EPIDEMIOLOGICAL STUDY OF MALOCCLUSIONS IN SCHOOLCHILDREN BETWEEN 6 AND 14 YEARS OLD FROM GORJ COUNTY, ROMANIA

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Abstract

The aim of this study is to determine the prevalence of malocclusions in a group of schoolchildren from both urban and rural areas of Gorj County, Romania. The study included 1007 schoolchildren aged between 6 and 14 years old, who were enrolled in randomly selected public schools from Gorj County. The data were collected from December 2019 to February 2020, based on the project „Educație pentru sănătate orală. Cercetări privind anomaliile dento-maxilare și leziunile odonto-parodontale la școlarii din Oltenia", in which several institutions were involved. The study was interrupted before it was completed due to the COVID-19 pandemic outbreak. In data collection and centralization we used: Angle's classification of malocclusions and the distribution of malocclusions according to gender, age groups and origin. We obtained a prevalence of 35.35% for malocclusions. Of the total number of schoolchildren with malocclusions, the highest prevalence was recorded for those included in Angle's class I (60.37% for males and 65.63% for females). We found the highest prevalence of malocclusions in female gender (36.64%). Regarding the origin, there is a higher prevalence of malocclusions in urban areas (37.86%). Due to the strong impact of malocclusions on the quality of life, it is necessary to apply preventive measures to avoid psychological implications.

Keywords: malocclusion, schoolchildren, prevalence

Introduction

Malocclusions are the result of oro-facial adaptability to various etiological factors, with implications in psycho-social problems caused by the dysfunctions of the dento-maxillary apparatus, deterioration of dento-facial aesthetics and greater susceptibility to trauma and periodontal disease.

Because the vast majority of people correlate dento-facial harmony with success in many activities, a person with malocclusion may develop a sense of shyness in certain social situations or may lose career opportunities [1-3].

Regional epidemiological assessment of malocclusions is extremely important as it provides useful information in estimating the type and distribution of occlusal contacts characteristics [4]. This data will helpdetermine priorities regarding the need for orthodontic therapy and establish the resources needed to conduct this treatment. In addition, determining the prevalence of these anomalies in several population groups from different locations may reflect the existence of genetic and environmental determinants [5-8]. Therefore, the availability of this data will be important for educational purposes as well. Malocclusions that are specific to a certain geographical area can change the public health policy, in order to develop the skills of orthodontists and provide the necessary resources top revent or treat these anomalies.

Establishing the prevalence of malocclusions and assessing the need for orthodontic treatment are directions of national importance in many countries. It is necessary to carry out periodic epidemiological studies in order to establish and adjust prevention programs [9-11]. Data obtained from epidemiological research show that malocclusions are the third most common oral worldwide health problem [12,13].

Material and Methods

The study was approved by the Ethical Committee of the University of Medicine and Pharmacy of Craiova, Romania, in accordance with the ethical guidelines for research with human participants. Also, all participants and parents/relatives expressed their informed consent.

The statistical study we conducted in order to establish the prevalence of malocclusions used a cross-sectional epidemiological investigation. The study took place in southwestern Romania, in Gorj County. Its period was from December 2019 to February 2020, when it was interrupted due to the COVID-19 pandemic outbreak. The study involved 1007 schoolchildren enrolled in public schools from Gorj County. The schoolchildren included in our study were aged between 6 and 14 years old. Of these, 522 schoolchildren were from urban areas (Târgu Jiu) and 455 from rural areas of Gorj County (Țânțăreni and Capu Dealului) (Fig. 1). The subjects were divided according to Angle's classification of malocclusions, but also according to gender, age groups and origin.

