ORIGINAL ARTICLE

Parafunctional Oral Habits: Frequency and Association with Malocclusion Traits in Adolescents

Faiza Malik[1]	**BDS, FCPS, CHPE**
Hooria Haq[2]	**BDS**
Rashid Mehmood[3]	**BDS**
Kashif Haroon[4]	**BDS, M Orth RCS Ed**
Mazhar Hussain[5]	**BDS**
Fiza Khan[6]	**BDS**

OBJECTIVE: To determine the frequency of parafunctional oral habits and their association with types of malocclusions in all three planes among the adolescents.

METHODOLOGY: This cross-sectional study involved 610 students studying in 8 different schools of Raiwind, Lahore. Ethical approval for the study was obtained from Sharif Medical and Dental College, Lahore. Data was collected by the primary researcher and recorded in predesigned proforma. Each student was inspected while seated in an upright position in natural day light, using disposable wooden blades to retract the cheek to record posterior dental relationships and to retract lips to record anterior dental relationships. Data was scrutinized using SPSS and chi-square test was used to find the statistical significance of the association between various parafunctional oral habits and types of malocclusions.

RESULTS: The frequency of parafunctional oral habits was 57.3% among 610 adolescent students, being more prevalent in females (72.9%) than males (52.3%). The most common oral parafunctional habit was bruxism (18.0%) and least frequent was thumb sucking (8.4%). Association between oral parafunctional habits and malocclusion in all three planes was found to be significant (p=0.0).

CONCLUSION: The parafunctional oral habits such as bruxism, tongue thrusting, nail biting, mouth breathing and thumb sucking are very commonly found among adolescents in the same descending order. Most common malocclusions found to be associated with parafunctional oral habits are exaggerated over-jet, open bite and deep bite. Parafunctional oral habits have a strong influence on developing malocclusion traits in all three dimensions.

KEYWORDS: Parafunctional oral habits, malocclusion, thumb sucking, tongue thrusting, mouth breathing, bruxism, nail biting.

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INTRODUCTION

Oral habits can be broadly divided into two groups: functional and parafunctional habits. Functional oral habits are a result of repeated normal function, whereas habits attained as a result of practices other than normal are labelled as parafunctional habits.[1] Parafunctional habit is a repeated abnormal act that targets the oral complex, which includes digit sucking, tongue thrusting, bruxism, nail biting and mouth breathing.[2] Some of these are also sleep related such as bruxism, thumb sucking and mouth breathing. Etiology of malocclusion involves genetic as well as environmental factors. Inappropriate oral habits can affect the dental and skeletal development in adverse way.[3]

Environmental factors such as digit sucking which is a habit acquired during early years due to putting thumb in mouth for non-nutritive purpose, often cause maxillary incisors proclination, anterior open bite, posterior crossbite, exaggerated overjet,midline diastema and risk of maxillary incisor trauma.[3] The crossbite of posterior teeth is due to

1. Assoicate Professor, Department of Orthodontics, Sharif Medical and Dental College, Lahore.
2. Post-Graduate, FCPS- II Resident, Department of Orthodontics, Sharif Medical and Dental College, Lahore.
3. Manager, Department of Monitoring and Evaluation, Punjab Health Care Commision.
4. Assistant Professor, Department of Orthodontics, Azra Naheed Dental College (Superior University)
5. Post-Graduate, FCPS- II Resident, Department of Orthodontics, Sharif Medical and Dental College, Lahore.
6. Post-Graduate, FCPS- II Resident, Department of Orthodontics, Sharif Medical and Dental College, Lahore.

Corresponding author: "Dr. Faiza Malik" < dr.faizahash@gmail.com >

downward positioning of the tongue and increased action of the cheek muscles during sucking that builds negative intra-oral pressure.[3] Blockage of upper respiratory tract, resulting in mouth breathing, refers to the act of breathing through the mouth which often occurs habitually or as a result of an obstruction to breathing through the nose, alters the sequence of craniofacial growth with classic dental and facial characteristics such as elongated face, high arched palate and incompetent lips.[3] There are other adverse effects associated with extended parafunctional habits. Tongue thrusting, which is the anterior placement of the tongue at rest, lips lies against or in between the anterior teeth can cause, anterior open bite, maxillary incisor proclination, lip trap, distoclusion and incompetent lips.[4,7]

