Original Research Paper

Relationship between Malocclusion and Oral Habits

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Abstract: In addition to heredity, oral habits are considered important factors in the etiology of malocclusion. This study was taken to assess the relationship between Malocclusion and Oral Habits. The sample comprised of 674 orthodontically untreated subjects, 324 males (48%) and 350 females (52%) 12 to 15-year-old schoolchildren from the southern part of Italy. Orthodontic variables and oral habits including mouth breathing and swallowing pattern; thumb, finger and lip sucking; and nail biting of the patients were evaluate. Two examiners, who had been previously trained in the use of occlusal indices, screened all the schoolchildren. The chi-square and binomial test was used to evaluate the data. A total of 589 of the subjects were found to have deleterious oral habits. Nail biting was found to be the most common habit (65.5%) followed by lip sucking (42.7%), mouth breathing (28.6%), abnormal swallowing pattern (22.7%) and thumb sucking (13.2%). Positive association exist between deleterious oral habits and malocclusions; however, there is no significant relationship between the type of oral habit and malocclusions.

Keywords: Malocclusion, Respiration, Tongue Habits, Mouth Breathing/Diagnosis, Deglutition

Introduction

Malocclusion has a large physical, social and psychological impact on individual and society; (Liu *et al*., 2009) therefore, epidemiological studies are essential to achieve extensive data for creating public health plans for orthodontic prevention. During the last three decades, a notable increase in orthodontic treatment demand has occurred as a consequence of the high perception rate of malocclusions, along with a greater attention to aesthetics. Many studies have been published on the prevalence of malocclusion and the need for orthodontic treatment in different ethnic groups. Perillo *et al*. (2010) evaluated the orthodontic features of 12-year-oldschoolchildren in Southern Italy and found a high prevalence rate of crowding and Class I malocclusion. Souames *et al*. (2006) assessed the orthodontic treatment need in a sample of 9 to 12-year-old French children and reported that the malocclusion status of French schoolchildren was lower than that of European children. Jamilian *et al*. (2010) observed a relatively lower grades 4 and 5 of orthodontic treatment need for high school students in Middle East.

Oral habits such as finger and thumb sucking, lip sucking, mouth breathing, nail biting (onicofagy) and so on can happen temporarily; however these habits, when excessive or continued, can lead to poor dental health or malocclusion. Lagana *et al*. (2013) studied the prevalence of malocclusions, oral habits and the need for orthodontic treatment in a sample of 7- to 15-year-old Albanese schoolchildren and stated that oral habits were present in 80.6% of their subjects. Cavalcanti *et al*. (2008) also confirmed that there was a positive association between deleterious oral habits and malocclusion. However, Luzzi *et al*. (2011) reported that no statistically significant associations could be detected between the non-nutritive sucking habits and malocclusion.

The aim of the present epidemiological study was to evaluate the prevalence of malocclusion in 12-year-old schoolchildren in Southern Italy and to verify the association between malocclusions and oral habits.

Subjects and Methods

The study was carried out in accordance with the ethical standards set forth in the 1964 Declaration of Helsinki. The study target population consisted of schoolchildren attending the second year of secondary school (corresponding to the eighth grade) of state-funded schools in Naples (Southern Italy). Forty-eight schools (13000 pupils) were randomly selected according to a cluster sampling design from an initial

pool of 79 schools that had been previously identified by the school district to avoid possible biases ensuing from social heterogeneity. Classes within schools were sampled systematically. All students belonging to the sampled classes were examined, both to improve study feasibility and so as not to discriminate among pupils in the same class. Written consent to the examination was obtained from the children and their parents. Sample size was calculated assuming a 50% prevalence ratio for any characteristics to be estimated and a precision of the estimate of ±3 with a 95% confidence interval (sampling from finite population, Query Advisor, v. 4.0, Statistical Solution Ltd, Cork, Ireland). This assumption leads to the highest sample size with the given precision. Nine hundred and eighty-seven students were randomly selected according to a cluster sampling design.

