



CODEN [USA]: IAJPBB

ISSN: 2349-7750

**INDO AMERICAN JOURNAL OF
PHARMACEUTICAL SCIENCES**

SJIF Impact Factor: 7.187

<http://doi.org/10.5281/zenodo.3980132>Available online at: <http://www.iajps.com>

Research Article

**THE FREQUENCY OF OCCURRENCE AND FACTORS RELATED TO
THE DENTOFACIAL CHARACTERISTICS OF MALOCCLUSION**Dr. Umar Iqbal¹, Dr. Arbaz Ali Shah², Dr. Ahmed Bilal³¹Punjab Dental Hospital Lahore²de'Montmorency College of Dentistry, Lahore³Lahore Medical and Dental College, Lahore**Article Received:** June 2020**Accepted:** July 2020**Published:** August 2020**Abstract:***Objectives:* The study was designed to investigate the prevalence of malocclusion in adults.*Place and Duration:* In the Dental department of Punjab Dental Hospital, Lahore for six months duration from October 2019 to March 2020.*Methods:* A cross-sectional study was designed to examine 350 adult patients. Data was obtained through self-reported questionnaires and clinical dental studies. Questionnaires consisting of socio-demographic and oral habits. The clinical dental examination was based on the criteria of the WHO core methods for craniofacial anomalies (1997). Statistical analyzes included descriptive statistics, chi-square tests, and binary logistic regression analysis.*Results:* Regarding oral habits; 6% reported thumb sucking, 11% tongue thrusting, 42% mouth breathing, and 5.7% had speech difficulties. The incidence of malocclusion of dentofacial was as follows: 41.5% had crowded in the front teeth, 31.4% had spacing in the front teeth, 16.6% had Diastema, 49.7% had tooth irregularities, 42.5% had an overjet, 18.3% had anterior cross bite and 31.1% had an open front bite. Crowding risk indicators are age and gender; the intervals were education, tongue sticking, and speech problems; there was education for Diastema; the abnormalities of the teeth were mouth breathing; and for a cross bite, thumb sucking, tongue stuffing and mouth breathing. No risk indicators were associated with the anterior overjet and the open bite.*Conclusion:* The incidence of maxillofacial malocclusion ranged from 17% to 50%. The frequency of oral habits that could cause malocclusion ranged from 6% to 44%. Age, gender, education, tongue sticking, speech problems, mouth breathing; and thumb sucking were risk indicators for malocclusion characteristics.*Keywords:* Characteristics, Facial and dental, Malocclusion, Morbidity.**Corresponding author:****Dr. Umar Iqbal,**

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Please cite this article in press Umar Iqbal et al, *The Frequency Of Occurrence And Factors Related To The Dentofacial Characteristics Of Malocclusion*, Indo Am. J. P. Sci, 2020; 07(08).

INTRODUCTION:

The prevalence of dental and facial characteristics associated with malocclusion in the community is essential for providing statistics on the extent of oral health problems and their importance for public health¹⁻². A review of the dental literature related to malocclusion in Pakistan showed that many published articles use the Angel classification to describe the incidence of malocclusion that is only appropriate in a clinical setting. Some studies have used the Dental Esthetic Index (DAI), but this index is useful in determining orthodontic treatment needs. This study is the first in Pakistan to look at the prevalence of malocclusion in adults in a social environment using the World Health Organization (WHO) Primary Oral Health Test Methods³⁻⁴. This index is beneficial in assessing the dento-facial characteristics proposed by the WHO, including crowding and anterior spacing, diastolic, anterior and mandibular, open bite, and anterior-posterior relationship. Malocclusion has been reported in children in several studies in Pakistan. Albakri et al. Studied malocclusion in children aged 12-15 years in the city of Riyadh. It turned out that the prevalence of crowding in the anterior segment was 23-28%, and the spacing was 9-11%. However, an older study found a 14.7% of congestion in children aged 4-6 years. In another study of teenagers in Pakistan, 47% had congestion, 27% spaced out, 22% overbite, and about 5% had a front cross bite or an open front bite⁵⁻⁶. The prevalence of crowding in the front teeth was reported as 47.3% based on the dental records of patients who reported to one orthodontic clinic. No study of malocclusion among adults has been found⁷⁻⁸. In addition, no study was found in Pakistan covering the comprehensive features of malocclusion in the face and teeth. Most maxillofacial anomalies are hereditary and can be passed on from parent to sibling, but many other conditions have played an important role in creating malocclusion. These conditions included habits such as thumb sucking, tongue thrusting, mouth breathing, speech problems. The demographic data of the respondents were also important factors⁹. The effects of demographics, habits, and other conditions on the characteristics of teeth and facial malocclusion in adults have not been studied. Therefore, the aim of this study is to investigate the prevalence of malocclusion in adults using the WHO index and to evaluate the concomitant effect of demographic problems, thumb sucking, tongue

thrust, mouth breathing, and speech problems on the malocclusion.