Non-nutritive sucking habits are common in young infants, however as children grows up, sucking habits tends to get reduced. Malocclusion occurs when these habits persist during and after the eruption of permanent dentition.[5] The frequency of oral habits and their consequences varies in different communities relying on factors such as type of parafunctional habit, its extent, frequency and intensity.[7] Bruxism is defined as the unintentional habitual grinding of teeth, which may cause attrition, periodontal problems and malocclusion.[8] There is a positive correlation between crowded anterior teeth and bruxism-associated parafunctional habits.[9]

The extended use of pacifiers and feeding bottles is more frequent in toddlers, while nail biting or onychophagia and digit sucking are more frequent in pre-schoolers and school children.[11] Its frequency increases in teenage years and drops later and its incidence is more amongst boys than girls.[12] There has been a surge in incidence of oral parafunctional habits in children, though not as widespread as dental caries, however, it is still a matter which needs to be addressed in early years.[13]

According to a study conducted in Jeddah, Saudi Arabia in 2021, it was concluded that 3.9% participants were mouth breathers, 39.6% participants had habit of nail biting and digit sucking was quite unusual among the subjects with 6.8% frequency. Bi-maxillary protrusion was found among 11.1%, edge to edge incisor relation in 6.6%, severe overjet in 3.1%, anterior crossbite in 1.3%, open bite in 3.1% and deep bite in 2.7% of the subjects. Another study conducted in Taif, Saudi Arabia in 2020, showed percentages of thumb sucking, tongue thrusting and mouth breathing to be 10.7%, 20.8% and 6.1% respectively. An investigation conducted in India in 2020 to find the association between oral habits and its effects on dentition among children showed similar results. The most common habit was tongue thrusting (44%), followed by thumb sucking (24%). It also showed that class I incisor relation was mostly seen in tongue thrusting habit (42%) and class II division 1 incisor relation was mostly seen in thumb sucking habit (12%).

Parafunctional habits constitute a significant etiological factor for developing malocclusion. Treatment of these malocclusions should focus on detecting and intercepting these etiological factors early on for better treatment outcomes and long-term stability. Awareness regarding parafunctional habits and their consequences on dentofacial characteristics is of prime importance. In a developing country like Pakistan, where orthodontist to population ratio is very low, community outreach programs to raise general awareness, should be encouraged for timely interception of parafunctional oral habits and prevention of malocclusion. Therefore, the objective of this research was to find out the frequency of parafunctional oral habits in a sample of adolescent population and its association with different types of malocclusions.

METHODOLOGY

This cross-sectional study involved 610 students studying in 8 different schools of Raiwind, Lahore. The sample was collected using non-probability consecutive sampling technique. Firstly, ethical approval was obtained from Sharif Medical and Dental College, Lahore. Thereafter, permission was taken from the schools' principals for history taking and intra-oral examination of the students fulfilling the selection criteria. Informed consent was also taken from their parents prior to the history and examination date. The study duration was 3 months. The inclusion criteria were adolescent males and females aged 13-20 years, having fully erupted permanent dentition except third molars. The exclusion criteria were students with on-going or prior history of orthodontic treatment, dentofacial trauma, dentofacial deformity or craniofacial syndrome.

Data was collected by the primary researcher and recorded in predesigned proforma. To avoid visual fatigue, the number of students examined per day was kept to a minimum of 30-40. Complete demographic details and medical/dental history was taken. Exclusive history of oral parafunctional habits was taken from each participant and recorded in the proforma. All intra-oral inspections were carried out in direct vision with gloved hands and disposable wooden blades. Each student was inspected while seated in an upright position in natural day light, using disposable wooden blades to retract the cheek to record posterior dental relationships and to retract lips to record anterior dental relationships. Overbite, which is the vertical distance between the maxillary and mandibular central incisal edges and overjet, which is the horizontal distance between the maxillary and mandibular central incisal edges, were measured using a stainless-steel ruler to the nearest 1 mm. Disposable clear plastic sleeve

was used to cover the measuring end of the ruler and changed before use on every participant.