Fig. 1 – Geographical location of the three studied localities (source – Google maps)

In order to establish the diagnosis of malocclusions, we chose Angle's classification of malocclusions, as it is well known and mostly used. This classification uses the relationship between the most mesial intercuspal groove from the buccal surface of the first permanent lower molar and the mesio-buccal cusp of the first permanent upper molar. Angle's class I is characterized by the alignment between between the most mesial intercuspal groove from the buccal the buccal surface of the first permanent lower molar and mesio-buccal cusp of the first permanent upper molar. In Angle's class II, the most mesial intercuspal groove from the buccal surface of the first permanent lower molar is distally positioned when in occlusion with the the mesio-buccal cusp of the first permanent upper molar. In Angle's class III, , the most mesial intercuspal groove from the buccal surface of the first permanent lower molar occludes mesially to the the mesio-buccal cusp of the first permanent upper molar [14].

For the relevant cases of our study, photographs were taken using a digital camera and the data were processed using a computer. The collected data were statistically processed by completing an Microsoft Excel document. Thus, all the aspects we wanted to highlight in this study could be concentrated in suggestive graphs.

In data analysis, we used the Chi-square Test (χ^2) or, when necessary, the equivalent version called Fisher's Exact Test, for those situations including a small number of participants. The use of Chi-square Test is not recommended when the total frequency is below 20 and the table cells have a frequency less than 5 or even 0. In these situations, it is advisable to apply Fiscer's Exact Test.

Results

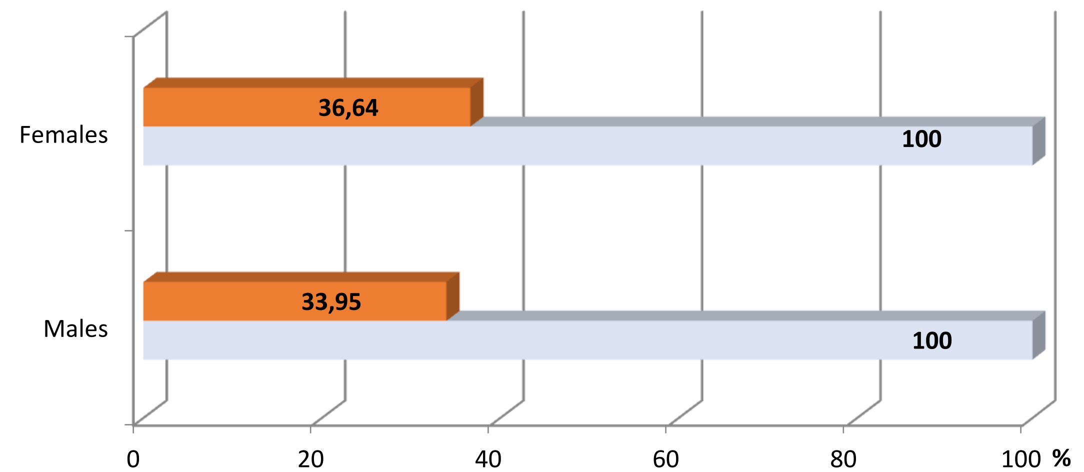
In terms of gender, the percentage of schoolchildren with malocclusions was 33.95% for males (164 boys presented malocclusions out of a total of 483) and

36.64% for females (192 girls presented malocclusions out of a total of 524) (Table 1 and Fig. 2).

Table 1 - Distribution of the number of schoolchildren according with gender

Patients	Males	Females
Total no. of schoolchildren	483	524
Schoolchildren with malocclusions	164	192
Percentage of malocclusions	33.95%	36.64%

