

# THE PREVALENCE OF OCCLUSION CLASSIFICATIONS OF PERMANENT DENTITION IN TEHRAN'S STUDENTS AGED 12 To 13 YEARS

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**Abstract-** Classification of occlusion is the first step in diagnosing the relationship between the upper and lower jaw's teeth. Based on Angle's classification, occlusion is divided into three categories: class I, class II, and class III. The aim of this study was to determine the prevalence of occlusion categories, based on Angle's classification, in adolescents with permanent dentition in Tehran. This is an epidemiological cross sectional and descriptive study. Based on minimum rate of prevalence belonging to class III, number of cases was calculated and 1524 students, equal boys and girls, were studied. The prevalence of each classification in boys, girls and in total was determined. Among all cases, 79% were in class I occlusion; about 14.5% were in class II and 6.5% in class III. From Angle's 1899 study of prevalence of occlusion type until now, many studies have been done with different results. It seems that prevalence of occlusion types strongly depends on genetic factors and area of the study.

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**Key words:** Malocclusion, occlusion, permanent dentition, Angle's classification

## INTRODUCTION

Classification of occlusion is one of the first steps in diagnosing the relationship between the upper and lower jaw's teeth (occlusion), and is used in evaluation of orthodontic treatments. Different classifications have been presented previously by Angle (1, 2), of which classification based on first permanent molars (6th tooth in each normal half of jaw) relationship is now used. Based on this classification, occlusion is divided into three categories: Class I is the normal relationship between upper and lower first permanent molars. In this class the lower first permanent molar is about

1/4 tooth width anterior to the same upper tooth. In class II, the lower first permanent molar (and other lower teeth) have a more posterior position and in class III, the lower first permanent molar (and other lower teeth) have a more anterior position.

We performed this study to show the prevalence of each classification of occlusion in the early permanent dentition in 12- and 13-year-old students of Tehran.

## MATERIALS AND METHODS

This cross sectional, randomized and descriptive study was performed in Tehran in 2005. Number of cases was calculated according to the minimum rate of prevalence of class III occlusion which is 4%, with assurance coefficient of 95%, and less than 1% error. We added an extra 50 people for examination. In total 1524 students were selected randomly and equally between girls and boys among middle school

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students of public and private schools in municipal regions 4, 5, 11, and 17. The cases studied included 12 and 13-year-old students who were in permanent dentition. Exclusion occurred in cases with any deciduous (primary) teeth. The study was approved by Ethics Committee of Tehran University of Medical Sciences and written informed consent was obtained from cases and parents of all subjects.

A researcher performed the examinations and two coworkers recorded the information. Checkups were performed with disposable mirrors and in a room having enough natural light. A form was designed to describe the category of occlusion as class I, class II, and class III. In patients with class II occlusion, the rate of distal position of first permanent molar in the lower jaw compared to the upper jaw was also noticed. If it was 1/2 cusp (almost 1/4 of tooth) to less than 1 cusp in distal situation, occlusion was classified as class II, group one (D1). If it was 1 cusp or more, then it was settled in class II, group two (D2). In the class III relation, the amount of mesial position of the lower first permanent molar was compared to the upper first permanent molar. In those with 1/2 cusp to less than 1 cusp in mesial position, occlusion was classified as class III, group one (M1), and in those with 1 cusp or more in mesial position as class III, group two (M2).

## RESULTS

Among 1524 examined students including 767 girls and 767 boys, cases having unknown relations in right or left side of the jaw were excluded from the study. Therefore, the numbers of cases evaluated for the permanent first molars relationship were different in right and left sides.

### Right side

A total of 1421 students, 708 girls and 713 boys, were studied on the right side molar relation after omitting the unknown cases (Table 1).

Class I relation was found in 500 (70.6%) of the girls and 515 (72.2%) of the boys.

