

Prevalence of malocclusion and orthodontic treatment needs among 16 and 17 year-old school-going children in Shimla city, Himachal Pradesh

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ABSTRACT

Background: Many studies have been conducted in India to know the prevalence of malocclusion and the orthodontic treatment needs using dental aesthetic index (DAI), but no study so far has been conducted in Shimla city, Himachal Pradesh.

Objective: To know the prevalence of malocclusion and orthodontic treatment needs among 16- and 17 year-old school-going children in Shimla city, Himachal Pradesh.

Materials and Methods: The study was carried out on 622 (365 boys and 257 girls) school children, aged 16 and 17 years, from February 2009 to May 2009. Type III examination was conducted and the assessment of malocclusion was done according to the DAI.

Results: 20.28% of the male and 24.52% of the female students in the sample were affected with malocclusion. The mean DAI scores of the male and female children were 22.26 and 21.79, respectively. Distribution of the four DAI grades was as follows: DAI-I (no abnormality or minor malocclusion) 79.58%, DAI-II (definite malocclusion) 16.39%, DAI-III (severe malocclusion) 3.69%, DAI-IV (very severe/handicapping malocclusion) 0.34%.

Conclusion: The present study shows that 20.42% of the children examined had malocclusion which required treatment.

Key words: Dental aesthetic index, malocclusion, orthodontic treatment needs

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Oral health is an integral part of general health.^[1] Healthy mouth enables an individual to eat, speak and socialize without active disease or discomfort and contributes to the general well-being. It is concerned with maintaining the health of craniofacial complex, the teeth and gums as well as the tissue of the face and head that surrounds the mouth.^[2]

Dentofacial appearance has a lot to do with the way the people are perceived in the society.^[3] Adolescents with significant dentofacial inharmonies are considered at risk for negative self-esteem and social maladjustments.^[4] In general, malocclusion is defined as an irregularity of the

teeth or a molar relationship of the dental arches beyond the accepted range of normal.^[2]

Severe malocclusion can be a social handicap.^[5] Malocclusion can cause different problems for the patient, such as psychosocial problem related to impaired dentofacial esthetics, problems with oral functions including difficulty in jaw movements, temporomandibular joint disturbances, difficulty in mastication, swallowing and speech, greater susceptibility to trauma and accentuated periodontal disease.^[6]

Malocclusion is one of the most widespread oral health problems that the society is facing. It has not been so thoroughly investigated, probably because the pain and misery caused by this disorder is seldom acute. The prevalence of malocclusion varies from country to country and among different races. Malocclusion is a developmental problem determined mainly by hereditary and environmental factors. Any of these factors may influence the type and frequency of malocclusion in a given population.^[7]

The demand for orthodontic treatment is increasing in most of the countries including India. Therefore, rational planning of orthodontic preventive measures on

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population basis is essential. This stresses the importance of epidemiological studies in order to obtain knowledge about the prevalence of different types of malocclusion and the need for the orthodontic treatment and in accessing the resources required for such services.

Malocclusion is a morphological variation and its diagnosis is heavily dependent on a man-made, more or less arbitrary classification system. This has intensified the demand for international standards for the epidemiological surveys, which are necessary as a foundation for the planning and evaluation of dental services.^[8]

Most of the malocclusion can be corrected if detected early by correctional methods. Growth and maturation of the jaws almost get completed by 16 and 17 years. So, correcting the malocclusion at this age will reduce the chances of the relapse which otherwise might take place during the active growth period of the local skeletal tissue.^[6]

There are no records of the earlier reports related to the prevalence of malocclusion and orthodontic treatment needs in senior secondary school children aged 16 and 17 years in Himachal Pradesh, in general, and Shimla, in particular. Hence, the present study was undertaken to assess the prevalence of malocclusion and need for orthodontic treatment in senior secondary school children aged 16 and 17 years in Shimla city, Himachal Pradesh.

MATERIALS AND METHODS

This descriptive cross-sectional study was conducted among 16- and 17-year-old school children in Shimla city, Himachal Pradesh. Prior permission was taken from Director, Higher Education, District Education Officer and Heads of the concerned schools. After getting ethical clearance from the education ethical committee of Government Dental College and Hospital, Shimla, a pilot study was done on 50 students. A simple random sample of a total of 622 students was taken, which consisted of 365 males and 257 females from randomly selected nine senior secondary schools (both government and private) in Shimla city, Himachal Pradesh. The study was conducted from 25th February to 4th May 2009 as per schedule in the schools.

Inclusion criterion: All the children aged 16 and 17 years who had not undergone orthodontic treatment and who agreed to take part in the study were examined.

