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Original Article

Prevalence of Dental Occlusal Patterns and Their Association with Obstractive Upper Airway Diseases in Primary School Children, Isfahan, Iran

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ABSTRACT

Background: Teeth, apart from their physiologic function, play an important role in general appearance of indivduals. Therefore any disorder in their growth and evolution, will cause psychologic, social and even economic problems for the person. This observational cross- sectional study aimed to investigate relationship between dental occlusal patterns and obstructive nasal-upper airway- diseases.

Methods: This study was perfromed in schools of No.4 Education at district of Isfahan in educational year 1381-82 between 607 students (277 male, 330 female) aged 9-12 years old. Results of accurate ENT and dentistry physical examination were registered and analyzed using SPSS software and Chi-square and Mantel - Hanzel test.

Results: With increasing age, The frequency of abnormal occlusal patterns increases (from 45.5% to 68.2% in males and 25.8% to 48.5% in females, p=0.015). The increasing in degree of palatal tonsilar hypertrophy was related to higher frequency of abnormal occlusal patterns (36.7% in +1 tonsilar hypertrophy, and 70% in +4 tonsilar hypertrophy, p=0.02). Also, history of frequent common colds, and history of previous nasal fractures were related with abnormal patterns [58.9% (p=0.032), and 83.4% (p= 0.043%), respectively].Five other parameters including sinusitis, hypertrophy of nasal turbinates, rhinitis, nasal polyposis and nasal septal deviation were not associated with abnormal occlusal patterns (p>0.1).

Conclusion: Some of obstructive upper airwacy diseases are related with abnormal dental occlusal patterns. These parameters can be simply diagnosed, treated or prevented.

Key words: dental occlusion, malocclusion, obstructive nasal disorders, nasal turbinates, adenoid, rhinitis, tonsillectomy, open mouth breathing

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Because of the important role of teeth in individual general appearance, existence of any disorder in growth and evolution of these structures will cause some psychosocial problems for the involved persons. The term "malocclusion" means malposition and abnormal contact of maxillary and mandibular teeth that interferes with exclusive movements of the jaws that are essential for mastication and also bear a special poor appearance for the patient. Dental malocclusion causes some oral and periodontal disorders that their management strategies generally are very complex and expensive for the individual and society.Time consumption for treating such a problem may interfere with sociol-economic function of the affected persons. Also, there are some obvious legal obstacles for employment of these individuals in some governmental organizations (such as airlines and so on).

Mouth-breathing secondary to relative or complex obstruction of nose or upper airway leads to abnormal bone growth and underdevelopment of craniofacial structures, and

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therefore, can adversely affect dental occlusion and natural interaction of upper and lower jaws[1]. This relationship has been shown in numerous studies, such as those performed by Hannuksela [2], Freg[2], Linder Aronson [3] and in several other studies [4-9]. There are some other studies that are less conclusive about this relationship, such as those performed by koski[2], woodshed DG. [10] and shanker S. [11] who had not confirmed such a relationship between obstructive nasal diseases and dental malocclusion. Because of these paradoxical findings in this subject and because diagnosis of ethiologic factors play a major role in prevention and treatment of such abnormalities, we decided to study the effects of nasal and upper airway obstruction on dental occlusal changes.

Subjects and Methods

This was an observational, cross-secctional study, performed in schools of No.4 Education al district of Isfahan, Iran in educational year 2002-3. By stratified random sampling method, 607 students of these schools (277 male and 330 female) between 9-12 years old were included in our study. These students generally belong to middle socio-economic class and also were in a range of age which is between two growth peacks; a matter that is very important in development and evolution of deciduous and permanent teeth and growth of jaws.The children with syndromic faces or with previous history of adenotonsillectomy or uvulopalatopharyngoplasty were excluded from our study. In each student,an accurate history taking (from children and their parents) and initial physical examination of ear, nose and throat and also dental occlusion patterns were performed in their schools by two well educated interns and two ENT residents ,and each suspiciouse case of malocclusion were refferred to the dentist for further advanced physical examination. Palatal tonsillar hypertrophy was examined by inspection and scored based on Brodsky,Moore,and Stanievich scoring system(19).Also,diagnoses of sinusitis and rhinitis were made clinically,based on history taking and direct inspection of anterior nasal caviy (anterior rhinscopy) and oropharynx for PND and mucosal changes, by means of appropriate nasal speculums,tongue blades,and headlight. Meanwhile, we inspected evidences of hypertrophic nasal turbinates, nasal polyposis, and septal deviation in our cases. The registered datas were computerized and analyzed, using

