the area therefore the current study looked at a specific population from the area (children with ages ranging from 7 to 14 years old) trying to establish whether the tendency of increased values of prevalence could be found for any aspects of dental health.

The study is a descriptive, cross sectional one and it was conducted on a group of 291 children from the area with ages ranging from 7 to 14 years old, during the phase of mixed dentition and the early stages of permanent dentition. The children were selected from schools from the mining area, both from rural and urban environments. They were examined into the medical facilities available in the area. The doctors from the area contributed to the success of the study by providing medical information on the subjects. The medical examination was conducted with the written formal approval of the parents or legal custodian of the children which were instructed regarding the scientific purpose of the data collection usage.

The approach of the human sample was done aiming two purposes: a medical purpose and statistical purpose. The medical examination comprised of: the anamnesis results, the intra-extra oral examination, the complementary examination from the orthodontic perspective aiming the clinical diagnosis establishment. The result of these examinations was to establish the existence of DM anomalies. The following clinical signs were taken into consideration:

a). Occlusion clinical signs (inter-arch) (Graber *et al* 2011):

- at the level of lateral group:

- at sagittal plan: presence or absence of neutral report at the 6 years old molars, respectively the presence of mesialisation

or distalization in order to establish the Angle class diagnosis (I, II or III);

- at transversal plan: narrowing of maxillary arch, which is an indicator of the posterior crossbite; narrowing of mandibular arch, which is an indicator of the scissors bite;

- at vertical plan: space for vertical in- occlusion, which is an indicator for posterior open bite; molar egression – which is an indicator for collapsed bite;

- at the level of incisive changes:

- at sagittal plan: positive overjet – indicator for molar class II; negative overjet – indicator for molar class III;

- at transversal plan: – deviation of median line, as indicator for lateral deviation;

- at vertical plan: overcoat exceeding 1/3 – as indicator for deep bite; vertical space for in-occlusion – as indicator for anterior open bite.

b) Inter-arch clinical signs (Graber *et al* 2011):

- anterior crowding (malposition of incisive/s): translation, egression, rotation – as indicators for dento-maxillary crowding disharmony;

- anterior spacing: diastema, diaeresis – indicators for dento-maxillary spacing disharmony.

The studied batch was divided considering the age, gender, and ethnicity (majority or Romanians versus Romany). The clinical and statistical studies were done considering variables such as clinical signs, as well as others correlated with clinical diagnosis, applied to resulting data base. The assessment of data and the interpretation of results were done using statistical analyses. The assessment of age normal distribution was done using Kolmogorov Smirnov test. The comparison of gender distribution within the batch was completed using Chi square test, as the variables were considered definite variables. The existence of definite ethnicity variables distribution within the batch determined the use of Chi square test in order to assess these data.

Results

87% of the subjects presented mixed dentition (coexistence of temporary and permanent dentition), which is considered optimal for diagnosis and treatment of dento-maxillary anomalies.

The age group of 6-9 years old consisted of 114 subjects, respectively 39.2% from the whole batch; the age group of 9-12 years old consisted of 139 subjects, respectively 47.8% from the whole batch; the age group over 12 years old consisted of 37 subjects, respectively 12.7% of the batch (see table 1). By applying Chi square test resulted into 58.47 and $p < 0.001$.

By applying Kolmogorov Smirnov test, the age distribution of subjects presented normal distribution.

By applying Chi square test to gender distribution (see table 2) turned the value $p = 0.15$, which was an indicator of the lack of significance statistical variances between the two gender batches.

By applying Chi square test to ethnical distribution (see table 3), it turned up the value of $p < 0.001$ which is significant statistical variance considering the ethnicity distribution.

By applying Chi square test to anomalies distribution (see table 4) resulted into significant variance regarding the anomalies ($p < 0.001$).

By considering the age categories distribution (see table 5) it was observed a maximum percentage of anomaly presence (100%) at the age category of 7 years old, which was followed

by a progressive decrease of anomaly presence at the consequent ages (9 years old - 84%) and then a progressive increase after 10 years old and above (13 years old – 100%).

Table 1. Age distribution

Age (years)	No. of subjects	% of Total subjects
7	18	6.2%
8	39	13.4%
9	57	19.6%
10	69	23.7%
11	37	12.7%
12	33	11.3%
13	14	4.8%
14	23	7.9%
Total	291	

Table 2. Gender distribution

Gender	No. of subjects	% of Total subjects
Male	158	54.3%
Female	133	45.7%

Table 3. Ethnical distribution

Ethnicity	No. of subjects	% of Total subjects
Majority / Romanians	237	81%
Romany	54	19%

Table 4. Anomalies distribution

Anomaly	No. of subjects	% of Total subjects
Presence of anomaly	267	92%
Absence of anomaly	24	8%
Total	291	

Table 5. Anomalies distribution by age categories

Age	No. of subjects	% of dento-maxillary anomalies versus total no. of subjects	% of total population	% of total age category
7	18	7%	6%	100%
8	36	13%	12%	92%
9	48	18%	16%	84%
10	62	23%	21%	90%
11	35	13%	12%	95%
12	32	12%	11%	97%
13	14	5%	5%	100%
14	22	8%	8%	96%

By considering dento-maxillary anomalies by gender (see table 6) it was observed that male subjects represented 54% of the subjects, whilst female subjects which represented 46%; the anomalies occurrence it was equal, respectively 92% for each gender category.

