

Periodontal Findings in Children with Cleft Lip and Palate: Systematic Review.

ABSTRACT:

A cleft lip occurs when the tissues that compose the lip fail to fuse together before delivery. There is a gap in the upper lip in the case of a cleft lip. An affected child may also have a cleft palate if they have a cleft lip. The condition is also sometimes diagnosed after birth. A cleft palate sometimes takes a long time to be diagnosed (such as sub mucous cleft palates and bifid uvulas). The surgical repair of a child's face can improve their breathing, hearing, and even their speech and language skills. Using the Medline and PubMed Central databases, this study examined periodontal findings in children with clefted lip and palate using a systematic literature search in English. All search terms were in English and were applicable to the articles related to periodontal findings in children with cleft lip and palate. To electronically extract data from Medline and PubMed Central, an electronic form is designed by the principal investigator. Upon screening using filters, inclusion and exclusion criteria, around 6 articles were selected related in this study. These articles were systematically reviewed and analyzed using PRISMA. When a child has a cleft lip or palate, it affects oral hygiene and the amount of periodontal pathogens in the oral biofilm. In the literature, there is a lack of studies which utilize validated, reliable measures to determine how individuals with oral clefts perceive their quality of life. It will be important to perform additional studies that utilize specific tools for assessing Quality of Life in patients with oral clefts with larger samples in hopes of better understanding their Quality of Life.

Keywords: periodontal findings, cleft lip, cleft palate, congenital abnormality.

INTRODUCTION:

As the pregnancy progresses, the lip forms between the fourth and seventh weeks during the fetal development. The face of a developing baby is formed by body tissues and specialized cells that grow from both sides of the head and join together in the center to form the center of the face [1]. The joining of tissue forms the features of the face, such as the lips and the mouth. If the tissues that make up the lip do not fully fuse together before delivery, the result is a cleft lip. A gap can be seen in the upper lip. Lip openings may be small slits or they may be larger openings that extend into the nose. A cleft lip can occur on one or both sides of the lips, or it can occur in the middle, which is very rare. There's a possibility that a child with a cleft lip will also have a cleft palate. Both the front and back of the palate appear open in some newborns. But in other cases, only a portion of the palate is exposed. Knowing what causes birth defects helps us learn about the causes and to prevent them [2].

Research studies were reported on to provide important information about some factors that increase the risk of having a baby with an orofacial cleft. Few factors reported like: Genetic factors, smoking, Use of certain Drugs or Diabetes. Prenatal ultrasounds can detect oral and facial clefts, especially cleft lips with or without cleft palates. Cleft palates can also be diagnosed after a baby is born. Cleft palates can sometimes be diagnosed later in life (as for instance, sub mucous cleft palate and bifid uvula) [3].

A child with cleft lips, with or without cleft palates or with a cleft palate alone can have problems eating, and speaking clearly, as well as development of frequent ear infections [4]. Additionally, they might have hearing and dental problems. In the United States, approximately one in 1,600 babies born is born with cleft lip and palate was reported. Orofacial Cleft palates are caused by unknown factors in most infants. Occasionally, a child is born with a cleft lip or cleft palate is due to genetic changes. In rare cases, cleft lip and cleft palate may result from a combination of genes and environmental factors, such as what the mother eats or drinks during pregnancy, or medications she takes [5].