Fig. 2 - Percentage of malocclusions according with gender

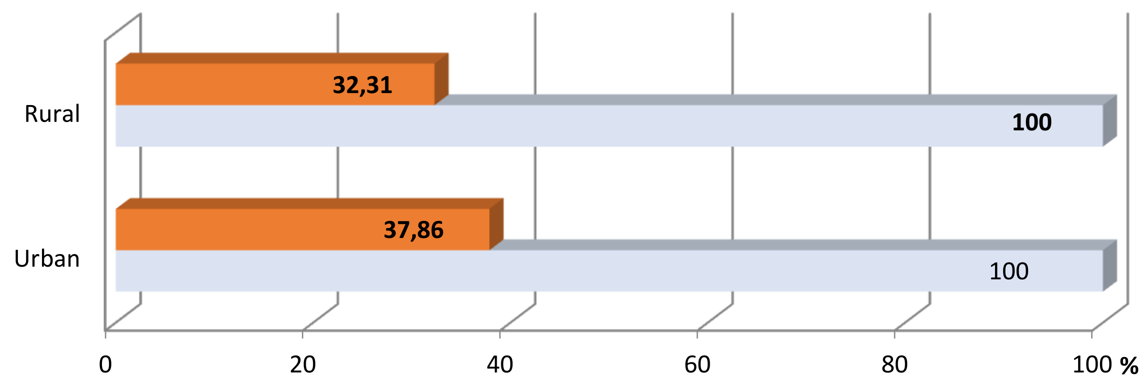


Regarding the origin, the schoolchildren from the urban areas presented malocclusions in a higher percentage (37.86%) than those from the rural areas (32.31%). In the urban areas (Târgu Jiu), we examined a number of 552 schoolchildren (209 presented malocclusions) and from the rural areas of Gorj County 455 schoolchildren (147 presented malocclusions) (Table 2 and Fig. 3).

Table 2 - Distribution of the number of schoolchildren with malocclusions according with their place of origin

Patients	**Urban**	**Rural**
Total no. of schoolchildren	552	455
Schoolchildren with malocclusions	209	147
Percentage of malocclusions	37.86%	32.31%

Fig. 3 - Percentage of schoolchildren with malocclusions according with their place of origin

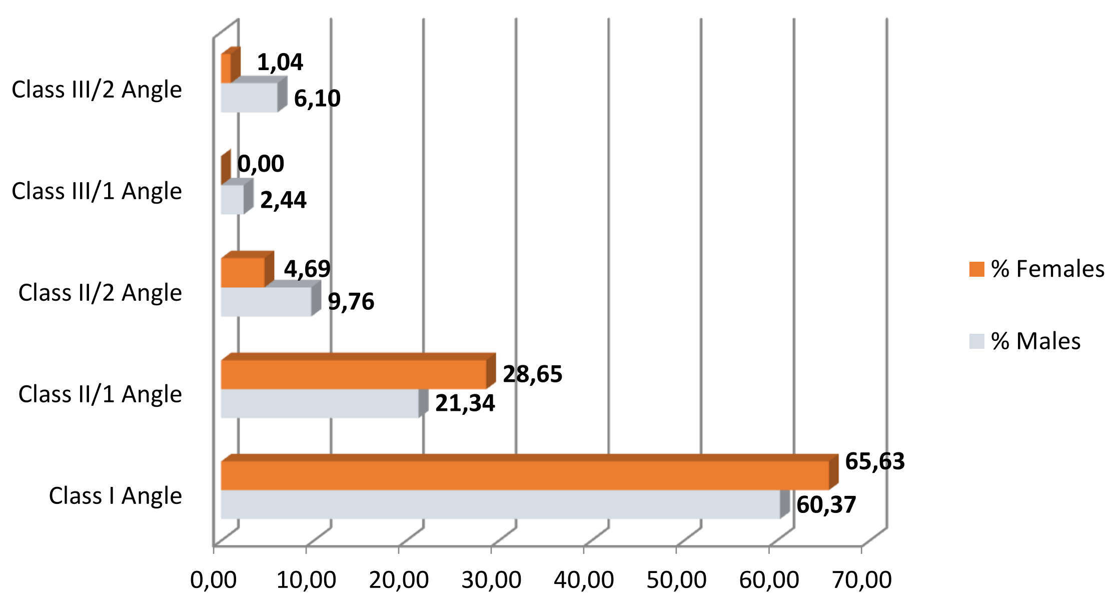


Taking into account Angle's classification of malocclusions and gender, we identified from the total number of schoolchildren: 99 boys (60.37%) and 126 girls (65.63%) with Angle's class I malocclusions, 35 boys (21.34%) and 55 girls (28.65%) with Angle's class II/1 malocclusions, 16 boys (9.76%) and 9 girls (4.69%) with Angle's class II/2 malocclusions, 10 boys (6.10%) and 2 girls (1.04%) with Angle's class III/2 malocclusions and 4 boys (2.44%) with Angle's class III/1 malocclusions (Table 3 and Fig. 4).

