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REVIEW

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The Influence of mouth cleaning of teethless babies and of the oral manipulations in early life on the oral microbiome: a critical mini-review

A influência da limpeza bucal de bebês desdentados e das manipulações orais no início da vida no microbioma bucal: uma mini-revisão crítica

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Abstract

Introduction: *Oral hygiene for edentulous babies is a cultural tradition carried out by mothers after breastfeeding or introducing food. For many years, dentists have recommended oral cleaning for newborns and babies up to the sixth month of life. With the advancement of research on breast milk and its benefits, it is clear that oral hygiene in edentulous babies results in the removal of immunoglobulins and important microorganisms that cooperate with the immune system.* ***Objectives:*** *Taking advantage of the scientific acquisition on the topic, this objective mini review brings together existing data in the literature and provides a general overview to the reader on clinical and biological aspects, making it possible to spark interest in new studies in the area.* ***Methods:*** *To achieve the intended objectives, 42 articles were used.* ***Results:*** *It is expected to provide a brief update for clinicians on the influence of oral cleaning of edentulous babies on the microbiome and corroborate existing data on a topic little explored by the scientific community.*

Keywords: *Microbiome, Oral hygiene, Oral health, Pediatric dentistry, Infant*

Resumo

Introdução: *A higiene bucal de bebês desdentados é uma tradição cultural realizada pelas mães após a amamentação ou introdução alimentar. Durante muitos anos, os dentistas recomendaram a limpeza bucal para recém-nascidos e bebês até o sexto mês de vida. Com o avanço das pesquisas sobre o aleitamento materno e seus benefícios, verificou-se que a higiene oral de bebês desdentados resulta na remoção de imunoglobulinas e microrganismos importantes que cooperam com o sistema imunológico.* ***Objetivos:*** *Considerando a escassez científica sobre o tema, essa mini revisão objetiva reunir dados existentes na literatura e fornecer um panorama geral ao leitor sobre aspectos clínicos e biológicos, possibilitando despertar o interesse para novos estudos na área.* ***Método:*** *Para atingir os objetivos pretendidos, utilizou-se 42 artigos.* ***Resultados:*** *Espera-se promover uma breve atualização para o clínico sobre a influência da limpeza bucal de bebês desdentados sobre o microbioma e corroborar com os dados existentes acerca de um tema pouco explorado pela comunidade científica.*

Palavras-chave: *Microbioma, Higiene bucal, Saúde bucal, Odontopediatria, Lactente*

Introduction

The mouth is a very important organ to the babies, since intrauterine life, being a favorable environment for the baby communicate with the universe and, in the future, exercise numerous skills essential for your survival[1,2]. Oral manipulations performed in the early childhood provide well-being for the baby and relief of your emotional tensions, that is why, many pediatric dentists prescribe the use of gum massagers, fingertips, oral wipes and diapers for this purpose[3,4].

Some authors defend the hypothesis of what the early hygiene from the oral cavity of edentulous babies is another way to stimulate the development of the child patient, besides reduce biofilm and keep the well-being of the mucosa, especially after breastfeeding[5,6].

With the evolution of the research about the immunological role of the oral microbiota and the benefits of the breaast milk, currently this cleaning is no longer prescribed, once clean the mouth of edentulous babies in an early life does not seem to

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bring relevant benefits that justifies its application, in addition to eliminating immunoglobulins athered in the epithelium and important microorganisms to the oral ecosystem[7].

Sundry studies have shown that the microbiome is essential for the establishment of the mucosa immune system, therefore, inappropiate manipulations in the mouth can cause microbiological desequillibriums, making the baby more susceptible to infections. Seeing the dearth of scientific content about the influence of the cleaning mouth of teethless babies on the oral microbiome, this mini-review aims to describe the main findings about this influence, enabling an evidence-based in pediatric dentistry[8-10].

The baby oral mucosa and your microbiota

Mucosa is a type of membranous epithelial lining that covers the organs of the body, protecting and separating the innermost noble structures from the adverse environment. It acts as a mechanical barrier against aggressive agents coming from the extracorporeal environment, having an organized and complex immune network that includes invasive elements and the eliminates when necessary, preventing the development of injuries[11]. The oral cavity is coated for a moistened squamous and stratified mucosa, with keratinized and non-keratinized areas[12].

