Anatomía Digital

ISSN: 2697-3391
Vol. 7 No. 3.2, pp. 42 – 56, September 2024

www.anatomiadigital.org

Asociación entre la maloclusión sagital y la dislalia. Revisión de literatura

Association between sagittal malocclusion and dyslalia. literature review

[1] Alyssa Monick Arias Neira https://orcid.org/0009-0009-8251-7153
Student of Dentistry, Catholic University of Cuenca. Cuenca. Ecuador
alyssarias@outlook.com

[2] Maria Isabel Cabrera Padron https://orcid.org/0000-0002-4086-6082
Professor of dentistry, Catholic University of Cuenca, Cuenca, Ecuador.
mcabrerap@ucacue.edu.ec

Scientific and Technological Research Article
Sent: 06/17/2024
Revised: 13/07/2024
Accepted: 08/19/2024
Published:12/09/2024
DOI: **https://doi.org/10.33262/anatomiadigital.v7i3.2.3168**

Please quote: Arias Neira, AM, & Cabrera Padrón, MI (2024). Association between sagittal malocclusion and dyslalia. Literature review. Digital Anatomy, 7(3.2), 42-56.https://doi.org/10.33262/anatomiadigital.v7i3.2.3168

DIGITAL ANATOMY is an electronic, quarterly journal that will be published in electronic format and has the mission of contributing to the training of competent professionals with a humanistic and critical vision who are capable of presenting their investigative and scientific results to the same extent that positive changes in society are promoted through their intervention.https://anatomiadigital.org
The journal is published by Editorial Ciencia Digital (a prestigious publisher registered with the Ecuadorian Book Chamber with membership number 663).www.celibro.org.ec

Anatomía Digital

ISSN: 2697-3391
Vol. 7 No. 3.2, pp. 42 – 56, September 2024

www.anatomiadigital.org

Palabras claves:
Maloclusión Dental, Dislalia, Clase I de Angle, Clase II de Angle, Clase III de Angle.

Resumen

Introducción. La maloclusión se define como la alteración de la oclusión, provocada por factores genéticos, pérdida de dientes temporales o permanentes, hábitos nocivos, entre otras causas, mientras que la dislalia es la alteración del habla en personas con audición normal debido a un factor mecánico o funcional. **Objetivo.** Correlacionar la presencia de dislalia en pacientes con maloclusiones sagitales. **Metodología.** Se elaboró una revisión bibliográfica con una metodología descriptiva en la cual se consideró publicaciones en las bases de datos digitales como: *PubMed, SCOPUS, BVS y Academic Google*. Se incluyeron artículos desde febrero del 2018 hasta marzo del 2022, publicados en los idiomas: inglés y español. **Resultados.** La correlación entre la dislalia y la maloclusión puede presentarse de formas variadas principalmente en maloclusiones de clase III y clase II con alteraciones en los fonemas /s/, /d/, /t/, /cr/, /gr/ y /pr/. **Conclusión.** Existe una relación alta y moderada entre las maloclusiones esqueléticas de origen sagital clase I, II y III consideradas como dislalias mecánicas, aunque se debe considerar que hay pacientes que pueden presentar dislalias sin tener alguna maloclusión a esto se le conoce como dislalias funcionales. **Área de estudio general:** Odontología. **Área de estudio específica:** Ortodoncia**. Tipo de estudio:** Artículos originales.

Keywords:
Dental Malocclusion, Dyslalia, Angle Class I, Angle Class II, Angle Class III.