Type III examination, as recommended by the American Dental Association,^[8] which includes inspection using a mirror and probe, done under good illumination was conducted. The examination was performed under natural light using disposable gloves, tongue blade and mouth mirrors. A periodontal probe was used for millimeter measurement. The assessment of malocclusion was made

according to the dental aesthetic index (DAI) as described by the WHO oral health survey, 1997.^[9] All the 10 components were measured. Each school visit was followed by imparting dental health education to the students. The students who needed orthodontic treatment were referred to H. P. Govt. Dental College and Hospital, Shimla, for further management.

The data obtained were analyzed using SPSS package. “*P*” ≤ 0.05 was considered as statistically significant and “*P*” values ≤ 0.01 were considered as statistically highly significant.

RESULTS

Out of a total sample of 622 students, 365 were males and 257 were females. 291 (79.72%) males and 194 (75.48%) females were found to have normal occlusion. The prevalence of malocclusion was found to be 20.28% among males and 24.52% among females [Table 1]. The distribution of each component of DAI is given in Table 2 where it can be seen that 8.68% of the subjects had at least one or more permanent teeth missing, 62.7% had crowding, 29.6% had spacing in one or two segments. 28.77% of the subjects had a diastema of 1 mm or more. Maximum irregularity of >1 mm was present in 32.8% subjects. 44.38% of the subjects had lower anterior irregularity of 1 mm or more. Only 1.13% of the students had anterior cross bite.

Anterior open bite was present only among 0.97% of the cases. 82.32% had normal occlusion. About four-fifths of the children presented DAI grade-I malocclusion representing a minor malocclusion or no anomalies. 16.44% of the subjects presented with definite malocclusion classified as grade-II. Grade-III score was present among 3.67% of the total subjects. Only two female subjects were with very severe handicapping malocclusion. No male subject was found with grade-IV DAI score [Table 3].

Majority of the subjects (79.58%) required no or slight treatment. Elective, highly desirable and mandatory treatment was required among 16.39%, 3.69% and 0.34% subjects, respectively [Table 4].

DISCUSSION

Many epidemiological studies have been conducted worldwide utilizing various indices for quantifying the

Table 1: Distribution of subjects gender wise indicating normal occlusion and malocclusion

Age	Sex	Total no.	Normal occlusion		Malocclusion	
			N*	%	N*	%
16-17 years	Male	365	291	79.72	74	20.28
	Female	257	194	75.48	63	24.52
	Total	622	485	77.97	137	22.03

*N = Number of subjects

Table 2: Distribution of DAI component

DAI component		Males		Females		Total		P value
		N*	%	N*	%	N*	%	
Missing teeth	0	322	88.22	246	95.72	568	91.32	<0.05 [†]
	1-5	43	11.78	11	4.28	54	8.03	
Crowding	0	167	45.75	65	25.29	232	37.29	<0.01 [§]
	1-2	198	54.25	192	74.71	390	62.41	
Spacing	0	256	70.13	182	70.82	438	70.71	0.32
	1-2	109	29.87	75	29.18	184	29.59	
Diastema (mm)	0	264	72.38	179	69.65	443	71.22	0.19
	1-3	101	27.62	78	30.35	179	28.78	
Upper ant. irregularity (mm)	0	260	71.23	158	61.48	418	67.2	0.28
	>1	105	28.77	99	38.52	204	32.8	
Lower ant. irregularity (mm)	0	224	61.37	122	47.47	346	55.62	<0.05 [†]
	>1	141	38.63	135	52.33	276	44.38	
Upper overjet (mm)	0-2	255	69.86	199	77.43	454	72.99	0.27
	>2	110	30.14	58	22.57	168	27.01	
Lower overjet (mm)	0	360	98.63	255	99.22	615	98.87	0.93
	>0	5	1.37	2	0.78	7	1.13	
Open bite (mm)	0	362	99.17	254	98.83	616	99.03	0.42
	>0	3	0.83	3	1.17	6	0.97	
Molar relation	Normal	306	83.84	206	80.16	512	82.32	<0.01 [§]
	Malocclusion	59	16.16	51	19.84	110	17.68	

*Number of subjects, [†]Significant, [§]Highly significant, DAI - Dental aesthetic index

Table 3: Distribution of the subjects according to DAI score and gender

DAI score	Severity of malocclusion	Treatment indicated	Male		Female		P value
			N*	%	N*	%	
≤25	No/minor abnormality	No/slight treatment	292	80	203	78.98	<0.01 [§]
>25 to 30	Definite malocclusion	Elective	59	16.16	43	16.73	>0.05
>30 to 35	Severe malocclusion	Highly desirable	14	3.84	9	3.5	<0.05 [†]
>35	Very severe malocclusion	Mandatory	0	0	2	0.77	>0.05
Total			365	100.0	257	100.0	

*Number of subjects, [†]Significant, [§]Highly significant, DAI - Dental aesthetic index

Table 4: Distribution of subjects according to severity of malocclusion and the treatment needs