SPSS software and chi-square test, chi-square Mantel- Haenszel test, and variance analysis.

Results

In this study, the relationship between dental occlusal patterns and several parameteres in nose and throat examination of our cases was studied. The results of our study are summerized in tables 1 and 2.

In all age groups, occlusion class I (normal) had the highest frequency, and then, the class II and III (abnormal patterns) were more frequent, respectively. With increasing the age, the frequency of abnormal occlusal patterns increased (from 45.5% to 68.2% in males and 25.8% to 48.5% in females, P= 0.015). In male subjects, abnormal occlusal patterns, were more frequent, relative to females. Palatal tonsillar hypestrophy was examined and scored, based on Brodsky, Moore, and Stanievich scoring system[19], in which, +1 hypertrophy means that the tonsils occupy less than 25% of distance from midline to tonsillar pili, and +2, +3, +4 means that 25-50%, 50-75%, and more than 75% of this distance are occupied by the tonsils, respectively[19]. According to our study, the increase in degree of palatal tonsillar hypertrophy were related with higher ferquency of abnormal occlusal patterns (36.7% in +1, and 70% in +4 palatal tonsillar hypertrophy; P=0.02). Also, history of frequent common colds, that means more than 6 episodes of common cold in each year, and history of nasal bone fracture, were statiscally related to abnormal occlusal patterns [relative frequency in each group was 59.5%, (P=0.006), 58.9% (P=0.032), and 83.4%, (P=0.047), respectively]. Five othere parameters such as sinusitis (P=0.49), nasal turbinate hypertrophy

(P=0.219), rhinitis (P=0.422), nasal polyposis (P=0.408) and nasal septal deviation (P=0.306) were not significantly related to dental occlusal abnormal patterns. One parameter, (i.e. nasal tumor), was not found in our study sample and its relationship with dental occlusal pattern was impossible to be determined.

In this study, we have also determined the relationship between these different occlusal patterns and mean number of abnormal parameters in upper airway physical examination. (P= 0.173). This is summerized in Table 2.

Table 1. Different dental Occlusal patterns and their relationship with some parameters in upper airway physical examination, observed in 607 students, aged 9-12 yearsold, Isfahan, Iran, 1382.

Parameter		N (frequency:%)	Occlusion class I (%)	Occlusion Class II (%)	Occlusion class III (%)
Age and gender *	9 yr (M)	44(7.2)	24(54.5)	19(43.2)	1(2.3)
	10yr (M)	94(15.5)	47(50)	43(45.7)	4(4.3)
	11yr (M)	95(15.6)	54(56.8)	35(36.8)	6(6.3)
	12yr (M)	44(7.2)	14(31.8)	27(61.4)	3(6.8)
	9yr (F)	31(5.1)	23(74.2)	7(22.6)	1(3.2)
	10yr (F)	57(9.4)	45(78.9)	12(21.1)	0(0)
	11yr (F)	145(23.9)	89(61.4)	52(35.9)	4(2.8)
	12yr (F)	97(15.9)	50(51.5)	46(47.4)	1(1)
Relative size of palatal tonsils	+1	452(74.5)	237(60.4)	166(36.7)	13(2.9)
	+2	90 (15)	46(51.1)	40(44.4)	4(4.4)
	+3	55(9.1)	24(43.6)	28(50.9)	3(5.5)
	+4	10(1.6)	3(30)	7(70)	0(0)
Frequent common colds		51(8.4)	21(41.2)	29(56.9)	1(2)
Positive Hx. of nasal fracture		6(1)	1(16.7)	4(66.7)	1(16.7)
Sinusitis		20(3.3)	10(50)	10(50)	0(0)
Hypertrophied nasal turbinates		237(39)	144(60.8)	84(35.4)	9(3.8)
Rhinitis		142(23.4)	81(57)	54(38)	7(4.9)
Polyposis		9(1.5)	5(55.6)	3(33.3)	1(11.1)
Different variants of septal deviation		220(36.2)	118(53.6)	96(43.6)	6(2.7)
total		607(100)	346(57)	241(39.7)	20(3.3)