Abstract

Introduction. Malocclusion is the alteration of occlusion caused by genetic factors, loss of temporary or permanent teeth, and harmful habits, among other causes; On the other hand, dyslalia is the alteration of speech in people with normal hearing due to a mechanical or functional factor. objective. To correlate the presence of dyslalia in patients with sagittal malocclusions. Methodology. A literature review was conducted using a descriptive methodology, and publications in digital databases such as PubMed, Scopus, BVS, and Google Scholar were considered. Articles published in English and Spanish from February 2018 to March 2022 were included. Results. The relationship between dyslalia and malocclusion can occur in various forms, in class III and class II malocclusions with alterations in the phoneme's /s/, /d/, /t/, /cr/,

Anatomía Digital

ISSN: 2697-3391
Vol. 7 No. 3.2, pp. 42 – 56, September 2024

www.anatomiadigital.org

/gr/, and /pr/. Conclusion. A high and moderate relationship exists between skeletal malocclusions of sagittal origin class I, II, and III considered mechanical dyslalia. However, it should be considered that there are patients who can present dyslalia without malocclusion; this is known as functional dyslalia.

Introduction

Malocclusion is described as an anomaly of occlusion, caused by various factors, whether genetic or environmental, such as the loss of temporary or permanent teeth, pernicious oral habits, among others. Deforming oral habits are complex neuromuscular patterns that are learned and are habits acquired through the constant repetition of the same action (1). There are deforming habits such as, for example: onychophagia, mouth breathing, digital sucking, cheilophagia, chewing objects, postural habits, among others (2). Frequently, malocclusion varies depending on the type of population, however, for some authors, the most predominant malocclusions are those of the sagittal type that according to Angle's classification can be class I, II and III (1, 2).

These malocclusions negatively affect aesthetics and the performance of functions such as malocclusion, swallowing and phonation: this alteration is known as dyslalia. Dyslalia is the alteration of speech in people with normal hearing due to a mechanical or functional factor (3). Mechanical (or organic) dyslalia is a consequence of defects in the articulation organs, such as shortening of the lingual frenulum, change in the size of the tongue, anomalies in the shape or size of the teeth, maxillomandibular deformities, among others. This disorder of the articulation of sounds results in the difficulty to form or pronounce certain sounds correctly, where there is no underlying neurological cause. Functional dyslalia refers to problems in the pronunciation of certain words due to poor coordination of movements for pronunciation in certain phonemes without organic damage (4).

Malocclusion and dyslalia are disorders that affect oral function and communication in children and adults, having a significant impact on their quality of life by affecting their ability to chew, speak and socialize. It has been observed that some patients with malocclusion also have difficulties in the articulation of certain speech sounds, suggesting a possible relationship between these two phenomena. Therefore, it is essential that the dentist is trained to recognize the etiological factors that may be contributing to the difficulty in pronouncing the different phonemes, whether for organic or functional reasons. This will allow him to provide his patients with an accurate diagnosis and guide them towards an appropriate treatment plan. In this context, the present study focuses on

establishing an association between dyslalia and sagittal malocclusions, with the aim of improving the understanding of these disorders and their clinical approach.

Methodology

A bibliographic review was developed with a descriptive documentary approach, for which original articles, bibliographic reviews, meta-analyses and systematic reviews were considered. To perform the literature search, keywords such as Dental Malocclusion, Angle Class I, Angle Class II, Angle Class III, Dyslalia were used. These were identified through the descriptor Medical Subject Headings (MeSH), Health Sciences Descriptors (DesC) and free terms as appropriate. The information was extracted from digital databases: PubMed, SCOPUS, BVS and Academic Google. In addition, Boolean Operators such as: OR and AND were implemented to achieve a more specific search (see table 1). The general objective of this study was to correlate the presence of dyslalia in patients with sagittal malocclusions.

Inclusion Criteria

- Original articles, clinical trials and literary reviews.
- Articles in English and Spanish.
- Articles published from February 2018 to March 2022, said articles must be related to the dental field.

Exclusion Criteria:

- Expert opinions.
- Undergraduate thesis.
- Book chapters.

Table 1. Search strategy

PubMed	Search:("malocclusal"[All fields] OR "malocclusion"[MeSH Terms] OR "malocclusion"[All fields] OR "malocclusions"[All fields] OR "malocclusive"[All fields]) AND ("speech disorders"[MeSH Terms] OR ("speech"[All fields] AND "disorders"[All fields]) OR "speech disorders"[All fields] OR "dyslalia"[All fields] OR "articulation disorders"[MeSH Terms] OR ("articulation"[All fields] AND "disorders"[All fields]) OR "articulation disorders"[All fields] OR "dyslalias"[All fields]).

