Frequency of Class II Disorders and their Relation to Ethnicity, Gender, Age and Residence in School Age Group

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Abstract

Malocclusions are a frequent occurrence and are subject to investigation of many authors since they present a very serious problem, not only as a health problem but also social, esthetical, and psychological. We want to show the inclusion of orthodontic disorders in sagittal aspect, with special emphasis on class II and presence or absence of statistical significance between ethnic groups, age, sex, and their residence.

Starting from the fact that in the region of Gostivar live different ethnicities, and at the same time data about orthodontic anomalies are scarce or non-existing, we have included in investigation 822 children of school-age between 7-14-year-olds, from three main ethnicities. During the examination, five digital photos, extra- and intraoral for each child were taken.

Prevalence of class II, subclass 1, resulted in a high percentage (28.35%), in comparison to class II, subclass 2, which has shown values almost three times lower (10.71%) in frequency. In the shown distribution, for Chi2=38.99 and p<0.001 (p=0.000), there is a significant difference. Investigation of a protective role for parameters of gender, age, ethnicity, and residency, as independent variables in comparison to disorders in the sagittal plane for class II/1 and class II/2 as dependent variables, among investigated pupils, the highest impact had age (Wald=1.33 of class II/1) and residency (Wald=2.85 for class II/2).

Disorders in the sagittal plane of class II have shown high representation. A significant difference was found in the comparison between disorders of class II/1 and class II/2.

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Introduction

The science of orthodontics has made efforts to thrive in secrets of growth and development of the oro-facial complex. This segment is a morpho-functional association of bone and muscular tissues which in postnatal period develop further in harmony with the biological maturation of individual, dictated by the genetic information, epigenetic factors and impact of the environment. Therefore, empiric experience has shown necessary demands for investigation and studying of all postulates which define normal development and report of intra-jaw dependence in the oro-facial system. This system is characterized by close ties and mutual coordination between themselves, and between morphology and functions which it performs.

For the normal performance of basic functions in this system and healthy maintenance of these tissues, it is a need to have a functional and morphological association. The harmonious relationship between all components of this system is of essential importance for functional efficiency and retention of their integrity, but growth and development of the oro-facial system are in accordance with growth and development of organs and surroundings and from functional needs.[1] In nature, it is difficult to define "normal", moreover to describe it, because sometimes

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there is no clear boundary. Therefore, malocclusion is considered as a condition which represents a deviation from the one that, at a specific period of growth, is counted as normal occlusion.

Consequences and disorders from malocclusions are in large number and great range and they negatively impact in the aesthetic appearance of an individual and its psychological development. Malocclusions could induce functional deterioration of oro-facial system and misbalance of masticatory apparatus.[2,3] Based on this, sagittal class II disorders do not represent disorders of occlusion of the simple clinical entity, but it is a combination of different morphological forms, the result of the genetic determination, skeletal morphology and soft tissues, type of motoric activity of muscles, general factors and local etiology. The prevalence of malocclusion in the population has been the subject of debate for many years, and the conclusions reached have satisfied no one, with the possible exception of the individual investigators.[4]

Malocclusion of class II/1 is very frequent, occurring in primary, mixed and permanent dentition. In primary dentition, the presentation is 40%, while in permanent 14.7%.[5]. Many studies have been conducted to estimate the occurrence of malocclusion of class II/1.[1,6,7] According to a study by Humphreys *et al*, the occurrence of malocclusion class II ranges from 4.8% up to 25.12%.[8] In a study with 13475 children and adolescents in the USA, disorders of class II/2 were found in 15% of cases.[9] Study in 1050 Chinese children of age group 12-14 years, during 1993, shows the presence of a normal occlusion at 7.1%, while 58.8% have malocclusion of class I, 21.5% of class II and 12.6% of class III.[10] Dental analysis done in 715 children in Ghana[11] showed the following prevalence of malocclusions: for Class I the frequency was 36.1%, for Class II - 12%, and for Class III with the lowest percentage - 1.3%.

