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ORIGINAL RESEARCH

ORAL HABITS AND THEIR IMPACT ON DEVELOPING DENTOFACIAL STRUCTURES: A CROSS-SECTIONAL STUDY IN CHILDREN AGED 4–12

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ABSTRACT

Background:Children's oral habits such as thumb sucking, mouth breathing, tongue thrusting, lip biting, and bruxism can adversely affect dentofacial development. If these habits persist during the critical period of craniofacial growth, they may lead to malocclusions and skeletal abnormalities, which can become irreversible during adolescence.

Objectives:To assess the prevalence of oral habits in children aged 4–12 years and to evaluate their association with dentofacial anomalies.

Results:A cross-sectional study was conducted on 200 children. Clinical examinations were performed to record occlusal and facial parameters, and parent-filled questionnaires documented the type, frequency, and duration of oral habits. Statistical tests (Chi-square and logistic regression) were applied, with a significance level set at $p < 0.05$. Oral habits were observed in 62% of the children. Thumb sucking was the most common (28%), followed by mouth breathing (20%), tongue thrusting (8%), lip biting (4%), and bruxism (2%). Mouth breathing showed a significant association with posterior crossbite and long-face pattern, while thumb sucking was linked to increased overjet and anterior open bite. Longer duration of habits was significantly associated with greater severity of abnormalities.

Conclusion:Destructive oral habits have a measurable impact on dentofacial development. Early identification and timely intervention are crucial to preventing long-term malocclusions and ensuring proper craniofacial growth in children.

Keywords: Oral habits, Dentofacial development, Malocclusion, Pediatric dentistry, Cross-sectional study, Maxillofacial growth.

INTRODUCTION

Dentofacial development in childhood is a crucial aspect of craniofacial development.¹ Dental eruption sequences, orofacial muscle functional adaptation, and the dynamic remodeling of the maxillary and

mandibular skeletal components are all occurring at this period.² Any interference with this stage of development can have a significant impact on the face shape and occlusal relationship. Environmental and functional variables also have a role in the development of the

craniofacial complex, in addition to hereditary considerations.³ Oral habits have lately attracted significant clinical attention among these functional factors due to their potential to modify typical development patterns.⁴ Correct dental alignment and beautiful facial proportions depend on the oral and perioral structures growing and functioning normally. The craniofacial bone is extremely malleable in early development, making it susceptible to external influences.⁵ The development of the dental arches and occlusion at this time depends critically on neuromuscular activity, swallowing habits, breathing techniques, and oral posture. This equilibrium can be upset by bad dental practices, which can result in structural defects that persist throughout adolescence and adulthood.⁶ These abnormalities affect not just the appearance of teeth but also speech, masticatory function, and psychological well-being. In order to provide targeted preventive therapy and lower future orthodontic needs, the physician must have a thorough awareness of how these behaviors interact with dentofacial development.⁷ Repetitive, non-masticatory motions of the oral or perioral tissues that put abnormal stresses on the teeth and their supporting structures are known as destructive oral habits.⁸ Bruxism, lip biting, tongue thrusting, mouth breathing, and thumb or finger sucking are a few examples. In early life, thumb sucking is frequently observed and is typically accepted as a typical newborn calming behavior.⁹ However, if it persists past the ages of 4 or 5, the teeth and skeleton may undergo noticeable alterations. Malocclusions such as increased overjet and anterior open bite are caused by the thumb's pressure on the palate and upper incisors, which throws off the force balance.¹⁰ However, mouth breathing can also be caused by airway impediments such as enlarged adenoids, allergic rhinitis, or nasal septum deviation.¹¹ The homeostasis of the facial musculature is affected by this habit's open mouth, which leads to a high palatal vault, a constricted maxillary arch, and an increase in vertical face dimension.¹² The tongue pushing forward against the front incisors during swallowing is called tongue thrusting, and it is an improper swallowing technique. Common results of this habit include an anterior open bite and upper incisor spacing.¹³ Although less frequent, lip biting tends to change the incisors' inclination, which results in upper tooth protrusion and decreased retroclination. In addition to wearing down tooth enamel, bruxism, or involuntary teeth clenching or grinding, can induce temporomandibular joint pain or sensitivity.¹⁴ There are several underlying causes for these actions, including psychological, physical, and behavioral ones.¹⁵ Long-term habit retention suggests the presence of emotional or functional needs, and doctors must take into account both the psychological and physical aspects of patient care.¹⁶ Additionally, there