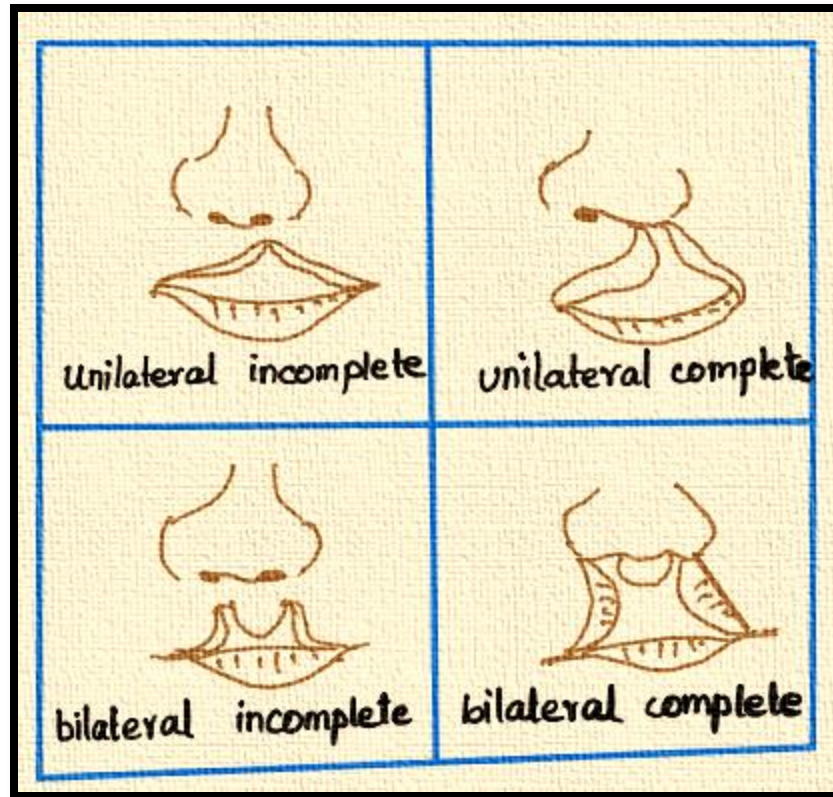


Figure 1: Showing the types of cleft lip

A child's orofacial cleft treatment may vary depending on the severity of the cleft, the child's age and needs, and the presence of associated syndromes or other birth defects, or both. Mostly it is recommended that surgery be completed within the first year of a child's birth for cleft lips. Surgical repair of a cleft palate is recommended within the first 18 months of life or earlier if possible.⁸ Many children will require additional operations as they age. Children can benefit from surgical repair by improving their face, and they may be able to breathe better, hear better, and even improve their speech and language abilities. In addition to dental and orthodontic care, children born with orofacial clefts may need speech therapy, orthodontics, or other types of therapies. The treatment for orofacial clefts allows most children to lead healthy and productive lives. It is possible for children with orofacial clefts to have problems with self-esteem if they are aware of their differences from other children. Orofacial cleft support groups may be helpful for families with babies born with birth defects of the head and face [6].

METHODOLOGY:

Research Design:

The purpose of this study was to conduct a systematic literature search in English using the Medline and PubMed Central databases on the periodontal findings in children with cleft lip and palate. For online databases such as Medline and PubMed Central, data was extracted using a predesigned form. Study citations and characteristics were gathered using data extraction forms, which included names of authors, year of publication, country, name of journal, title of study, periodontal findings and treatment plan of the children with cleft lip and palate. We also compiled a list of therapies according to the age of the cleft lip and palate patient. Using an electronic form, which must be designed by the principal investigator, the data must be electronically extracted from Medline and PubMed Central. Observation records will be used in the analysis. Principal investigator reviewed carefully the articles for review and analyzed the data.

Keywords used for search:

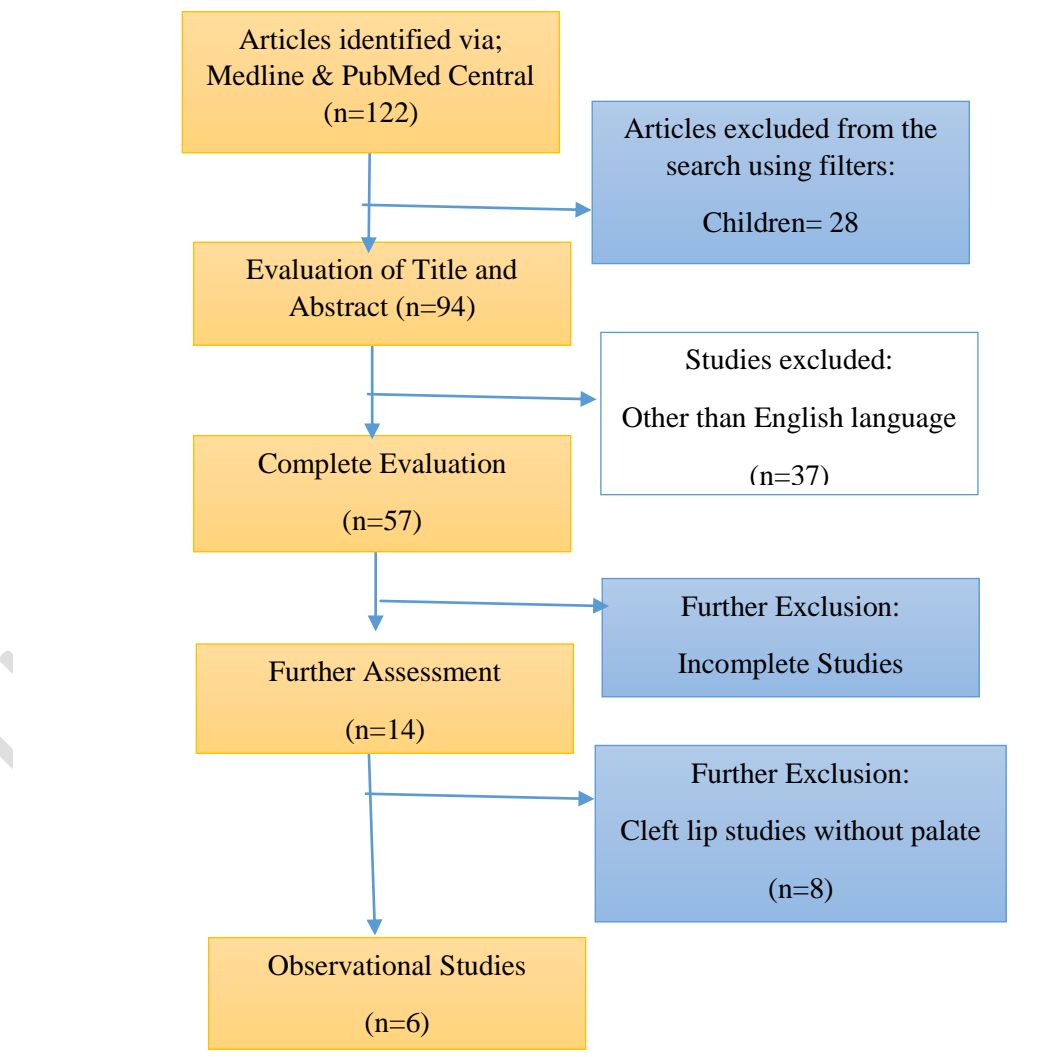
All search terms were in English and were applicable to the articles related to periodontal findings in children with cleft lip and palate, like: “periodontal”, “periodontic”, “gum disease” “gingivitis”, “inflammatory gums”, “bleeding gums”, “periodontitis”, findings. “Hare-lip”, “cleft lip”, “cheiloschisis”, “palate”, “soft palate”, “hard palate”. All these MeSH terms use the Boolean operator 'AND' to apply periodontal findings in children with cleft lip palate.

The filters include:

The search was conducted without filters at the beginning to ensure potential screening of all previous studies. As part of the exclusion criteria, Medline and PubMed Central added the following filters: human studies, studies in English, and adults over 18. By this method, studies can be easily filtered out of the original list of literature.

