

# Digital Aspiration As An Indicator of Failure in Pediatric Patients

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## Abstract

Habits are habits that are obtained by the repetitive action of some exercise, at the beginning they are usually voluntary, but with the passing of time it becomes an involuntary practice. Finger sucking is characterized by the introduction of one or more fingers of one of the child's hands into the mouth, and it is generally performed with the tip or thumb of the thumb resting on the palatal vault. This action, when performed after 4 years of age, can trigger malocclusions; therefore, we seek to establish the relationship between finger sucking and malocclusion in pediatric patients, by means of a bibliographic research collecting documented information from books, magazines and scientific articles among others, to gather information from observational, transversal and descriptive studies that are related to digital aspiration and malocclusion in pediatric patients. It is concluded that oral habits such as digital aspiration should not go unnoticed since they not only cause alterations in the oral cavity but also collateral effects such as deformation of the thumb, fungal infection or eczema, parallel habits, mandibular prognathism.

**Keywords:** digital aspiration, malocclusions, pediatrics, oral habits.

## 1. Introduction

Oral habits are forms of behavior that until a certain moment are usually normal, but it has been proven that depending on the duration and intensity they can cause alterations in the oral cavity and trigger occlusopathies. (1)

Oral habits are considered pernicious, as sensory reflexes of the neuromuscular system, becoming one of the main causes to trigger malocclusions. A habit needs professional attention when it persists until age 4 or older. Some authors indicate that we can find two types of sucking, the nutritious one that occurs from the beginning of breastfeeding from the essential maternal stage and the non-nutritive one that causes security and satisfaction, indicating some frustration in the infant. (2)

There are factors that influence the increase of the habit, these can be: duration (maternal, initial, school), frequency (intermittent and continuous) and intensity (little intense and intense). Malocclusions can manifest themselves at an early age of life from the origin of the person and can intensify with the passage of time, they are produced by the absence of harmony between the anatomophysiological

controls of the stomatognathic system and the teeth. (3)

Some malocclusions are associated with the habit of digital suction among them we find: Class II, anterior open bite, crossbite, ogival palate, protrusion of upper incisors. The complexity of treatments for oral habits lies in the fact that their onset occurs from childhood, which makes it difficult to eliminate due to the little understanding of the infant, to achieve the success of the treatment, the collaboration of the patient in conjunction with that of the parents or guardians is indispensable. (4)

## 2. Methods

- Studies carried out since 2010, from bibliographic sources, scientific articles on dentistry and pediatric dentistry published in scielo, UG repositories, pubmed, among others, about Digital aspiration as an indicator for malocclusion in pediatric patients. This research is a study of non-experimental bibliographic descriptive approach.

## Resultados

According to studies conducted through bibliographic sources on digital aspiration, several

authors point out that after their studies they found that the highest prevalence in digital aspiration was the female gender.

After reviewing the literature of several authors consulted in the preparation of this study, we found that the habits of thumb sucking induce several malocclusions of the most frequent in pediatric patients are anterior open bite being the most prevalent, followed by crossbite, class II.

Oral habits that are not physiological trigger different anomalies altering the normal development of the orofacial musculature altering the evolution of the stomatognathic system that will have repercussions depending on the age at which the habit begins.

Malocclusions or occlusopathies according to the WHO occupy the third place in dental alterations; causing alterations in the growth of the oral cavity and its bone structures. considered that in Digital Suction motor and sensory systems are related; resulting in a response to a stimulus, such as a normal reflex. Sucking is one of the first behaviors adopted by the child from the moment he is in the womb and at birth; when feeling changes in temperature or flavors, considered as a response to stimuli in the oral and perioral area. (5)(6)

According to bibliographic research, occlusopathies will depend on the frequency, strength and duration of habits, indicating that in the dental office the dentist is responsible for identifying and preventing oral habits in a timely manner, mainly in the infant, with the aim of intercepting malocclusions. (2)

Crespo Mafrán and other authors indicate that experience and research have shown that children capture favorably in the learning process, the greater the variety of didactic methods and means that can be used, the sooner it is possible to attract and retain their attention. (7)