The following parameters were assessed and data was recorded in a pre-designed proforma:

i. Digit Sucking
ii. Tongue Thrusting
iii. Nail Biting or Onychophagia
iv. Mouth Breathing
v. Bruxism

• **Malocclusion:**

I. Sagittal Plane

Over-jet: Overjet is the horizontal overlap of the maxillary central incisors over the mandibular central incisors[1], which can be classified as:

a. Normal Overjet (2-3mm)
b. Exaggerated Overjet (>3mm)
c. Reverse Overjet (≤0mm)

II. Vertical Plane:

Over-bite: The normal vertical over-lap between maxillary and mandibular central incisors[21], which can be classified as:

a. Open Bite (≤0mm)
b. Normal Over bite (1-2mm)
c. Deep Bite (>5mm)

III. Transverse Plane:

Crossbite: Crossbite is a transverse malocclusion where maxillary teeth fit inside of mandibular teeth. It can be anterior crossbite for anterior teeth and posterior crossbite if it involves posterior teeth.[16]

STATISTICAL ANALYSIS

Data was scrutinized using Statistical Package for the Social Sciences software, version 25.0 (SPSS, Inc., Chicago, IL, USA) developed by IBM. Descriptive analyses were performed using frequencies and percentages for gender, malocclusion features and parafunctional oral habits. Quantitative variable like age was represented as mean ±SD. Chi-square test was applied to verify the statistical significance of the association between various parafunctional oral habits and types of malocclusions. The level of significance was set at 5% (p≤0.05).

RESULTS

A total of 610 adolescents participated in this study with a mean age of 15.47±1.6 years, out of which 462(75.7%) were males and 148(24.3%) were females. The prevalence of parafunctional habits was 57.3%, among which 108(72.9%) were females and 242(52.3%) were males.

Figure 1 shows the frequency distribution of parafunctional oral habits. The most frequently found oral habit was bruxism (18%) followed by tongue thrusting (15.2%), nail biting (12.8%), mouth breathing (8.7%) and lastly thumb sucking (8.4%).

Figure 2 shows the gender-based comparison of parafunctional oral habits. There was a total of 610 participants in this study out of which 462(75.7%) were males and 148(24.3%) were females. The prevalence of parafunctional habits was 72.9% for females and 52.3% for males.

Figure.1: Frequency Distribution of oral habits among subjects

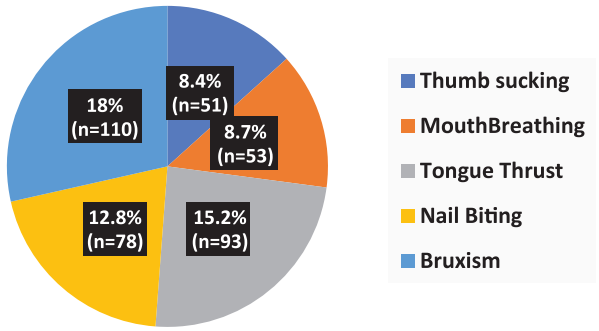

Figure.2: Gender based comparison of parafunctional oral habits

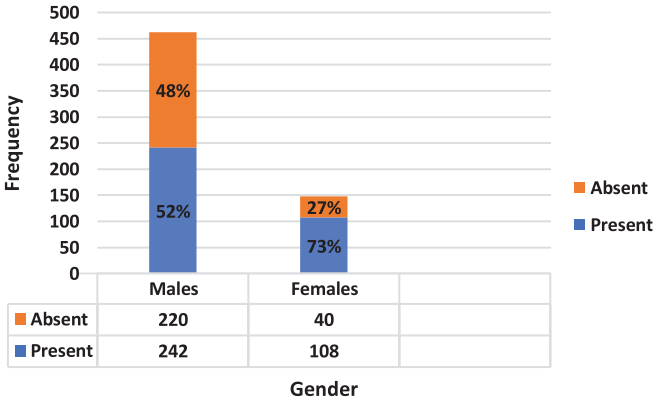

Figure.3: Age related distribution of parafunctional oral habits

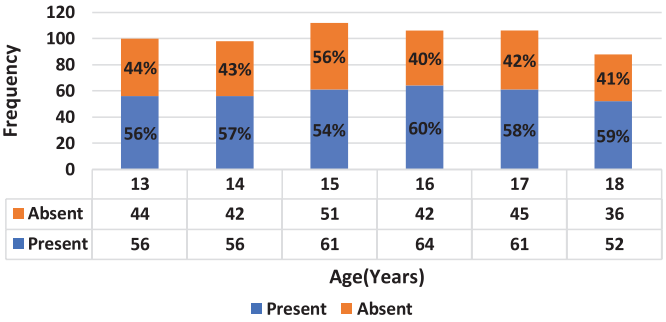

Figure 3 shows the age-related distribution of the parafunctional oral habitswhich concludes that age has no effect on the presence or absence of deleterious oral habits.

Figure 4 shows the frequency distribution of malocclusion in total sample. Table 1 displays detailed distribution of individual parafunctional oral habits in both genders.