The mouth is an ecologically special organ that has a highly complex microbiota. This is due to the presence of teeth, variations in pH, temperature, and the different textures, therefore, the oral microbiome is the target of many studies due to its regulatory potential and for influencing in the maintenance of the homeostasis[13-15]. It is possible to find variations in the oral microbiota, since in each region of the mouth we will have a different ecology, for example, the microbiota of the tongue dorsum differs from the microbiota present in the gingiva and that close to the tonsil pillars, but they all share the same environment and together perform numerous functions[13].

The oral microbiota undergoes an incredible evolution throughout life. Inside the uterus, the mouth is a sterile environment, but after natural childbirth we have its first contamination by transient microorganisms, which originate from the maternal vaginal canal. The first microorganisms to reach the oral cavity are *Streptococcus*, *Lactobacillus*, *Difteroides*, *Coliformes*, *Candida* and some viruses and protozoa[16].

Although the placenta has been considered a sterile environment for many years, today it is possible to consider that a single microbiome exists in it, similar the maternal oral cavity, but even surrounded by different microorganisms, the embryo's mouth remains free of microorganisms, until minutes before birth[17].

The lingual dorsum is covered by a specialized mucosa, being full of sensory buttons to identify the different flavors and microbes characteristic of this region, such as the genera *Streptococcus*, *Actinomyces*, *Veillonela* and *Prevotella*[18]. We know that the sharp and untimely reduction of these microorganisms can trigger imbalances in the regional ecology, giving rise to the emergence of various systemic problems. Studies carried out in humans clearly show the harmful effects of the reduction of the genus *Veillonella* and *Actinomyces* on the cardiovascular system, contributing to the increase in blood pressure by interfering with nitrogen metabolism, but there are very few studies in the literature that solidify the harm of the marked reduction of oral germs in the beginning of life[19].

Mother´s milk and your microbiome

The breast milk is a complete food from a nutritional point of view, furthermore, provides the baby with fundamental chemical compounds and a very rich microbiota that, later, will lead the development of the baby's mucosal immune system[8]. Important studies provide evidences on the role of the breast milk microbiome and its impact on gut and oral mucosa homeostasis (20). Through breastfeeding, the baby gets important microorganisms for the regulation of many functions, keeping the equilibrium for the maintenance of the health of the child and for the maturation of your immunological system that starts in early childhood and lasts throughout life[20,21].

The microorganisms present in the baby´s saliva are important for your healthy growth and development. These microorganisms do part of a complex microbiological ecosystem, being this environment is altered and influenced by the breast milk consumption[21,22]. The mother´s milk is associated with a greater protection of the child against the obesity, when compared to the use of formulas, in addition, the use of formulas tends to change the characteristics of the intestinal mucosa microbiome, leading to several problems throughout life, the same occurs with the microbiota of the oral cavity, which also undergoes modifications depending on the characteristics of the food[23].

Recent studies also suggest that the microbiota present in the mouth´s babies tends to alter the composition of the microbiome present in the breast milk, what could impact in the child growth and development[23-25]. The breast milk, due to its privileged composition, gives the baby greater protection against gastrointestinal problems and is associated with a lower infant mortality rate[26]. During years, the mother`s milk was considered a sterile fluid and, when microbes

were found in its composition, it was believed that this was due to contamination by external agents. Currently the breast milk is considered the home of a biggest, diverse and specialized microbiome, with unique characteristics, but the origins of this microorganisms in the milk are still the subject of many studies. It is believed that there is an entero-mammary pathway that allows the transfer of intestinal microorganisms to the mammary glands rate[26]. In the composition of the microbiome present in breast milk, we can find more bacteria than in infant feces, making this food a powerful immunological pump against aggressive agents present in the adverse environment, as many of these microorganisms are beneficial and live in harmony with the host, without causing diseases[27]. In addition to this microbiological arsenal and the defense cells present, the mother`s milk also has important proteins for the protection of oral mucosa, such as casein[28].