ISSN: 2697-3391
Vol. 7 No. 3.2, pp. 42 – 56, September 2024

www.anatomiadigital.org

Table 1. Search strategy (continued)

Google Scholar	Search: (Malocclusion) AND (dyslalia) (2018-2023), (articles), (Spanish) (English).
Bvs	Search: (Malocclusion) AND (dyslalia) (2018-2023), (articles), (Spanish) (English).
Scopus	Search: (Malocclusion) AND (dyslalia) (2018-2023), (articles), (Spanish) (English).

Results

The following flowchart presents the process of selecting articles found in the databases:*PubMed, SCOPUS, BVS and Academic Google*Screening and application of inclusion and exclusion criteria were carried out. As a result, 16 articles were selected as part of this bibliographic review.

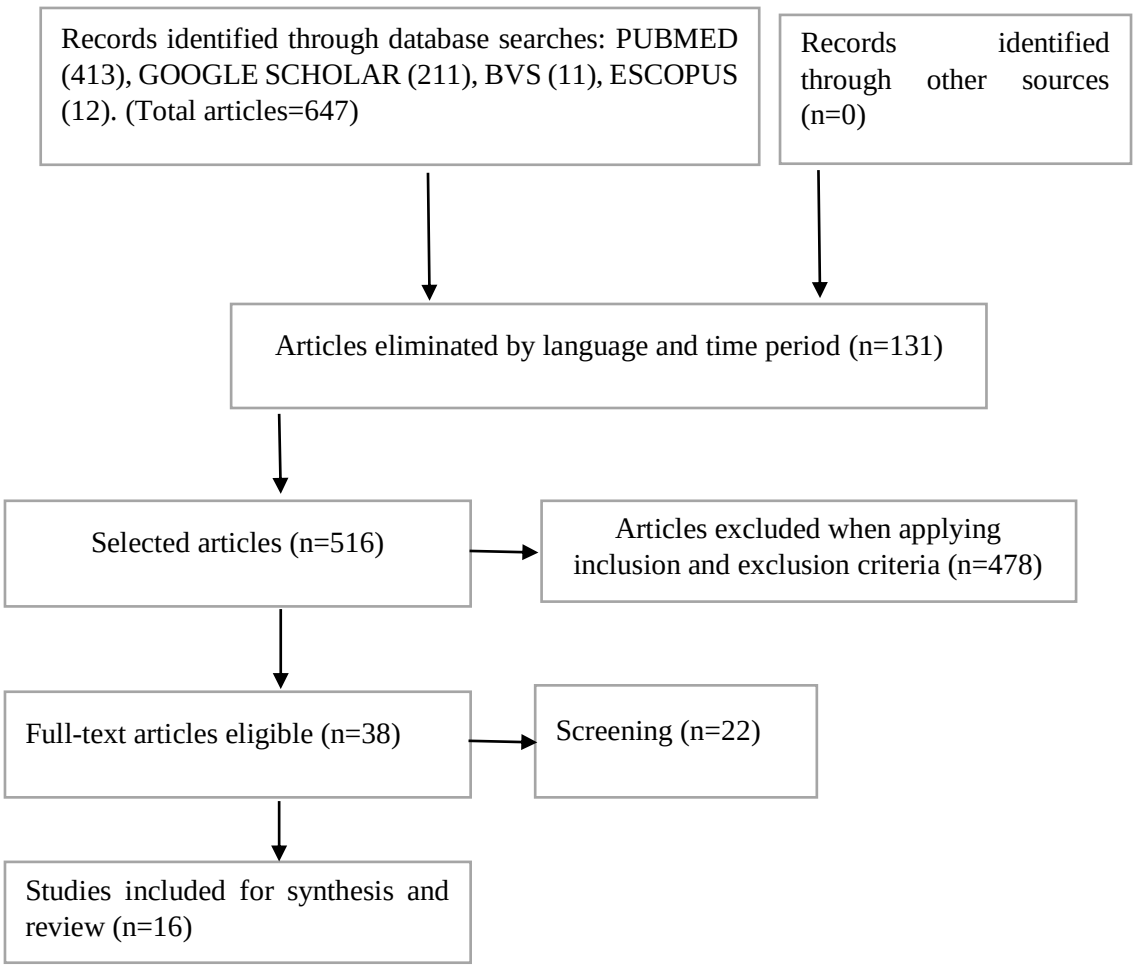

Figure 1:*Flowchart*

The records identified through database searches were: PUBMED with 413 articles, GOOGLE ACADEMIC with 211, BVS with 11 and ESCOPUS with 12 articles, the total number of articles found was 647 and we did not obtain records identified through other sources. The articles eliminated due to language and temporality were 131, therefore, 516 articles were selected, we applied inclusion and exclusion criteria, eliminating 478 articles, resulting in 38 articles for full text analysis with the possibility of eligibility and when screening, 22 articles were eliminated, obtaining 16 studies included for synthesis and review.

Malocclusion is described as an anomaly of occlusion, caused genetically or environmentally, such as the loss of temporary or permanent teeth due to different causes and deforming oral habits, among others (1). Epidemiological studies have shown that the frequent occurrence of malocclusion is related to its multifactorial etiology, with the combination of the influence of environmental and genetic factors (3). The premature loss of temporary teeth (molars) is one of the etiological factors of malocclusions. Dental malocclusion is the consequence of discrepancies in maxillomandibular growth and distortions in the position of the teeth within each arch.(5, 6).

Various epidemiological studies have revealed that more than 60% of the population is predisposed to developing malocclusions. In addition, it is important to consider that occlusal alterations are influenced by aesthetic, ethnic and cultural factors (7). The prevalence of these conditions varies according to the type of population, although some authors indicate that Class I and II malocclusions are the most common. This can be attributed to various conditions, such as diet, deforming oral habits, proximal caries, poor fillings, premature tooth extractions and diseases that affect the mixed and permanent dentition process.(8).