In the class II cases, 14.8% of the girls and 13.7% of the boys were in D1 group, and 4.7% of the girls and 6.6% of the boys were in D2 group. In total, 19.5% of the girls and 20.3% of the boys had class II molar relation on the right side.

In class III relation, 8.6% of the girls and 5.5% of the boys with milder positions were in the first group (M1) and 1.3% of girls and 2% of boys with more severe positions settled in the second group (M2). In total, 9.9% of girls and 7.5% of boys had class III molar relation in right side.

Statistical analysis showed no significant difference between girls and boys in prevalence of different occlusion classes.

**Table 1.** Characters of relation of right and left side first permanent molars in studied groups

Side & Situation	Girl		Boy		Total		Statistical analysis		
	Number	Percent	Number	Percent	Number	Percent	P	Chi Square	
Class I	500	70.6	515	72.2	1015	71.4	0.54	0.38	
Cl II	D1	105	14.8	98	13.7	203	14.03	0.61	0.26
	D2	33	4.7	47	6.6	80	5.6	0.14	2.14
Cl III	M1	61	8.6	39	5.5	100	7	0.02	4.90
	M2	9	1.3	14	2	23	1.6	0.41	0.68
Total	708	100	713	100	1421	100			
Class I	516	72	514	71.9	1030	71.9	0.97	0	
Cl II	D1	83	11.6	94	13.1	177	12.4	0.41	0.68
	D2	39	5.4	39	5.5	78	5.4	0.91	0.01
Cl III	M1	63	8.8	50	7	113	7.9	0.24	1.35
	M2	16	2.2	18	2.5	34	2.4	0.85	0.03
Total	717	100	715	100	1432	100			

## Left side

The first permanent molar relationship on the left side was evaluated among 1432 students, including 717 girls and 715 boys after excluding unknown cases. The result showed that 72% of girls and 71.9% of boys were in class I occlusion group. In total, 17% of the girls and 18.6% of the boys on the left side had class II relation; 11.6% of the girls and 13.1% of the boys were settled in the first group of class II (D1), and 5.4% of the girls and 5.5% of the boys were settled in the second group of class II (D2). Furthermore, 8.8% of girls and 7% of boys had mild class III and settled in the first group (M1) while 2.2% of the girls and 2.5% of the boys were in the second group of class III (M2). In total, 11% of the girls and 9.5% of the boys had class III molar relation on their left side.

There was no significant difference in the statistical analysis between girls and boys. Table 1 shows the number and percent of the right and left molar relation in girls and boys. The results of the statistical analysis between the two genders have been shown.

## The evaluation of relation of right and left

The relation of first permanent molars on the left and right sides in girls and boys were compared together in persons with known relations on both sides. If relationships were unknown, they were omitted from the study.

Among 767 examined girls, 684 had known relations on both sides. Highest rate of symmetry of occlusion classes in two sides was found for class I

occlusion (62% of the cases). Lowest symmetry of two sides was found for class III and class II. More details are shown in Fig. 1.A.