Table 2-4 show the association of parafunctional oral habits with malocclusion in sagittal, vertical and transverse planes, using chi-square test for statistical significance.

Figure.4: Frequency distribution of types of malocclusion

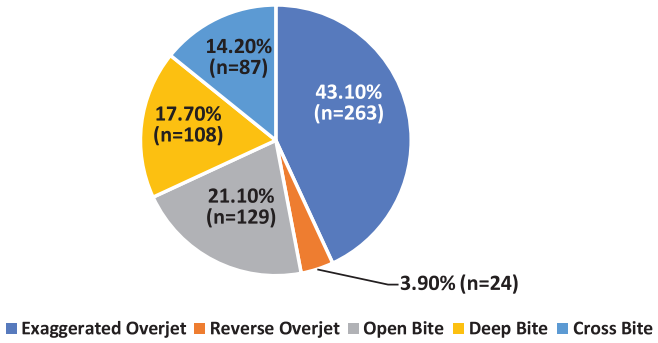

Table 1: Gender-based comparison of individual parafunctional oral habits

Gender	Thumb Sucking			Mouth Breathing			Tongue Thrusting			Nail Biting			Bruxism		
	N	%	Sig	N	%	Sig	N	%	Sig	N	%	Sig	N	%	Sig
Male	38	8.2%	0.83	40	8.6%	0.96	69	14.9%	0.70	50	11%	0.01*	72	15.6%	0.005*
Female	13	8.8%		13	8.8%		24	16.2%		28	19%		38	25.7%	

*p<0.05 is significant

Table 2: Association of Parafunctional Oral Habits with Sagittal Malocclusion using Chi-Square Test

Parafunctional Habits	Sagittal Malocclusion					
	Exaggerated Over Jet			Reverse Over Jet		
	N	%	Sig.	N	%	Sig.
Thumb Sucking	31	61%	0.028*	0	0%	0.13
Mouth Breathing	32	60%	0.029*	1	1.8%	0.42
Tongue Thrusting	68	73%	0.001*	0	0%	0.33
Nail Biting	14	17.9%	0.011*	0	0%	0.60
Bruxism	41	37.2%	0.344	14	12.7%	0.001*

*p<0.05 is significant

Table 3: Association of Parafunctional Oral Habits with Vertical Malocclusion using Chi-Square Test

Parafunctional Habits	Vertical Malocclusion					
	Open Bite			Deep Bite		
	N	%	Sig.	N	%	Sig.
Thumb Sucking	41	80%	0.001*	0	0%	0.11
Mouth Breathing	21	40%	0.001*	10	19%	0.76
Tongue Thrusting	48	52%	0.001*	2	2.1%	0.11
Nail Biting	6	7.7%	0.002*	9	11.3%	0.15
Bruxism	4	3.6%	0.11	60	54.5%	0.001*

*p<0.05 is significant

Table 4: Association of Parafunctional Oral Habits with Transverse Malocclusion using Chi-Square Test

Parafunctional Habits	Transverse Malocclusion		
	Cross Bite		
	N	%	Sig.
Thumb Sucking	10	19.6%	0.025*
Mouth Breathing	3	5.7%	0.061
Tongue Thrusting	1	1.1%	0.111
Nail Biting	16	20.5%	0.091
Bruxism	18	16.3%	0.486

*p<0.05 is significant

DISCUSSION

Parafunctional oral habits are repetitively acquired automatisms, which present as an altered pattern of orofacial muscle contraction which proceeds unconsciously on consistent basis.[2] Parafunctional oral habits result in various malocclusions, temporomandibular joint problems, loss of tooth structure and increase in psychosocial distress.[1] The consequences of these habits depends on character, commencement and prolongation of habit. These pertinacious parafunctional habits might result in complications in long run which can affect the orofacial functions which leads to imbalance between outer and inner muscle activity.[3]

The current study showed that 57.3% adolescents had history of parafunctional habits, being more prevalent in females than males. The result of our study shows greater frequency for tongue thrusting parafunctional habit (15.2%) and lesser frequency for mouth breathing (6.18%). which closely matches with the results of a study conducted by Aldawood which also shows that mouth breathing was less frequent while tongue thrusting was more frequent among parafunctional oral habits in people of Taif, Saudi Arabia.[1] This similarity was probably due to the almost similar age group of the participants in both studies.

