Original Article

Malocclusion & occlusal traits among Iranian female elementary students: an epidemiologic study

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ABSTRACT

background: Malocclusion detection is straightforward in the mixed dentition and is enabling more efficient provision of orthodontic treatment. This study aimed to assess the frequency of malocclusion in female elementary students in Qazvin, Iran. Materials and Methods: This descriptive, cross-sectional study, randomly evaluated 450 female elementary students in Qazvin, Iran. Type of malocclusion, overjet, overbite, anterior and posterior open bite, lingual posterior crossbite, crowding, spacing, midline deviation, facial asymmetry, facial profile, and vertical facial height were evaluated and recorded. The data were analyzed using SPSS version 21 via descriptive statistics. Results: The results showed that 9.6% of the study population had normal occlusion. The commonest malocclusions were class II division I (41.5%) followed by class I (33.3%), class II division II (12%) and class III (3.6%). Overjet between 0 to 3.5 mm (52%) and overbite ≤1/3 (54.2%) had the highest frequency. The most common facial profile was convex in 55.3%. The highest vertical facial height was normal in 70.4%. The other occlusal traits did not present, in most of the subjects. The occlusal traits distribution of subjects, according to occlusion type were evaluated. Conclusions: Contrary to the results of the most epidemiologic studies in Iranian population that have shown most subjects had normal occlusion or class I malocclusion; in female elementary students in Qazvin, Class II division 1 malocclusion and convex profile were the most prevalent, whereas class III malocclusion and concave profile were the least. It was noticeable in treatment programs.

Keywords: female, Iran, Malocclusion, Students.

Introduction

Maxillofacial deformities have a high prevalence worldwide [1]. According to [2], around 75% of 6-11 year-olds had maxillofacial deformities. These deformities can have consequences such as temporomandibular joint [3, 4] and psychological problems [5, 6]. The variation in craniofacial growth and/or development with esthetic influence, and following psychosocial implication in children and adults is named malocclusion [7].

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The first classification of malocclusion is Angle's that was based on the relationship between the first molars in the anterior-posterior dimension and their inclination relative to the occlusal plane [2, 8, 9]. However, this classification has shortcomings as well. It cannot differentiate between malocclusions with an anterior-posterior discrepancy of dental arch and disharmony of facial structures. It does not include vertical and transverse discrepancies either (Overbite, as an index for assessment of vertical occlusal relationship and Cross bites in the transverse plane). It does not evaluate dental malalignments such as rotation, crowding, and spacing. The missing or impacted teeth are not taken into account in the Angle's classification either. Therefore, a classification was presented by [2, 10] to overcome the limitations of Angle's classification and was named as "orthodontic analysis", that included the assessment of facial ratios and esthetics, alignment and symmetry of teeth in dental arch and dental and skeletal relationships in transverse dimension, anterior-posterior dimension, and vertical dimension [2].

Numerous other methods have been available for the assessment of malocclusion in communities, such as epidemiological assessment method by Bjork, Krebs, and Slow, the method invented by the Federation Dentaire International, dental esthetic index and malocclusion severity index [11]. Considering the lack of a consensus on a comprehensive classification for malocclusion types, it seemed that a combination of these classifications should be used for such assessments. Epidemiological data regarding malocclusion have been imperative for the assessment of the quality and quantity of orthodontic services. Not only detection and prediction of malocclusion in the mixed dentition are easier, enabling more efficient provision of orthodontic treatment, but also management of maxillofacial discrepancies in this stage may eliminate the need for complex high-cost corrective surgeries and more invasive procedures in the future [2, 12]. Epidemiological investigations on the prevalence of malocclusion in a certain region have provided important data to enable outlining of the measures necessary for a reduction in the incidence of unfavorable factors, in addition to the stopping of the skeletal problems at a suitable age [13].

To the best of authors' knowledge, no comprehensive study on the prevalence of different types of malocclusions has been available among a large group of female elementary students in Qazvin, Iran. Considering the need for epidemiological studies on dentofacial deformities, this study aimed to assess the frequency of malocclusion in female elementary students in Qazvin, Iran in 2017.

Materials and Methods

Permission to undertake the records was obtained from the Ministry of Health and Education. Ethical approval was given by the Research Ethics Committee and Faculty of Community Dentistry, School of Dentistry, Qazvin University of Medical Sciences (IR.QUMS.REC.1396.108).

This descriptive cross-sectional study evaluated randomly chosen 450 female elementary students (7-12 years) in Qazvin, Iran in 2017. The sample size (n= 390) was calculated assuming P=0.1 and d=0.03. To increase the accuracy of results, 450 subjects were enrolled. Subjects were selected using stratified random cluster sampling.

The exclusion criteria:

- Craniofacial anomalies
- Congenital anomalies (clefts, syndromes)
- History of trauma to the head or face
- Orthognathic surgery
- Orthodontic treatment
- Non-Iranian ethnicity

Written informed consent was obtained from parents or legal guardians of children.