The saliva and the human milk contain lactoferrina and Lactoperoxidases, glycoproteins that play a significand antimicrobial role. Newborns and babies until the first year of life, are more susceptible to fungal infections in the mouth. The reduction of these glycoproteins is associated with an increased growth of the fungus *Candida albicans*, which causes oral candidiasis. Due to this current information taken directly from the best present evidence, it is suggested that the presence of breast milk in the baby's oral cavity brings benefits for the child's overall development. The benefits of the mother´s milk are well described in the medical literature, but little has been said about its role on the oral mucosa of teethless babies in early life[28,29].

New guidelines in Pediatric Dentistry

The Pediatric Dentistry has been through numerous evolutions from a scientific point of view, as well other areas of dentistry. Currently a precocious in the childhood approach is recommended, in search of prevention and treatment of oral affections that affect children. Therefore, is necessary that the specialist in pediatric dentistry is properly prepared and capacited to attend the little patients, since the dental approach in the early stages of life is a daily challenge faced by dentists. The American Academy of Pediatric Dentistry (AAPD), the American Pediatric Association (AAP) and the Brazilian Association of Pediatric Dentistry recommend that the first appointment with the pediatric dentist occur before the first year of life, however, several authors emphasize that the best time to perform a clinical examination of the oral cavity and stipulate preventive or therapeutic measures is before the presence of the first teeth[30].

Edentulous babies also need specialized oral care, but the clinician must be prepared to follow dentistry based on the best available evidence[31]. We know that oral manipulations in early childhood tend to impact the child's overall development, from a physical, psychological and social point of view. Recognizing the mouth as an extremely complex organ, endowed with its own characteristics and inhabited by a multitude of microorganisms, pediatric dentists must work to maintain oral well-being, without, however, disturbing the resident ecology that protects and participates in child immunity[30,32]. Guidelines without technical and scientific support tend to put the baby's health at risk, favoring the appearance of opportunistic infections[28, 30-32].

Until a few years ago, many dentists recommended oral hygiene for babies without teeth to remove breast milk in the mouth and excess plaque. In addition, even today, dentists have recommended the massage of the baby's oral mucosa with rubber massagers and silicone fingertips, considering that this massage would promote tension relief and provide sensorineural stimulation of the oral cavity[29,32].

With the strengthening of practice based on scientific evidence, national and international clinical recommendations consider the mouth as an environment with a rich microbiome and that breast milk adhered to the mucosa has sufficient properties to promote health and not trigger diseases, so it is not recommended to clean the mucosa of babies without teeth with washcloths, diapers or any other utensils[28-34].

Would scraping the oral mucosa of edentulous babies be the best way in early childhood?

It is not yet possible to find an evidence-based answer in science due to the scarcity of research on the proposed topic, but there are reliable sources that provide good evidence for the presence of immunoglobulins from saliva that adhere to the oral mucosa and offer local protection. Throughout the baby's development, the levels of salivary immunoglobulins increase significantly, with the IgA type being the most abundant, therefore, promoting the friction of the mucous membranes could not only remove factors that make up immunity, but also unbalance the microbiota, removing important niches that make to part of the healthy ecosystem of the oral cavity[35].

Breast milk as a protective barrier

For containing a rich microbiome and numerous beneficial properties for child growth and development, when the mother`s milk remains in contact with the oral mucosa, it does not promote harm, on the contrary, it maintains immunoglobulin levels in

the epithelial barriers besides contains a range of microbes that regulate and promote the maintenance of homeostasis. Cleaning the mucous membranes to remove milk appears to have no benefit, according to recent research in the literature[35-42].

When to start a baby`s mouth hygiene?