Gender-based comparison concluded that parafunctional oral habits were more prevalent in females (72.9%) than males (52.3%) unlike another study reported by Grippaudo that showed insignificant difference with respect to gender.[3,8] However, comparison of individual parafunctional oral habits did not yield any statistically significant difference for thumb sucking, mouth breathing and tongue thrust. Females reported with higher frequencies for nail biting and for bruxism. Another study conducted by Zakirulla et al also showed significant presence of bruxism and nail biting.[14] The association between age and parafunctional oral habits was statistically insignificant, similar to a study done by Gurunathan on Indian population.[19]

In this study, the malocclusion parameters found were

exaggerated overjet, reverse overjet, open bite, deep bite and crossbite. Association of thumb sucking, mouth breathing and tongue thrust, with exaggerated overjet and open bite showed significant results (p=0.001). A study conducted by Grippaudo concluded that parafunctional oral habits were directly related to malocclusion.[3] Another investigation conducted by Ahmed et al revealed similar results to our study.[5]

Kharat et al concluded in his research that negative oral habits can lead to malocclusion. A total of 40% cases of malocclusion were found to be related to oral habits[15], which is consistent with our results. Children with exaggerated overjet presented with tongue thrusting (73%), thumb sucking (61%) and mouth breathing (60%). Most of the children (80%) with open bite had a habit of thumb sucking. Arora concluded similar results that digit sucking habit can cause significant complications such as open bite and increased overjet.[10] However, the cause-and-effect relationship of open bite with mouth breathing and tongue thrusting remains inconclusive.[16]

There are many factors that can adversely affect the development of dentition and occlusion. Abnormal sucking habits such as thumb sucking can cause transverse discrepancy which presents as crossbite.[8] The current study found a significant association between thumb sucking habit and crossbite (p=0.001).

Breathing patterns have a major impact on the maturation of orofacial features. Any situation which disrupts normal breathing physiology may affect the facial development. It has been reported that due to chronic mouth breathing, the mandible gets rotated downwards and backward leading to open bite.[8,10] Similarly, in our study a statistically significant association (p=0.001) was seen among mouth breathing and open bite.

Tooth grinding, clenching or bruxism is related to several etiological factors ranging from psychological, neuromuscular and occlusal disharmonies.[9,12] It can lead to the development of deep bite due to attrition of posterior occlusal surfaces. The current study shows that 54.4% of adolescents who had deep bite also gave history of bruxism or clenching, which was more prevalent in females (25.7%).

Anterior placement of the tongue at rest is known as tongue thrusting.[12] An anterior tongue placement where the tongue rests between incisors may hinder incisor eruption leading to development of anterior open bite, increased overjet and generalized spacing.[15] This current study shows similar results, whereby 73 % individuals with tongue thrusting had exaggerated overjet and 52.1% had open bite. Similarly, a study done by Zakirullah et al showed open bite and exaggerated overjet in children with tongue thrusting.[14]

Various previous studies predicted a deep-rooted association between parafunctional oral habits and malocclusion. In order to minimize the bad oral habits and their adverse effects, a comprehensive approach is required, which consists of patient-parent guidance, behavior modification procedures, habit breaking devices, frequent follow up visits. Prevention and interference of these harmful oral habits during childhood is very crucial for the optimal oral health and dentofacial development. Hence, it is essential to raise awareness in our communities regarding early interception of parafunctional oral habits to avoid the development of dental and skeletal malocclusion.

CONCLUSION

The most common parafunctional habits in descending order were bruxism, tongue thrusting, nail biting, mouth breathing and thumb sucking. Sagittal malocclusions were significantly associated with parafunctional habits such as tongue thrust, mouth breathing and thumb sucking. Vertical malocclusions were significantly associated with thumb sucking, mouth breathing, tongue thrusting and bruxism. Association between transverse malocclusion and thumb sucking was statistically significant. Gender-based comparison was statistically significant, with oral parafunctional habits being more prevalent in females, whereas age- related differences were statistically insignificant. Therefore, oral parafunctional habits have a strong adverse influence on dentofacial development of adolescent, leading to malocclusion in all three dimensions.

LIMITATIONS OF STUDY

Firstly, it was a community-based study, therefore, detailed history and examination to discern the severity of parafunctional oral habit could not be done. Secondly, the cross-sectional design of this study limited the potential to rule out the cause-effect relationship of oral parafunctional habit and malocclusion.

FINANCIAL DISCLOSURE

We have no relevant financial interests in this manuscript.

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CONFLICT OF INTEREST

We have no conflict of interest that we should disclose.

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