was a substantial correlation between mouth breathing and posterior crossbites and long-face syndrome symptoms.¹⁷ In addition to causing constricted arches and distorted vertical growth patterns, mouth breathing also causes aberrant oral and facial muscle posture, which disrupts the natural balance of forces required for appropriate maxillary development. The duration of the habit affects the severity of the abnormalities. Malocclusions treatment is strongly associated with habits that last longer than the initial years of the mixed dentition period.¹⁸ The need for pediatric dentists and orthodontists to inform parents about the negative consequences of ingrained behaviors and the need to take preventative action.¹⁹

This study aims to identify detrimental oral practices that impact the development of dentofacial structures in children aged 4 to 12. By investigating the relationship between early and long-term non-nutritive oral habits and dentofacial abnormalities, the current study evaluates the incidence and severity of malocclusions in preschool-aged children from an epidemiological perspective. The study's primary goal is to ascertain if the duration of these activities affects the severity and genesis of the subsequent malocclusions. In order to ascertain correlations between certain non-nutritive oral habits and predictable craniofacial alterations, it employs statistical processes, stringent diagnostic criteria, and comprehensive parental surveys.

2. MATERIALS AND METHODS

2.1 Study Design

This cross-sectional observational study aimed to assess the effect of harmful oral habits on the formation of dentofacial structures among children aged 4 to 12 years. Upon approval from the institutional review board, it was conducted for six months at the chosen pediatric dentistry clinics and schools within proximity. Informed consent was obtained from parents or guardians for the enrollment of participants. Dentofacial characteristics were recorded by clinical examinations, and the type, frequency, and duration of oral habits were obtained by a standardized parental questionnaire. Orthodontic norms were adhered to in diagnostic assessment. All observations were carried out by a calibrated examiner to make accurate and repeatable judgments.

2.2 Study Population

The children aged 4 to 12 years attending nearby pediatric dentistry clinics and schools were included in the study. Inclusion criteria in the strict sense, including children with normal growth, no systemic diseases, and no congenital craniofacial anomalies, were utilized to select the subjects. Only individuals whose parents or guardians gave written informed consent were included. To avoid confounding factors, patients who were being treated for orthodontics, had a history of maxillofacial trauma, or had been treated in the past for craniofacial deformities were excluded.

2.3 Sample Size

Prevalence figures from previous epidemiologic research on oral habits and impact on dentofacial development were employed to select the sample size for the present study. With parameters at the 95% level of confidence and 5% margin of error, statistical power analysis was employed to select enough participants that would represent the targeted population. A minimum of 200 subjects was deemed adequate to yield significant outcomes according to these estimates. The sample size bypassed the danger of type II errors and ensured a considerable statistical comparison. The selection of sample size also allowed for the inclusion of adequate variances in age, gender, and oral habits.

2.4 Data Collection Methods

Two parallel methods were employed to gather the data. All subjects underwent a thorough clinical evaluation with standardized pediatric dental and orthodontic procedures, done by a calibrated examiner. Extraoral and intraoral examinations to accurately assess the dentofacial structures, recorded occlusal relations, overjet, open bite, crossbite, and facial symmetry. Second, parents filled out a standardized questionnaire to record the presence, type, frequency, and duration of oral behaviors like lip biting, tongue thrusting, mouth breathing, thumb sucking, and bruxism.

2.5 Variables

The study aimed to find out the relationships between oral habits and dentofacial development patterns. Thumb sucking, mouth breathing, tongue thrusting, lip biting, and bruxism and their existence, type, frequency, and duration were all taken as independent variables. Clinical confirmation and parents' questionnaires were employed to measure these features. Dentofacial values that were measured on assessment, such as global facial morphology, overjet, open bite, crossbite, malocclusion

characteristics, and dental arch form changes, were dependent variables. To standardize them, they were measured with established orthodontic diagnostic criteria.

2.6 Diagnostic Criteria

Standardized orthodontic and maxillofacial examination techniques were used for the diagnostic evaluation in order to ensure dependability. Angle's system was employed for the diagnosis of malocclusion, which facilitated the creation of Class I, II, and III relationships with ease. Calibrated measuring instruments were employed to record other measurements like overjet, overbite, open bite, and crossbite. When appropriate, cephalometric analysis augmented the assessment of skeletal variations and face growth patterns. Each measurement met guidelines established by pediatric orthodontics and maxillofacial diagnostics.