All selected children present at the schools on the day of the examination (867subjects) participated in the study. Students who had already finished their orthodontic treatment and those who were undergoing treatment at the time of the study were excluded. Therefore, the sample for final analysis comprised only 674 orthodontically untreated subjects.

The students were examined at their schools, in a quiet classroom without external interference, under natural or artificial illumination. The examination lasted approximately 15 min per child. The assessment of dental occlusion was carried out using latex gloves, dental mouth mirrors and millimetric rulers. No radiographs, study casts, or previous written records were used. Personal data and information about orthodontic treatment were obtained directly from the students. The clinical examination was carried out by two examiners, who had previously undergone calibration to standardize their procedures.

The orthodontic variables and Oral habits evaluated were as follows.

Orthodontic Variables

Molar relationship: The relationship between the upper and lower first permanent molars was determined according to Angle's classification. Patients with subdivision malocclusions were included in the Class II or Class III groups on the basis of the predominant occlusal characteristic, or according to the relationship between the canines.

Overjet and Overbite: Values between 0 and 4 mm were considered normal.

Posterior crossbite: A posterior crossbite was diagnosed when there was a crossover of at least one tooth in the posterior segments of the dental arches. A posterior crossbite could be unilateral (right or left) or bilateral.

Scissor bite: A scissor bite was considered to be present when the palatal cusps of the upper molars were positioned buccally in relation to the buccal cusps of the lower molars.

Crowding and diastema: These were recorded for the anterior as well as for the posterior segments. A midlinediastema was considered to be present when there was a space of at least 2 mm between the maxillary central incisors.

Oral Habits

Oral habits including mouth breathing and swallowing pattern; thumb, finger and lip sucking; and nail biting of the patients were evaluated. The presence of these oral habits was determined independently by two investigators and further confirmed by questioning. The children were observed when completely relaxed. Each assessment was repeated two or three times until the two examiners reached an agreement. Before the oral habit examinations, the parents answered a questionnaire.

Mouth breathing was diagnosed observing lip incompetence at rest, the tension of the oral muscles while closing the lips and dilated nostrils when it was asked to breathe through the nose.

The swallowing pattern was assessed by a method suggested by Melsen *et al*. (1987) the evaluation was done while the child was swallowing saliva or small amounts of water. First, the mandibular movements and the perioral muscle contractions were observed during swallowing. A normal swallowing pattern was characterized by tooth contact and activity of the masseter muscle, with little if any use of the perioral muscles. If a muscle contraction was not registered, the swallowing pattern was considered as abnormal. Each swallowing assessment was repeated 3 times and the consensus opinion was accepted thumb and lip sucking along with nail biting were diagnosed by observing fingers, lip and nails to see if there were any signs indicating persistence of sucking or biting. A questionnaire was also used to confirm the findings.

Statistical Methods

Statistical Package for Social Sciences version 20 (SPSS Inc, Chicago, Illinois, USA) was used for data analysis. The chi-square and binomial test was used to evaluate the data.

Results

A total of 867 students from 44 secondary schools in Naples were examined. One hundred and ninety three students were excluded because either they had received orthodontic treatment or were currently undergoing orthodontic treatment. The final sample comprised of 674 subjects, 324 males (48%) and 350 females (52%) 12 to 15-year-old schoolchildren. From the study population, 282 of the males and 307 of the females had deleterious oral habits. Pearson's Chi-square test showed that there was no relationship between gender and oral habits (p<0.791) Table 1. Regarding type of the habit; nail biting (65.5%) was most commonly seen followed by lip sucking (42.7%), mouth breathing (28.6%), abnormal swallowing pattern (22.7%) and thumb sucking (13.2%).

The prevalence of each malocclusion in the total sample is reported in Table 2. Tables 3 to 7 show the distribution of deleterious oral habits according to the various types of malocclusions. Pearson's Chi-square test showed that there were no relationship between the type of oral habit and malocclusions. However, binomial test showed that there were significant relationships between subjects with deleterious oral habits and malocclusions.