Criteria for inclusion and exclusion:

This study was designed to review and evaluate the previous research on the periodontal findings in children with cleft lip palate. It is necessary to screen article submissions for study eligibility after they have been submitted. The inclusion criteria of this study includes, all the articles or cases, children with cleft lip palate; that treated both the genders (males and females); that considered the periodontal findings of children with cleft lip palate; all the dental treatment related to it. The exclusion criteria of the study are to exclude, all the articles or cases, that are not in the English language; that treated the non-human subjects; that included the patients aged above 18 years of age; periodontal findings reported in children without a cleft lip palate.



Flow Chart: Showing the Analysis of all the literature related to the periodontal findings of children with cleft lip palate.

AUTHOR'S NAME	YEAR OF PUBLICATION	JOURNAL'S NAME	STUDY TITLE	PERIODONTAL FINDINGS	CARE GIVEN
COSTA B, LIMA JE, GOMIDE MR, ROSA OP. [10]	2003	The Cleft Palate Craniofacial Journal	Clinical and microbiological evaluation of the periodontal status of children with unilateral complete cleft lip and palate.	To investigate differences in the prevalence of dental plaque and gingivitis in children with cleft lip and palate, compared with children without cleft. Early colonization might predispose them to periodontal diseases later in life.	The increased prevalence of gingival inflammation in children with cleft lip and palate demonstrates the need for early and regular follow-up of their periodontal health, through the analysis of clinical and microbiological risk factors.
QUIRYNEN M, DEWINTER G, AVONTROODT P, HEIDBÜCHEL K, VERDONCK A, CARELS C. [12]	2003	Journal of Clinical periodontology	A split-mouth study on periodontal and microbial parameters in children with complete unilateral cleft lip and palate.	Children and adolescents with a cleft lip and palate (CLP) are at increased risk for the development of periodontitis and carious lesions. The split-mouth design and the multiple microbiological analyses of the current investigation allow us to draw the conclusion that pockets in the direct vicinity of a previous unilateral lip and palate cleft are not necessarily predisposed to severe attachment loss.	Complete unilateral cleft lip and palate (UCLP) is a hereditary or multifactorial malformation that can be corrected successfully with a combined orthodontic, surgical and restorative treatment. Such multidisciplinary treatment takes many years and demands a lot of attention to both patients' teeth and periodontium
PERDIKOGIANNI H, PAPAIOANNOU W, NAKOU M, OULIS C, PAPAGIANNOULIS L. [9]	2009	International Journal of Paediatric Dentistry	Periodontal and microbiological parameters in children and adolescents with cleft lip and /or palate.	The oral health of children and adolescents with CLP has been evaluated in the literature by examining mostly the presence of carious lesions, the oral hygiene level, and the degree of gingival inflammation	The factors that hinder proper oral hygiene such as the cleft deformity, collapse of the maxillary segments, orthodontic anomalies, scarring, and

<p>LEWIS CW, JACOB LS, LEHMANN CU [7]</p> <p>VEIGA KA, PORTO AN, MATOS FZ, DE BRITO PC, BORGES ÁH, VOLPATO LE, ARANHA AM. [8]</p> <p>PASSINATO GHELLER SA, PORTO AN, BORBA AM, VEIGA KA, ARANHA AMF. [11]</p>	2017	Paediatrics.	The Primary Care Paediatrician and the Care of Children With Cleft Lip and/or Cleft Palate.	Children with Cleft palate need regular audiologic evaluation and otolaryngology assessment as part of cleft/craniofacial team care.	inelastic upper lip as a result of corrective surgeries. This study emphasise the importance of a regular recall programme that should start early in the life of children with cleft, and should be integrated in their treatment protocol. The care of a patient with Clefted lip with palate requires individualized planning and referrals. The further treatment of patients need a detailed summary of their cleft/craniofacial team care and surgery, as well as information about their other special needs.
	2017	Paediatric Dentistry	Caries Experience and Periodontal Status in Children and Adolescents with Cleft Lip and Palate.	The caries experience in both dentitions was higher for Cleft lip with palate patients, and the presence of Cleft lip palate is a determining factor for higher risk of gingival inflammation.	DMFT (decayed, missing and filled permanent teeth) and DMFS scores were significantly higher in the control group. The PI (plaque index), BI (gingival bleeding index), and PPD (probing pocket depth) indices were higher in the CLP group.
	2021	Paediatric Dentistry	Periodontal Findings in Children and Adolescents with Cleft Lip and/or Palate: A Case-Control Study.	Aggregatibacter actinomycetemcomitans, Tannerella forsythia, Porphyromonas gingivalis, and Streptococcus oralis were identified and quantified by qPCR (quantitative polymerase chain reaction) using	The presence of cleft lip and/or palate negatively affects oral hygiene and levels of periodontal pathogens in oral biofilm. In