3. RESULTS

3.1 Participant Characteristics

The study included 200 kids between the ages of 4 and 12. 102 boys (51%) and 98 girls (49%), with an average age of 8.1 years (± 2.3), made up the sample. Each of the three age groups—4–6 years (30%), 7–9 years (36%), and 10–12 years (34%)— splits the children evenly. All participants had equal access to dental treatment, and most came from metropolitan areas. The selection criteria ensured sample homogeneity by excluding any of the children from having congenital craniofacial abnormalities, systemic illnesses, or previous orthodontic treatment. The study population's demographic profile is shown in Table 1, which also confirms that all participants fulfilled the inclusion requirements. The genders are equally represented, and the age groups are distributed evenly.

Table 1. Demographic Characteristics of the Study Population

Characteristic	Category	Number (n)	Percentage (%)
Total Participants	All Children	200	100
Gender	Boys	102	51
	Girls	98	49
Age Groups (Years)	4–6	60	30
	7–9	72	36
	10–12	68	34
Mean Age	Overall	8.1 years (± 2.3)	100
Residence	Urban Areas	200	100

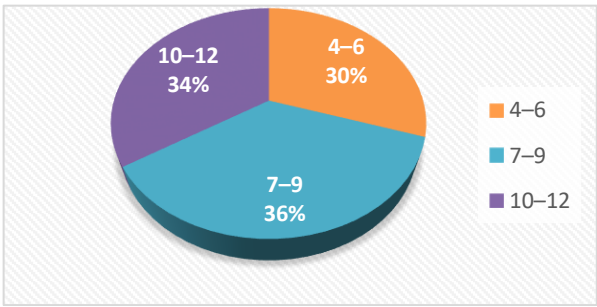


Figure 1. Age Group Distribution of the Participants

The age distribution of participants is shown graphically in Figure 1, with about equal participation in each of the three age groups.

3.2 Prevalence of Oral Habits

Out of the entire sample of participants, 76 children (38%) were habit-free, whereas 124 children (62%) had at least one oral habit. The most prevalent practice among habitual people was thumb sucking, which was seen in 28% of the sample. Twenty percent had mouth breathing, eight percent pushed their tongues, four percent bit their lips, and two percent experienced bruxism. 10 % of the youngsters had several habits, with thumb sucking and tongue thrusting co-occurring most frequently. The behaviors varied in frequency and length. While persistent mouth breathing was most frequently linked to enlarged adenoids or allergic rhinitis, more than half of the thumb suckers had been doing it for more than two years. While habit persistence into later age groups was associated with more severe dentofacial changes, habit prevalence was highest in younger age groups. The incidence of different oral habits among the 200 youngsters analyzed is shown in Table 2. The habit that was most commonly noticed was thumb sucking, which was followed by mouth breathing. A sizable fraction (38%) lacked any discernible habits.

Table 2. Distribution of Oral Habits among the Study Population

Oral Habit	Number of Children (n)	Percentage (%)
Thumb Sucking	56	28
Mouth Breathing	40	20
Tongue Thrusting	16	8
Lip Biting	8	4
Bruxism	4	2
No Habit	76	38

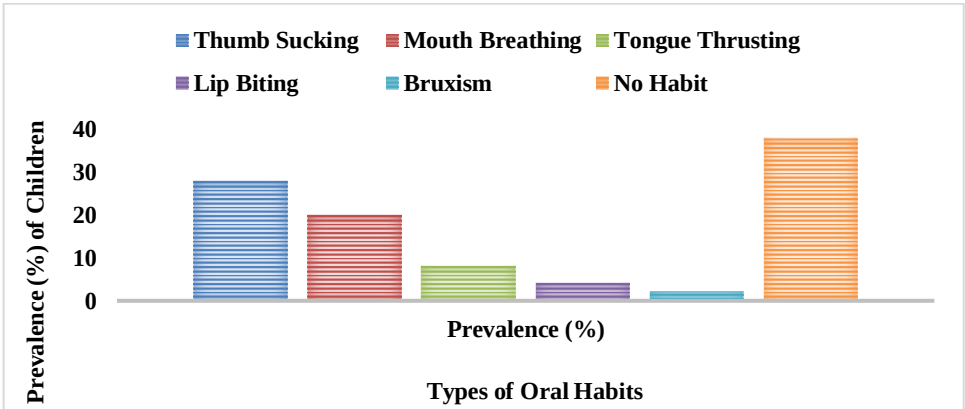


Figure 2. Prevalence of Oral Habits among Children

The frequency of various oral habits in the research population is depicted in Figure 2. Bruxism is the least prevalent, whereas thumb sucking and mouth breathing are the most common. A sizable fraction of kids (38%) had no oral habits at all.

