Prevalence of malocclusions in school-age children attending the orthodontics department of Shiraz University of Medical Sciences

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معدل انتشار سوء الإطباق بين طلاب المدارس المترددين على قسم تقويم الأسنان في جامعة العلوم الطبية في شيراز

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الخلاصة: استهدف الباحثون تقديم معطيات كمية عن معدل انتشار سوء الإطباق لدى سكان شيراز، فدرسوا سجلات 700 مريضاً (391 فتاة و309 فتى)، ممن تتراوح أعمارهم بين 6 و14 عاماً وممن ترددوا على قسم تقويم الأسنان قبل التخرج من جامعة العلوم الطبية في شيراز. ولدى توزيعهم إلى فئات بحسب تصنيف أنجل، كان معدل انتشار سوء إطباق الأضراس الأولي في الفئة 52.0٪) I) والفئة 32.6٪) II)، والفئة 12.3٪) III) كما وجد الباحثون معدل انتشار سوء إطباق الأضراس الأولى في سوء الإطباق الهيكلي في الفئة 18.0٪) I) وفي الفئة 70.0٪) II)، وفي الفئة 12.0٪) III). ولم تكن هناك فروق يعتدُّ بها إحصائياً بين الجنسين في معدل انتشار الأنماط المختلفة لسوء الإطباق الهيكلي، وكان الأطفال من الفئة III (العمر الوسطي 8.9 سنوات) أصغر عمراً بمقدار يعتدُّ به إحصائياً، من أطفال الفئة 9.6) I أعوام)، ومن الفئة 9.7) II أعوام). ويحتاج طلاّب اختصاص تقويم الأسنان إلى مزيد من التعليم والتدريب على معالجة سوء الإطباق من الفئة II بهدف تحسين الجودة الإجمالية لرعاية المرضى.

ABSTRACT To provide quantitative data about the prevalence of malocclusions in the Shiraz orthodontic population, we studied the records of 700 patients (391 girls and 309 boys) aged 6–14 years attending the undergraduate Department of Orthodontics at Shiraz University of Medical Sciences. The prevalence of Angle class I, II and III malocclusion of first molars was 52.0%, 32.6% and 12.3% respectively. Skeletal class I, II and III malocclusion was found in 18.0%, 70.0% and 12.0% respectively. There were no significant differences between the sexes in the prevalence of different types of skeletal malocclusion. Children with class III were significantly younger (mean age 8.9 years) than those with class I (9.6 years) or class II (9.7 years) malocclusions. Orthodontics students need more education and training in the management of class II malocclusion to improve the overall quality of care for patients.

Prévalence des malocclusions chez les enfants d'âge scolaire en consultation dans le service d'orthodontie de l'Université des Sciences médicales de Shiraz (République islamique d'Iran)

RÉSUMÉ Pour fournir des données quantitatives sur la prévalence des malocclusions dans la population orthodontique de Chiraz, nous avons étudié les dossiers médicaux de 700 patients (391 filles et 309 garçons), âgés de six à quatorze ans ayant consulté dans le service d'orthodontie du premier cycle de l'Université des Sciences médicales de Shiraz. La prévalence des malocclusions des premières molaires correspondait respectivement à 52,0 % des patients pour la classe I, à 32,6 % pour la classe II et à 12,3 % du groupe étudié pour la classe III, selon la classification d'Angle. La prévalence des malocclusions squelettiques de classe I correspondait respectivement à 18,0 % des patients, celle de la classe II à 70,0 % et celle de la classe III à 12,0 % du groupe étudié. Il n'y avait pas de différences significatives entre les sexes pour la prévalence des types de malocclusion squelettique. Les enfants ayant une malocclusion de classe III étaient nettement plus jeunes (âge moyen 8,9 ans) que ceux qui présentaient une malocclusion de classe I (9,6 ans) ou de classe II (9,7 ans). Les étudiants en orthodontie ont besoin d'un enseignement et d'une formation renforcés pour la prise en charge des malocclusions de classe II afin d'améliorer la qualité globale des soins aux patients.

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Introduction

The prevalence of malocclusion has been reported for different populations, but the figures can vary widely, even for the same population. Variables such as differences in the classification of malocclusions, age of the study sample, examiner differences in determining normal occlusion, and differences in sample sizes can affect the results [1].