MATERIALS AND METHODS:

This study included a cross-sectional observational analytical study of the prevalence of dento-facial features among adults in Pakistan held in the Dental department of Punjab Dental Hospital, Lahore for six months duration from October 2019 to March 2020. Participants were asked to sign a consent form prior to the interview and clinical trial. Eligible persons were all adult patients and their companions waiting to be visited at the external patient clinics. No attempt was made to select or exclude any participant from these lounges. The exclusion criteria included people who had undergone orthodontic treatment or orthognathic surgery, people who had preserved deciduous teeth, and people with systemic syndromes. The sample size was calculated by the online sample size calculator for a confidence level of 0.95% and a confidence interval of 5 for a population of approximately 3,000. The sample size needed for this study was 341 participants. The study was conducted using self-reported questionnaires and clinical dental examinations. The questionnaires were prepared to include the following sections: A) Socio-demographic data, including age, gender, nationality, education and income. B) Oral habits including thumb-sucking, tongue thrusting, mouth breathing, and speech problems. The questionnaire was tested on a pilot sample of 20 dental patients who were asked to provide feedback with comments on the questions. The necessary changes to the questionnaire were implemented accordingly. The results of clinical dental examinations were recorded on the examination grade sheets. Both examiners were calibrated against examination criteria by a senior faculty member, and credibility between examiners was also calculated. Oral examinations were carried out on ordinary, portable chairs with headrests and lighting, obtained by natural and / or artificial light. Sterilized dental mirrors, standard periodontal probes, and wooden spatulas were used by examiners wearing disposable gloves and masks. The clinical dental examination was based on the criteria of the World Health Organization (WHO) Core Methods for dento-facial anomalies. The study took into account the following dento-facial features: 1) crowding in the incisal segments 2) spacing in the incisal section 3) diastema 4) irregularities in the anterior teeth of the maxilla and

mandible 5) anterior incision of the maxilla 6) anterior incision of the mandible 7) vertical bite, open anterior and 8) antero-posterior molars. All occlusal relationships were assessed in the centric occlusion position, which was achieved by asking the subject to swallow and then bite the most posterior teeth. The statistical program SPSS version 23 was used to enter, clear and analyze the data. Statistical analyzes included descriptive statistics, chi-square tests, and logistic binary regression analysis. Chi square tests were used to compare the incidence of craniofacial malocclusion in different sexes. Binary logistic regression analysis was used to assess the simultaneous effects of age, gender, education, income, and oral habits on the characteristics of teeth and facial malocclusion. A probability value of 0.05 or less was considered

significant, and the odd coefficient and inner confidence were rated as 95%.

RESULTS:

Table 1 shows the frequency distribution of demographic features and oral habits related to features of the face and teeth. The mean age of the participants was 34 and ranged from 18 to 70. About 70% of the participants were women, only 39% of the respondents had higher education with a bachelor's degree and higher. The percentage of people with incomes close to the average national income and below the income was 54%. For oral habits that can affect tooth and facial features, only 6% had thumb sucking and 11% tongue sticking out. In addition, about 42% reported breathing through the mouth. Most of the participants stated that they had no problems with speech (5.7%).

Table 1 Frequency distribution of participants among demographic characteristics and oral habits related to malocclusion

Variable	Category	No. (%)	Total
Gender	Male	105 (30.0%)	350
	Female	245 (70.0%)	
Educational Qualification	Illiterate	18 (5.2%)	349
	Primary school	19 (5.4%)	
	Intermediate school	39 (12.2%)	
	High school	136 (39.0%)	
	Bachelor degree	125 (35.8%)	
	Postgraduate degree	12 (3.4%)	
Thumb sucking	Yes	21 (6.0%)	350
	No	329 (94.0%)	
Tongue thrusting	Yes	38 (10.9%)	350
	No	312 (89.1%)	
Mouth breathing	Yes	153 (43.8%)	349
	No	196 (56.2%)	
Speech problems	Yes	20 (5.7%)	349
	No	329 (94.3%)	

Table 2 presents the occurrence of specific features of the face and teeth by gender among the participants.