In studies of many orthodontists regarding the etiology of malocclusion have been noticed specificities of some ethnic groups, eating habits and living practices which have an impact on occlusion development.[12,13]

Despite the fact that in recent years our country, Macedonia, has made efforts to direct dentistry science toward prevention of oral health and it achieved results in increasing the level of knowledge and upgrading health culture and education of population, and education of dentistry professionals as well, the number of patients that are requesting help in treating orthodontic disorders continues to be high.

Epidemiological studies in the prevalence of orthodontic disorders have been conducted previously also in our country, in different settings and different periods of time of growth and development. Based on the fact that these data for the city of Gostivar and surroundings are scarce or non-existing, we have decided to undertake this step. In the region of Gostivar and surroundings (app. 120.000 inhabitants) lives a mixed population, with the domination of Albanian ethnicity, followed by Macedonians and Turkish inhabitants.

Driven by cases of almost without a solution, of large inclusion of orthodontic disorders through analyses and data from dentistry check-ups, we have determined the following aims:
1. To estimate presence of orthodontic disorders in sagittal direction – class II;
2. To determine presence of statistical significance between ethnic groups for malocclusion class II;
3. To determine the dependence of occurrence of class II malocclusion to gender, ethnicity, age, and residence.

Materials and methods

Our study has been implemented through systematic dental check-ups in schools in order to estimate the distribution of orthodontic disorders and its correlation with parameters mentioned in the aims.

This epidemiological study was conducted in larger schools in Gostivar, in 7-14-year-old children. Approximately 820 pupils, from all three ethnicities, have been included in the study.
There were 581 (70.68%) pupils from urban school and 241 (29.32%) pupils from rural ones. For the examination, we have utilized basic dental and orthodontic instruments. Findings have been recorded in their personal health card developed especially for this study. Furthermore, for each examined pupil five digital photographs were taken, two extraoral (in profile and *en face*) and three intraoral (left, right and frontal side).

Data have been analyzed with these statistical methods: Pearson Chi-square, Kruskal-

Wallis, logistic regression and descriptive statistics, using software Statistica 7.1 and SPSS 13.0.

Results

Eight hundred and twenty-two children were included in the study, from which 396 (48.18%) females and 426 (51.81%) males. Their mean age was 10.48 (Table 1).
(Table 1)

The inclusion of children according to ethnicity shows that the largest number of investigated children are of Albanian ethnicity with 395 (48.05%), followed by Macedonians 332 (40.39%) and Turks 95 (11.56%) as presented in Table 2.
(Table 2)

Sagittal disorders of class II/1 were found among 233 (28.35%) of investigated children and they were missing in rest 589 (71.65%) children included in the study.
(Table 3)

Sagittal disorders of class II/2 have been recorded in 88 (10.71%) of cases, while in 734 (89.29%) of cases there were no disorders.
(Table 4)

In table 5 we presented distribution of data with regard to differences in presence of disorders in sagittal class II subclass 1 and class II subclass 2. In this distribution for Chi^2=38.99 and p<0.001 (p=0.000) we found significant difference.
(Table 5)

In logistic regression, it has been analyzed the predictive role of gender, age, ethnic background and residence of studied subjects as independent variables in the report with sagittal disorders of class II subclass 1 as a depended variable (Table 6).
(Table 6)

Largest impact on disorders in sagittal of class II/1 have age of studied subjects (Wald = 1.33), gender (Wald = 0,38), Macedonian ethnicity (Wald = 0,37), place of residence (Wald = 0,020) and Albanian ethnicity (Wald = 0,01). However, in all parameters, the impact in the development of sagittal disorders of class II/1, for p>0.05, is not significant.

With the increase of age for one year, the risk for development of sagittal disorder class II/1 increases for 3.0% (ExpB=1,03), however, the impact of age on the development of disorder class II/1 for p > 0.05 is not significant (±95.00%, CI: 0.90-1.02).

Studied males are for 1.04 times at a higher risk than females in developing disorders of class II/1, however, gender does not have an impact on the development of this disorder for p>0.05 (±95.00%, CI: 0.81-1.49).