The selected subjects received a comprehensive oral and dental examination under adequate lighting in a seated position with teeth in centric occlusion and head in natural head position. All examinations were performed by a calibrated dental student as an examiner using a dental mirror and a wooden stick.

The following variables were evaluated (see table 1 including definitions and criterions of malocclusions and occlusal traits):

- Type of occlusion

This variable was determined according to the Angle's classification.

- Overjet, Reverse overjet (anterior crossbite), Overbite, Deep bite

The amounts of overjet and overbite were marked on a wooden stick using 0.5 mm tip of a red pencil and the distances were measured by a metal ruler.

- Anterior open bite, Posterior open bite, Lingual posterior crossbite, Crowding, Spacing, Midline deviation, Facial asymmetry

To assess facial symmetry, three anatomical points (gnathion, subnasale, and nasion) should have been in line; otherwise, the face would be considered asymmetric.

- Facial profile, Vertical facial height

After clinical examination, the subjects were provided with oral hygiene instructions.

The data were analyzed using SPSS version 21 via descriptive statistics.

Results

A total of 450 students, being 7, 8, 9, 10, 11 and 12 year olds accounted for 17%, 17.8%, 16.2%, 16.4%, 16.4% and 16.2%; respectively, were the study population.

The frequency of malocclusions among the subjects was, 9.6% normal occlusion, 33.3% class I, 41.5% class II division I, 12% class II division II and 3.6% class III malocclusion (Table 2 shows the prevalence of each malocclusion.). The highest overjet was noted 0 mm to 3.5 mm in 52% (table 2). The highest overbite was ≤ 1/3 in 54.2% (Table 2).

The most common facial profile was convex in 55.3% (Table 2). The highest vertical facial height was normal in 70.4% (Table 2). The other malocclusions were not present, in most of the subjects (Table 2). The occlusal traits distribution of subjects, according to occlusion type, can be seen in Table 3.

The highest frequency of increased overjet belonged to class II division I patients (36.4%), while the highest frequency of edge to edge and reverse overjet was noted in class III patients (68.88%) (Table 3). The highest frequency of overbite was in class II division II patients (100%), while edge to edge overbite had the highest frequency in class III patients (56.3%) (Table 3). The highest frequency of lingual posterior cross bite was in class III patients, that in most subjects, it was bilateral (43.8%) (table 3). The highest frequency of crowding was noted in class II division II patients (71.4%), while its lowest frequency was noted in normal occlusion subjects (0.0%) (table 3). The highest and the lowest frequency of spacing was noted in class II division I (44.9%) and class II division II malocclusion (0.0%);

respectively (Table 3). The highest frequency of midline deviation was 68.7% in class III patients (table 3). The frequency of asymmetry was the highest in class III (25%) and the lowest in normal occlusion (0.0%) (Table 3).

Regarding facial profile, convex profile was the most common type in class II patients (98.4% in div.1 & 100% in div.2), concave profile was the most common type in class III (87.5%) and straight profile was the most common type in normal occlusion (93%) and class I malocclusion (93.3%) (table 3). The highest frequency of long face was in class III (37.5%), and the highest frequency of short face was in class II division II (100%) (Table 3).

Discussion

This study aimed to comprehensively assess the frequency of different types of malocclusion and occlusal traits in female elementary students in Qazvin, Iran.

Types of malocclusion and occlusal traits frequency in this study and reviewed literature in Iran and other countries (notice Table 2 and 4)

- **Type of occlusion:**

The frequency of class II division I malocclusion in this study was found to be 41.5%, which had the highest frequency among different types of malocclusion, that was not similar to other studies. This value on the literature in Iran was recorded 24.1% in the study by Borzabadi-Farahani et al [9], 17.6% in a study by Atashi [14], 26.3% in a study by Khaneh et al [15], 16.4% in the study by Ramezanzadeh and Hosseini [16] and 4.78% in a study by Arabiun [17] (Tables 2,4).

In the studies evaluating malocclusion in similar population of this study, by Hanna et al [18], the largest population had Class I (normal) occlusion and Moaris et al [19] reported a similar percentage of Class I and II.

Class I malocclusion had a frequency of 33.3% in this study, which ranked the second in terms of frequency. Previous studies have reported that class I malocclusion had the highest frequency in Iran, unlike this study's population in Qazvin (table 4). However, similar to other reports, class III had the lowest frequency in this study (Table 4).

- **Overjet:**

Based on this study, the normal overjet was the commonest in 52%. Similarly, this value was the highest in normal criterion in reported frequency in Iranian population as follow: 52% by Oshagh et al [20], 71% by Ramezanzadeh and Hosseini [16], 67.7% by Borzabadi-Farahani et al [9] (Tables 2,4). Increased overjet in this study had a higher frequency (43.3%), compared to the previous ones (Tables 2,4). The frequency of edge to edge and reverse overjet in this study was 3.6% and 1.1%; respectively (Table 2).