In 1899, Angle proposed the classification of dental malocclusions that is widely used today. This classification is divided into three main classes:(9):

- Class I: In this category, the mesiodistal relationship of the maxilla and dental arches are within normal ranges. The lower first molar has an appropriate relationship, with the mesiobuccal cusp of the upper first molars aligned with the mesiobuccal groove of the lower molars.(9).

- Class II: In this class, the lower first molar is located in a distal position compared to the upper molar. This class is divided into two categories based on the inclination of the upper incisors: Class II, division 1: Characterized by distal occlusion on both sides of the lower dental arches. Class II, division 2: Characterized by distal occlusion of the teeth on both sides of the lower dental arch, with retrusion rather than protrusion of the upper incisor teeth.(9).

- Class III: In this category, the lower first molar is positioned mesially in relation to the upper first molar. The classification is based on the position of the molar cusps.(9).

Borja et al.(9) classified dentomaxillofacial anomalies according to the characteristics of the dental arches in three main dimensions: anteroposterior (protraction and retraction), transverse (contraction and distraction) and vertical (attraction and abstraction). LaterBravo et al. (10)developed a revision of the points of Angle's scheme, focusing on the functional assessment of malocclusion. This involved consideration of facial and aesthetic aspects, as well as the arrangement and asymmetry in the dental arches, as well as the dental skeletal relationships in the transverse, anteroposterior and vertical planes.(9).

Before making any association, it is essential to understand the concept of dyslalia, which denotes difficulties in speaking (the term 'dyslalia', derived from the Greek 'dis', difficulty and 'lalein', to speak). Dyslalia encompasses problems in the pronunciation of speech sounds, characterized by pronunciation difficulties that are not associated with an underlying neurological entity. These disorders usually manifest most frequently between the ages of 5 and 7 and, in many cases, are temporary.(10).