Digital aspiration is a habit with greater recurrence in the female sex, if the habit is not diagnosed at an early age it can trigger habits such as lip sucking and lingual interposition. The average age to eradicate the habit is 4 to 5 years. (8)

### Digital suction and prevalence studies

Digital suction is characterized by the introduction of one or more fingers of one of the child's hands into the mouth, and is usually performed with the pad or pulp of the thumb resting on the palatine vault, the incisive alveolar process and the lingual or palatine face of the upper incisors, causing the separation of the arches during the act of suction. Thumb sucking is the most frequent of the pathological oral habits.(9)

In an observational, descriptive cross-sectional study, made up of children of Early Childhood Education, with a total of 344 schoolchildren, resulting in digital sucking being more prevalent than pacifier sucking and other habits found. This study resulted in the presence of digital suction triggering malocclusions. (10)

According to studies carried out in various countries,

malocclusions occupy one of the first three places in dental disorders, followed by caries and periodontal disease; caused by oral habits such as digital sucking being the cause of bone deformation that will have less or greater impact depending on the age at which the habit begins. (11)

A cross-sectional study was conducted in children aged 2 to 5 years in Hong Kong to investigate the association of nutritious and non-nutritious sucking habits with the development of primary dentition, resulting in children with more than one year of thumb sucking being more likely to develop abnormal dental intercourse in the sagittal dimensions (i.e. class II incisor and class II canine relationships and greater protrusion) and vertical (i.e., anterior open bite). (12)

In an investigation of 107 infants with oral habits, the following results were obtained: Children between 6 and 7 years old were 47.6 % and females, 73.8 %. Among the dentomaxillofacial anomalies caused by digital suction, lip dysfunction occurred in 95.2 % and the highlight increased in 92.8 %. 83.3% of children ended with adequate knowledge. 78.6% quit. (13)

In an observational research of cross-sectional and descriptive type, carried out to 185 children of the educational unit Emilio Abad of the city of Azogues Ecuador, to obtain present or past oral habits, obtaining the following results 77 % of the sample consisted of male schoolchildren and 78 % female, the prevalence of oral habits in the children evaluated was evidenced, where 77.29 % presented habits of oral breathing, digital aspiration and atypical swallowing; being mostly affected the population aged between 8 and 9 years with 39.86 %. (14)

A descriptive, cross-sectional observational study was conducted in children aged 5–13 years who attended a pediatric dentistry consultation in the second semester of the University of Manabí. Among the main variables analyzed were: age, sex, predisposing factors and triggers. The results in relation to deforming oral habits were that digital aspiration and mouth breathing manifested in 61.5% and 48.0% respectively. (15)

### Types of digital suction

Thumb suction: The active muscles in this habit have the function of creating a vacuum in the oral cavity. The jaw is depressed by the action of the external pterygoid, increasing the intraoral space and creating negative pressure. (1)

Suction of the index finger: It can produce a unilateral open bite, and / or protrusion of one or more incisors or canines.

Suction of the index and middle finger: It can produce a unilateral open bite, and / or protrusion of one or more incisors or canines.

Suction of the middle or ring finger: It can produce a unilateral open bite, protrusion of one or more incisors or canines, intrusion or retroclination of the lower incisors.

Suction of several fingers: Similar to the previous ones, it will depend on the frequency, intensity of the suction. (6)

## Factors influencing habit growth

### Duration

According to Moyers it is composed of 3 phases  
**Maternal Stage:** it is considered normal until three years of age, it is usually common in children, it can be resolved in a natural way without the need to use any dental treatment.

**Initial Stage: it occurs in a range of 3 to 7 years of age,** at this stage the habit of sucking becomes a visible problem, causing malformations in the temporary dentition, it is important with timely treatment to interrupt it before 6 years, since it is the best period to solve any problem. (16)

**School Stage:** occurs between 7 to 12 years of age, here there is already a malocclusion and is usually intractable, it is important to examine the cause that triggered this oral problem. (17)

### Effects caused by the habit of digital aspiration

The time that the child spends sucking is the most important factor in the change of position of the teeth. It is necessary that the child receives strength in the teeth for 4 to 6 hours a day. Intermittent and short-lived aspiration does not produce as many changes in the position of the teeth. (8)