Table 6. Anomalies distribution by gender

Age	No. of subjects	% of dento-maxillary anomalies versus total no. of subjects	% of total population	% of total gender category
Male	145	54%	50%	92%
Female	123	46%	42%	92%

By considering the ethnical distribution (see table 7), it was seen that Romany represented 17% of the batch, while majority represented 83%. When assessing the anomaly distribution by ethnicity, it was seen a different distribution, respectively majority/Romanians - 94% while Romany – 83%.

Table 7. Anomalies distribution by ethnicity

Ethnicity	No. of subjects	% of dento-maxillary anomalies versus total no. of subjects	% of total population	% of total category
Majority/Romanian	223	83%	77%	94%
Romany	45	17%	15%	83%

Table 8: Anomalies distribution by Angle class diagnosis:

Angle Class	Cl. I	Cl. II/1	Cl. II/2	Cl. III
No. of subjects w/h anomaly	164	47	39	18
% of the total anomaly subjects	61%	18%	15%	7%

Based on table 9, it was seen that the correlation of Angle Class I with crowding dento-maxillary disharmony was of 54 %, followed by the deep bite (20%) and open bite (13%). Angle Class II/1 was correlated with crowding bi-maxillary disharmony (21%), with deep bite (28%) and open bite (9%). Angle Class II/2 Angle was correlated with deep bite (90%), with crowding dento-maxillary disharmony (33%) and reverse bite (10%). Angle Class III it was associated with anterior cross bite (56%), posterior cross bite (28%), crowding bi-maxillary disharmony (17%) and reverse bite (11%).

Discussions

The batch represented 34% of the total population of respective age category from the studied area, which was of high significance from statistical perspective. The gender distribution within the batch was similar with the county gender distribution as described within the 2011 census public results (mail

Table no. 9: Correlation between Angle Class diagnosis and the other types of dento-maxillary anomalies

Angle	Occlusion						Crowding dento-maxillary disharmony			Spacing dento-maxillary disharmony	
	Class	Frontal open bite	Lateral open bite	Deep bite	Anterior cross bite	Posterior cross bite	Reverse bite	Sup	Inf		Bimax
Cl. I		21	0	33	0	13	21	11	12	89	7
164		13%	0%	20%	0%	8%	13%	7%	7%	54%	4%
Cl. II/1		4	0	13	0	0	0	1	0	10	0
47		9%	0%	28%	0%	0%	0%	2%	0%	21%	0%
Cl. II/2		0	1	35	0	1	4	3	1	13	0
39		0%	3%	90%	0%	3%	10%	8%	3%	33%	0%
Cl. III		1	0	0	10	5	2	0	0	3	0
18		6%	0%	0%	56%	28%	11%	0%	0%	17%	0%

population exceeding female population) (<http://www.recensamantromania.ro/rezultate-2/>). Still, as shown by the results, the gender was not of significant statistical variation. From ethnicity perspective, the majority/Romanian population exceeded the Romany population by 5 times; on the other hand the Romany presence within the batch was 5 time higher than the general Romany presence within the total area population (as per the above mention census); this was mainly because of the significant Romany population living in Rosia Montana.

Data resulted from similar researches aiming to establish the prevalence of dento-maxillary anomalies conducted in Europe underlined values ranging from 37% (Norway) to 47% (Finland). In USA, according to NHANES III the prevalence of dento-maxillary anomalies during mixed dentition period ranged from 20% to 55% (depending on anomaly type) (Proffit 2012)8. Data available regarding the prevalence of malocclusions in Romania presented values ranging from 41.99% (Schapira) to 75% (Firu and Rusu) (Schapira 1973; Dorobat et al 2011).

Comparing data from current study with available data from various sources resulted into a significant variance (92% the average occurrence within the batch). This fact could be explained by various factors, including but not being limited to social factors, poor living standards, poor access to dental services, lack of dental care and dental prevention specific education or environmental factors.

By ethnicity distribution of dento-maxillary anomalies it was observed that the Romany population presented 83% anomalies within the Romany batch population whilst the majority/Romanian population presented 94% anomalies. This fact could become a study objective itself in order to understand weather the variance between the two ethnicities is just a matter of the batch dimension or could have different causes such as socio-economics (difficult to sustain as the living standards and education of Romany population is generally lower than of the majority and this should affect as well the dental condition) or genetics. It was observed that crowding was present at all types of Angle classes. Crowding is an indicator of the discrepancies between the arch dimension and teeth dimension. This fact suggested that the cause of dento-maxillary disharmonies could be independent of the type of Angle class.

It was observed also the correlation of Angle Class II with modification of occlusion at vertical level; this hypothesis

was supported by various authors (Graber et al 2011; Cabrera et al 2013; Grippaudo et al 2013). The association of maxillary narrowing at transversal level, which was an indicator of Angle Class II, with the increasing of incisive over-covering presented at deep byte, could be determined by the retention of mandible into a distalized position. The type of occlusion modification at vertical level which is a cause of maxillary narrowing could be influenced by the type of mandibular rotation (Temelcea et al 2012).

Conclusions

The prevalence of dento-maxillary anomalies within the studied batch presented a global value of 92% which was significant higher than the values available within the specialized literature from Romania (values ranging from approx. 45% to 75%). This could be a subject for separate in-deep studies to understand the causal.

The higher anomalies occurrence was found for subjects of 7 and 13 years old groups (100%), respectively the smaller occurrence was found at 9 years old group (84%); the gender distribution presented similar values for male and female subjects. The Romany minority presented a statistically significant smaller occurrence than the majority/Romanians. Angle Class I was the preponderant anomaly.

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