There are four types of etiological classification for dyslalias:

1. Developmental; These joint problems typically arise between 3 and 4 years of age and are a natural part of child development. They are considered physiological, forming part of the normal language learning process.(10).
2. Audiogenic; These changes are related to hearing loss. When hearing loss is partial, as in the case of hypoacusia, either before or after the development of language, problems in articulation may appear. Hypoacusia affects both the ability to recognize and produce sounds with phonetic similarities.(10).
3. Organic; These joint disorders originate from anatomical malformations, which are also known as dysglosias, among which we can identify(10):

    - Lip dysglossia: These are difficulties that occur when pronouncing words correctly and are consequently caused by changes in the mobility, shape or strength of the lips.(10).
    - Mandibular dysglossia: These are complications that occur when articulating due to an alteration in one or both jaws.(10).
    - Lingual Dysglossia: It is characterized by difficulties in correct pronunciation due to alterations in the tongue that affect the precision and speed of its movements (10). The tongue is a mobile muscle that covers the floor of the mouth, has an irregular oval shape, with a thicker posterior end and another inclined forward. These anatomical variations can significantly

influence the individual's ability to articulate speech sounds clearly and fluently. It consists of seventeen muscles, of which one is odd and eight are even. The muscular classification of the tongue is: intrinsic, if its beginning and end are in the tongue, and extrinsic if they come from different adjacent structures. It has a skeleton, which is formed by the hyoid bone and two sheets of fibers, the median lingual septum and the hyoglossa. The average volume of the adult tongue is greater in men with (25.3 cm3) than in women with (22.6 cm3)(11).

- Palatal dysglossia: Problems during articulation may occur due to organic changes in the soft palate or the bony palate.(10).
- Dental dysglossia: This can cause pronunciation problems due to poor dental shape or position.(10).

4. Functional; These problems manifest themselves in the incorrect pronunciation of certain words due to poor coordination in the movements necessary to articulate specific phonemes. They are not associated with any underlying physical or organic condition, but are exclusively functional disorders. The underlying causes are usually related to a lack of adequate education, a disadvantaged social environment and difficulties in motor coordination.(10).

There are three types of dyslalia that can be classified according to the way of pronunciation:

1. Substitution: This phenomenon occurs when a child makes a different sound than the one he or she should produce, thus replacing one phoneme with another similar but incorrect one. This replacement can happen at the beginning, middle, or end of a word. For example, the child might say "thistle" instead of "car."(10).
2. Omission: In cases of omission, the child omits phonemes that he or she finds difficult to pronounce. For example, he or she might say "lápiz" instead of "lápiz"(10).
3. Distortion: This phenomenon is characterized by an incorrect or distorted pronunciation of phonemes, where one sound is replaced by another. This is usually due to an inappropriate position of the articulatory organs, the way in which the air is released, or the vibration of the vocal cords. For example, the child might say "tax" instead of "house"(10).

In order to determine if the patient has dyslalia, it is important to know the classifications of phonemes. According to Krohn (12), he mentions in his article that Sánchez Corrales classifies phonemes as bilabial, dental-alveolar, alveolar, palatal and velar. He also mentions that the author Krohn (12) classifies consonants according to their manner of articulation as occlusives, affricates, fricatives, laterals and nasals.(12).

In the study conducted by Bravo et al. (10) the relationship between dyslalia and dental malocclusions was examined using the TEPROSIF test in schoolchildren aged 4 to 6. The results revealed a relationship between "terminal plane, omission and substitution", as well as "type of bite and substitution", and "absence of teeth, omission and substitution". Notably, no differences were found based on the sex of the children evaluated. It is important to note that phoneme substitution emerged as the most frequent change, followed by phoneme omission and distortion.(10).