1. Thumb deformation
2. Fungal infection or eczema
3. Parallel habits
4. Mandibular prognathism

### Malocclusions produced by the habit of digital aspiration

The presence of habits in the child is related to Graber's Triad, which consists of the duration, frequency and intensity with which the habits are executed, as well as will depend on the willpower of the individual that is related to his facial growth pattern. (18)

Placing the thumb on the palatine vault causes pressure out of the upper incisors causing dentoalveolar protrusion. In turn, the support of the dorsal part of the thumb on the lower incisors causes its retroinclination, causing alterations in dental occlusion. (19)

The malocclusions that are associated with the habit of digital sucking are:

1. Class II
2. Anterior open bite
3. Crossbite
4. Pointed palate
5. Protrusion of upper incisors

**Class ii:** Class II malocclusion defined by Angle, are those characterized by the distal relationship of the lower dental arch with respect to the upper, taking as reference the mesiovestibular cusp of the first maxillary molar, the groove of the first lower molar is

located by distal. (20)

Currently, class II is called a sagittal problem, being able to be the basal bone, being called skeletal class II, either by bone size or by position; following its definition the dentoalveolar origin being an ectopic eruption of upper canines and the mesialization of premolars and molars consequently the cause of class II. Finally, we have the functional etiology, being able to be the origin both breathing, swallowing or the appearance of a habit. (21)

**Anterior open bite:** It is the decrease of overbite or normal vertical protrusion, being the normal 1 - 2 mm, values less than this can be considered mild open bite. When it presents a vertical separation of 0 - 2 mm it will be a moderate MA, values between 3 - 4 mm severe and from 4 mm extreme. The open bite is caused by harmful habits acquired in childhood, although problems can also intervene in the eruption of the teeth. The open bite causes discomfort due to its functional chewing ineffectiveness, respiratory distress, phonetics and aesthetics. It can also cause problems in the temporomandibular joint. (22)

**Cross mordide:** It is defined as a transverse arch discrepancy where one or more teeth may be involved, in the vestibular cusps of the upper teeth occlude by lingual of the vestibular cusps of the lower teeth. Possible etiologies of crossbites include prolonged retention or premature loss of deciduous teeth, crowding, cleft palate, genetics, arching deficiencies, abnormalities in tooth anatomy or rash sequence, non-nutritive sucking habits, oral breathing, and temporomandibular joint malfunction. (23)

**Ojival palate:** The ogival palate is a narrower than normal palate and domed in the center. In normal palates, the tongue is in permanent contact with it, pressing it constantly. If for some reason this contact does not occur, the palate develops abnormally, narrows and bulges in the center. (24)

**Protrusion Of Upper Incisors:** it is caused by protruded and pro-inclined upper incisors, and by the protrusion of the lips. Its etiology is caused by several factors, characterized by a genetic component, as well as environmental factors, such as mouth breathing, lingual and labial habits, and volume of the tongue. (25)

Therapies for cessation of the habit

1. Habit Reversal Therapy
2. Use of adhesive tape
3. Removable appliances

**Habit reversal therapy:** this treatment consists of making the child aware that performing this habit is not correct and should avoid doing it, this therapy does not always work since there is not much collaboration of children with parents. (26)

**Use of adhesive tape:** it is used to help the child as a reminder and avoid digital suction. (27)

**Removable devices:** The appliances used must not be punitive and must be versatile to allow several functions simultaneously. The appliances employed

should not be punitive and should be versatile to allow several functions simultaneously.

The grid fulfills the double function of blocking the digital suction and restricting the lingual interposition, on the other hand, the anterior handle can serve to reduce the inclination of the incisors. (28)

1. Fixed devices have the advantage that the child does not lose them and are very effective, since he wears them all day.
2. Removable ones are indicated in case of emotional problems. In this case it will act only as a reminder for the habit and at the same time correct some occlusion problems. If after correcting the sucking habit the bite is not improved, it is because there are other habits such as atypical swallowing, mouth breathing and inadequate position of the tongue. (29)

### Treatment according to age

Oral habits can be stopped and corrected if diagnosed in a timely manner. It is essential to have a specialized medical team made up of speech therapists, psychologists, pediatric dentistry, orthodontist and oral mycologists being fundamental for the cessation of this habit. (30)

1. **Children under three years of age:** these patients stop the habit at approximately four years, class I malocclusions at this age are self-correcting. One of the tips to relatives, parents or guardians is to show affection to the child and give him the greatest attention when he is not exercising this habit. The use of appliances as a treatment is not recommended.
2. **From three years to 7 years:** the first indicator to eradicate the habit is communication with the child. In the first stage of replacement, the participation of appliances or through behavior modification should be considered. Some occlusal alterations, excessive overjet, open bite and / or cross tend to appear, even if this habit is not being practiced. (8)
3. **Children over 7 years old:** You should talk like the child and explain the problems involved in this habit. It is essential to be patient, avoid criticizing them and tell them that you can help them if you really want to. To start the treatment, the self-help program is used with explanations, solutions on the fingers, devices on the fingers, all in collaboration with the infant. (8)

### 3. Discusión

According to studies conducted using bibliographic sources whose purpose was to determine the oral malocclusions of greater prevalence present in pediatric patients who practice the habit of digital sucking, the authors conclude that the increased highlight is the one with the highest prevalence with 40.8%, while they indicated that crossbite was the malocclusion that was most prevalent in infants, As indicated that malocclusions is the normal development of the stomatognathic system and

gives rise to skeletal deformities more or less affected according to the age at which the habit is initiated.(31)(32)(33)

In a descriptive study by (43) children between 3 and 6 years who practiced oral habits concluded that digital sucking is the most frequent habit with 37.2 followed by bottle use with 16.3%.

Chemical therapy as a treatment for digital sucking is a good option to eradicate this habit, which consists of placing unpleasant substances on the finger, on the contrary it recommends that it is better to give explanations to the child with simple methods about the damage that can cause them if they continue with this habit and go to bed with some object to keep their hands occupied.

Digital aspiration is a serious concern in pediatric patients that can lead to respiratory distress and even death. It occurs when a foreign object, such as food, small toys or other objects, is inhaled into the airway. Digital aspiration can serve as an indicator of failure in pediatric patients, as it is often caused by improper feeding practices or lack of supervision.

In a study published in *Neutrosophic Sets and Systems*, researchers Gustavo Álvarez Gómez, Miriam Janneth Pantoja Burbano, Miryan Janeth Arévalo Haro, Aurelia María Cleonares Borbor, and Rodolfo González Ortega used a neutrosophic statistical approach to explore the incidence of digital aspiration in pediatric patients. Their research revealed that digital aspiration is a serious and common problem in pediatric patients, particularly among infants and young children(34).

In another study published in the same journal, researchers Gustavo Adolfo Álvarez Gómez, Maikel Yelandi Leyva Vázquez, and Jesús Estupiñán Ricardo applied the concept of neutrosophy to analyze the implementation and contribution of open government to the Ecuadorian judicial system. The application of neutrosophy to this issue could potentially lead to more effective governance and better outcomes for the population(35).

In a third study, researchers Gustavo Álvarez Gómez, Jorge Fernando Goyes García, Sharon Dinarza Álvarez Gómez, and Florentin Smarandache used a neutrosophic sociogram for group analysis. Their research demonstrated the utility of neutrosophic theory in analyzing group dynamics and decision-making processes.

Overall, the use of neutrosophic theory and statistics in these studies highlights the potential benefits of this approach in analyzing complex issues in various fields, including medicine and governance. By applying neutrosophy to the analysis of digital aspiration, researchers may gain a better understanding of this issue and develop more effective strategies for prevention and treatment in pediatric patients(36).

### 4. Conclusions

The habits are customs, which are acquired by the repetitive practice of an exercise, at first they are a voluntary action that becomes involuntary once it

gets used to it, within the characteristics of the habit of digital suction we find different types that can be suction of the thumb, index finger, index and middle, middle or ring finger and several fingers. The factors that influence this habit are duration, frequency and intensity.

It is concluded that oral habits such as digital sucking should not go unnoticed since they not only cause alterations in the oral cavity but also side effects such as thumb deformation, fungal infection or eczema, parallel habits, mandibular prognathism.

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