Table 3 - Total number of schoolchildren with malocclusions according with Angle's classification of malocclusions and their percentage distribution according to gender

Angle's classification of malocclusions	No. of cases		Percentage	
	Males	Females	Males	Females
Class I Angle	99	126	60.37%	65.63%
Class II/1 Angle	35	55	21.34%	28.65%
Class II/2 Angle	16	9	9.76%	4.69%
Class III/1 Angle	4	0	2.44%	0.00%
Class III/2 Angle	10	2	6.10%	1.04%
Total	164	192	100%	100%
Fisher's Exact Test	**p=0.0015** (S – significant).			

Fig. 4 - Schoolchildren with malocclusions according with Angle's classification of malocclusions and their percentage distribution according to gender



Regarding the identification by classes of malocclusions for the schoolchildren from urban areas (from the total number of schoolchildren with malocclusions from urban areas), we found: 48 boys (52.17%) and 74 girls (63.25%) with Angle's class I malocclusions, 25 boys (27.17%) and 35 girls (29.91%) with Angle's class II/1 malocclusions, 10 boys (10.87%) and 7 girls (5.98%) with Angle's class II/2 malocclusions, 6 boys (6.52%) and one girl (0.85%) with Angle's class III/2 malcclusions and 3 boys (3.26%) with Angle's class III/1 malocclusions (Table 4.1).

Table 4.1 - Total number of urban schoolchildren with malocclusions according with Angle's classification of malocclusions and their percentage distribution according to gender

Angle's classification of malocclusions	**No. of cases**		**Percentage**	
	Males	**Females**	**Males**	**Females**
Class I Angle	48	74	52.17%	63.25%
Class II/1 Angle	25	35	27.17%	29.91%
Class II/2 Angle	10	7	10.87%	5.98%
Class III/1 Angle	3	0	3.26%	0.00%
Class III/2 Angle	6	1	6.52%	0.85%
Total	92	117	100%	100%
Fisher's Exact Test	**p=0.0195** (S – Significant).			

Regarding the identification by classes of malocclusions for the schoolchildren from rural areas (from the total number of schoolchildren with malocclusions from rural areas), we found: 51 boys (70.83%) and 52 girls (69.33%) with Angle's class I malocclusions, 10 boys (13.89%) and 20 girls (26.67%) with Angle's class II/1 malocclusions, 6 boys (8.33%) and 2 girls (2.67%) with Angle's class II/2 malocclusions, 4 boys (5.56%) and one girl (1.33%) with Angle's class III/2 malcclusions and one boy (1.39%) with Angle's class III/1 malocclusion (Table 4.1).

Table 4.2 - Total number of rural schoolchildren with malocclusions according with Angle's classification of malocclusions and their percentage distribution according to gender

Angle's classification of malocclusions	No. of cases		Percentage	
	Males	Females	Males	Females
Class I Angle	51	52	70.83%	69.33%
Class II/1 Angle	10	20	13.89%	26.67%
Class II/2 Angle	6	2	8.33%	2.67%
Class III/1 Angle	1	0	1.39%	0.00%
Class III/2 Angle	4	1	5.56%	1.33%
Total	72	75	100%	100%
Fisher's exact Test	p=0.0701 (NS – Not significant).			

Following this study, we noticed the highest prevalence for Angle's class I malocclusions in female gender (65.63% of the total number of schoolchildren with malocclusions). We identified the lowest prevalence in class Angle's class III/2 for female gender (1.04% of the total number of schoolchildren with malocclusions). We did not found any case of Angle's class III/1 malocclusion for female gender. Fisher's Exact Test was applied and a statistically significant result was obtained (p=0.0015) (Table 3 and Fig. 4).