Omaya Amr-Rey et al. (13) in their article conclude that there is a connection between malocclusion and speech problems. Both can be related to oral habits and muscular problems, which causes orofacial dysfunction and requires the collaboration of different disciplines. Both malocclusion and phonological disorders have multiple causes, so pediatric dentists and orthodontists must consider and evaluate the physical factors that affect tooth growth and how these factors affect speech development in children.(13).

Likewise, Bravo et al. (10) investigated the relationship between speech disorders and occlusion characteristics in a sample of 50 children under 5 years of age. The findings showed an important connection between the mesial and distal positions of the terminal planes and the presence of open bite with speech problems, with substitution being the most frequent disorder. Likewise, it was observed that, in situations of vertical and horizontal overbite, omission was the most frequent disorder. In addition, regarding phonemes, it was found that those most affected by distortion were /r/, /rr/ and /s/, while those most prone to omission were /d/, /l/ and /r/, and those most susceptible to substitution were /dxl/, /lxr/ and /lxrr/.(10).

According to Bravo et al. (10) there is a high association between patients who present negative dentoalveolar discrepancy and Angle class III with difficulty in the pronunciation of some phonemes, on the contrary, Angle class II patients could have a low association with dyslalia; he mentions that within Angle class I malocclusions alterations such as crowding or diastemas can be seen, patients who present diastemas have difficulty pronouncing /l/, /n/, /d/ and /r/ due to the spacing found in the anterior teeth, in his research he highlights the results published by Bravo et al. (10) where it shows that the anterior open bite is closely related to phoneme pronunciation disorders in 75.8% and that there is a greater difficulty in the pronunciation of the phonemes /t/ and /d/ because the air leaks when having an open bite, if there is no good dental occlusion these phonemes cannot be performed correctly.(10).

Espada et al. mention in their article that, in skeletal malocclusion, the resting position of the tongue is affected, Class II is superior and posterior and has less volume; In Class III the resting position of the tongue is inferior and anterior and with greater volume. It has also been shown that the position of the tongue is related to the proportion of teeth and the alveolar characteristics in the maxilla and mandible.(14).

HeSanthosh& Deepak (15) mentions that skeletal muscles cause alteration of phonemes, modifying the space and trajectory during functions. The identification of dyslalia is based on the auditory and visual analysis of tongue movements. Children with an overjet greater than 4 mm have a higher prevalence of speech disorders than children without them, as well as unilateral crossbite. We frequently find distortions of phonemes /s/, /e/, /z/ and the phonemes /s/, /z/, /t/, /d/, /l/ altering pronunciation. Anterior open bite is the most common malocclusion in patients with dyslalia, because it causes the alteration of the emission of phonemes.(15).

Bravo et al. (10) refers to the result of Villanueva et al., who obtained the correlation between malocclusions of sagittal origin and dyslalia, where it is mentioned that the problems in the pronunciation of syllables such as /cr/, /gr/ and /pr/ are linked to class III malocclusion, increasing the risk of dyslalia. Those phonemes /d/, /s/ and /t/ have a greater probability in patients with class II malocclusion than in those with class I or class III. The correlation between dyslalia and malocclusion can occur in various ways, mainly in class III and class II malocclusions with alterations in the phonemes /s/, /e/, /z/, /d/, /l/ and /r/, /n/, /t/(10).

These results may be mainly due to mandibular mobility which is compromised in situations of excessive overbite, lateral crossbite and anterior open bite (10). It should be noted that patients with malocclusions have a high correlation with those who have deforming oral habits such as digital sucking which generally produces anterior open bite, mouth breathing which produces posterior crossbite and anterior open bite, atypical swallowing, lip sucking which increases overjet. In addition, it is mentioned that the position of the incisors and canines are the main factors which alter the articulation of sounds, since around 90% of the consonants are made in this region.(16).