- **Overbite:**

The frequency of normal and increased overbite were 54.2% and 43.1%; respectively in this study, and 2.7% had edge to edge overbite (Table 2). The findings indicated that the normal overbite had the highest frequency in different populations, however, in the study by Oshagh et al, deep bite had the highest frequency (53%) [20] (Table 4).

- **Other occlusal traits:**

The commonest subjects of this study had shown no other occlusal traits, such as anterior and posterior open bite, lingual posterior crossbite, crowding, spacing, midline deviation, and facial asymmetry. These results approximately were similar to the other studies in different populations (Tables 2,4).

However, in the study by Borzabadi-Farahani et al [9] and Atashi [14], more than 70% of the subjects had crowding. Also, in the study by Asiry, 59.5% of the subjects had spacing [21]. In the study by Narayanan and Kumar, most of the subjects had, midline deviation (63.4%) [22] (Table 4).

The following data have been shown in the evaluation of the result details:

The frequency of unilateral posterior crossbite (5.54%) was higher than bilateral, in the subjects of this study. This result was similar to the other studies (Tables 2,4).

In this study, the frequency of anterior crowding (19.6%) was higher than that of posterior crowding (3.3%) (Table 2).

The frequency of spacing was higher in the anterior of the maxilla (20.7%), compared to the anterior of the mandible, in this study. In the study by Asiry [21], 17.6% had spacing in the anterior of the maxilla, and 9.3% had spacing in the anterior of the mandible, which was in agreement with the findings of this study. In contrast to Borzabadi-Farahani et al, [9], the frequency of spacing was higher in the maxilla (Tables 2,4).

- **Facial profile:**

Regarding facial profile, 41.1% had a straight, 55.3% had a convex and 3.6% had a concave profile. Similar to that, in the study by Ramezanzadeh and Hosseini [16], the convex profile had the highest frequency (Tables 2,4).

- **Vertical facial height:**

The frequency of normal vertical facial height was the commonest (70.4%) in this study (Table 2).

Prevalence of occlusal traits based on the type of occlusion in the subjects (Table 3)

- **Normal occlusion & Class I malocclusion:**

In these groups, all of the occlusal traits were normal in the highest frequency (Table 3). The majority of subjects had normal overjet and overbite and did not have an anterior and posterior open bite, lingual posterior crossbite, crowding, spacing, midline deviation and facial asymmetry (Table 3). Regarding facial profile, straight was the commonest. The vertical facial height was normal in the highest frequency (Table 3).

- **Class II division 1 malocclusion:**

In this group, the majority of the subjects had 3.5mm to 6 mm overjet (63.6%) and normal overbite (50.3%). Results showed that the subjects in the highest frequency did not have an anterior and posterior open bite, lingual posterior crossbite, crowding, spacing, midline deviation and facial asymmetry (Table 3). Regarding facial profile, convex was the commonest (98.4%). The vertical facial height was normal in the highest frequency (79.1%) (Table 3). Increased overjet in class II division 1 patients was probably due to the retruded position of the mandible and subsequent incompetency of the lower lip to cover the maxillary incisors. In such cases, the lower lip was positioned behind the maxillary incisors, and applied pressure to their palatal surface causing their protrusion. At the same time, it applied pressure to the labial surface of the lower incisors causing their retrusion. Thus, it increased the overjet over time [2, 23].

- **Class II division 2 malocclusion:**

In this group, all of the subjects had normal overjet and 2/3 to 3/3 overbite. Results showed that subjects in the highest frequency did not have an anterior and posterior open bite, lingual posterior crossbite, spacing, midline deviation and facial asymmetry (Table 3). In the highest frequency, subjects had crowding in anterior of maxilla & mandible (33.3%) (Table 3). In almost all of the subjects, the profile was convex, and the vertical facial height was short, due to anti-clockwise rotation of the mandible [2] (Table 3).

Crowding in the mandibular arch of class II division II patients can be attributed to the smaller size of the mandibular arch, while crowding of the maxillary arch can be due to the palatal inclination of the maxillary incisors and decreased overjet, causing overlapping of lateral and central incisors [2, 23].

- **Class III malocclusion:**

In this group, all of the subjects had edge to edge overjet (68.88%) and overbite (56.3%). Results showed that subjects in the highest frequency did not have an anterior and posterior open bite, spacing and facial asymmetry (Table 3). In the highest frequency, the subjects had lingual bilateral posterior crossbite (43.8%) and had 1/2 to ¼ width of lower incisor midline deviation (37.4%) (Table 3).

Regarding facial profile, concave was the commonest (87.5%). The vertical facial height was normal in the highest frequency (62.5%) (Table 3). Posterior cross bite had the highest frequency in class III patients in this study (62.5%), which was in agreement with the results of Borzabadi-Farahani et al, [9] and can be due to the smaller size of the maxillary arch in class III patients [2] (Table 3).

In general, the comparison of the findings of epidemiological studies was difficult because the variations in many factors might affect the results. Thus, the interpretation of the findings should be done with care. Age, sample size, the method of sampling, race, ethnicity, assessment tools and expertise of the examiners have been among the main factors that can affect the results [9]. Patients in primary, mixed and permanent dentition period can have different patterns of occlusion [11]. Also, the definition of normal occlusion and classifications varied in different stages of development of the masticatory system [11].

The age range of patients in some of the studies was different from that in this study (7-12 years).

Regarding the race, despite the fact that the present study, as well as some others, were conducted on the Iranian population, differences existed in the reported frequency of malocclusions, which can be due to the conduction of studies in different geographical locations and on different ethnic populations with variable age ranges, methods of examination and sample sizes [16, 23, 24].

The available definitions and classifications for different types of malocclusion can also be responsible for the controversy in results. The difference in the prevalence of normal occlusion and class I malocclusion can be due to the overlapping of these two entities, and the fact that normal occlusion may be mistaken for class I malocclusion or vice versa. The accuracy of tools used for the assessments is also important, and last but not the least, the experience and expertise of the examiners also play a role in the accuracy of findings, and special attention should be paid to intra- and inter-examiner reliability.

Based on the descriptive data of this study, there was a high prevalence of malocclusion among female elementary student in Qazvin, Iran, that would be valuable in planning the best preventive and treatment program. Also, contrary to the results of the most epidemiologic studies in Iranian population, it was shown that most subjects had normal occlusion or class I malocclusion, Considering the high prevalence of class II malocclusion in this study's population, it can be suggested that the undergraduate dental students, general dentists, pediatric dentists and orthodontists should obtain further training to management of class II malocclusion to improve the quality of care provided to the patients in Qazvin, Iran. Focus on prevention may be more efficient in the initial phases. Interceptive orthodontic treatment in US Medicaid patients has been useful in lessening malocclusion severity; some problems might not require additional comprehensive orthodontic treatment at later stages [25, 26].

Further studies with larger sample size are required on the larger population and other ethnic groups in Iran.

Table 1- malocclusion/ occlusal traits definitions and criterions

Malocclusion/ occlusal traits	Definition	criterions
Type of occlusion		
Normal occlusion	the mesiobuccal cusp of the maxillary first molar was in the buccal groove of the mandibular first molar, and the upper and lower teeth were in the occlusal plane with no tooth size discrepancy.[2,11]	

Class I malocclusion	the mesiobuccal cusp of the maxillary first molar was in the buccal groove of the mandibular first molar and the teeth were not in a correct position relative to the occlusal plane.[2]	
Class II malocclusion	the mesiobuccal cusp of the maxillary first molar was more mesially than buccal groove of the mandibular first molar and the teeth were not in a correct position relative to the occlusal plane. [2] • **Class II division 1:** a disto-occlusion where the maxillary incisors are significantly protruded. • **Class II division 2:** a disto-occlusion where the maxillary central incisors have a natural or palatal inclination, maxillary lateral incisors have flaring or overlap the central incisors.	
Class III malocclusion	the mesiobuccal cusp of the maxillary first molar was more distally than buccal groove of the mandibular first molar and the teeth were not in a correct position relative to the occlusal plane.[2]	
Overjet	Horizontal overlapping of mandibular incisors by the maxillary incisors The incisal edge of the maxillary incisors should be placed ahead of the incisal edge of the mandibular incisors. [14] • **Reverse overjet (anterior crossbite):** Mandibular incisors are placed ahead of the maxillary incisors.[2]	**Normal:** 0 mm to 3.5 mm **Increased**: 3.5 mm to 6 mm 6 mm to 9 mm 9< mm **Edge to edge** **Reversed:** -3.5mm to -1 mm -1 mm to 0 mm
Overbite	Vertical overlapping of mandibular incisors by the maxillary incisors [14] • ***Deep bite:*** Increased vertical overlapping [27]	**Normal:** ≤ 1/3 **Edge to edge** ***Deep bite:*** 1/3 to 2/3 2/3 to 3/3
Anterior open bite	No overlapping of mandibular incisors by the maxillary incisors [28]	0 ≤ 1 mm 1.1 mm to 2 mm 2.1 mm to 4 mm 4mm<
Posterior open bite	No contact of the occlusal surface of the posterior teeth in centric occlusion[28]	No Right unilateral Left unilateral bilateral
Lingual posterior cross bite	The palatal cusps of the maxillary teeth are positioned more palatally relative to the central groove of the mandibular teeth [2]	No Right unilateral Left unilateral Bilateral
Crowding:	A smaller periphery of the dental arch from the sum of mesiodistal widths of teeth leads to crowding, overlapping or rotation of teeth [20]	No Ant. Of maxilla Ant. Of mandible Ant of maxilla & mandible Post of maxilla Post of mandible
Spacing:	A larger size of the dental arch than the sum of mesiodistal widths of teeth leads to spacing [20]	No Ant. Of maxilla Ant. Of mandible Post of maxilla Post of mandible
Midline deviation:	The maxillary and mandibular dental midline do not inline. [10]	No ½ to ¼ width of lower incisor ½< width of lower incisor