With regard to ethnic background, although Macedonians are for 0.55 times at a lower risk than Turkish children, also Albanians have 0.95 times lower risk in relation to Turkish in development of sagittal disorder class II/1. However, in both situations, the impact of ethnic background in the development of sagittal disorders of class II/1 for p > 0.05 is not significant (±95.00%, CI: 0.50-1.42 / ±95.00%, CI: 0.60-1.61). Studied subjects living in urban areas have 0.89 times higher risk for development of class II/1 disorders in comparison with those living in villages (ExpB=0.89), however, the impact of residency in development of disorders in sagittal for class II/1 is not significant for p > 0.05 (±95.00%, CI: -0.73: -1.43).

We have also studied subjects toward gender, age, ethnic background and place of residence as an independent variable in comparison to disorders in sagittal for class II/2 as the dependent variable (Table 7).
(Table 7)

For Chi-square=4.93 and p>0.05, no significant correlation between gender, age, ethnic background and residency as an independent variable was found in regards to disorders in sagittal of class II/2 as the dependent variable.

Highest impact in sagittal disorders of class II/2 have residence (Wald = 2.85), age (Wald = 0.81), ethnic background (Macedonian, Wald = 0.38) and gender (Wald=0,01). However, in all mentioned parameters, the impact in the development of sagittal disorders class II/2 for p>0.05 was not significant.

Although it was found that subjects living in urban areas have lower risk for 0.67 times than those who live in rural areas (ExpB = 0.67), also males compared to females for 1.02 times (ExpB = 1.02), the impact of residence and gender in development of sagittal disorders of class II/2 for p>0.05 was not significant (±95.00%, CI: 0.42–1.07/ ±95%, CI: 0.65–1.59, respectively).

It was found that with increase of age for one year, the risk for development of sagittal

disorder for class II/2 decreased for 5.0% (Exp B = 0.95), however, impact of age in development of sagittal disorder of class II/2 for p > 0.05 was not significant (± 95%, CI -0.87-1.06).

Discussion

A study by Josefsson *et al.* in Sweden found these prevalence's of Class II: for Sweden participants 48.8%, Eastern Europe participants 46.9%, Asians participants 36.2% and other country participants with a 47.9%.[14] In a Finnish study of children at the onset of the mixed dentition period (4.0–7.8 years), a Class II canine relationship was found in 52.4%.[15] These percentages are higher than that found in our study where the presence of malocclusion Class II was 39.05% of the whole number of participants (N=822).

A similar prevalence of Class II to our study was found in different researches done in Islamabad, where class II malocclusions were found at 32% of the participants in a study[16], while in Tumkur population 10% were diagnosed with Class II malocclusions[17], which is lower than our percentage (39.05%). In a Pakistani sample, the study found that the overall prevalence of class II malocclusions within the sample was found to be 41%.[18]

Independent evaluation of three categories of class II malocclusion revealed a prevalence of 29.9% for class II/1, 0.7% for class II/2 and 10.4% for class II subdivisions.[18] Our research found a prevalence of 28.35% for Class II division 1 which is similar to the above mentioned research and a prevalence of 10.71% for Class II division 2 which is higher than the prevalence in the above mentioned research but similar to the upcoming research done by Sayin in Turkish population were a higher presence of Class II/2 was found in a research were the frequency of Class II division 1 and Class II, division 2 malocclusions were 19 and 5, respectively.[19]

We must say that such a diversity of malocclusion frequency for Class II, also Class I and Class III is dependent from the territory in which the epidemiological study was done, time period and also ethnical differences. Our findings are similar to the founding's of other authors especially those in the near region and state, such as showed in a research in 1422 preschool children aged from 2 to 6-year-olds found that 32% of the whole children examined were diagnosed with malocclusion, most frequent with the Class II subdivision 1.[20] In the epidemiologic study conducted a malocclusion presence was found for Class I 72.8%, Class II 23% and Class III 3.44%.[21]

While higher percentages were found in a research in 445 children checked from age 3 to 6 years old in Split, Croatia, found anomalies in 54.2% cases, from which the Class II subdivision 1 and open bite were the most evident.[22] In a research done in 40 children aged 2 to 7-year-olds concluded a high percentage of malocclusion 52.3%.[23]