Conclusions

- Dyslalia is a speech disorder in which patients cannot pronounce some phonemes, the most frequent being /s/, /e/, /z/, /d/, /l/ and /r/, /n/, /t/, this is due to etiological factors that are evolutionary, audiogenic, organic and/or functional. After having carried out the research on the correlation between dyslalia and malocclusion, it can be concluded that malocclusion does not guarantee a speech disorder, nor that all patients who present dyslalia have a malocclusion. It is important to consider specific and individual factors, such as the type of malocclusion, the presence of oral habits and the affected phonemes, to fully understand the association between dyslalia and dental malocclusion.
- However, according to this literature review, a relationship was found with class I dyslalia associated with crowding and diastemas, where patients with diastemas present air leakage through the interdental spaces and in those with crowding the tongue cannot be positioned correctly on the palatal surfaces of the teeth causing

the dental phonemes to be altered. In class II malocclusion the overjet increases, the length of both the ramus and the mandibular body decreases, producing mechanical dyslalia. Patients with class III may have transverse narrowing of the maxilla and anterior crossbite, preventing the correct placement of the tongue posture and causing air to leak between the overjet space and the negative overbite. Therefore, it has been observed that depending on the position of the tongue, the mandibular position may also change, which can trigger dyslalia.

- Finally, there is a high and moderate relationship between skeletal malocclusion of sagittal origin class I, II and III considered as mechanical dyslalias, although it must be considered that there are patients who may present dyslalias without having any malocclusion, this is known as functional dyslalias.

Conflict of interest

There is no conflict of interest since it is a bibliographic review without the need for informed consent.

Authors' contribution statement

Author 1: Has conducted an extensive bibliographic search in various databases of the relevant scientific literature, adequately supporting and contextualizing the research. By considering the most recent advances in the area, it has been possible to establish a solid theoretical basis.

Author 2: Provided specialized experience in the literature review, collaborated in the review and correction of the manuscript, and offered valuable comments and suggestions to improve the quality and coherence of the work.

In summary, the participation of Alyssa Arias and Isabel Cabrera in this scientific article has been crucial for the development and successful conclusion of the study. Their efforts have allowed us to advance in the understanding of the topic and have offered new perspectives for future research in this field.

Bibliographic References

1. Flores Carrillo Claudia Leticia, Gutiérrez Rojo Jaime Fabián. Three-dimensional comparison of the maxillary dental arch in the classes I and II malocclusions. Medisan [Internet]. 2018 [cited 13 July 2024]; 22(2): 174-180. Available at:https://www.medigraphic.com/cgi-bin/new/resumen.cgi?IDARTICULO=78682

2. Castro Jorge, Yero-Mier Ileana, Torrecilla Rolando, Castro Irma, Álvarez Alexis, Gómez Ivis. Characterization of deforming oral habits in third grade

students. April 16[Internet]. 2022 [cited 13 July 2024]; 61(283): 1-11. Available at:https://www.medigraphic.com/pdfs/abril/abr-2022/abr22283d.pdf

3. Fadel MAV, Santos BZ, Antoniazzi RP, Koerich L, Bosco VL, Locks A. Prevalence of malocclusion in public school students in the mixed dentition phase and its association with early loss of deciduous teeth. Dental Press JJournal of Orthodontics [Internet]. 2022 [cited 13 July 2024]; 27(4): 1-24. Available at:https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9507017/

4. Lykhota K, Petrychenko O, Ardykutse V, Mykhailovska L, Kutsiuk A. Treatment of malocclusions in the temporal period of bite, children with speech disorders by means of myogymnastics and face tapping. Balneo Research Journal [Internet]. 2019 [cited July 13, 2024]; 10(3): 218-24. Available in:https://bioclima.ro/Balneo260.pdf

5. Cambino C, Ospina E, Rojas A. Prevalence of class III malocclusion in children and young adults served at a university institution.Journal of Stomatology [Internet]. 2018 [cited 13 July 2024]; 26(2): 20-3. Available at:https://dialnet.unirioja.es/servlet/articulo?codigo=6788300

6. Mogren, Havner C, Westerlund A, Sjögreen L, Agholme MB, Mcallister A. Malocclusion in children with speech sound disorders and motor speech involvement: a cross-sectional clinical study in Swedish children.European Archives of Pediatric Dentistry [Internet]. 2022 [cited 13 July 2024]; 23(4): 619-628. Available at:https://pubmed.ncbi.nlm.nih.gov/35776286/