Although several studies have investigated the prevalence of dentofacial characteristics in a given population, few studies have been conducted among patients who seek or are referred for orthodontic care [1–10]. Danaei et al. reported that in Shiraz, Islamic Republic of Iran, the prevalence of class I, II and III malocclusions in schoolchildren aged 7–9 years was 47.4%, 14.7% and 2.1% respectively [11]. Hedayati et al. found that almost half of the 11–14-year-old schoolchildren in Shiraz had a slight need or no need for orthodontic treatment according to the index of orthodontic treatment need [12]. In another study, however, they concluded that 70.1% of 12–15-year-old students in Shiraz had normal or minor malocclusions, indicating no need for orthodontic treatment [13].

No representative data on the prevalence of dentofacial characteristics are available for the orthodontic population in Shiraz. Because the number of orthodontists available to treat patients in Shiraz is only about 15, there is a high demand on each practitioner for treatment. Moreover, the establishment of a service usually leads to increased demand for treatment and there has been a steady increase in the number of patients being referred for treatment. Clearly the evaluation of referred patients and the distribution of malocclusion types can provide valuable information for planning an orthodontic service. The present study was therefore designed to determine the frequency of malocclusions in a population of patients attending a university department of orthodontics in Shiraz for orthodontic treatment.

Methods

The orthodontic records of 700 patients (391 girls and 309 boys) attending the Department of Orthodontics at Shiraz University of Medical Sciences were selected randomly from 1200 patients and retrieved from the archives for evaluation.

Patients with a history of previous orthodontic treatment or with systematic disease, craniofacial deformities or syndrome and patients with incomplete records were excluded from this study. All patients were from the southern regions of the Islamic Republic of Iran and none of them had undergone previous orthodontic treatment. Information about social class or ethnic origin was not recorded in the patient records at the department of orthodontics. Almost all patients were self-referred since there is no formal referral system for dental care through the Iranian health service. In addition, the insurance system in the country provides almost no special coverage for orthodontic treatment.

Written case records, dental casts, panoramic and cephalometric X-rays and intraoral and extraoral photographs were studied. The following dentofacial characteristics were investigated from initial records: molar relation according to Angle's classification and skeletal relation according to ANB and Wit's appraisal, overjet, overbite, crossbite, growth pattern and oral habits [14,15]. Lateral cephalometric X-rays were retrieved and traced to establish skeletal relations. Skeletal malocclusion and growth pattern were determined by measuring SNA (saddle–nasion–A-point angle), SNB (saddle–nasion–B-point angle), ANB (A point–nasion–B-point angle), Wit's distances, Go-Gn-SN (gonion–gnathion–saddle–nasion angle) and FMA (Frankfort plan–mandibular plan angle). Non-nutritional habits (thumb sucking, pacifier sucking, pen or nail biting, lip sucking or cheek biting) were determined by questioning children and their parents. Other characteristics were determined by clinical examination.

The data were pooled and analysed with the chi-squared test and 1-way analysis of variance. All analyses were done using *SPSS*, version 8.

Results

The overall ratio of boys to girls was approximately 4:5. The age distribution of patients is shown in Figure 1. The age

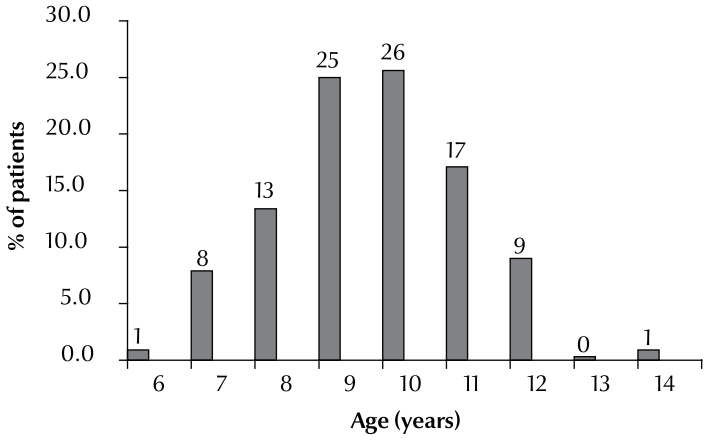

Figure 1 Age distribution of paediatric patients attending Shiraz University of Medical Sciences orthodontics department

Table 1 Orthodontic profile of boys and girls attending Shiraz University of Medical Sciences orthodontics department