With the development of the baby's oral microbiota, new microorganisms start to colonize the region, promoting a significant ecological due to the transitions environmental that occur. Around six months of life the first teeth erupt, giving rise to the periodontium that, until then, did not exist. In the presence of teeth and the periodontium, new colonizers arrive in the region and, when the parents do not remove the microbial biofilm that is on the teeth, it becomes pathological, which can lead to dysbiosis and favor the appearance of caries and lesions. inflammatory gums. Large entities recommend that oral hygiene occurs from the eruption of the first tooth. This hygiene must be performed with fluoridated toothpaste, at least twice a day. The manipulations that precede tooth eruption do not seem to bring benefits and have no plausible justifications in the literature[35-42].

Concluding remarks

There is a gap in science that does not allow us to conclude whether we really should contraindicate the oral hygiene of babies without teeth, but many studies consider hygiene before tooth eruption unnecessary, which seems to promote the reduction of immunoglobulins and change the oral microbiota in the early in life. Through this mini review, we can conclude that to decision-making must consider the risks and benefits before recommending educational methods for the promotion of children's oral health.

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References

1. Brecher EA, Lewis CW. Infant oral health. Pediatr Clin North Am. 2018; 65(5):909-21. https://doi.org/10.1016/j.pcl.2018.05.016
2. Clark-Gambelunghe MB, Clark DA. Sensory development. Pediatr Clin North Am. 2015; 62(2):367-84. https://doi.org/10.1016/j.pcl.2014.11.003
3. Thakkar PA, Rohit HR, Ranjan Das R, Thakkar UP, Singh A. Effect of oral stimulation on feeding performance and weight gain in preterm neonates: a randomised controlled trial. Paediatr Int Child Health. 2018; 38(3):181-6. https://doi.org/10.1080/20469047.2018.1435172
4. Fucile S, Milutinov M, Timmons K, Dow K. Oral sensorimotor intervention enhances breastfeeding establishment in preterm infants. Breastfeed Med. 2018; 13(7):473-8. https://doi.org/10.1089/bfm.2018.0014
5. Hurley E, Mullinsa D, Barretta MP, O'Sheac CA, Kinironsb M, Ryand CA, et al. The microbiota of the mother at birth and its influence on the emerging infant oral microbiota from birth to 1 year of age: a cohort study. J Oral Microbiol. 2019; 11(1):1599652. https://doi.org/10.1080/20002297.2019.1599652
6. Gomez A, Nelson KE. The oral microbiome of children: development, disease, and implications beyond oral health. Microb Ecol. 2017; 73(2):492-503. https://doi.org/10.1007/s00248-016-0854-1
7. Zhang Y, Wang X, Li H, Ni C, Du Z, Yan F. Human oral microbiota and its modulation for oral health. Biomed Pharmacother. 2018; 99:883-93. https://doi.org/10.1016/j.biopha.2018.01.146.
8. Le Doare K, Holder B, Bassett A, Pannaraj PS. Mother's milk: a purposeful contribution to the development of the infant microbiota and immunity. Front Immunol. 2018 Feb 28; 9:361. https://doi.org/10.1016/10.3389/fimmu.2018.00361.
9. Jo R, Yama K, Aita Y, Tsutsumi K, Ishihara C, Maruyama M, et al. Comparison of oral microbiome profiles in 18-month-old infants and their parents. Sci Rep. 2021; 11(1):861. https://doi.org/10.1038/s41598-020-78295-1
10. Zenobia C, Herpoldt KL, Freire M. Is the oral microbiome a source to enhance mucosal immunity against infectious diseases? NPJ Vaccines. 2021; 6(1):80. https://doi.org/10.1038/s41541-021-00341-4
11. Evans EW. Treating scars on the oral mucosa. Facial Plast Surg Clin North Am. 2017; 25(1):89-97. https://doi.org /10.1016/j.fsc.2016.08.008
12. Gaffen SL, Moutsopoulos NM. Regulation of host-microbe interactions at oral mucosal barriers by type 17 immunity. Sci Immunol. 2020; 5(43):eaau4594. https://doi.org/10.1126/sciimmunol.aau4594
13. Verma D, Garg PK, Dubey AK. Insights into the human oral microbiome. Arch Microbiol. 2018; 200(4):525-40. https://doi.org 10.1007/s00203-018-1505-3
14. Ho SX, Min N, Wong EPY, Chong CY, Chu JJH. Characterization of oral virome and microbiome revealed distinctive microbiome disruptions in paediatric patients with hand, foot and mouth disease. NPJ Biofilms Microbiomes. 2021; 7(1):19. https://doi.org/10.1038/s41522-021-00190-y
15. Li B, Ge Y, Cheng L, Zeng B, Yu J, Peng X, et al. Oral bacteria colonize and compete with gut microbiota in gnotobiotic mice. Int J Oral Sci. 2019; 11(1):10. https://doi.org/10.1038/s41368-018-0043-9
16. Shu SA, Yuen AWT, Woo E, Chu KH, Kwan HS, Yang GX, et al. Microbiota and food allergy. Clin Rev Allergy Immunol. 2019; 57(1):83-97. https://doi.org/10.1007/s12016-018-8723-y
17. Beckers KF, Sones JL. Maternal microbiome and the hypertensive disorder of pregnancy, preeclampsia. Am J Physiol Heart Circ Physiol. 2020; 318(1):H1-H10. https://doi.org/10.1152/ajpheart.00469.2019
18. Asakawa M, Takeshita T, Furuta M, Kageyama S, Takeuchi K, Hata J, et al. Tongue microbiota and oral health status in community-dwelling elderly adults. mSphere. 2018; 3(4):e00332-18. https://doi.org/10.1128/mSphere.00332-18
19. Bescos R, Ashworth A, Cutler C, Brookes ZL, Belfield L, Rodiles A, et al. Effects of chlorhexidine mouthwash on the oral microbiome. Sci Rep. 2020; 10(1):5254. https://doi.org/10.1038/s41598-020-61912-4
20. Stower H. The breast milk microbiome. Nat Med. 2019; 25(4):541. https://doi.org/10.1038/s41591-019-0427-1
21. Dzidic M, Collado MC, Abrahamsson T, Artacho A, Stensson M, Jenmalm MC, et al. Oral microbiome development during