Conclusions

Summarising cases from this study we could draw following conclusions:
- From 822 studied pupils with sagittal disorders, malocclusions of class II/1 were present among 223 (28.35%) of them and malocclusions of class II/2 among 88 (10.71%) pupils;
- Significant difference was shown in comparison between malocclusions of class II/1 and class II/2;
- Logistic regression of predictive role of sagittal disorders class II/1 has shown that impact of ethnic background and gender, despite some differences (Macedonians for 0.99 times and Albanians for 0.91 times had lower risk than Turkish children), males for 1.04 times have shown lower risk than females, however for p > 0.05 it was not significant;
- With regard to residency, gender, ethnic background and age (in cities for 0.67 times lower risk, males for 1.02 times with higher risk, Macedonians for 1.27 and Albanians for 1.04 times higher risk than Turkish children), with increase of age disorder decreases for 5%, however despite the fact that there were noted differences in all parameters, for p > 0.05 there were without statistical significance (the highest difference has been shown with regard to residency with Wald – 2.85);
- The orthodontic treatment need, according to WHO, was 86.62%.

Declaration of Interest

	Valid no.	Mean	Confidence – 95.00%	Confidence +95%	Minim.	Maxim	Stand. deviation
Age (years)	822	10.48	10.32	10.63	7.0	14.0	2.28
Male N (%)	426 (51.81%)						
Female N (%)	396 (48.18%)						

Table 1. Distribution according to age and gender.

Ethnicity	Value	Cumulative value	Percentage	Cumulative percentage
Macedonian	332	332	40.39	40.39
Albanian	395	727	48.05	88.44
Turks	95	822	11.56	100.00

Table 2. Investigated children according to the ethnicity.

Disorders	Value	Cumulative value	Percentage	Cumulative percentage
No presence	589	589	71.65	71.65
Presence	233	822	28.35	100.00

Table 3. Sagittal disorders of class II subclass 1.

Disorders	Value	Cumulative value	Percentage	Cumulative percentage
No presence	734	734	89.29	89.29
Presence	88	822	10.71	100.00

Table 4. Sagittal disorders of class II subclass 2.

	Disorders in sagittal of cl. II/1	Disorders in sagittal of cl. II/2 No presence	Disorders in sagittal of cl. II/2 Presence	Total
Value	No presence	501	88	589
Total percentage		60.95%	10.71%	71.65%
Value	No presence	233	0	233
Total percentage		28.35%	0.00%	28.35%
Value	All groups	734	88	822
Total percentage		89.29%	10.71%	
Pearson Chi-square: 38.99, df=1, p<0.000				

Table 5. Differences in distribution of disorders in sagittal class II/1 and class II/2.

Parameters	B	S.E.	Wald	df	Sig	Exp (B)	95% C.I. For EXP (B)	
							Lower	Upper
Step[1a] Gender (1)	10	0,16	0,38*	1	0,54	1.04**	0,81	1,49
Age	4	0,03	1,33*	1	0,25	1,03*	0,90	1,02
Macedonian (1)	-0,16	0,26	0,37***	1	0,97	0,55***	0,52	1,42
Albanian(1)	-0,2	0,25	0,01	1	0,67	0,95	0,60	1,61
Residence (1)	0,02	0,17	0,02****	1	0,47	0,89	0,73	1,43
Constant	-0,51	0,46	1,26	1	0,69	0,26		

Table 6. Sagittal disorders of class II subclass 1.
a: variables entered on step 1[a]: gender, age, Macedonian, Albanian, Residence.

Parameters	B	S.E.	Wald	df	Sig	Exp (B)	95, 0% C.I. For EXP (B)	
							Lower	Upper
Step[1a] Gender (1)	0,17	0,23	0,01	1	0,94	1,02	0,65	1,59
Age	0,05	0,05	0,81	1	0,37	0,95	0,87	1,06
Macedonian (1)	0,24	0,39	0,38	1	0,54	1,27	0,59	2,74
Albanian(1)	0,04	0,39	0,01	1	0,92	1,04	0,48	2,23
Residency (1)	0,4	0,24	2,85	1	0,09	0,67	0,42	1,07
Constant	-1,52	0,67	5,08	1	0,02	0,22		

Table 7. Sagittal disorders class II/2.

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