M:male, F:female, yr: years old, Hx: history.

Table 2. Different dental occlusal patterns and their relationship with mean number of abnormal parameters in upper airway physical examination.

Class of Occlusion	N	Mean number of abnormal parameters
I	346	1.3324(SD=0.72)
II	241	1.3324(SD=0.47)
III	20	1.4979(SD=0.4)
total	607	1.5500(SD=0.6)

Discussion

According to classification of Angle in 1899, three major types of dental occlusion have been defined as [12]:

Occlusion class I(normal pattern): In this pattern, mesial buccal casps of the first molars of upper jaw, lie just on the buccal sulcus of their lower jaw equivalents.

Occlusion class II (abnormal pattern): In this pattern, mesial buccal casps of the first molars of upper jaw, lie more anteriorly than the buccal sulcus of their lower jaw equivalents and even may lie on sulci between lower jaw molars and second premolars.

Occlusion class III (abnormal pattern): In this pattern, opposite to the class II pattern, mesial buccal casps of the first molars of upper jaw, lie on distal casps or on sulci between first and second molars of lower jaw.

Chronic mouth breathing secondary to relative or complete nasal or upper airway obstruction, leads to abnormal craniofacial growth, and subsequently affects evolution of dental occlusion and interaction of upper and lower jaws. In human beings, there are two peacks in growth curve: the first in ages of 7-8 years old, and another in ages of 13-14 years old and puberty period [1]. If causes of upper airway obstruction and chronic mouth breathing are not obviated before these ages, their stigmata and sequelae will be established and their management in future will be very unlikely or even impossible.

We can classify the etiologic factors of nasal and upper airway obstruction as follow [20]:

1- Structural disorders:

a: Deformities: external, internal, congenital molformations, injuries,

b: Neoplasms and masses,

c: Foreign bodies,

2- Inflammatory disorders:

a: Rhinitis / sinusitis: bacterial, viral, fungal,

b: Nasal and sinus polyposis,

c: Ozena, atrophic rhinitis,

d: Immunologic diseases: sarcoidosis, wegener's granolomatosis,

3- Allergic rhinitis,

4- Vasomotor rhinitis.

Adenotonsillar hyprertrophy is one of the most common etiologic factors of upper aiway obstruction, especially in children [19]. Postural changes secondary to chronic mouth breathing lead to disequilibrium in normal forces that affect teeth, and also, soft and hard tissues of orofacial structures, and there after may cause some sequelae such as open bite, protrusion of maxilla, posterior cross bite, and so on [19]. It is interesting to mention that some of these aspects may resolve after medical or surgical interventions such as adenotonsillectomy [19]. Meanwhile, some of etiologic facrtors may be simply preventable.

Several studies have shown some aspects of relationship between causes of upper respiratory tract obstruction and dental malocclusion. For example, Linder-Anderson and oulis C.J. Showed the relationship between enlarged tonsils and craniofacial dysmorphology [13], and lopatien K. in 2002, found some causative relations between upper respiratory tract obstruction and malocclusion 14, but these studies are not thorough and have not considered all of causes of upper airway obstruction, and on the other hand, some another studies have not met to similar results and there are many controversies in this regard. At last, we didnot have any documented study about prevalance of dental occlusal patterns in our patients, especially pediatric-age groups, in whom some couses of upper airway obstruction such as adenotonsillar hypertrophy are common. Therefore, we decided to study the relative frequency of different occlusal patterns in a group of students aged between 9-12 years old, and also show the role of nasal and upper airway obstructive disorders in creation of abnormal occlusal patterns. This population of cases has passed their first growth peack, and meanwhile, and we can find some upper airway obstructive diseases such as adenotousillar hypertrophy in them that can be managed to prevent further sequelae in their carniofacial growth through their second growth peack.