childhood: an ecological succession influenced by postnatal factors and associated with tooth decay. ISME J. 2018; 12(9):2292-306. https://doi.org/10.1038/s41396-018-0204-z
22. Lif Holgerson P, Esberg A, Sjödin A, West CE, Johansson I. A longitudinal study of the development of the saliva microbiome in infants 2 days to 5 years compared to the microbiome in adolescents. Sci Rep. 2020; 10(1):9629. https://doi.org/1038/s41598-020-66658-7
23. Mueller E, Blaser M. Breast milk, formula, the microbiome and overweight. Nat Rev Endocrinol. 2018; 14(9):510-1. https://doi.org/10.1038/s41574-018-0066-5
24. Burns P, Alard J, Hrdỳ J, Boutillier D, Páez R, Reinheimer J, et al. Spray-drying process preserves the protective capacity of a breast milk-derived Bifidobacterium lactis strain on acute and chronic colitis in mice. Sci Rep. 2017; 7:43211. https://doi.org/10.1038/srep43211
25. Moossavi S, Sepehri S, Robertson B, Bode L, Goruk S, Field CJ, et al. Composition and variation of the human milk microbiota are influenced by maternal and early-life factors. Cell Host Microbe. 2019; 25(2):324-35.e4. https://doi.org/10.1016/j. chom.2019.01.011
26. Lyons KE, Ryan CA, Dempsey EM, Ross RP, Stanton C. Breast milk, a source of beneficial microbes and associated benefits for infant health. Nutrients. 2020; 12(4):1039. https://doi.org/10.3390/nu12041039
27. Zimmermann P, Curtis N. Breast milk microbiota: a review of the factors that influence composition. J Infect. 2020; 81(1):17-47. https://doi.org/10.1016/j.jinf.2020.01.023
28. Johansson I, Lif Holgerson P. Milk and oral health. Nestle Nutr Workshop Ser Pediatr Program. 2011; 67:55-66. https://doi.org/10.1159/000325575
29. Nakano M, Suzuki M, Wakabayashi H, Hayama K, Yamauchi K, Abe F, et al. Synergistic anti-candida activities of lactoferrin and the lactoperoxidase system. