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Gabriela Garcia Gonzalez
Master of Sciences Student, Facultad de Odontologia, Universidad Autonoma de Nuevo Leon, Monterrey, Nuevo Leon, 64460 ZIP, Mexico

Nelly Alejandra Rodriguez Guajardo
Professor, Unidad Academica de Odontologia, Universidad Autonoma de Zacatecas, Zacatecas, Zacatecas, 98000 ZIP, Mexico

Gloria Martha Alvarez Morales
Professor, Unidad Academica de Odontologia, Universidad Autonoma de Zacatecas, Zacatecas, Zacatecas, 98000 ZIP, Mexico

Fatima Del Muro Casas
Professor, Unidad Academica de Odontologia, Universidad Autonoma de Zacatecas, Zacatecas, Zacatecas, 98000 ZIP, Mexico

Maria Argelia Akemi Nakagoshi Cepeda
Professor, Facultad de Odontologia, Universidad Autonoma de Nuevo Leon, Monterrey, Nuevo Leon, 64460 ZIP, Mexico

Patricia Medina Santos
Professor, Facultad de Odontologia, Universidad Autonoma de Sinaloa, Culiacan, Sinaloa, 80023 ZIP, Mexico

Jose Aurelio Cortina Aguilar
Professor, Facultad de Odontologia, Universidad Autonoma de Sinaloa, Culiacan, Sinaloa, 80023 ZIP, Mexico

Nahomi Yamileth Silva Sanmiguel
Dentistry Student, Facultad de Odontologia, Universidad Autonoma de Nuevo Leon, Monterrey, Nuevo Leon, 64460 ZIP, Mexico

Dr. Juan Manuel Solis Soto
Professor, Facultad de Odontologia, Universidad Autonoma de Nuevo Leon, Monterrey, Nuevo Leon, 64460 ZIP, Mexico

Corresponding Author:
Dr. Juan Manuel Solis Soto
Professor, Facultad de Odontologia, Universidad Autonoma de Nuevo Leon, Monterrey, Nuevo Leon, 64460 ZIP, Mexico

Anterior open bite: A scoping review

Gabriela Garcia Gonzalez, Nelly Alejandra Rodriguez Guajardo, Gloria Martha Alvarez Morales, Fatima Del Muro Casas, Maria Argelia Akemi Nakagoshi Cepeda, Patricia Medina Santos, Jose Aurelio Cortina Aguilar, Nahomi Yamileth Silva Sanmiguel and Juan Manuel Solis Soto

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Abstract
Introduction: Malocclusion is a common pathological condition affecting a significant portion of the global population. It is characterized by impaired facial and dental development, leading to misaligned teeth and jaws.
Objective: This study aims to review the literature on anterior open bite, focusing on its prevalence, etiology, classification, diagnosis, and treatment in pediatric patients.
Methodology: A systematic search was conducted in PubMed, Scopus, Science Direct, and Web of Science for relevant studies published from 2021 to the present.
Results: The global prevalence of anterior open bite is 16.80%, with digital sucking being the most common etiological factor. Malocclusions are classified as skeletal, dental, or a combination of both. Cephalometric tracings are among the most widely used diagnostic tools, aiding in determining the malocclusion type and guiding treatment selection. In pediatric patients, interceptive orthodontics is frequently employed to achieve optimal outcomes.
Conclusion: The high prevalence of anterior open bite, primarily attributed to digital sucking, highlights the importance of early detection using diagnostic tools such as cephalometric tracings. Timely and accurate diagnosis facilitates appropriate intervention, preventing long-term complications.

Keywords: Malocclusion, anterior open bite, etiology, classification, diagnosis, malocclusion treatment

1. Introduction
Malocclusion is a common disorder that impacts a significant percentage of the global population. This condition is distinguished by an abnormal development in the facial and dental structure, causing an incorrect alignment of both teeth and jaw bones [1].
Malocclusions represent irregularities of craniofacial development. This condition is defined by the World Health Organization as a “potentially disabling dentofacial anomaly” and is considered one of the three diseases that compromise oral functions [2]. It is a common problem in children, with a multifactorial etiology contributing to the development of this condition [3].
The alteration of the normal occlusion pattern is due to hereditary and environmental causes, as well as the adoption of harmful habits acquired in childhood and adolescence. These factors interfere in the balanced development of the stomatognathic system, which can result in consequences such as low self-esteem, difficulties in eating, sleeping and a general dissatisfaction with dental health [4].
This paper analyzed the literature on relevant aspects of anterior open bite (AOB), its prevalence, etiology, classification, diagnosis and treatment.

2. Methodology
Bibliographic searches were conducted across PubMed, Scopus, and Google Scholar to identify relevant published studies. The selected articles were evaluated based on predefined criteria, including identification, screening, eligibility, and inclusion, with standardized measurement tools applied for quality assessment. A systematic search strategy was employed using Boolean operators (AND, OR, NOT) with keywords such as anterior open bite, dental

malocclusion in children, dental malocclusion treatments, prevalence of open bite, and diagnosis of open bite. Only high-impact journals were considered for inclusion.

3. Results

3.1 Epidemiology

Globally, malocclusions present a high prevalence, representing 60.6% of cases. Among these, occlusal anomalies are the most common, with a prevalence of 59.2% [5]. Asia recorded a prevalence of 61.81%, Europe 61.50%, South America 52.69% and Africa 32.50%. Europe had the highest rate of deep overbite (33.08%) and posterior crossbite (15.38%), while Africa showed the highest prevalence of anterior open bite (18.60%) [2].

Patients with anterior open bite have various characteristics in different percentages, they have competent lips in 81.8%, straight nasolabial angle in 86.6% and shallow palatal vault in 49.5% [6]. AOB showed an overall prevalence of 16.52% in children and adolescents globally, in primary dentition the prevalence of anterior open bite occurred in 18.84% of cases, in primary dentition 14.26% [7].

The current prevalence of anterior open bite is 16.52%, it is more common to find an AOB in children with mixed with 18.84% compared to 14.26% of deciduous dentition.

3.2 Classification

3.2.1 Anterior open bite

A dental condition characterized by a lack of contact between the upper and lower central incisors, this condition causes difficulty in daily activities such as speech and chewing, and can also cause insecurity problems in patients [1]. AOB is classified as dental, skeletal or functional, depending on its clinical presentation and predisposing factors [8]. The molar class is not related to AOB, the nasolabial angle is in a higher percentage related to this maxillary classification [6].

Posterior crossbite is one of the pathologies of occlusion that occurs with greater predilection in mixed dentition [9]. It has a prevalence of about 8 to 11% [10].

Anterior crossbite is the misalignment of anterosuperior teeth, in which the occlusion of these occurs in the back of the anteroinferior teeth, with greater predilection in mixed dentition [11].

AOB, posterior cruciate and anterior cruciate are common occlusal disorders, especially in mixed dentition, with significant functional and esthetic implications. These malocclusions can cause problems in phonation, chewing, swallowing and facial development, highlighting the importance of early diagnosis and adequate treatment to improve the quality of life of patients.

3.3 Etiology

3.3.1 Oral Habits

Harmful habits are one of the main causes attributing to the development of malocclusions, together with other conditions that have a negative impact on the orofacial complex. These are acquired routines, acts that are learned repetitively, which generate the development of a routine with a negative outcome in facial development [12].

3.3.2 Atypical swallowing

Visceral or infantile swallowing is a process characterized by anterior movements of the tongue against the incisors during swallowing with a persistent swallowing pattern [13, 14]. There is a close relationship between the interposition and thrust of the tongue during the basic functions of the oral cavity such as swallowing and phonation, which will predispose to the appearance and determination of other alterations of the maxillofacial morphology and the development of malocclusions such as anterior open bite [15]. The tongue plays a fundamental role in the development of the mouth and face, influencing the formation of the dental arches and the maxillary complex. Throughout life, the tongue acts as a natural balancer, compensating for dental alignment and occlusion problems [16]. In cases of malocclusion, the tongue can adapt to keep the teeth in contact, although this is not always ideal [17]. Patients with AOB are more likely to have an altered tongue position, with a higher prevalence in females [18]. Few patients develop infantile swallowing habit, sometimes this is related to habits such as digital sucking or enlarged adenoids [14]. When atypical swallowing is persistent for a long time, beyond the age of 7 years, it is recognized as abnormal swallowing, this is related to habits such as prolonged breastfeeding, late weaning, liquid diet, oral habits or pathological causes [19].

3.3.3 Digital suction

One of the most common oral habits associated with anterior open bite, this is often triggered by psychological, physiological or anatomical factors [20]. Its incidence occurs more frequently in girls with a prevalence of 17.4%, often the habit decreases with the age of the patients [21].

3.3.4 Other habits

There are other habits that will also generate predisposition to the appearance of AOB such as nail biting, teeth grinding, pacifier use, which produce misalignment of the teeth and AOB or dental overbite, especially if the habits are still recurrent in adolescence [21]. Pacifier use is mainly associated with posterior crossbite, with a minor involvement in the occurrence of anterior open bite, according to observations in a group of children who used it for a year or more. It is recommended that parents and guardians stop offering the pacifier to their children from the first year of life [23].