Variable	Total (*n* = 700)		Boys (*n* = 309)		Girls (*n* = 391)		*P*-value (boys vs girls)
	No.	%	No.	%	No.	%	
Malocclusion (skeletal)							
Class I	126	18.0	54	17.5	70	17.9	0.25
Class II	490	70.0	224	72.5	270	69.1	
Class III	84	12.0	31	10.0	51	13.0	
Malocclusion (Angle class)							0.06
Class I	364	52.0	147	47.6	217	55.5	
Class II	228	32.6	105	34.0	123	31.5	
Class III	86	12.3	48	15.5	38	9.7	
End-to-end	22	3.1	9	2.9	13	3.3	
Growth pattern							0.71
Normal	168	24.0	77	24.9	91	23.3	
Vertical	396	56.6	169	54.7	227	58.1	
Horizontal	136	19.4	62	20.1	74	18.9	
Overjet							< 0.001
Normal	364	52.0	–	–	–	–	
Large	210	30.0	–	–	–	–	
Negative	126	18.0	–	–	–	–	
Bite type							0.46
Normal	252	36.0	102	33.0	160	40.9	
Deep bite	371	53.0	170	55.0	215	55.0	
Open bite	77	11.0	37	12.0	46	11.8	
Cross bite	252	36.0	115	37.2	137	35.0	0.17
Other							
Oral habits	119	17.0	51	16.5	68	17.4	0.08

at first consultation ranged from 6–14 years but almost all (97.9%) were in the age range 7–12 years.

The prevalence of skeletal class I, II and III malocclusion was 18.0%, 70.0% and 12.0% respectively, and there was no significant difference between the sexes in the prevalence of skeletal malocclusion ($P = 0.25$) (Table 1). The mean age of patients with skeletal class III malocclusion [8.9 (SD 1.5) years] was significantly lower than patients with class I [9.6 (SD 1.5) years] or class II malocclusions [9.7 (SD 1.4) years] ($P < 0.001$).

Table 1 also shows the distribution of malocclusion in both sexes according to Angle's classification of first molars. The prevalence of Angle class I malocclusion was 52.0%, class II 32.6% and class III 12.3%. There were some differences in the prevalence of Angle malocclusion between the sexes but these were not statistically significant ($P = 0.06$). However, among all class III patients the percentage of girls (44.2%) was significantly lower than boys (55.8%) ($P < 0.05$) (Table 1).

The growth pattern was normal in 24.0% of children, vertical in 56.6% and horizontal in 19.4%, and there was no significant difference in growth patterns between the sexes ($P = 0.71$).

The prevalence of large overjet was 30.0% and negative overjet was 18.0%. The rate of overjet was significantly higher in boys than girls ($P < 0.001$) (Table 1). However, there were no significant differences in the prevalence of different overbites between the sexes ($P = 0.46$). Crossbite was found in 36.0% of the sample (17.0% anterior and 19.0% posterior crossbite). Oral habits were noted in 17.0% of patients, including thumb sucking in 9.2% and lip biting in 2.0%. No significant difference was found in the prevalence of crossbite ($P = 0.17$) or oral habits ($P = 0.08$) between the sexes.

Discussion

In this study of Iranian children who sought orthodontic treatment, the prevalence of class I, II and III malocclusion of first molars was 52.0%, 32.6% and 12.3% respectively. The reported prevalence of dental malocclusion in a Colombian study of young patients varied from 39% to 93% [16]. The prevalence

of different types of malocclusion may show considerable variability, even in a population of the same origin. The criteria for normality vary from one examiner to another, and this affects the results of different studies. Our data are in agreement with Sari et al., who reported that 61.7% of the patients in Turkey had class I, 28.1% had class II and 10.2% had class III Angle dental malocclusion [17]. Small differences between different sets of results may be related to sample selection, ethnic origin and sample size. The sample analysed by Sari et al. consisted of patients accepted for treatment, whereas our sample consisted of the total referred population [17].

Our results are also very similar to those of Jones, who investigated dental malocclusion in 132 Saudi Arabian patients referred for orthodontic treatment and reported that 53.8% had class I, 33.3% class II and 12.9% had class III Angle dental malocclusions [7]. However, these results might not represent the prevalence of malocclusion in the reference population because the sample size was insufficient.

Our findings show less agreement with Sayin and Türkkahraman's study, which found that the prevalence of class I, II and III Angle dental malocclusions in a Turkish population referred for orthodontic treatment was 64%, 24% and 12% respectively [1]. Although their reported frequency of class I and II malocclusions was different from our results, the frequency of class III malocclusion was similar. However, a study in Indonesia obtained different figures for class III frequencies, reporting a 2% incidence in the Indonesian sample compared to 4% in an English sample and 23% in a Chinese population [5].

The male:female ratio in our study was 4:5 ,which is similar to the 4:6 ratio in the studies by Willems et al. [18], Jones [7] and Sayin and Türkkahraman [1]. In our study 48.0% of the patients had abnormal (class II or III) molar interdigitation. This is in agreement with a 2007 study onstudents in Shiraz, which found deviation from the class I molar relation in about half the sample [13].