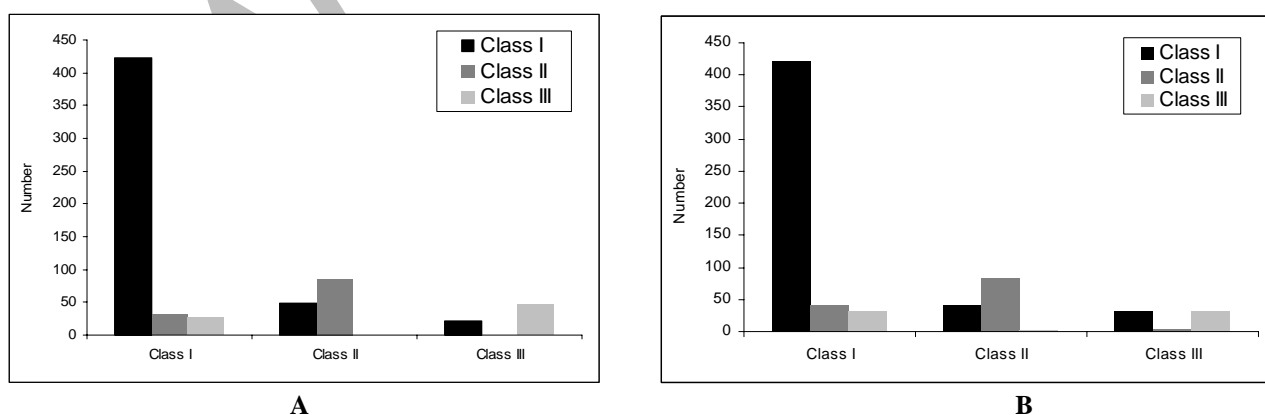
The same study was performed in boys with known relationships on both sides. Unknown cases were omitted. Among 767 examined boys, 686 had a known relation in both sides. Results showed that 61.7% had class I on both sides. The minimum rate of symmetry was found for class III and class II. Figure 1.B shows results of evaluation of the right and left sides in boys.

In each of these relationships, statistical analysis was performed between girls and boys without any significant difference.

## Occlusion classification

According to the clinical assessment by the researcher, each of the examined individuals were divided into three specific classifications of occlusion. In order to classify each individual into these groups it is important to consider space loss and excessive spacing followed by delayed exfoliation of the second primary molars. The relationship between the position of canines and second molars also needed to be taken into consideration.

Thirty cases with unknown relationship on both sides and additional cases not having a specific occlusion were omitted from the study. The prevalence of class I occlusion was 76% in girls and 77.4% in boys. Moreover, 14.4% girls and 13.9% boys had class II relationship. Also, 7.3% of girls and 5.4% of boys had class III relationship and 2.3%



**Fig. 1.** Characters of relation of right and left side first permanent molars in girls (A) and boys (B). The right side has been shown in X axis and left side in Z axis.

**Table 2.** Prevalence of occlusion's classification in girls, boys and totally

Situation	Girl		Boy		Total		Statistical analysis	
	Number	Percent	Number	Percent	Number	Percent	P	Chi Square
Class I	563	76	575	77.4	1138	76.7	0.97	0
Class II	107	14.4	103	13.9	210	14.2	0.80	0.06
Class III	54	7.3	40	5.4	94	6.3	0.16	1.96
Asymmetrical	17	2.3	25	3.3	42	2.8	0.008	6.88
Total	741	100	743	100	1484	100		

of girls and 3.3% of boys had an asymmetrical occlusion relationship. Generally, the prevalence of different occlusion classes among students 12 and 13 year of age in Tehran included: 76.7% in class I, 14.2% in class II, 6.3% in class III and 2.8% with asymmetrical occlusion.

Statistical analysis indicated that there was no significant difference in prevalence of classes I, II, III occlusion between girls and boys. However, there was a significant difference in asymmetrical occlusion among boys (Chi square = 6.88,  $P = 0.008$ ) (Table 2).

## DISCUSSION

The classification of permanent teeth occlusion was first introduced by Angle in 1899 when he stated the relationship of the first mandibular and maxillary molars as the key to occlusion (1, 2). He classified the relationship into three groups. Having a slight distally or mesially position of the first permanent molar less than 1/2 cusp was ignored and more than this was classified into classes II or III.

Accordingly, we compare our study with some previous studies: in 1899, Angle evaluated one thousand white Americans (3). Altemus evaluated different classes of occlusion on Black Americans in 1959 (4). In 1972, Josef Sim performed a similar study in United States (5). In 1983, Corruccini *et al.* studied prevalence of different classes of permanent teeth occlusion in Panjab, India (6). Garner *et al.* performed two comparative studies on Blacks of Indiana State (United States) and Kenya in 1985 (7). Woon *et al.* performed a similar study on three races: Chinese, Malaysians and Indians in Malaysia (8). Kerosuo *et al.* also performed two comparative researches in Tanzania and Finland (9). In 2002, Huang *et al.* did an investigation among children in

China (10). In 2003, Onyeano performed a study on secondary school students aged 12-17 years in Nigeria (11). Sayin and Türkkehraman did a similar study in Turkey in 2004 (12). The comparison of present research with other studies indicates that occlusion is greatly depending on race and area.