Facial asymmetry:	Deviation of the hypothetical line passing through the gnathion, subnasale and nasion [29]	No Yes
Facial profile:	The relationship between the connecting line of the nasal bridge to the base of the upper lip and the connecting line of the base of the upper lip and chin [2]	Straight Concave convex
Vertical facial height:	hypothetically three segments of the face in the frontal view: from the hairline to the nasion from the nasion to the anterior nasal spine from the anterior nasal spine to menton [30]	Normal Long face Short face

Table 2-Prevalence of malocclusion/ occlusal traits in the subjects (450 girls).

Malocclusion/occlusal traits	n	%
Type of occlusion		
Normal	43	9.6
Cl I	150	33.3
Cl II- Div. 1	187	41.6
Cl II- Div. 2	54	12
Cl III	16	3.6
Overjet		
-3.5mm to -1 mm	2	0.4
-1 mm to 0 mm	3	0.7
Edge to edge	16	3.6
0 mm to 3.5 mm	234	52
3.5 mm to 6 mm	126	28
6 mm to 9 mm	62	13.7
9< mm	7	1.6
Overbite:		
≤ 1/3	244	54.2
1/3 to 2/3	109	24.2
2/3 to 3/3	85	18.9
Edge to edge	12	2.7
Anterior open bite:		
0	431	95.8
≤ 1 mm	10	2.2
1.1mm to 2 mm	6	1.3
2.1 mm to 4 mm	3	0.7
4mm<		
Posterior open bite:		
No	446	99.1
bilateral		
Right	3	0.7
left	1	0.2
Lingual posterior cross bite:		
No	413	91.8
Bilateral	11	2.4
Right	11	2.4
left	15	3.4
Crowding:		
No	315	70
Ant. Of maxilla	35	7.8
Ant. Of mandible	53	11.8
Ant of maxilla & mandible	32	7.1
Post of maxilla	2	0.4
Post of mandible	13	2.9
Spacing:		
No	354	78.7
Ant. Of maxilla	93	20.7
Ant. Of mandible	3	0.6
Post of maxilla		
Post of mandible		
Midline deviation:		
No	389	86.4
½ to ¼ width of lower incisor	39	8.7
½< width of lower incisor	22	4.9
Facial asymmetry:		
No	427	94.9

	Yes	23	5.1
Facial profile:			
	Straight	185	41.1
	Concave	16	3.6
	convex	249	55.3
Vertical facial height:			
	Normal	317	70.4
	Long face	63	14
	Short face	70	15.6

Table 3-Prevalence of malocclusion/ occlusal traits based on the type of occlusion in the subjects (450 girls).

Malocclusion/ occlusal traits	normal		Class I		Class II Div.1		Class II Div.2		Class III	
	n	%	n	%	n	%	N	%	n	%
Overjet										
-3.5mm to -1 mm									2	12.5
-1 mm to 0 mm									3	18.7
Edge to edge			5	3.3					11	68.88
0 mm to 3.5 mm	43	100	137	91.3			54	100		
3.5 mm to 6 mm			7	4.7	119	63.6				
6 mm to 9 mm					62	33.2				
9< mm			1	0.7	6	3.2				
Overbite:										
≤ 1/3	43	100	100	66.6	94	50.3			7	43.7
1/3 to 2/3			43	28.7	66	35.3				
2/3 to 3/3			4	2.7	27	14.4	54	100		
Edge to edge			3	2					9	56.3
Anterior open bite:										
0	43	100	141	94	181	96.8	54	100	12	75
≤ 1 mm			5	3.3	3	1.6			2	12.5
1.1mm to 2 mm			3	2	2	1.1			1	6.3
2.1 mm to 4 mm			1	0.7	1	0.5			1	6.3
4mm<										
Posterior open bite:										
No	43	100	149	99.3	184	98.4	54	100	16	100
bilateral										
Right			1	0.7	2	1.1				
Left					1	0.5				
Lingual posterior cross bite:										
No	43	100	136	90.7	180	96.3	48	88.9	6	37.5
Bilateral			2	1.3			2	3.7	7	43.8
Right			5	3.3	4	2.1	1	1.9	1	6.3
left			7	4.7	3	1.6	3	5.6	2	12.5
Crowding:										
No	43	100	95	63.3	151	80.8	16	29.6	10	62.5
Ant. Of maxilla			13	8.7			16	29.6	6	37.5
Ant. Of mandible			21	14	30	16	2	3.7		
Ant of maxilla & mandible			14	9.3			18	33.3		
Post of maxilla			1	0.7	6	3.2	1	1.9		
Post of mandible			6	4			1	1.9		
Spacing:										
No			141	94	103	55.1	54	100	13	81.2
Ant. Of maxilla			9	6	84	44.9				
Ant. Of mandible									3	18.8
Post of maxilla										
Post of mandible										
Midline deviation:										
No	43	100	139	92.7	166	88.8	36	66.7	5	31.3