Table 2 Gender specific prevalence of certain dentofacial characteristics among Saudi participants

Variable	Category	Male		Female		Both		χ^2	p-value
		N	%	N	%	N	%		
Crowding in anterior teeth	Present	34	32.4%	110	45.5%	144	41.5%	5.15	0.023*
	Absent	71	67.6%	132	54.5%	203	58.5%		
Spacing in anterior teeth	Present	38	36.2%	71	29.3%	109	31.4%	1.6	0.207
	Absent	67	63.8%	171	70.7%	238	68.6%		
Median Diastema	0-1 mm (Ideal)	82	81.2%	204	84.3%	286	83.4%	7.7	0.053
	2-3 mm (mild)	16	15.8%	37	15.3%	53	15.5%		
	4-6 mm (moderate)	3	3%	0	0%	3	0.9%		
	6 mm (severe)	0	0%	1	0.4%	1	0.3%		
Teeth irregularities	Present	53	50.5%	121	49.4%	174	49.7%	0.35	0.852
	Absent	52	49.5%	124	50.6%	176	50.3%		
Anterior Maxillary overjet	1-2 mm (normal)	51	54.3%	132	58.9%	183	57.5%	1.36	0.716
	3-4 mm (mild)	35	37.2%	74	33%	109	34.3%		
	5-6 mm (moderate)	7	7.4%	13	5.8%	20	6.3%		
	>6mm (severe)	1	1.1%	110	2.2%	6	1.9%		
Anterior crossbite	Normal	82	78.1%	204	83.3%	286	81.7%	2.59	0.275
	Single tooth	12	11.4%	27	11%	39	11.1%		
	Multiple teeth	11	10.5%	14	5.7%	25	7.1%		
Anterior open bite	0 mm normal	175	71.4%	66	62.9%	241	68.9%	3.75	0.29
	1-2 mm (mild)	62	25.3%	33	31.4%	95	27.1%		
	3-4 mm (moderate)	5	2%	5	4.8%	10	2.9%		
	>4 mm (severe)	3	1.2%	1	1%	4	1.1%		

*Statistically significant using Chi square tests

Anterior crowding was observed in approximately 46% of women and 32% of men, and the difference was statistically significant ($p = 0.023$). Additionally, the incidence of spacing in the anterior teeth was higher in men (36.2) than in women (29.3). However, the difference was not statistically significant ($p = 0.21$). Normal diastema was observed in 286 participants. The presence of Diastema was observed in 18.8% of men compared with 15.7% of women ($p = 0.053$). The presence of dental abnormalities was found in 49.7% of respondents, with no significant difference between men and women ($p = 0.85$). The correct anterior mandible was found in approximately 57.5% of the

examined patients. About 34% of participants showed mild bite growth and an additional 8% had moderate to severe bite growth. Normal overjet was observed more often in women (59%) than in men (54%), but the difference was not significant ($p = 0.72$). Normal crossbite (anterior mandible) was observed in 83.3% of women and 78% of men. Of the 64 subjects (18.3%) with an anterior crossbite, 22% were men and 17% were women. An open front bite of > 2 mm was found in 31% of the examined patients. Approximately 37% of men had an open front bite compared with 28.6% of women, but the difference was not statistically significant ($p = 0.11$).

Table 3 Demographic characteristics and oral habits in relation to crowding in the anterior teeth among participants using Binary Logistic Regression analysis

Variables	B	S.E.	p-value	Exp(B)	95% C.I. for EXP(B)	
					Lower	Upper
Age	0.42	0.14	0	1.52	1.16	1.98
Gender	0.63	0.26	0.01	1.88	1.15	3.01
Education	0.2	0.11	0.08	1.22	0.98	1.52
Monthly Income	0.13	0.09	0.17	1.13	0.95	1.36
Thumb Sucking	0.28	0.49	0.57	1.32	0.5	3.47
Tongue Thrusting	0.24	0.39	0.53	1.28	0.6	2.74
Mouth Breathing	0.1	0.23	0.68	1.1	0.7	1.73
Speech Problem	0.31	0.48	0.52	0.73	1.37	3.52
Constant	0.46	0.63	0.47	1.58		

B: Regression coefficient; S.E.: Standard Error; Exp(B): Odd Ratio; C.I.: Confidence Interval

The relationship between demographic characteristics and oral habits with regard to crowding in the anterior teeth among participants using a binary logistic regression analysis is presented in Table 3. Younger age group (odds ratio [OR] = 1.52) and women (odds ratio [OR] = 1.88) showed a good chance of predicting crowding in the front teeth.