3.3 Clinical Findings

Clinical evaluation revealed a strong link between dentofacial abnormalities and oral habits. Narrow maxillary arches, anterior open bites, and increased overjet (>4 mm) were more common in children who regularly sucked their thumbs. These alterations were more noticeable in kids whose habit persisted past the age of six. Constricted upper arches, high palatal vaults, and posterior crossbites were associated with mouth breathing. Additionally, these kids had demonstrated a propensity for lip incompetence and long-face type. The anterior open bite and anterior tooth spacing were directly correlated with tongue pushing. Lip biting was associated with modest upper incisor proclination and lower incisor retroclination. Even though it was less prevalent, bruxism displayed intermittent dental discomfort and early enamel wear aspects. Although there was little difference between the sexes, boys had somewhat poorer malocclusion types in terms of habits, possibly as a result of their longer habit persistence. The particular dentofacial abnormalities linked to each kind of oral habit are displayed in Table 3. The majority of behaviors and anatomical abnormalities showed substantial links, according to statistical analysis; thumb sucking and tongue thrusting showed the greatest relationships.

Table 3. Association Between Oral Habits and Dentofacial Anomalies

Oral Habit	Common Dentofacial Anomalies Observed	Significance (p-value)
Thumb Sucking	Open bite, increased overjet, narrow maxillary arch	< 0.05
Mouth Breathing	Posterior crossbite, long face pattern, high palatal vault	0.02
Tongue Thrusting	Anterior open bite, spacing of anterior teeth	0.01
Lip Biting	Proclined upper incisors, retroclined lower incisors	0.04
Bruxism	Early enamel wear, dental sensitivity	NS (Not significant)

3.4 Statistical Analysis

Strong correlations between oral habits and dentofacial changes were confirmed by data analysis. According to the chi-square test, children with oral habits had a significantly increased chance of developing malocclusion than children without habits (p<0.05). The logistic regression-derived odds ratio for thumb sucking showed that, once the behavior persisted for more than six years, the chance of getting an open bite doubled. There was a statistically significant correlation between mouth breathing and both long face height (p=0.03) and posterior crossbite (p=0.02). Anterior open bite and tongue pushing were highly correlated (p=0.01). The impact of habit length was particularly noticeable; children who had followed a habit for more than three years were far more likely to suffer from severe malocclusion.

4. DISCUSSION

The current cross-sectional study assesses the effects of harmful oral habits on children's dentofacial tissues between the ages of 4 and 12. The results show a correlation between the kind and duration of behaviors and the severity of dentofacial abnormalities. The study's high oral habit rate of 62% is in line with previous studies carried out in other communities, where it has been shown that between 50% and 75% of children under the age of twelve have habits.

The most prevalent behavior was thumb sucking, especially among younger participants, and it was linked to anterior open bite, small maxillary arches, and increased overjet. Similar patterns have been seen in pediatric orthodontic research studies, which show that prolonged sucking applies persistent pressures to formative dentoalveolar structures, resulting in abnormal occlusal connections. Mouth breathing was present in 20% of the subjects and was associated with posterior crossbite, limited maxillary arches, and long facial patterns. Long-term mouth breathing changes skeletal development and disrupts the balance of the facial muscles, as the study shows. Bruxism and lip biting were connected with less obvious but clinically significant traits such as early enamel loss and proclined upper incisors, respectively, whereas tongue thrusting was mainly linked to anterior open bite and incisor spacing ²⁰.

The statistical significance of the associations guarantees that the severity and duration of habits enhance their influence. More severe abnormalities were displayed by children whose habits persisted past the age of 6, suggesting that early intervention is necessary to lessen long-term effects. ²¹ The combination of functional changes and mechanical stresses with the development of the craniofacial structure results in the reported dentofacial abnormalities. Proclination, anterior stress on the maxillary and palatal incisors, and a gradual decrease in the dental arch are all results of thumb sucking. The posterior occlusion can be impacted concurrently with lower incisor retrocline.