½ to ¼ width of lower incisor				8	5.3	14	7.5	11	20.3	6	37.4
½< width of lower incisor				3	2	7	3.7	7	13	5	31.3
Facial asymmetry:											
	No	43	100	143	95.3	178	95.2	51	94.4	12	75
	Yes			7	4.7	9	4.8	3	5.6	4	25
Facial profile:											
	Straight	40	93	140	93.3	3	1.6			2	12.5
	Concave			2	1.3					14	87.5
	convex	3	7	8	5.5	184	98.4	54	100		
Vertical facial height:											
	Normal	35	81.3	124	82.7	148	79.1			10	62.5
	Long face	2	4.7	16	10.6	39	20.9			6	37.5
	Short face	6	14	10	6.7			54	100		

Table 4-Prevalence of malocclusion/ occlusal traits based in different populations.

Authors	Country/ City	Subjects		%	malocclusion/ occlusal traits	
		Member gender	age			
Narayanan et al (2016) [22]	South India /Kerala	2366	10-12 Yrs.		Type of occlusion	
				16.7		Normal
				69.8		Cl I
				8.85		Cl II- Div. 1
				0.5		Cl II- Div. 2
				4.1		Cl III
					Overjet:	
				23.2		Increased
				0.4		reverse
					Overbite:	
				35.6		Increased
				0.29	*open bite*	
				63.4	*Midline deviation*	
Sobouti et al (2015) [27]	Iran/ Sari	485 female	13-15 Yrs.		Type of occlusion	
				12		Normal
				53		Cl I
				19.4		Cl II
				15.6		Cl III
					Overjet:	
				26.1		Increased
				35		Decreased
				2		reverse
					Overbite:	
				30.7		Increased
				23.5		Decreased
				4		Deep
				5.3	*open bite*	
				75	*crowding*	
Asiry (2015) [21]	Saudi Arabia/ Riyadh	1825 female& male	12-16 Yrs.		*Overjet:*	
				10		Negative to 0 mm
				67		1-3 mm
				15.2		4-6 mm
				1.2		6mm<
					Overbite:	
				76		1-3 mm
				6.52		4-6 mm
				0.16		6mm <
				6.67	*open bite*	
					post cross bite	
				7		unilateral
				1.9		Bilateral
					Crowding:	
				20		Ant. Of maxilla

				18		Ant. Of mandible
				3.5		Post of maxilla
				4		Post of mandible
					Spacing:	
				17.6		Ant. Of maxilla
				9.3		Ant. Of mandible
Arabiun et al (2014) [17]	Iran/ Shiraz	1338	14-18 Yrs.		Type of occlusion	
				76.3		Normal
				12.78		Cl I
				4.78		Cl II- Div. 1
				5.16		Cl II- Div. 2
				0.97		Cl III
				0.82	*Ant open bite*	
				0.37	*Post open bite*	
					posterior cross bite:	
				0.37		Bilateral
				1.56		Unilateral
Bourzgui et al (2012) [28]	Morocco/ Casablanca	1000	8-12 Yrs.		Type of occlusion	
				61.4		Cl I
				24		Cl II
				10		Cl III
					Overjet:	
				2		Negative to 0 mm
				5.9		Edge to edge
				63.9		1-4 mm
				17.2		4-6 mm
				10		6mm<
					Overbite:	
				7.1		Edge to edge
				65.4		1-4 mm
				16.6		4-6 mm
				7		6mm<
				3.1	*open bite*	
					post cross bite	
				2.9		right
				2.6		left
				1.6		Bilateral
				49.2	*Crowding*	
				42.2	*Midline deviation*	
Oshagh et al (2010) [20]	Iran/ Shiraz	700 female& male	6-14 Yrs.		Type of occlusion	
				18		Normal
				70		Cl I
				12		Cl II
						Cl III
					Overjet:	
				52		Normal
				30		Large
				18		negative
					Overbite:	
				36		Normal
				53		deep
				11	*open bite*	
				36	*cross bite*	
Borzabadi-Farahani et al. (2009) [9]	Iran/Isfahan	502 female& male	11-14 Yrs.		Type of occlusion	
				22.9		Normal
				41.8		Cl I
				24.1		Cl II- Div. 1
				3.4		Cl II- Div. 2
				7.8		Cl III
					Overjet:	
				1		3.5mm to -1 mm