Table 4 Demographic characteristics and oral habits in relation to Spacing in the anterior teeth among participants using Binary Logistic Regression analysis

Variables	B	S.E.	p-value	Exp(B)	95% C.I. for EXP(B)	
					Lower	Upper
Age	0.28	0.15	0.06	1.33	0.99	1.77
Gender	0.47	0.27	0.08	1.6	1.15	3.01
Education	0.3	0.11	0.01	1.34	0.98	1.52
Monthly Income	0.01	0.1	0.9	1.01	0.95	1.36
Thumb Sucking	0	0.54	1	1	0.5	3.47
Tongue Thrusting	0.81	0.4	0.05	2.24	1.02	4.93
Mouth Breathing	0.05	0.25	0.83	1.06	0.65	1.72
Speech Problem	1.59	0.78	0.04	4.92	1.37	3.52
Constant	0.28	0.15	0.06	1.09		

B: Regression coefficient; S.E.: Standard Error; Exp(B): Odd Ratio; C.I.: Confidence Interval

Table 4 shows the relationship between demographic characteristics and oral habits in relation to anterior tooth spacing among participants using logistic binary regression analysis. The illiterate (Odds Ratio [OR] = 1.34), patients with tongue stuffing (Odds Ratio [OR] = 2.24) and patients with speech difficulties (Odds Ratio [OR] = 4.92) had a significant odd prediction front tooth spacing.

Table 5 Demographic characteristics and oral habits in relation to Diastema in the anterior teeth among participants using Binary Logistic Regression analysis

Variables	B	S.E.	p-value	Exp (B)	95% C.I. for EXP(B)	
					Lower	Upper
Age	0.25	0.19	0.17	1.29	0.9	1.85
Gender	0.32	0.33	0.33	1.38	0.72	2.63
Education	0.33	0.14	0.02	1.4	1.06	1.83
Thumb Sucking	0.27	0.67	0.69	1.31	0.35	4.85
Tongue Thrusting	0.57	0.43	0.18	1.78	0.76	4.14
Mouth Breathing	0.2	0.31	0.51	1.23	0.67	2.23
Speech Problem	0.39	0.68	0.57	1.48	0.39	5.62
Constant	0.43	0.85	0.61	1.54		

B: Regression coefficient; S.E.: Standard Error; Exp(B): Odd Ratio; C.I.: Confidence Interval

A binary logistic regression analysis was also performed between the presence of diastema and some demographic variables and oral habits (Table 5). The only related factor is diastema among people with less education (odds ratio [OR] = 1.4).

Table 6 Demographic characteristics and oral habits in relation to teeth irregularities in the anterior teeth among participants using**Binary Logistic Regression analysis**

Variables	B	S.E.	p-value	Exp (B)	95% C.I. for EXP(B)	
					Lower	Upper
Age	0.12	0.13	0.36	1.13	0.87	1.46
Gender	0.03	0.24	0.9	1.03	0.64	1.66
Education	0.07	0.1	0.5	1.07	0.88	1.32
Thumb Sucking	0.07	0.48	0.89	1.07	0.41	2.76
Tongue Thrusting	0.43	0.38	0.26	1.54	0.73	3.23
Mouth Breathing	0.54	0.23	0.02	1.72	1.11	2.67
Speech Problem	0.51	0.5	0.31	1.66	0.63	4.39
Constant	0.45	0.61	0.47	1.57		

B: Regression coefficient; S.E.: Standard Error; Exp(B): Odd Ratio; C.I.: Confidence Interval

Tables 6 and 7 show the relationship between demographic characteristics and oral habits in relation to dental abnormalities and bite in the anterior teeth. The only variable that was considered significantly related was mouth breathing in relation to dental regularity (Odds ratio [OR] = 1.72). No other variable was found to predict the presence of undershot or abnormal teeth.