Healthy growth depends on the natural equilibrium of the tongue, lips, and cheeks, which is interrupted by the forces. Because the lips are apart and the tongue is positioned lower in the oral cavity, mouth breathing changes orofacial posture²². This lessens the lateral support the tongue gives the maxillary arch, which causes a narrow palate and high vault²³. Changes in muscle function also lead to a long-face pattern, which promotes vertical facial growth. When swallowing, the tongue pushes forward pressure on the anterior teeth, causing them to procline and resulting in an open bite. The opposite forces brought on by lip biting induce the mandibular incisors to retrocline. Although it is less common in our group, bruxism causes occlusal wear and may eventually increase the likelihood of temporomandibular joint discomfort. Given that bone modeling and dentoalveolar alignment may be impacted by repeated or ongoing stresses throughout development, our findings are consistent with biological notions of growth modification.

They have therapeutic implications right away. Pediatric dentists, orthodontists, and maxillofacial specialists need to be aware that skeletal abnormalities and severe malocclusions can be avoided by identifying oral habits early. Habit assessment should be a routine screening process in primary care and school dental programs. It is advised to use habit-breaking tools and behavioral intervention when thumb sucking and tongue thrusting continue into early infancy. Mouth breathing requires multidisciplinary treatment. When treating airway congestion, collaboration with ENT specialists is essential since dental repair by itself cannot address the underlying problem. Early intervention might avoid long-face patterns and extreme crossbites²⁶.

These results further support the notion that parents should be educated about the harmful effects of long-term dental habits. Routine exams may include counseling to help stop negative behaviors before structural changes become permanent. If there are existing anomalies, interceptive orthodontics may be employed to return the development patterns to normal. Despite the fact that the results offer insightful clinical information, it is crucial to recognize some limitations. First, it limits the capacity to establish causality since the cross-sectional design only shows associations at a single point in time. In order to track the evolution of anomalies over time and confirm causal relationships, longitudinal studies would be necessary.²⁴ Second-parent questionnaires, which are susceptible to recall bias, were used to gather data on the frequency and duration of activities. Parents may overestimate or underestimate their child's habits. Third, the study only examined one community, which might limit its generalizability to other populations where oral habits are impacted by distinct environmental, cultural, or genetic factors. Notwithstanding these drawbacks, the study's reliable and substantial sample size, reliable test

methods, and uniform diagnostic approach raise the validity of its findings.²⁵

Longitudinal study designs should be used in future research to track changes in dentofacial structures over time when behaviors persist or cease. More reliable proof of causality and the timing of intervention would come from this approach. Cephalometric analysis may also provide more accurate information on skeletal changes associated with oral habits when it is included in larger samples. Effective preventative measures should be informed by research that also examines the psychological and environmental factors that contribute to the habit's persistence. Clinicians would benefit from intervention trials evaluating the efficacy of myofunctional therapy, early orthodontic treatment, and habit-breaking appliances.

5. CONCLUSION

The association between maladaptive oral habits and dentofacial development in children ages four to twelve is assessed in this study using a cross-sectional methodology. The research shows a wide range of activities in children, with thumb sucking and mouth breathing being the most common. Abnormalities resulting from habits' substantial impact on craniofacial development include crossbite, higher palatal vault, anterior open bite, increased overjet, and changed face shape. According to a statistical study, the kind and duration of these activities are closely correlated with the extent of dentofacial alterations, with long-term habits having the greatest negative effects. The findings highlight the need of early screening in pediatric dental settings to spot harmful habits before they cause permanent changes. When early detection is attained, clinicians can take prophylactic measures, such as habit counseling, myofunctional therapy, and, if required, interceptive orthodontic treatment. ENT experts' multidisciplinary management is crucial in treating both structural and functional issues with habits like mouth breathing, which typically have airway roots. By emphasizing the direct influence of oral habits on dentofacial development, the current study provides valuable information that may help professionals adopt rapid intervention. The study emphasizes the need for early professional help, regular dental examinations, and parental awareness in preventing severe malocclusion and fostering children's healthy craniofacial development. Promoting early issue diagnosis and prevention not only enhances oral health but also reduces the need for later, more involved orthodontic or surgical operations.

DECLARATIONS

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Competing Interests

The authors have no competing interests to declare.

Informed Consent

Not applicable.

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