Does a secular trend exist in the distribution of occlusal patterns?

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Secular trend is a well-known phenomenon in the western world; during the last few centuries, secular trends have been recorded for several parameters, such as height, weight, and onset of puberty. Analysis of craniofacial skeletons has revealed an increase in some dimensions in offspring compared with their parents.[1,2] The existence of secular trend in occlusal relationships, however, has not been investigated. The purpose of this study was to look for possible occlusal changes in two generations of the same ethnic group. Ethnic group specificity is essential, as significant morphologic differences have been found among Jewish communities of diverse origin.[3,4] A secular trend in height was recently observed in Israeli military conscripts that was differentially expressed in the various ethnic groups comprising the Israeli population.[5]

Materials and methods

Two generations of Jewish children of Ashkenazi origin were examined. The first group was extracted from the Jerusalem Growth Study,[6] which was carried out from 1969 to 1970. Study models of these children, born between 1957 and 1964 were evaluated by three of the authors (OZS, YB, and IB) following several calibration sessions. The study models were obtained when the children were between 5 and 13 years old. The sampling method was random, provided both parents and grandparents were of Jewish Ashkenazi origin. This group comprised 265 children. None of the examined children had undergone orthodontic treatment and none was excluded from the study because of this type of treatment.

The second group, representing children of the

Abstract

The existence of a secular trend in the distribution of occlusal patterns was studied in two generations of children. Study models and demographic data of a sample of 265 childen from the previous generation (group A) and recordings of clinical examinations of 988 children from the present generation (group B) served as the data base for this study. Children in whom caries affected the occlusion and those in the deciduous dentition stage were excluded. Thus, occlusal analysis was performed for 102 children in group A and 703 in group B. A dramatic decrease was found in the prevalence of caries affecting the occlusion. No difference existed between the two groups with respect to molar and canine anteroposterior relationships. However, there was a decrease in the prevalence of normal occlusion accompanied by an increase of Class I malocclusion.

Key Words

Secular trend • Occlusion • Angle classification

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Table 1
Distribution of the participating children, unaffected by caries, according to dental developmental stages

Dent dev. stage	Group A n	Group A %	Group B n	Group B %
Early mixed	29	28.4	411	58.4
Late mixed	33	32.4	219	31.2
Permanent	40	39.2	73	10.4
Total	102	100	703	100

Table 2
Differentiation of the occlusal classes

Occlusal class	Group A n	Group A %	Group B n	Group B %	*p*
Normocclusion	21	20.6	52	7.4	0.001
Class I	38	37.3	345	49.1	0.025
Class II	42	41.1	301	42.8	ns
Class III	1	1	5	0.7	ns
Total	102	100	703	100	

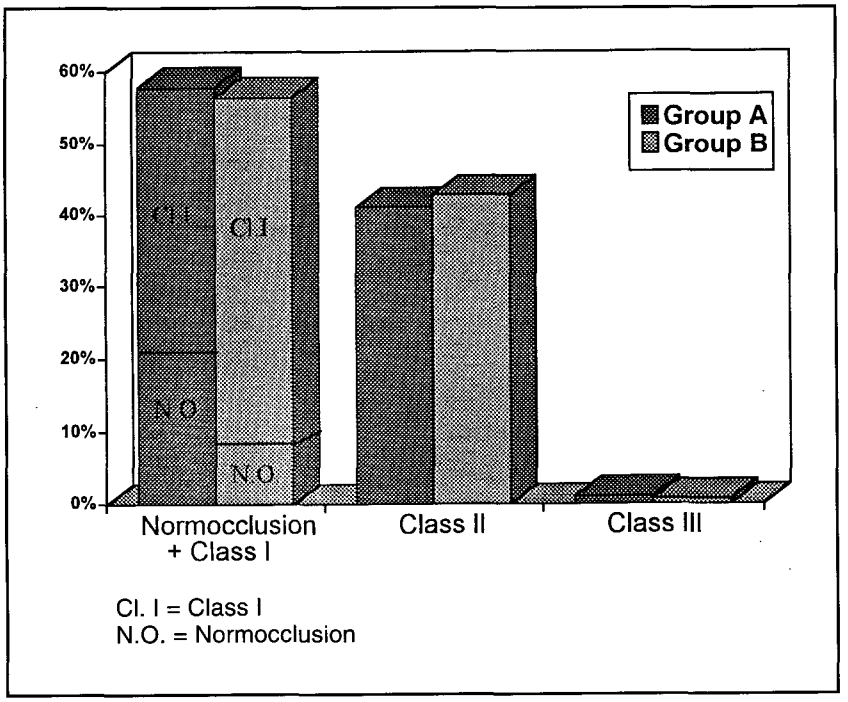

Figure 1

Figure 1
Distribution of occlusal patterns classified according to canine and molar relationships in groups A and B.

same ethnic origin, was examined during the 1992-93 school year by three of the authors (DH, YB, and IB) following a calibration session. This group comprised 988 individuals, 6 to 13 years old, (born between 1979 and 1987). The examination was conducted in the classrooms of three schools in an ultra-orthodox Jewish community of strictly Ashkenazi origin. All pupils present in the classroom at the time of screening were entered into the survey, except for 30 children who were currently undergoing, or had undergone in the past, orthodontic treatment. Pretreatment records for 17 children were obtained from their orthodontists, thus making them eligible for participation in the survey. The 13 children whose study models could not be traced, absentees, the few who refused to participate, and one child with Down syndrome, were excluded. The data based on the clinical examination were entered into specially designed forms that also served as data registrations for group A.

Both groups were subdivided into "caries-affected" and "nonaffected" subgroups. Caries-affected occlusion was defined as a mesial or distal carious lesion or premature extraction causing space loss. This exclusion resulted in a significant reduction in the size of both groups (143 children were excluded from the previous generation group and 234 from the present generation group). Further occlusal evaluation was performed only for the nonaffected subgroups.

As the deciduous dentition groups were extremely small they were also excluded from further evaluation. Distribution of the subjects according to dental developmental stage is presented in Table 1. The final number of participants in group A was 102 and in group B, 705.

Occlusal relationships were defined according to Angle's classification. The criteria for normal occlusion were Class I canine and molar relationships, positive overjet of up to 4 mm and overbite of up to 3.5 mm, and well aligned arches. Slightly irregular arches and crowding or spacing of up to 2.5 mm in the upper or lower arch were included within normal limits.

Chi-square test for frequency tables was employed to compare between groups.

Results

Comparison between boys and girls revealed no significant differences between sexes, thus the results are reported with the sexes pooled.

Caries-affected occlusion was found in 54% of group A and 24.5% of group B.

Classification of the occlusal patterns by molar and canine relationships into three large categories (normocclusion + Class I, Class II, and Class III) rendered similar distributions for both groups (Figure 1). However, further differentiation into normocclusion and Class I malocclusion demonstrated a significant difference between groups A and B (Figure 1, Table 2): the prevalence of normocclusion was lower in Group B while the prevalence of Class I malocclusion was higher. The distribution of the Class II and Class III categories did not differ in the groups. Sev-

eral dental parameters that were examined in both groups are presented in Table 3.

Meaningful comparison between the two generations according to each dental developmental stage was feasible for the permanent dentition stage only because of the small size of group A. When the permanent subgroups were compared, the significantly lower prevalence of normocclusion in group B was maintained (p = 0.002). However , the difference in the prevalence of Class I malocclusion at the same stage did not reach statistical significance, although the same trend was noted as for the total group A and B.

Table 3
Comparison of four dental parameters examined

	Group A (n=102)		Group B (n=703)	
	n	%	n	%
Anterior crossbite	8	7.8	65	9.3
Posterior crossbite	14	13.7	128	18.2
Upper crowding	31	30.7	268	38.1
Lower crowding	40	39.2	304	43.1

Discussion

As secular trend encompasses various parameters, including the facial skeleton, orthodontists should reexamine their concept of distribution of occlusal patterns with passing generations. However, the comparison of two generations poses several problems. Intermarriage between ethnic groups is one of the most difficult variables to evaluate. This is especially so in an immigration country like Israel, with its ethnically heterogeneous population. In the present study, an attempt was made to limit the sample to one specific ethnic group, the Ashkenazim. Data for group A were compiled within the then well defined Ashkenazi communities. Today, due to some degree of intermarriage among the various Jewish ethnic groups that settled in Israel, identification of children as being of a specific descent is difficult. However, the ultra-orthodox Ashkenazi community still conducts an insular life-style, characterized by endogamy, among other features. Thus, the data for group B were obtained from three religious schools attended only by children of this community.

In addition, an attempt was made to exclude the factor of caries-affected occlusion. The question of imposing biases by excluding more individuals with carious involvement in group A may be raised. Yet, as malocclusion is not listed among known predisposing factors for caries,[7,8] it cannot be claimed that the exclusion of these individuals could raise the normocclusion percentage in this group. These two limitations, namely, confinement to one ethnic group and elimination of individuals with caries-affected occlusion, drastically reduced the number of participants, mainly in group A. However, due to the uniqueness of the material with regard to the previous generation, comparison of the two groups seemed of importance.

The decline of carious lesions affecting occlusion within one generation as observed in this study is remarkable, although it has been universally observed in the western world.[9] Two possible explanations are suggested:

1. Water fluoridation and increased dental awareness have significantly reduced the prevalence of caries. This is supported by an independent epidemiological study on the changing patterns of dental caries in a Jerusalem neighborhood;[10]

2. Prompt and adequate treatment of carious lesions in the recent generation has resulted in a reduction in the prevalence of severe lesions.

As caries epidemiology per se was not one of the objectives of the present study, an exact answer to this question is not possible within this framework.

Sexual dimorphism regarding the occurrence of various occlusal patterns is mentioned in some studies. El Mangoury and Mostafa[11] found that occlusal variation was sex-dependent in a sample of young Egyptian adults, 18 to 24 years old. The fact that no difference was found between the sexes in our sample may be explained by the relatively young age range of our groups and the lack of sex-dependent dental differentiation at this stage. Another possible factor may be the ethnic diversity between Israelis and Egyptians, one expression of which may be sexual dimorphism in occlusal patterns in the latter population.

The similarity of distribution of gross occlusal patterns in groups A and B (Figure 1) suggests skeletal stability within the two generations. If some skeletal alterations did occur, they were probably successfully compensated for by dental movements in the buccal segments. Changes in the prevalence of normal occlusion to Class I malocclusion (Table 2) suggest the effect of dental factors affecting occlusion. For example, comparison of the total group A with the total group B reveals a trend, though not statistically significant, of increase in the prevalence of anterior and posterior crossbites and maxillary and mandibular crowding (Table 3). Similarly, Corruccini[12]

observed a transition from "predominantly good to predominantly bad occlusion within one or two generations' time." His explanation points to environmental factors, such as a soft diet, which may also be valid for our sample. Other factors, including the increasing evidence of respiratory diseases in our adolescent population,[13] may be related to the increased prevalence of mouth breathing and, indirectly, malocclusion,[14] including posterior crossbite. On the other hand, the increased prevalence of crowding may be related to the known secular trend in tooth size[15] and the lack of dental attrition.[16]

In view of the small number of participants in group A, our findings should be accepted with caution. There was no way we could supplement this specific group of the previous generation due to the lack of random, ethnic-specific records from that period. However, if similar material of other ethnic groups could be compared with today's data, our findings could be reconfirmed.

Conclusions

Comparison of two generations of the same ethnic group suggests the following:

1. The occlusion of the contemporary generation is less affected by caries.
2. Both generations demonstrate similar anteroposterior dental relationships in the buccal segments.
3. A trend for decrease in the prevalence of normocclusion and increase in the prevalence of Class I malocclusion can be distinguished.

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