Our research identified in urban areas the highest prevalence for Angle's class I malocclusions in female gender (63.25% of the total number of schoolchildren with malocclusions from urban areas). We identified the lowest the lowest prevalence in class Angle's class III/2 for female gender (0.85% of the total number of schoolchildren with malocclusions in urban areas). We did not found any case of Angle's class III/1 malocclusion for female gender. We also applied Fisher's Exact Test and the result was statistically significant (p=0.0195) (Table 4.1).

In rural areas, we found the highest prevalence for Angle's class I malocclusions in male gender (70.83% of the total number of schoolchildren with malocclusions from rural areas). We identified the lowest the lowest prevalence in class Angle's class III/2 for female gender (1.33% of the total number of schoolchildren with malocclusions in rural areas). We did not found any case of Angle's class III/1 malocclusion for female gender. The application of Fisher's Exact Test showed a not significant result (p=0.0701) (Table 4.2).

Discussions

In Romania, a similar epidemiological study conducted in the mining areas of Apuseni Mountains found that the highest prevalence of malocclusions was in those from Angle's class I (56.4%) and the lowest incidence was recorded for those from Angle's class III (5.7%) [15]. Our results were similar to this.

A statistical research of malocclusions performed in the Dental Ambulatory for Children (Iaşi), from 2000 to 2010, on a number of 375 children aged between 4 and 24 years old identified the highest prevalence for Angle's class I malocclusions (63.2%) and the lowest for Angle's class III malocclusions (5.8%) [16].

A study performed on 300 adolescents from Saudi Arabia found statistically significant differences between genders and classes of malocclusions [17].

Following a survey conducted in Cyprus on 426 schoolchildren (203 girls and 223 boys) aged between 12 and 15 years old, was noted a prevalence of 74.6% for Angle's class I malocclusions, 21.2% for Angle's class II malocclusions (13.6% for Angle's class II/1 and 1.6% for Angle's class II/2) and 3.3% for Angle's class III malocclusions [18]. Compared to our study, where we found the lowest prevalence for Angle's class III malocclusions, in this research the lowest incidence was found for Angle's class II/2 malocclusions.

An investigation conducted in eastern Anatolia, Turkey on 2145 patients aged between 6 and 29 years old identified a predominant prevalence for Angle's class I malocclusions (44.6%) and the lowest incidence was noted for Angle's class III malocclusions (10.5%) [19].

The overall prevalence for Angle's class I malocclusions is the highest (74.7 ± 15.17%), ranging from 31% in Belgium to 96.6% in Nigeria. These are more common among Africans (89.44%) and equivalent to Caucasians and Asians (71.61% and 74.87%). This distribution pattern has been reported for both dentitions with slight differences. It should be noted that the prevalence for Angle's class I malocclusions in permanent dentitions of Asians tends to increase with the development during puberty. This is a characteristic of this race [20].

The overall Angle's class III malocclusions is the lowest (5,93 ± 4,69%). The percentages were varied: from 0.7% in Israel to 19.9% in China. The reported prevalence for Caucasians was 5.92%, for Africans 3.8% and for Asians 9.63%. This model of global distribution of Angle's class III malocclusions applies to both mixed and permanent dentitions. The tendency to develop this type of anomaly seems to increase with the transition from mixed to permanent dentition in Africans and Caucasians. The importance of the genetic factor in the etiology of this malocclusions should also be emphasized. In fact, Angle's class III malocclusions in Asians are mainly due to the developmental deficiency of the middle third of the face rather than mandibular prognathism [20].

Conclusions

The ever-increasing prevalence of malocclusions requires the implementation of prevention programs in the public health institutions in collaboration with schools and school dental offices. In addition, children's parents/relatives have an important role, being necessary a permanent interaction with them in order to diagnose the dysfunctions and parafunctions of the dento-maxillary apparatus early. In this sense, parents/relatives must be aware of the importance of early orthodontic consultation.

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