The data from our orthodontic population was affected by selection bias and cannot be extrapolated to the whole Shiraz population. Therefore, our patients would be expected to have a greater prevalence of malocclusion. Similarly, Ucuncu and Ertugay found that 83.2% of the Turkish patients referred for treatment, but only 38.3% of the school-aged population, had a great need for orthodontic treatment [10]. In another study Danaei et al. found that in 7–9-year-old children in Shiraz, the prevalence of class I, II and III malocclusion was 47.4%, 14.7% and 2.1% respectively [11]. The lower prevalence of class II and III malocclusion in their study may be related to sample selection, as noted above. Nevertheless, the orthodontic population can be a useful group for analyses related to specific orthodontic treatments, as others have previously reported [8,9,19,20].

Although Angle's classification has been the topic of many discussions in the literature [21,22], it remains a fairly easy and accurate way of categorizing malocclusions, and is widely used in the dental profession. We therefore used Angle's original classification in this study to categorize dental malocclusions. The results of this categorization are shown in Table 2, and compared with those of other surveys [8,9,19,20,23]. It is nonetheless difficult to compare prevalence studies of dentofacial characteristics because the results represent different ethnic types [18].

The type of malocclusion is an important factor that affects a patient's motivation to seek treatment [1]. In our study, comparisons of the mean ages of the malocclusion groups indicated a statistically significant difference between skeletal class III and other groups, and the lowest mean age was in the class III group (8.9 years). This contrasts with Wilmont et al.'s study, which reported that patients with a severe sagittal class II deformity had a higher motivation for orthodontic treatment [24]. This may be attributed to the fact that in Iranian society, a slightly convex profile in young children is more acceptable than concave profiles. Adolescence is often associated with increased self-consciousness, confusion about identity and acceptance by others, and concerns about recognition from adults and peers [25]. Accordingly, adolescents are more likely to be highly motivated to seek orthodontic treatment. According to our results, the majority of patients were 7–12 years old. Thus (and while acknowledging that external motivations may also play a role) we can conclude that the motivation for orthodontic

Table 2 Prevalence of Angle classes in our Shiraz orthodontic population compared with other orthodontic populations

Angle class	Present study	Willems et al. [18]	Beresford [23]	Sheiham et al. [19]	Rose [8]	Vig et al. [20]	Yang [9]
	Islamic Republic of Iran	Belgium	England	England	England	USA	Korea
	%	%	%	%	%	%	%
Class I	52.0	31	37.8	47.1	49.2	43.7	53.9
Class II	35.6	63	60.4	44.3	46.3	50.8	14.9
Class III	12.3	6	1.8	8.6	4.5	5.5	49.1

treatment increased during early adolescence in our Iranian population sample. However, this interpretation must take into consideration the fact that at the Shiraz orthodontic department, most patients older than 12 years attend the postgraduate section of the department, and those records were not reviewed in the present study.

In our study skeletal class II patients comprised the greatest percentage of cases, but in Danaei et al.'s study the prevalence of class II malocclusion in the Shiraz population was only 14.7% [11]. This suggests that more class II patients in our population were referred for orthodontic treatment. It therefore seems logical to reinforce education and training about class II malocclusion for Iranian dental students. Moreover, our results suggest that insurance system coverage for these patients would be appropriate.

In our sample of children the prevalence of skeletal class I, II and III malocclusions was 18%, 70% and 12% respectively. These figures differ from those of Jones, who reported 46.4% for class I, 27.5% for class II and 26.1% for class III skeletal malocclusion in Saudi Arabian patients [7]. This difference may be attributed to ethnic differences and the small size of the Saudi Arabian study sample.

In our study, 56.5% of the patients had a vertical growth pattern of the facial skeleton, compared with Willem's study, which reported 29% vertical growth pattern at a Belgian university [18]. On the other hand our study showed that 19% of our sample had posterior crossbite, similar to the prevalence of this anomaly in Willem's study (15%) [18].

The prevalences of large overjet (30.0%), negative overjet (18,0%) and open bite (11.0%) were higher than in a study by Danaei et al., which reported prevalences of increased overjet of 17%, reverse overjet of less than 2% and open bite of less than 3% [13]. These differences can also be attributed to the fact that their sample consisted of a random selection of schoolchildren rather than referred patients and to the older age in general of the students in their study compared to our sample.

Conclusions

Most of the children attending the Department of Orthodontics at this Shiraz hospital had skeletal class II malocclusion. Since the number of orthodontists available to treat patients in the city of Shiraz is limited, there is a high demand on each practitioner for treatment. Therefore current orthodontics students should receive more education and training in the management of class II malocclusion to improve the overall quality of care for patients.

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