Taqman primers and probes. PI (Plaque Index), BI (Gingival Bleeding Index), CAL (clinical attachment level), and PPD were statistically higher in the CLP group. addition, clinical and microbiological results highlight the importance of early assessment of young people with cleft lip and/or palate and the permanent dentition to prevent periodontal disease.

Table 1: Showing the systematic review of all the articles related to periodontal findings of children with cleft lip and palate.

TREATMENT PLAN FOR CLEFT LIP REPAIREMENT	
3-6 months	<ul style="list-style-type: none"> ✓ Cleft Lip reparation ✓ Monitoring nutrition, growth, development, growth, development, psychosocial, sleep, speech and hearing.
7-23 months	<ul style="list-style-type: none"> ✓ Use of Fluoride toothpaste twice a day ✓ fluoride varnish twice a year ✓ Palate repair ✓ Monitoring nutrition, growth, development, growth, development, psychosocial, sleep, speech and hearing. ✓ Speech evaluation
2-5 years	<ul style="list-style-type: none"> ✓ Dental visits every 3-6 months ✓ Lip or nose revision ✓ Pharyngeal or palate surgery for speech ✓ Use of Fluoride toothpaste twice a day ✓ fluoride varnish twice a year ✓ Monitoring nutrition, growth, development, growth, development, psychosocial, sleep, speech and hearing
6-11 years	<ul style="list-style-type: none"> ✓ Consulting Orthodontics ✓ Assessment of facial growth and occlusal ✓ Alveolar bone graft surgery if required ✓ Speech therapy ✓ Regular dental visits ✓ Monitoring nutrition, growth, development, growth, development, psychosocial, sleep, speech and hearing ✓ Oral health guidance
12-18 years	<ul style="list-style-type: none"> ✓ Second phase orthodontic treatment ✓ Jaw surgery ✓ Regular dental visits ✓ Genetic counseling ✓ Septo-rhinoplasty ✓ Monitoring nutrition, growth, development, growth, development, psychosocial, sleep, speech and hearing
≥ 19 years	<ul style="list-style-type: none"> ✓ Transition to adult oral care ✓ Final surgeries if required.

Table 2: Showing the treatment plan for cleft lip reparation

DISCUSSION:

Among congenital anomalies, the orofacial cleft with palate are the most severe to affect the mouth and related structures [13]. Approximately one in 1000 births is reported to be affected by this condition. Girls are more likely to have cleft palates alone, while boys are more likely to have lip clefts, with or without the palate. In most cases, the cause of clefting is unknown. It is interesting to know that the left side occurs more often than the right side [14]. Typically, no single factor can be identified as the cause of cleft conditions. Clefts associated with other birth disorders or syndromes should, however, be distinguished from isolated clefts (during which the patient has no other related health problems). In the absence of family history, an abnormality may be the result of mutation or chance occurrence during pregnancy [15]. It is during these early weeks of intrauterine life that lips and palates form, and any factor affecting their development must have an influence during this relatively short time period. There are only limited positive views that can be expressed on factors linking maternal health to pregnancy in this respect. A German measles infection and x-ray examination during early pregnancy can cause congenital anomalies and can be avoided if diagnosed. Certain medications, notably thalidomide, possess teratogenic activity. The expectant mother is advised to avoid taking any drugs necessary during the early stages of her pregnancy [16].