				3.2		-1 mm to 0 mm
						Edge to edge
				67.7		0 mm to 3.5 mm
				24.5		3.5 mm to 6 mm
				3.4		6 mm to 9 mm
				0.2		9< mm
					Overbite:	
				60.4		≤ 1/3
				23.5		1/3 to 2/3
				8.8		2/3 to 3/3
				3.6		Edge to edge
				1.6	*Anterior open bite*	
					posterior cross bite:	
				2		Bilateral
				4.6		Right
				3.8		Left
					Crowding:	
				75.2		maxilla
				73.7		mandible
					Spacing:	
				18.9		maxilla
				20.7		mandible
					Midline deviation:	
				76.3		No
				17.9		½ to ¼ width of lower incisor
				5.8		½< width of lower incisor
Atashi (2007) [14]	Iran/ Tabriz	398	13-15 Yrs.		Type of occlusion	
				4		Normal
				57		Cl I
				17.6		Cl II- Div. 1
				4.3		Cl II- Div. 2
				17.1		Cl III
					Overjet:	
				30.7		Increased (3mm<)
				33.9		Decreased (2mm>)
				2		Reverse
					Overbite:	
				40.2		Increased (2mm<)
				3.3		Deep
				19.3		Decreased (1mm>)
				3.3	*open bite*	
				77.4	*Crowding*	
					Facial profile:	
				54.8		Straight
				3		Concave
				42.2		Convex
Ramezanzadeh and Hosseini (2005) [16]	Iran/ Neishabour	469 female& male	12-15 Yrs.		Type of occlusion	
				13.7		Normal
				54		Cl I
				16.4		Cl II- Div. 1
				6.8		Cl II- Div. 2
				9.2		Cl III
					Overjet:	
				71		1-3 mm
				16.2		4-6 mm
				4.1		7mm<
				6.4		Edge to edge
				2.3		Reverse
					Overbite:	
				8.3		0 mm

				52.2	1-3 mm
				30.1	4-6 mm
				2.1	7mm <
				7.3	*Anterior open bite*
					Facial profile:
				19.4	Straight
				3.6	Concave
				77	Convex
					Type of occlusion
Khaneh et al (2004) [15]	Iran/ Ahwaz	744 male	11-14 Yrs.	2.8	Normal
				69.9	Cl I
				26.3	Cl II- Div. 1
				2.8	Cl II- Div. 2
				5.1	Cl III

Conclusions:

Contrary to the results of the most epidemiologic studies in Iranian population which showed that most subjects had normal occlusion or class I malocclusion, in female elementary students aged 7-12 in Qazvin, Iran:

1. Class II division 1 malocclusion and convex profile were the most prevalent, whereas class III malocclusion and concave profile were the least.
2. Normal overjet, overbite, and vertical facial height were the most prevalent.

These conclusions are noticeable because they can affect on the preventive and treatment programs in this region.

References

1. Silva LF, Thomaz EB, Freitas HV, Pereira AL, Ribeiro CC, Alves CM. Impact of malocclusion on the quality of life of Brazilian adolescents: A population-based study. PloS one. 2016 Sep 30; 11(9): e0162715.
2. Siécola GS, Filho LC, Lorenzoni DC, Janson G, JFC. Subjective facial analysis and its correlation with dental relationships. Dental Press J Orthod. 2017; 22(2): 87–94.
3. Bilgiç F, Gelgör İE. Prevalence of temporomandibular dysfunction and its association with malocclusion in children: an epidemiologic study. Journal of Clinical Pediatric Dentistry. 2017; 41(2):161-5.
4. Farronato G, Rosso G, Giannini L, Galbiati G, Maspero C. Correlation between skeletal Class II and temporomandibular joint disorders: a literature review. Minerva stomatologica. 2016 Aug; 65(4):239-47.
5. Bittencourt JM, Martins LP, Bendo CB, Vale MP, Paiva SM. Negative effect of malocclusion on the emotional and social well-being of Brazilian adolescents: a population-based study. European journal of orthodontics. 2017 Mar 25; 39(6):628-33.
6. Pithon MM, dos Santos CR, Lima Santos ND, Aguiar Sales Lima SO, da Silva Coqueiro R, dos Santos RL. Impact of malocclusion on affective/romantic relationships among young adults. The Angle Orthodontist. 2015 Sep 14; 86(4):638-43.
7. Almeida MR, Pereira ALP, Almeida RR, Almeida-Pedrin RR, Silva Filho OG. Prevalence of malocclusion in children aged 7 to 12 years. Dental Press J Orthod. 2011; 16(4):123-31.
8. Akbari M, Lankarani KB, Honarvar B, Tabrizi R, Mirhadi H, Moosazadeh M. Prevalence of malocclusion among Iranian children: A systematic review and meta-analysis. Dental research journal. 2016 Sep; 13(5):387.
9. Borzabadi-Farahani A, Borzabadi-Farahani A, Eslamipour F. Malocclusion and occlusal traits in an urban Iranian population. An epidemiological study of 11-to 14-year-old children. The European Journal of Orthodontics. 2009 May 28; 31(5):477-84.
10. Baeshen H. The Prevalence of Major Types of Occlusal Anomalies among Saudi Middle School Students. The journal of contemporary dental practice. 2017 Feb 1; 18(2):142-6.
11. Hassan R, Rahimah AK. Occlusion, malocclusion and method of measurements - an overview. Archives of Orofacial Sciences. 2007; 2:3-9.
12. Amat P. The search for balance in the therapeutic decision-making process: the example of Class II malocclusion treatments in children and adolescents. L'Orthodontie francaise. 2016 Dec; 87(4):375-92.
13. Bittencourt MA, Machado AW. An overview of the prevalence of malocclusion in 6 to 10-year-old children in Brazil. Dental Press J Orthod. 2010; 15(6):113-22.
14. Atashi MH. Prevalence of malocclusion in 13-15 year-old adolescents in Tabriz. Journal of dental research, dental clinics, dental prospects. 2007; 1(1):13-8.
15. Khaneh MM, Basir L. A study on prevalence of dentofacial anomalies according to angle's classification in 11-14 year old boy students in ahwaz 2002.Jundishapur Scientific Medical Journal. 2004; 42:20-25.
16. Ramezanzadeh B, HOSSEINI SH. Evaluation of prevalence of dental malocclusion in students of junior high school students in the city of Neishabour in year

