

Prevalence of malocclusion in a sample of Lebanese schoolchildren: an epidemiological study

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معدل انتشار سوء الإطباق في عينة من التلاميذ اللبنانيين: دراسة وبائية
فايز قاسم صالح

خلاصة: كان الهدف من هذه الدراسة تزويد مخططي خدمات صحة الفم في لبنان بمعلومات عن معدل انتشار سوء الإطباق بين التلاميذ، سعياً إلى تحديد الجماعة المستهدفة بخدمات تقويم الأسنان مستقبلاً. فتم فحص عدد بمجموعه 851 تلميذاً (446 من الذكور و405 من الإناث) تتراوح أعمارهم بين 9 و15 سنة، بحثاً عن سوء الإطباق باستعمال تصنيف أنجيل. ولقد تبين بصفة إجمالية أن 59.5% من أفراد العينة كانوا يعانون سوء الإطباق، وكان 35.5% من هذه الحالات ناجماً عن سبب سنّي، بينما كان 24% من الحالات يعانون اختلافات عظمية (19% من الصنف الثاني و5% من الصنف الثالث من سوء الإطباق). ووجد فارق إحصائي جوهري بين نتائج الذكور ونتائج الإناث. وقورنت هذه النتائج بالدراسات التي أجريت على جماعات إثنية أخرى. وانتهت الدراسة إلى مقترحات لإجراء بحوث وبائية أخرى في المستقبل.

ABSTRACT The study aimed to provide oral health planners in Lebanon with information on the prevalence of malocclusion in schoolchildren in an attempt to define the target population for orthodontic services in the future. A total of 851 schoolchildren (446 males and 405 females) aged 9–15 years were examined for malocclusion using Angle's classification. In all, 59.5% of the sample had malocclusions, 35.5% of which were of dental origin and 24% had skeletal discrepancy (19% Class II and 5% Class III malocclusions). A statistically significant difference was found between males and females. The findings are compared with those of studies of other ethnic groups and suggestions for future epidemiological research are presented.

La prévalence des malocclusions dans un échantillon de la population libanaise: étude épidémiologique

RESUME Le but de cette étude était de fournir aux planificateurs des soins de santé bucco-dentaire des informations adéquates sur la prévalence des malocclusions chez les écoliers pour essayer de définir la population cible des services d'orthodontie dans le futur. Au total, 851 écoliers (446 garçons et 405 filles) âgés de 9 à 15 ans ont été examinés à la recherche de malocclusions en utilisant la classification d'Angle. En tout, 59,5% de l'échantillon avait des malocclusions, dont 35,5% étaient d'origine dentaire et 24% présentaient des anomalies squelettiques (19% des malocclusions de Classe II et 5% de Classe III). Les résultats ont été comparés à ceux des études d'autres groupes ethniques et des suggestions concernant les futures recherches épidémiologiques sont présentées.

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Introduction and literature review

Quantitative methods of recording and measuring occlusal features are important for epidemiologists and for those planning the provision of orthodontic services in a certain community. Untreated malocclusion may lead to mandibular dysfunction and severe psychological problems.

In recent years, there has been a steady increase in the number of young and adult patients seeking orthodontic treatment in the dental schools and other public or private dental care centres in Beirut. The phenomenon of busy clinics and long waiting lists reflects the mismatch between the growing demand for orthodontic treatment and the lack of resources needed to provide high quality oral health services.

Angle's classification of malocclusion in 1899 was an important step in the development of orthodontics [1]. It not only subdivided the major types of malocclusion, but also provided the first clear definition of normal occlusion in natural dentition. Since then, numerous classifications and indices have been developed but as yet none has been universally accepted. This could be due to variations in the terminology, sampling differences of age and sex, levels of severity and the accuracy of examining methods [2].

Angle's classification is based on the antero-posterior relationship of the jaws with each other and does not take into account the vertical or transverse discrepancies. Despite early criticism by Cryer [3], Case [4], Hellman [5], Simon [6] and Ackerman and Proffit [7], Angle's classification has remained widely accepted and used in most dental schools and practices [8]. Moyers [9] considered it the most practical and popular method of studying occlusion. Recently, Graber and Vanars-

dall [10] confirmed the simplicity and practicality of this system.