### Class I

Prevalence of class I occlusion was 69% in Angle's study, 83% in Altemus *et al.*, 60-65% in Sim, and 71.3% in Corruccini *et al.* studies. Class I occlusion was reported in 71% of subjects in Indiana and 68.5% of subjects in Kenya in Garner and Butt study. In Woon *et al.* study, class I occlusion was found in 47%, 57% and 67% of Chinese, Malaysians and Indians, respectively. Kerosuo *et al.* reported class I occlusion in 95.5% of subjects in Tanzania and 81% of subjects in Finland. While Huang *et al.* found this class in 96.87% of subjects, in Chukwudi *et al.* study its prevalence was 74%. Prevalence of class I occlusion in present study was 76.7%.

### Class II and Class III

For class II occlusion, the range was from 2.64% in Huang *et al.* study in China to 35% in Sim study in United States. In present study, 14.1% of the examined individuals had class II occlusion.

For class III, the range was from 0.49% in Huang *et al.* study in China to 21.1% in Corruccini *et al.* study in North India. In present study, 6.3% of the examined individuals had class III occlusion.

### Asymmetrical occlusion

In some studies, asymmetry of occlusion classes on both sides was also evaluated. Angle announced a prevalence of 4.6%, Garner and Butt 4.3% in Indiana and 6.8% in Kenya, and Woon *et al.* 16%, 23%, 28% in Chinese, Malaysians and Indians, respectively.

**Table 3.** Comparison of results of different studies\*

Study	Class			
	Class I	Class II	Class III	Asymmetrical
Angle	69	23	3.4	4.6
Sim	60-65	30-35	3-5	--
Altemus	83	12	5	--
Garner and Butt (USA )	71	16	8.7	4.3
Garner and Butt (Kenya )	68.5	7.9	16.8	6.8
Kerosuo <i>et al.</i> (Tanzania)	95.5	3	1.5	--
Kerosuo <i>et al.</i> (Finland)	81	18	1	--
Woon <i>et al.</i> (Indians)	47	7	18	28
Woon <i>et al.</i> (Malayans)	57	3	17	23
Woon <i>et al.</i> (Chinese)	67	6	11	16
Corruccini <i>et al.</i>	71.3	7.6	21.1	--
Huang <i>et al.</i>	96.87	2.64	0.49	
Onyeaso	74	14	12	--
Jafari <i>et al.</i> <sup>1†</sup>	76.7	14.2	6.3	2.8
Jafari <i>et al.</i> <sup>2†</sup>	79	14.5	6.5	--

\*Data are given as percent.

†Results of present study has been analyzed in two ways: Jafari *et al.*<sup>1</sup> statistic whit inclusion of asymmetrical cases, and Jafari *et al.*<sup>2</sup> statistic without inclusion of asymmetrical cases.

Present study indicates the rate of 2.8% of the examined individuals. However, just few studies have determined asymmetrical cases separately. Other researches have only reported three occlusion classes. In present study, with omitting asymmetrical cases, the prevalence of classes I, II, III would be 79%, 14.5%, 6.5%, respectively. Table 3 shows the results of present study by both including and not including cases with asymmetrical classes.

In conclusion, these studies show prevalence of different occlusion classes varies widely, not only among countries, but also in different races in one country such as United States and Malaysia. Present study shows rates similar to rates in Nigeria in the middle of Africa. It seems that occlusion is greatly depended on race and area of study.

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### Conflict of interests

The authors declare that they have no competing interests.

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