Table 7 Demographic characteristics and oral habits in relation to overjet in the anterior teeth among participants using Binary Logistic Regression analysis

Variables	B	S.E.	p-value	Exp (B)	95% C.I. for EXP(B)	
					Lower	Upper
Age	0.07	0.14	0.6	1.07	0.82	1.4
Gender	0.16	0.25	0.53	1.17	0.71	1.93
Education	0.14	0.11	0.22	1.15	0.92	1.43
Thumb Sucking	0.3	0.55	0.58	1.36	0.46	3.97
Tongue Thrusting	0.16	0.39	0.68	1.17	0.55	2.51
Mouth Breathing	0.04	0.24	0.88	1.04	0.65	1.65
Speech Problem	0.03	0.5	0.96	1.03	0.38	2.74
Constant	0.84	0.64	0.19	2.32		

B: Regression coefficient; S.E.: Standard Error; Exp(B): Odd Ratio; C.I.: Confidence Interval

The relationship between demographic characteristics and oral habits with respect to cross and open bite in anterior teeth using binary logistic regression analysis is shown in Tables 8 and 9. People with thumb sucking, tongue thrust, and mouth breathing had significant strange characteristics in predicting cross bite in the anterior teeth (odds ratio [OR] = 6.94, 2.47 and 1.89, respectively). There were no significant factors related to the open bite in the front teeth.

DISCUSSION:

The incidence of malocclusion in the face and teeth was as follows: 49.7% had dental abnormalities, 43% had an anterior bite, 42% had a crowded bite, 31% had a set or front bite, 18% an anterior cross bite, and 17% had diastema¹⁰⁻¹¹. Regarding oral habits that can affect maxillofacial characteristics, mouth breathing was seen in 44% of the subjects, followed by tongue thrust (11%) and thumb sucking (6%), and speech difficulties (5.7%). Binary logistic regression analyzes revealed that age and gender were indicators of congestion risk; the intervals were education, tongue sticking, and speech problems; there was education for Diastema; tooth abnormalities consisted of mouth breathing; and for a cross bite, thumb sucking, tongue stuffing and mouth breathing. No risk indicators were associated with the front bite and the open bite¹²⁻¹³. The Angel classification has been used in most of the published studies on the incidence of malocclusion in Pakistan. This index was not intended to assess malocclusion in the social environment, but rather to provide the percentage of the population from classes I to III. When using this classification, many occlusive features will be ignored. However, our study is the first in Pakistan to measure the incidence of malocclusion using the WHO index [6]. By reviewing the current dental literature on malocclusion, most of these studies have looked at malocclusion in children or adolescents. In addition, most of these studies looked only at the incidence of malocclusion, but not the associated risk markers of determinants. This study also differs in the consideration of malocclusion in adults (untreated malocclusion); The risk indicators associated with each characteristic malocclusion due to demographics and oral habits that are considered confounding malocclusion factors were investigated¹⁴. Anterior teeth pressing was found in approximately 46% of the subjects, a result comparable to some previous studies. However, a study from Colombia found a higher incidence of frontal crowding. These results are in line with another finding, although most studies have considered anterior and posterior tooth spacing as a single component. Diastema has been described in two previous studies with a frequency of around 22%. However, Diastema in our sample was presented in about 15%. This can be explained that diastema in children may decrease with age. About 43% of Pakistani subjects showed an increased overjet in the anterior teeth, comparable to Iranians, Turks, Germans, and Indians. However, Italians had a lower incidence of overjet (4.1% -16.2%). This

difference was not surprising as they considered increasing the attack to 4mm over the normal attack. Two studies with different results were found in Pakistan. Anterior cross bite was observed in 18% of our sample, which was higher than the rates observed in other studies. The method of recording the findings played an important role in this difference¹⁵. In our study, a cross bite was considered present if a single tooth was recorded. The open front bite was also similar to the rates reported in other studies.

CONCLUSION:

The incidence of dento-facial malocclusion ranged from 17–18% in the case of diastemas and anterior cross bites, up to 31% in the case of a set or anterior open bite, to over 40% in the case of crowded, undershot and tooth abnormalities. The incidence of oral habits that may cause malocclusion ranged from 6% for problems with thumb sucking and speech to 44% for mouth breathing. Among the few demographic and oral habits that may affect occlusion, age and gender were at risk of congestion, for intervals were education, tongue pushing, and speech problems, and for diastema, education; tooth abnormalities consisted of mouth breathing; and for a cross bite, thumb sucking, tongue stuffing and mouth breathing.

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