To date, no epidemiological study of malocclusion has been conducted in Lebanon. This survey aimed to provide oral health care planners with information on:

- the prevalence of malocclusion in a Lebanese population group as compared with other ethnic groups;
- the sex distribution of occlusal variation and whether a significant difference exists among the children examined.

Subjects and methods

Sample

The sample consisted of 851 Lebanese schoolchildren (446 males and 405 females) randomly selected from five different comprehensive schools. The criteria for selection were:

- The participants and their parents must be of Lebanese origin.
- They must be between 9 years and 15 years of age.
- They must be free of any serious illness and have no history of trauma or surgery that could affect occlusion.

Methods

Clinical examination of each participant was carried out and the occlusal status was recorded in centric occlusion according to Parker [11]. The occlusion was then classified into normal occlusion or malocclusion using the first permanent molars as described by Angle [1]. The occlusal status of participants in the mixed dentition stage was recorded after clinical examination, which was supported by a good quality X-ray to confirm the presence, position and size of unerupted teeth.

The materials used for examination included:

- disposable dental mirrors and probes
- portable spotlight
- registration data sheet of occlusion, modified from Bjork et al. [12] and Massler and Frankel [13]
- panoramic X-ray for participants in the mixed dentition stage.

Results

A summary of the results is presented in Table 1 and Figure 1. The sex distribution and the percentage of occlusal variation among the schoolchildren are shown. A statistically significant difference was found between males and females which indicates occlusal variation is not independent of sex. Table 2 and Figure 2 compare the occlusal variation between the Lebanese and other ethnic groups

Discussion

The purpose of this epidemiological study was to provide the oral health care planners in Lebanon with adequate information about the prevalence of malocclusion among the age group (9–15 years) that most often

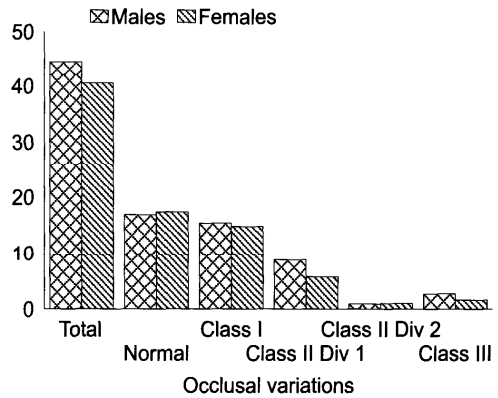


Figure 1 Sex distribution of occlusal variations in Lebanese schoolchildren

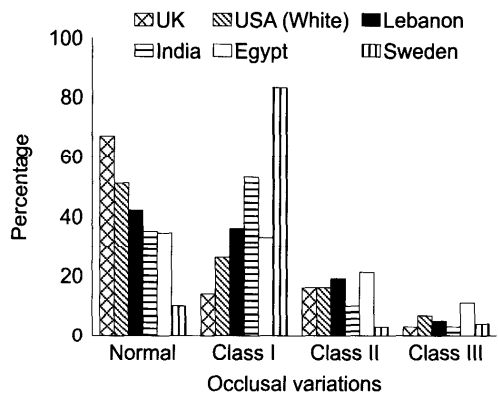


Figure 2 Angle's classification of occlusion in different ethnic groups

Table 1 Prevalence of occlusal variations by sex among Lebanese schoolchildren

Sex	Normal occlusion		CL I		CL II 1		CL II 2		CL III	
	No.	%	No.	%	No.	%	No.	%	No.	%
Males (n = 446)	169	37.9	154	34.5	87	19.5	9	2.0	27	6.1
Females (n = 405)	174	43.0	148	36.5	57	14.1	10	2.5	16	4.0
Total (n = 851)	343	40.3	302	35.5	144	16.9	19	2.2	43	5.1

$\chi^2 = 18.87$ $P = 0.0263$ Degrees of freedom = 4
 CL = class

Table 2 Prevalence of malocclusion among Lebanese schoolchildren compared with other ethnic groups

Authors	Ethnic group	Sample		Occlusion				
		Size	Age (years)	Normal	Class I	Division 1	Division 2	Class III
Saleh (1997) ^a	Lebanese	851 (446 M, 405 F)	9-15	343 (40.3%) (169 M, 174 F)	302 (35.5%) (154 M, 148 F)	144 (16.9%) (87 M, 57 F)	19 (2.2%) (9 M, 10 F)	43 (5.1%) (27 M, 16 F)
Luffingham and Campbell (1974) [14]	Scottish	269 (127 M, 142 F)	14	Normal + Class I Skeletal 55% Dental 57%				Skeletal 29% Dental 35%
El-Mangoury and Mostafa (1990) [15]	Egyptian	501	18-24	34.33%	33.30%	16.17%	21.00%	10.90%
Grewe et al. (1968) [16]	Indian	651	9-14	34.50%	53.00%		9.60%	2.90%
Massler and Frankel (1951) [13]	White American	2758 (1238 M, 1520 F)	14-18	21.20%	50.00%	16.17%	2.70%	9.50%
Tipton and Rinchuse (1991) [17]	White American	101 (57 M, 44 F)	18-32	51%	26%		16%	7%
Goose et al. (1957) [18]	British	2956	-	67.30%	13.70%		16.10%	2.90%
Ingervall (1974) [19]	Swedish	301	18	10%	83%		3%	4%

^a Present study

M = male F = female

seeks orthodontic treatment. Although assessment of occlusion in non-growing and permanent dentition periods is more reliable, this range was chosen for two reasons: first, it represents the majority of candidates for orthodontic treatment, and second, studying occlusion in the mixed dentition period could modify treatment plans for preventive or interceptive treatment before growth is completed.

The results showed that 40.3% of the Lebanese schoolchildren surveyed had normal occlusion as shown in Table 1 and Figures 1 and 2. When the findings were compared with similar studies, it was found that the British had the highest percentage with normal occlusion (67.3%) [18] followed by white Americans (51%) [17], the Lebanese (40.3%) (our study), Indians (34.5%) [16], Egyptians (34.33%) [15] and Swedish (10%) [19] (Table 2 and Figure 2).

The prevalence of class I malocclusion in the Lebanese sample was 35.5%; it was higher in females. The Swedish had the highest incidence of Class I malocclusion followed by the Indians, the Lebanese, the Egyptians, white Americans and then the British (Table 2 and Figure 2).

Angle's Class II malocclusion was found in 19% of the total sample (16.9% division 1 and 2.2% division 2). The prevalence of Class II, division 1 in males was much higher than females. However, the prevalence in Class II, division 2 was higher in females. When these findings were compared with other ethnic groups, Egyptians had the highest prevalence of class II malocclusion (21%), followed by Lebanese (19.1%), British (16.1%), white Americans (16%), Indians (9.6%) and Swedish (3%).

Angle's class III malocclusion was found in only about 5% of the Lebanese sample studied. In descending order, the prevalence of class III malocclusion was

highest in Egyptians (10.6%), followed by Scots (8%) white Americans (7%), Lebanese (5.1%), Swedish (4%), Indians (2.9%) and British (2.9%) (Table 2).

The main focus of this survey was to collect information on the prevalence of malocclusion in a sample of Lebanese schoolchildren. The survey found that 59.7% of the Lebanese children between 9 years and 15 years of age had a certain degree of malocclusion; 35.5% had local irregularities with a relatively normal jaw relationship, the remaining 24.2% had some jaw disharmony in addition to local irregularities.

To distinguish between those whose malocclusion is severe enough to require orthodontic treatment and those with minor deviations, one needs to establish certain criteria to rank patients properly according to the severity of the case, and to develop a treatment priority index relevant to the resources available.

Several indices have been presented since the 1950s. Among these are those by Massler and Frankel [13], van Kirk and Pennell [20], Draker [21], Bjork et al. [12], Salzmann [22], Summers [23], Luffingham and Campbell [14]. However, none of these has become a universally accepted method for reliably assessing occlusion [24]. Recently Brook and Shaw [25], and Richmond et al. [26] have developed the two most commonly used indices of occlusion (PAR index and IOTN index). They claim the indices can be used to assess severity and treatment needs.

Conclusions and suggestions for further study

In this study the sagittal relationship in a sample of Lebanese children was assessed according to Angle's classification. Other

occlusal features such as crowding, overjet, overbite, crossbite, lips competency should be examined if reliable information on the severity of malocclusion is to be obtained. In the author's opinion, the key to providing the best possible orthodontic service to the population is qualified manpower.

er. Highly educated, skilled and experienced specialists can develop indices relevant to the local needs, collaborate in teams, improve the quality of education and services in dental schools and private practice, and stimulate epidemiological research projects.

References

1. Angle EH. Classification of malocclusion. *Dental cosmos*, 1899, 41(18):248-63; 350-7.
2. Pine CM. *Community oral health*. Oxford, Wright, Butterworth-Heinemann, 1997.
3. Cryer M. Typical and atypical occlusion of teeth. *Dental Cosmos*, 1904, 46:720-1.
4. Case C. principles of occlusion and dentofacial relations. *Dental cosmos*, 1904, 46:713-9.
5. Hellman M. Variation in occlusion. *Dental cosmos*, 1921, 63:608-17.
6. Simon PW. *Diagnosis of dental anomalies*. Boston, Stratford Company, 1926.
7. Ackerman JL, Proffit WR. Characteristics of malocclusion: a modern approach to classification and diagnosis. *American journal of orthodontics*, 1969, 56:443-54.
8. Graber TM, Swain BF. *Orthodontics. Current principles and techniques*. St. Louis, CV Mosby Company, 1985.
9. Moyers RE. *Handbook of orthodontics*, 4th ed. Chicago, Yearbook Medical Publishers, 1988.
10. Graber TM, Vanarsdall RL. *Orthodontics. Current principles and techniques*. St. Louis, CV Mosby Company, 1994.
11. Parker WS. Centric relation and centric occlusion — an orthodontic responsibility. *American journal of orthodontics*, 1978, 74:481-500.
12. Bjork A, Krebs A, Solow B. A method for epidemiological registration of malocclusion. *Acta odontologica Scandinavica*, 1954, 22:27-41.
13. Massler M, Frankel JM. Prevalence of malocclusion in children aged 14 to 18 years. *American journal of orthodontics*, 1951, 37:751-68.
14. Luffingham JK, Campbell HM. The need for orthodontic treatment. A pilot survey of 14-year-old schoolchildren in Paisley, Scotland. *Transactions of the European Orthodontic Society*, 1974:259-66.
15. El-Mangoury NH, Mostafa YA. Epidemiologic panorama of dental occlusion. *Angle orthodontist*, 1990, 60:207-14.
16. Grewe JM et al. Prevalence of malocclusion in Cheppewa Indian children. *Journal of dental research*, 1968, 47:302-5.
17. Tipton RT, Rinchuse DJ. The relationship between static occlusion and functional occlusion in a dental school population. *Angle orthodontist*, 1991, 16:57-63.
18. Goose DH, Thomson DG, Winter FC. Malocclusion in schoolchildren of the west Midlands. *British dental journal*, 1957, 102:174-8.
19. Ingervall B. Prevalence of dental and occlusal anomalies in Swedish conscripts.

- Acta odontologica Scandinavica*, 1974, 32:83-92.
20. van Kirk LK, Pennell EH. Assessment of malocclusion in population groups. *American journal of orthodontics*, 1959, 45:752-8.
 21. Draker HL. Handicapping labio-lingual deviations: a proposed index for public health purposes. *American journal of orthodontics*, 1960, 46:295-305.
 22. Salzman JA. Malocclusion severity assessment. *American journal of orthodontics*, 1967, 23:109-19.
 23. Summers CJ. The occlusal index: a system for identifying and scoring occlusal disorders. *American journal of orthodontics*, 1971, 59:552-67.
 24. McLain JB, Proffit WR. Oral health status in the United States: prevalence of malocclusion. *Journal of dental education*, 1985, 49:386-96.
 25. Brook PH, Shaw WE. The development of an index of orthodontic treatment priority. *European journal of orthodontics*, 1989, 11:309-20.
 26. Richmond S et al. The development of the PAR Index (peer assessment rating): reliability and validity. *European journal of orthodontics*, 1992, 14:123-39.

The collaborative programme in oral health continued to focus on promoting national capacities to develop oral health preventive programmes, particularly those targeting children. This direction is in accordance with the regional strategy to prioritize programmes for both pre-school children and schoolchildren as the principal activity to combat rising regional trends in oral health morbidity. The collaborative programme also maintained its commitment to promoting the adoption of the atraumatic restorative treatment technique, which does not require electrically driven equipment, so as to widen the coverage with restorative oral health treatment. Consultants visited Lebanon and Pakistan to train national master trainers in the skills of atraumatic restorative treatment.

Source: The Work of WHO in the Eastern Mediterranean Region. Annual Report of the Regional Director, 1 January-31 December, 1998. WHO Regional Office for the Eastern Mediterranean, Alexandria, 1998, page 79.