CLASSIFICATION OF THE CLEFTED LIP

<i>Type I</i>	Clefts that involve the lip, alveolus, and anterior part of the palate up to the palatal foramen are known as primary palate clefts
<i>Type II</i>	Clefts of the secondary palate, extending to involve the hard palate along the palatal foramen as well as the soft palate.
<i>Type III</i>	Clefts of the primary or secondary palate are unilateral or bilateral.
<i>Type IV</i>	Rare facial clefts

Table 3: Showing classification of clefted lip based on the Embryological Characteristics [13]

A cleft palate is a risk factor for an upper respiratory tract infection that can lead to middle ear problems and hearing loss. As a general rule, clefts of the lip cause aesthetic problems, clefts of the alveolus cause dental problems, and clefts of the palate cause speech problems [17]. Obviously, these structures are closely related, thus causing the problems not always to be isolated, such as a cleft leading to speech difficulties. Rarely does a cleft of the lip or palate is present at the site of an alveolar cleft. Most children with cleft lip and palate develop normal speech, with a minority requiring the aid of a speech therapist [18]. It is sometimes necessary to have close collaboration between the speech therapist and dental surgeon to treat special speech problems that arise. Over 300 syndromes are known to develop clefts, but most of them are very rare. The overall number of cleft lip and palate syndromes is approximately 15% [19].

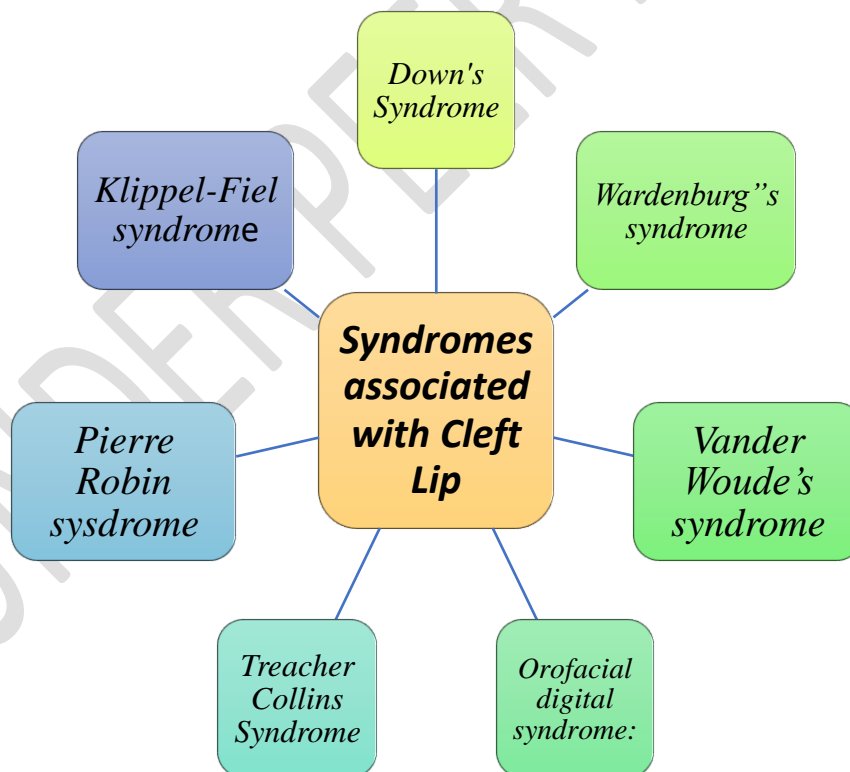


Figure 2: Showing the various syndromes associated with cleft lip [19].