3.3.5 Genetic and Hereditary Factors

Over the years, research has identified specific genetic factors and signaling pathways that influence bone development and growth, dental eruption and occlusion, thus contributing to the development of the open bite [1]. Malocclusions are the result of multiple environmental factors that are conducive to the appearance of these dental anomalies, in addition to this we must recognize the pathological determinants of malocclusion belonging to the genetic basis, making the development of this inevitable [12]. Based on different investigations it has been concluded that the polymorphism of the growth hormone receptor gene is an indicator that helps us to predict the different variations of maxillary and mandibular growth [24]. On the other hand, over the years it has been identified that blood type is related to the propensity for oral diseases, which could also be considered in the future for earlier diagnosis and prevention of oral diseases [25]. In most cases the pathologies present a genetic origin, it is estimated that 6 to 8 thousand rare diseases have been discovered, which cause affectation to different systemic components, needing a specific treatment [26]. The main habit causing AOB is digital sucking. This habit, by exerting abnormal forces on the teeth and jaw bones, can alter facial growth and development.

3.4 Diagnosis

It is essential to diagnose and treat the modifiable risk factors

associated with malocclusion in order to prevent the occurrence of this pathology in both the primary and permanent dentition [5]. The diagnosis of patients with malocclusions is supported by various studies that, through the use of cephalometric landmarks, allow the analysis of the relationship between orthopedic treatment, anatomical changes and function, thus facilitating the determination of an accurate skeletal classification [7]. Cephalometry allows evaluation of skeletal and dental parameters, the analysis allows comparison of subjects with AOB to subjects with normal occlusion [27]. It should be taken into consideration that each patient is a unique case, the purpose of this is to know and classify the etiologies of malocclusion development, in order to define a personalized treatment plan for each patient based on their unique etiology [28]. Providing a diagnosis that allows us to intervene and prevent malocclusion to control the progression of the bony alteration that severely compromises craniofacial development [3].

A good anamnesis includes educating parents and children about the need for good hygiene and recurrent follow-up appointments; according to the American Association of Orthodontists, they recommend the first orthodontic evaluation at 7 years of age for pediatric patients, or earlier when parents notice an abnormality [29].

The main method of diagnosis is performed by cephalometric tracings, as they help to diagnose and classify such occlusal alteration, it is essential to obtain a good lateral skull radiograph, to achieve a good tracing that allows us to obtain skeletal and dental relationships of our patients.

3.5 Treatment

The main objective of the treatment plan is to eliminate the etiology, based on retraining exercises and mechanical restriction appliances [30]. Orthodontic treatment is one of the most used and required treatments to solve oral health and esthetic problems in patients, with greater predilection in adolescents or young adults [31]. Early orthodontic treatment can have a significant impact on the proper development of dental arches and alveolar arches [32]. Depending on the orthodontic or orthopedic approach that is decided to be used in a comprehensive manner, we must consider that it may or may not mitigate or restore normal chewing functions, due to all the predisposing factors to the pathology [33]. The effort made should be comprehensive to achieve maximum control and surveillance of malocclusions, aiming to prevent and control severe problems resulting from the condition [34]. To develop an effective treatment plan will be constituted by determining the cause that produces the imbalance, it will be necessary to apply a change in the patient's behavior in conjunction with orthopedic and orthodontic treatments, in order to obtain successful treatments [19]. Braces will be intended for patients presenting in an active growth phase, as they will offer the possibility to effectively address the anterior open bite. While surgical treatment in most cases is recommended in more severe cases presenting with skeletal vertical and horizontal overgrowth [8].

The best therapeutic approach for anterior open bite is recognition of the stimulus and elimination of the stimulus with the aid of orthopedic appliances. Orthodontic treatments, both early and late, are essential to correct dental and skeletal alterations.

4. Conclusion

Malocclusions represent an oral health problem of great prevalence worldwide, presenting 59.2%, with a significant impact on the quality of life of people. The main etiology is related to habits, as in the case of digital suction developed by various factors that affect children directly from their environment. To define a diagnosis it is necessary to remove the stimulus that causes the abnormal growth of the craniofacial complex, to define a good diagnosis is also necessary to use cephalometries, which will allow us to define a precise classification of the condition, the best treatment will be the breaking of the habit pattern, combined with interoceptive orthodontics in developmental ages in children.

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6. Author's Contribution

Not available.

7. Conflict of Interest

Not available.

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9. References

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