Table 1. Prevalence and distribution of oral habits by gender

| Gender | Presence of oral habit | | | | | | |
| | Yes | | No | | Total | | |
	N	%	N	%	N	%	P-Value
Male	282	41.8	42	6.2	324	48.0	0.791
Female	307	45.6	43	6.4	350	52.0	
Total	589	87.4	85	12.6	674	100.0	-

Table 2. Prevalence of malocclusions in the total sample

| Occlusal variables | | Prevalence | | 95% Confidence interval |
		N	%	
Sagittal variables	CL I Malocclusion	415	61.6	57.9-65.3
	CL II Malocclusion	237	35.2	31.4-39.20
	CL III Malocclusion	22	3.3	1.8-4.600
	Overjet > 4 mm	99	14.7	12.0-17.50
	Overjet 0-4 mm	573	85.0	82.2-87.70
	Overjet <0 mm	2	0.3	0.0-0.700
Vertical variables	Overbite > 4 mm	146	21.7	18.8-24.80
	Overbite 0-4 mm	525	77.9	74.8- 80.7
	Overbite <0 mm	3	0.4	0-100000
Transverse variables	Unilateral Crossbite	83	12.3	9.9-15.00
	Bilateral Crossbite	18	2.7	1.6-3.900
	Scissor Bite	18	2.7	1.5-4.000

Table 3. Prevalence of oral habit according to dental class

| Oral habit Problem | Mouth Breathing | | Abnormal Swallowing | | Thumb Sucking | | Lip Sucking | | Nail Biting | |
	Yes n = 193	No n = 481	Yes n = 153	No n = 521	Yes n = 89	No n = 585	Yes n = 288	No n = 386	Yes n = 442	No n = 232
CL I Malocclusion	114	301	97	318	56	359	179	236	274	141
CL II Malocclusion	74	163	49	188	27	210	102	135	152	85
CL III Malocclusion	5	17	7	15	6	16	7	15	16	6
P value	0.490		0.427		0.105		0.575		0.686	

Table 4. Prevalence of oral habit according to overjet

| Oral habit Problem | Mouth Breathing | | Abnormal Swallowing | | Thumb Sucking | | Lip Sucking | | Nail Biting | |
	Yes n = 193	No n = 481	Yes n = 153	No n = 521	Yes n = 89	No n = 585	Yes n = 288	No n = 386	Yes n = 442	No n = 232
Overjet > 4 mm	0	2	1	1	0	2	0	2	2	0
Overjet 0-4 mm	155	418	129	444	81	492	245	328	381	192
Overjet <0 mm	38	61	23	76	8	91	43	56	59	40
P value	0.067		0.645		0.222		0.469		0.243	

Table 5. Prevalence of oral habit according to overbite

| Oral habit Problem | Mouth breathing | | Abnormal swallowing | | Thumb sucking | | Lip sucking | | Nail biting | |
	Yes n = 193	No n = 481	Yes n = 153	No n = 521	Yes n = 89	No n = 585	Yes n = 288	No n = 386	Yes n = 442	No n = 232
Overbite > 4 mm	1.000	2	1.000	2	0.000	3	1.000	2	1.000	2
Overbite 0-4 mm	149.000	376	120.000	405	72.000	453	222.000	303	346.000	179
Overbite < 0 mm	43.000	103	32.000	114	17.000	129	65.000	81	95.000	51
P value	0.953		0.882		0.642		0.843		0.491	

Table 6. Prevalence of oral habit according to cross bite

Oral habit Problem	Mouth Breathing		Abnormal Swallowing		Thumb Sucking		Lip Sucking		Nail Biting	
	Yes n = 193	No n = 481	Yes n = 153	No n = 521	Yes n = 89	No n = 585	Yes n = 288	No n = 386	Yes n = 442	No n = 232
Cross Bite	33.000	68	29.000	72	11.000	90	47.000	54	68.000	33
Non-Cross Bite	160.000	413	124.000	449	78.000	495	241.000	332	374.000	199
P value	0.330		0.118		0.456		0.402		0.688	