7. Sánchez P, Del Cojo B, Simón P, Macías A. Prevalence of malocclusions according to Angle's classification in a university population. JournalDental Scientist [Internet]. 2021[cited 13 July 2024]; 18(1): 15-20. Available at:https://coem.org.es/pdf/publicaciones/cientifica/vol18num1/2prevalencia.pdf

8. Adolfo WilliamsPrevalence of malocclusions in primary school children. UNIMED [Internet]. 2022 [cited 13 July 2024]; 4(2): 1-12. Available at:http://revunimed.scu.sld.cuCC-BY-NC4.0

9. Borja Espinosa DM, Ortega Montoya EA, Cazar Almache ME. Prevalence of skeletal malocclusions in the population of the province of Azuay - Ecuador. Research Society and Development[Internet]. 2021 [cited 13 July 2024]; 10(5): 1-9. Available at:https://rsdjournal.org/index.php/rsd/article/view/15022

10. Bravo Rivera LL, Gerbert Castilo KJ, Salas Toloza GM. Association between malocclusions and language disorders. San Marcos Dentistry[Internet]. 2019

[cited 13 July 2024]; 22(2): 126-131. Available at:https://pesquisa.bvsalud.org/portal/resource/pt/biblio-1010036

11. Maria Eugenia IT, Rivarola E. An intimate relationship:the dental arches and the tongue. Journal of the Faculty of Dentistry, National University of Cuyo [Internet]. 2022 [cited July 13, 2024]; 16(1): 14-8. Available at:https://bdigital.uncu.edu.ar/objetos_digitales/18029/ingrassiatonelli-rfo1162022.pdf

12. Krohn HS. Analysisof the segmental phonological system of maleku based on previous descriptions. Lexis (Peru) [Internet]. 2023 [cited Jul 13, 2024]; 47(2): 565-597. Available in:http://www.scielo.org.pe/scielo.php?script=sci_abstract&pid=S0254-92392023000200565&lng=es&nrm=iso&tlng=en

13. Amr-Rey O, Sánchez-Delgado P, Salvador-Palmer R, Cibrián R, Paredes-Gallardo V. Association between malocclusion and articulation of phonemes in early childhood.Angle Orthodontist [Internet]. 2022 [cited 13 July 2024]; 92(4): 505-511. Available at:https://pubmed.ncbi.nlm.nih.gov/35275982/

14. SwordHyoid position, lingual position and dimension of the pharyngeal airway according to skeletal malocclusion. Odontoestomatologia [Internet]. 2021 [cited 13 July 2024]; 23(38): 1-9. Available in:http://www.scielo.edu.uy/scielo.php?script=sci_arttext&pid=S1688-93392021000201305

15. Santhosh PriyaAKR, Deepak Prabhu. Evaluation of correlation between habits and dyslalias- an observational study. JIDAM An Official Journal of IDA - Madras Branch [Internet]. 2022 [cited July 13, 2024]; 9(1): 1-4. Available in:http://jidam.idamadras.com/back_issue_Journal/2022/jan/EVALUATION%20OF%20CORRELATION%20BETWEEN%20HABITS%20AND%20DYSLALIAS-%20AN%20OBSERVATIONAL%20STUDY.pdf

16. Assaf DDC, Knorst JK, Busanello-Stella AR, Ferrazzo VA, Berwig LC, Ardenghi TM,Marquezan M. Association between malocclusion, tongue position and speech distortion in mixed-dentition schoolchildren: An epidemiological study. Journal of Applied Oral Science [Internet]. 2021 [cited July 13, 2024]; 29:1-11. Available in:https://pubmed.ncbi.nlm.nih.gov/34406316/

ISSN: 2697-3391
Vol. 7 No. 3.2, pp. 42 – 56, September 2024

www.anatomiadigital.org