DAI score	Severity of malocclusion	Treatment indicated	N*	%
≤25	No/minor abnormality	No/slight treatment	495	79.58
>25 to 30	Definite malocclusion	Elective	102	16.39
>30 to 35	Severe malocclusion	Highly desirable	23	3.69
>35	Very severe malocclusion	Mandatory	2	0.34
Total			622	100.0

*Number of subjects, DAI - Dental aesthetic index

extent of malocclusion. The DAI was selected for this study rather than orthodontic treatment index because it combines both the objective occlusal and the subjective esthetic aspects of the occlusion. Its relative simplicity and high reliability have made DAI a widely used cross-cultural index by WHO.^[10]

Apart from the genetic makeup for the malocclusion, growth and development of the maxilla is also an important factor for the prevalence of malocclusion. 8.03% of the subjects had missing anterior teeth. The difference was statistically significant among the genders. Similar results were obtained in a study conducted on Peruvian young adults.^[10] Missing teeth could be due to nonavailability of dental health services or not availing existing health facilities.

Almost two-thirds of the subjects presented with crowding of one or two segments and the difference among genders was highly significant. Similar results were found in a study done on an ethnic Chinese population^[11] and among adolescents in Central America.^[12]

Higher prevalence of crowding was found in a study conducted on Peruvian young adults.^[11] However, results of some studies^[13-15] showed lesser prevalence of crowding. Crowding could be due to a discrepancy that arises when the tooth size is relatively too big for the given arch circumference.^[16]

In the present study, the results obtained on incisal segment spacing were similar to those of a study conducted on 13-15 year old North Jordanian school children,^[16] but lesser

than the results of studies conducted on Swedish men^[13] and Peruvian young adults.^[10] Muniz^[15] reported that diastema was prevalent among one-tenth of the total subjects in a study conducted on Argentine children,^[15] which is only one-third of the diastema found in this study. The difference could be due to geographical and genetic variation.^[16]

One-third of the subjects showed anterior maxillary irregularity in the present study. Similar figures were obtained in a study on Hungarian adolescents.^[17] Peruvian young adults^[10] showed a higher prevalence of mandibular irregularity than the results of the present study where it was found in 44.38% of the total subjects. In the present study, anterior irregularity was more in mandible than in the maxilla and females exhibited more irregularity and statistically significant difference was found among the genders.

The results obtained on increased overjet in the present study are comparable to the results obtained by Mike^[14] in a study conducted in Lagos, Nigeria. In contrast, higher prevalence of overjet was found in this study as compared to the one conducted by Foster *et al.*^[18] on Shropshire school population and lower prevalence of overjet was found than that obtained in the studies on Dutch adults^[19] and Saudi Arabian school children.^[20]

Results of some studies^[14,15] showed a higher prevalence of anterior crossbite than the present study where it was only 1.13%. Prevalence of open bite in the present study was almost negligible (0.97%) which is similar to the results of the studies done on similar populations.^[10,14,19]

Almost four-fifth of the subjects had normal molar relationship. 11.89% had half cusp deviation and 5.78% had one cusp deviation. These figures are higher than that obtained in the study on Hungarian adolescents.^[17] Mean DAI scores were 22.13 and 22.01 among the study participants. American school children^[21] and high school students^[22] in Japan were found to have higher mean DAI scores compared to the scores obtained in the present study. Four-fifth of the subjects in the present study presented no abnormality, with no or slight treatment required. Difference among genders was highly significant when DAI score ≤ 25 (grade-I) was calculated. Results of the present study showed higher scores compared to those of similar studies.^[23-25]

16.39% presented with a definite malocclusion and required elective treatment which is comparatively lesser than the results of studies conducted on school children in United states^[23] and Brazil.^[25] 3.69% and 0.34% of the subjects had severe and handicapping malocclusion, respectively, for which treatment was highly desirable and mandatory, which is lesser than the prevalence among Malaysian school children.^[24] Significant difference was found among genders when severe malocclusion was calculated, for which treatment was highly desirable.

CONCLUSION

The study was undertaken to assess the prevalence of malocclusion among 16- and 17-year olds, which is the ideal age for correctional orthodontic treatment. It also indicates the burden of orthodontic treatment in a subpopulation in Shimla city. The results of this screening of the school children show that majority of them are not affected with malocclusion. However, one-fifth of the study sample needed one or other orthodontic corrections. The finding of the present study remains significant in providing the first data on the orthodontic status and treatment needs of 16- and 17 year-old school children in Shimla city. Hence, the authorities in the government and in the government dental college should think of a screening program for the school children to identify the needy for the orthodontic correction and motivate them to accept orthodontic treatment.

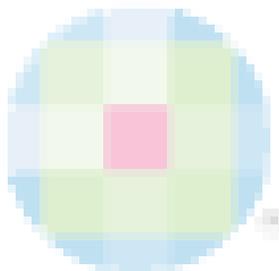
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