Table 7. Prevalence of oral habit according to scissor bite

Oral habit Problem	Mouth breathing		Abnormal swallowing		Thumb sucking		Lip sucking		Nail biting	
	Yes n = 193	No n = 481	Yes n = 153	No n = 521	Yes n = 89	No n = 585	Yes n = 288	No n = 386	Yes n = 442	No n = 232
Scissor bite	6.000	12	3.000	15	2.000	16	9.000	9	11.000	7
Non-Scissor bite	187.000	469	150.000	506	87.000	569	279.000	377	431.000	225
P value	0.655		0.536		0.790		0.527		0.686	

Table 8. Distribution of malocclusions according to the presence of deleterious oral habits

Type of malocclusion	Oral habit					
	Present		Absent			
	N	%	N	%	P-Value	
CL I Malocclusion	360	53.4	55	8.1	0.001	
CL II Malocclusion	208	30.9	29	4.3	0.001	
CL III Malocclusion	21	3.1	1	0.1	0.001	
Overjet > 4 mm	89	13.2	10	1.5	0.001	
Overjet 0-4 mm	498	73.9	75	11.1	0.001	
Overjet <0 mm	2	0.3	0	0.0	-	
Overbite > 4 mm	125	18.9	21	3.1	0.001	
Overbite 0-4 mm	462	68.5	63	9.3	0.001	
Overbite < 0 mm	2	0.3	1	0.1	-	
Cross Bite	92	13.6	9	1.3	0.001	
Non-Cross Bite	497	73.7	76	11.3	0.001	
Scissor Bite	15	2.2	3	0.5	0.008	
Non-Scissor Bite	584	86.6	72	10.7	0.001	

Discussion

Oral habits such as mouth breathing, abnormal swallowing, thumb sucking, lip sucking and nail biting can have direct influence onquality of life and can affect the stomatognathic system of the body (Agarwal *et al.*, 2014). The present study represents an epidemiological survey carried out on an Italian population (Table 8). This study showed that significant relationships existed between deleterious oral habits and malocclusions. In a similar study, (Aznar *et al*., 2006) evaluated the relationship between arch width and certain oral habits in 3 to 6 year-old children and found that a dummy habit leads to a reduction in maxillary arch width and mouth breathing causes a reduction in the size of both arches.

Cavalcanti *et al*. (2008) studied the associations between malocclusions and deleterious oral habits in preschool children in Brazil and found a high prevalence of malocclusions in a pediatric population under the age of 5 and a positive association with deleterious oral habits.

In the current study the total prevalence rate for oral habits was found to be 84.7%. This amount is similar and comparable to other studies. Hebling *et al*. (2008) conducted an epidemiological study in a sample of 5-year-old children attending preschools and reported that deleterious oral habits were observed in 83.1% of the children.

In this study, the highest prevalence of deleterious oral habit was for nail biting, which was common in more than 65% of the subjects and the lowest prevalence was for thumb sucking which was common in only 13% of the subjects. The habit of mouth breathing was seen among 28.6% of study population and the results were significantly higher when compared to the findings of the study done by Garde *et al*. (2014) in among 6 to 12 year old children who found the habit in only 4.3% of their population. This huge difference might lie in the difference between the methodologies of the researches and the fact that in the current study even subject with mixed mouth and nasal breathing were considered as

mouth breathers. The same huge difference between the two studies apply for nail biting which was a surprisingly lower amount of 5.8% in the study conducted by Garde *et al.* (2014).

Epidemiological surveys assist in recognizing the oral health conditions of different populations, which is essential for taking preventive/interceptive measurements (Perillo *et al.*, 2011a; 2011b; Showkatbakhsh *et al.*, 2013).

This study thus confirms other authors' earlier findings, i.e., various oral habits encourage the development of impaired occlusion of the deciduous dentition and this is more marked when the habit persists for longer than 3 years.

Conclusion

Positive association exists between deleterious oral habits and malocclusions; however, there is no significant relationship between the type of oral habit and malocclusions.

Author's Contributions

Letizia Perillo and Abdolreza Jamilian were responsible for study concept, study design, administration, recruitment, drafting, statistical analysis, critical revision and final approval of the article. Davide Giugliano, Fabrizia d'Apuzzo were responsible for recruitment of participants, obtaining ethical approval, data collection and data interpretation.

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