During the fourth to twelfth weeks of a fetus' life, the maxillary processes do not fuse properly, causing an orofacial cleft. Etiologic factors include genetic characteristics, as well as some exogenous factors (smoking, alcohol, X-rays, and antimitotic). Different types of deformation can be seen, in the cleft lip, alveolar process, and cleft palate. The cleft can be complete, incomplete, unilateral, or bilateral [20]. There is a possibility that the disorder may occur independently or together with a syndrome such as Pierre-Robin Syndrome, Crouzon, and Treacher-Collins. The majority of children who have cleft lips and palates suffer from lack of soft tissue, a limited jawbone volume and tooth malformations. The majority of those children have feeding, speech and hearing difficulties [21].

Race and nationality play a significant role in determining the prevalence of this malformation. There is an incidence rate between 1.33% and 1.43% in Belgium, which is more common in males and 80% of cases are unilateral [22]. In order to minimize interference with palato-facial and speech development, closure of the defects is instituted at different stages. Those with cleft lips and palates are more likely to suffer from periodontitis and dental caries. It has been shown that the scar tissue produced after defect closure affects plaque control. Orthodontic treatment on a lengthy basis can cause iatrogenic trauma to the periodontium [23].

As soft tissue folds are hard to clean with conventional cleaning techniques, they may serve as a habitat for putative pathogens and thereby enhance intraoral transmission and infection risk. It is virtually impossible to obtain data on the periodontal and especially microbiological conditions of children and adolescents with Cleft Lip palate, documented high rates of plaque and bleeding on probing in adolescents with a wide variety of forms of Cleft Lip Palate. There were also a few teeth with a longer supracrestal attachment, which showed a slight cumulative periodontal destruction.

CONCLUSION:

It is imperative to analyze the clinical and microbiological risk factors for early and regular assessment of periodontal health of children with cleft lip and palate because of the increased prevalence of gingival inflammation. Children's physicians can promote dental health through proactive guidance, referral to a dentist, and application of fluoride varnish. When a child has a cleft lip or palate, it affects oral hygiene and the amount of periodontal pathogens in the oral

biofilm. In the literature, there is a lack of studies which utilize validated, reliable measures to determine how individuals with oral clefts perceive their quality of life. It will be important to perform additional studies that utilize specific tools for assessing Quality of Life in patients with oral clefts with larger samples in hopes of better understanding their Quality of Life. It is necessary to include questions and answers regarding Quality of Life in future research in order to better understand the rehabilitation process and to attain a better quality of life for children with cleft lip and palate.

ETHICAL CONSIDERATIONS:

Compliance with ethical standards

Ethical approval: This research contains a systematic review related to the periodontal findings of children with clefted lip and palate, hence requires no ethical approval.

REFERENCES:

1. Yazdy MM, Autry AR, Honein MA, Frias JL. Use of special education services by children with orofacial clefts. *Birth Defects Research (Part A): Clinical and Molecular Teratology* 2008;82:147-54.
2. Little J, Munger RG, Dixon MJ, et al. Cleft lip and palate. *Lancet*. 2009;374(9703):1773–1785.
3. Melnick M. Cleft lip and palate: Etiology and pathogenesis. In *Cleft lip and palate: A system of management*. Edited by Kernahan DA, Rosenstein SW, and Dado DV. Baltimore: Williams and Wilkins; 1990. 3–12 p.
4. Vanderas AP. Incidence of cleft lip, cleft palate and cleft lip and cleft palate among races. *Cleft Palate J*. 1987;24(3):216–225.
5. Correa A, Gilboa SM, Besser LM, Botto LD, Moore CA, Hobbs CA, Cleves MA, Riehle-Colarusso TJ, Waller DK, Reece EA. Diabetes mellitus and birth defects. *American Journal of Obstetrics and Gynecology* 2008;199:237.
6. Margulis AV, Mitchell AA, Gilboa SM, Werler MM, Glynn RJ, Hernandez-Diaz S, National Birth Defects Prevention Study. Use of topiramate in pregnancy and risk of oral clefts. *American Journal of Obstetrics and Gynecology* 2012;207:405.
7. Lewis CW, Jacob LS, Lehmann CU; SECTION ON ORAL HEALTH. The Primary Care Pediatrician and the Care of Children with Cleft Lip and/or Cleft Palate. *Pediatrics*. 2017 May;139(5):e20170628.
8. Veiga KA, Porto AN, Matos FZ, de Brito PC, Borges ÁH, Volpato LE, Aranha AM. Caries Experience and Periodontal Status in Children and Adolescents with Cleft Lip and Palate. *Pediatr Dent*. 2017 Mar 15;39(2):139-144.
9. Perdikogianni H, Papaioannou W, Nakou M, Oulis C, Papagiannoulis L. Periodontal and microbiological parameters in children and adolescents with cleft lip and /or palate. *Int J Paediatr Dent*. 2009 Nov;19(6):455-67.
10. Costa B, Lima JE, Gomide MR, Rosa OP. Clinical and microbiological evaluation of the periodontal status of children with unilateral complete cleft lip and palate. *Cleft Palate Craniofac J*. 2003 Nov;40(6):585-9.
11. Passinato Gheller SA, Porto AN, Borba AM, Veiga KA, Aranha AMF. Periodontal Findings in Children and Adolescents with Cleft Lip and/or Palate: A Case-Control Study. *Pediatr Dent*. 2021 Mar 15;43(2):133-139.
12. Quirynen M, Dewinter G, Avontroodt P, Heidbüchel K, Verdonck A, Carels C. A split-mouth study on periodontal and microbial parameters in children with complete unilateral cleft lip and palate. *J Clin Periodontol*. 2003 Jan;30(1):49-56.
13. Barron SL, Riviere GR, Simonson LG, Lukehart AS, Tira DE, O'Neil DW. Use of monoclonal antibodies to enumerate spirochetes and identify *Treponema denticola* in dental plaque of children, adolescents and young adults. *Oral Microbiol Immunol*. 1991;6:97–101.

14. Bokhout B, Hofman FXWM, Van Limbeek J, Kramer GJC, Prahl-Andersen B. Incidence of dental caries in the primary dentition in children with a cleft lip and/or palate. *Caries Res.* 1997;31:8–12.
15. Conrads G, Mutters R, Fischer J, Braunor A, Lulticken R, Lampert F. PCR reaction and dot-blot hybridization to monitor the distribution of oral pathogens within plaque samples of periodontally healthy individuals. *J Periodontol.* 1996;67:994–1003.
16. Cunha ACP, Chambrone LA. Prevalência de gengivite em crianças. *Rev Period.* 1998a;7:1–5.
17. Al-Wahadni A, Alhaija EA, Al-Omari MA. Oral disease status of a sample of Jordanian people ages 10 to 28 with cleft lip and palate. *Cleft Palate Craniofac J* 2005; 42: 304–308
18. Socransky SS, Haffajee AD, Cugini MA, Smith C, Kent RL Jr. Microbial complexes in subgingival plaque. *J Clin Periodontol* 1998; 25: 134–144.
19. Gharbia SE, Shah HN, Lawson PA, Haapasalo M. The distribution of *Fusobacterium nucleatum* subspecies in the human oral cavity. *Oral Microbiol Immunol* 1990; 5: 324–327.
20. Frisken KW, Tag JR, Laws AJ, Orr MB. Suspected periodontopathic microorganisms and their oral habitats in young children. *Oral Microbiol Immunol*, 1987; 2: 60–64.
21. Zschieschack B, Grabowski R. The influence of caries of the deciduous teeth upon development of the dentition in patients with cleft lip, jaw and palate. *J Orofac Orthop.* 1999;60(3):215–224
22. Lin YT, Tsai CL. Caries prevalence and bottle-feeding practices in 2-year-old children with cleft lip, cleft palate, or both in Taiwan. *Cleft Palate Craniofac J.* 1999;36(6):522–526
23. The Henry J Kaiser Family Foundation. Health Insurance Coverage of Children, Accessed March 27, 2017.