- According to our results (tables 1,2), occlusion class I(normal pattern) had the highest frequency in all age groups, except in 12 years old boys, which was related to this age and gender of these subgroup. After class I occlusion, the classes II and III occlusions (abnormal patterns) were more frequent, respectively, which is concordant with reference books [12]. It is obvious that with increasing the age, the frequency of occlusion class I reduces and substitutely, the frequency of occlysion classes II and III increase. Therefore, the frequency of abnormal occlusions increases with age and this relationship is statistically significant.
- In male subjects, relative to females, normal occlusion had lower and abnormal occlusions had higher frequencies. This is similar to ob-

servations of Woodside D.G. in 1991, who found that, abnormal occlusal patterns are more frequaent in boys who underwent adenoidectomy than in girls underwent this surgery [10].

- Hypertrophy of palatal tonsils was related statistically with frequency of abnormal dental occlusions (p=0.02). This is compatible with findings of other studies, mentioned previously [13, 14].
- Frequent common colds and history of nasal bone fracture, were meaningfully related with the type of dental occlusal pattern (p=0.032 and 0.047, respectivety). We could not find any thing in this regard in our review of textbooks and articles.
- Our observations suggest that in students with sinusitis and nasal septal deviation, there were relatively lower frequency of normal occlusion and higher frequency of occlusion class II, compared with healthy students; howerer, chi-square test did not show any significant relationship between them. Also, there isn't any similar study in this regard in medical references.
- Nasal polyposis and hypertrophy of turbinates had no valid relationship with occlusal patterns. Also in this regard we could not find any similar study in references.
- Relative frequency of occlusion class I in any of two groups of students, with and without rhinitis, was simillar; also, frequency of calss II occlusion was approximately equal (even a little lower in rhinitis group). Abhnormal occlusion class III was more frequent in rhinitis group, but this is not statistically significant, according to chi-square test. Because of disconcordance between these results and results of other studies snch as that of Martinez Estenous Ji. In 1998 [15], and Bertolani MF in 2004 [16], we suggest complementary and advanced studies in this regard, especially, when we consider that in the first study, results of radiologic criteriae were concordant with results of this study.
- As we demonstrate in table 3, individuals who had abnormal occlusal patterns, had averagely further obstructive problems compared to individuals who had normal occlusal patterns; however, this is not statistically significant. Numerous studies have been done in this regard, and some of them are concordant with our results, and some others are not. For example, the results of observations of kluemper GT. in 1995 [17], shanker S. in 1999 [11], and Faria in 2002 [18] are simillar to our study results, while, those of Lofstrand in 1999 [8] and other studies are not. Therefore we suggest furter studies in this regard.

Conclusion

According to results of this study and some other ones about influence of obstructive upper airway diseases on craniofacial growth and their role as etiologic, or at least, as comorbid factors in generation of abnormal dental occlusion patterns, we can conclude that early diagnosis and treatment of such etiologic factors can prevent aberrant changes in craniofacial and dentofacial region and abnormal sequelae in appearance of individuals, and reduce necessity of advanced and very expensive orthodontic treatments. This is achievable simply by two ENT and dentistry visits, and like other screening tests, such as thalassemia test before marriage, or thyroid function test in newborns, can achieve to its important place in perventive medicine. Also, these diagnostic-therapeutic measures can reduce relapses of orthodontic treatments which are done for correction of these malformed dento-facial appearances. To achieaving these purposes, a thorough coordination between otolaryngologist, pediatrician, orthodontist, and pediatric dentist is mandatory, and also, utilization of advanced instruments and equipments, such as rhinomanometry, rhinoscopy, platysmography and so on is suggested.

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