2002-2003. Journal of Dentistry Mashhad University of Medical Sciences. 2005; 29:57-66.
17. Arabiun H, Mirzaye M, Dehghani-Nazhvani A, Ajami S, Faridi S, Bahrpeima F. The prevalence of malocclusion among 14-18 years old students in Shiraz. Journal of Oral Health and Oral Epidemiology. 2014 Jun 3; 3(3):8-11.
18. Hanna A, Chaaya M, Moukarzel C, Asmar K, Jaffa M, Ghafari J.G. Malocclusion in Elementary School Children in Beirut: Severity and Related Social/Behavioral Factors. International Journal of Dentistry. 2015: 351231. doi: 10.1155/2015/351231
19. Moaris CHD, Zanin L, Degan VV, Valdrighi HC, Venezian GC, Vedovello SAS. Malocclusion in schoolhildren aged 7-12 years old in Minas Gerais, Brazil, RGO, Rev Gaúch Odontol, Porto Alegre,2016;64(2):164-170.
20. Oshagh M, Ghaderi F, Pakshir HR, Baghmollai AM. Prevalence of malocclusions in school-age children attending the orthodontics department of Shiraz University of Medical Sciences. Eastern Mediterranean Health Journal. 2010 Dec 1; 16(12):1245.
21. Asiry MA. Occlusal status among 12-16 year-old school children in Riyadh, Saudi Arabia. Journal of international oral health: JIOH. 2015 May; 7(5):20-3.
22. Retna Kumari Narayanan MT, Kumar TA. Prevalence of malocclusion among 10-12-year-old schoolchildren in Kozhikode District, Kerala: An epidemiological study. International journal of clinical pediatric dentistry. 2016 Jan; 9(1):50-5.
23. Buschang PH. The development, phenotypic characteristics, and etiology of Class II malocclusion. Recognizing and correcting developing malocclusions A problem-oriented approach to orthodontics. 2016 Jan 25:90-107.
24. Danaie SM, Asadi Z. Distribution of malocclusion types, hereditary crowding and the need of 7 9 year old children to serial extraction in Shiraz, 2000-2001. Journal of Dentistry, Shiraz University of Medical Sciences. 2003; 4(2):44-51.
25. Patrick DL, Lee RSY, Nucci M, Grembowski D, Jolles CZ, Milgrom P. Reducing oral health disparities: a focus on social and cultural determinants. BMC Oral Health.2006; 6 (Suppl 1): S4. https://doi.org/10.1186/1472-6831-6-S1-S4
26. King G, Spiekerman C, Greenlee G, Huang G. Randomized clinical trial of interceptive and comprehensive orthodontics. Journal of Dental Research. 2012; 91(7), supplement, 59S–64S.
27. Sobouti F, Namadar P, Behzadi Y, Motevalli S, Armin M. Prevalence of Dental Malocclusion among 13-15 year Old Girls. Journal of Mazandaran University of Medical Sciences. 2016 Jan 15; 25 (132):300-3.
28. Bourzgui F, Sebbar M, Hamza M, Lazrak L, Abidine Z, El Quars F. Prevalence of malocclusions and orthodontic treatment need in 8-to 12-year-old schoolchildren in Casablanca, Morocco. Progress in orthodontics. 2012 Sep 1; 13(2):164-72.
29. Al Taki A, Ahmed MH, Ghani HA, Al Kaddah F. Impact of different malocclusion types on the vertical mandibular asymmetry in young adult sample. European journal of dentistry. 2015 Jul; 9(3):373-7.
30. Vinnakota DN, Kanneganti KC, Pulagam M, Keerthi GK. Determination of vertical dimension of occlusion using lateral profile photographs: A pilot study. The Journal of the Indian Prosthodontic Society. 2016 Oct; 16(4):323-27.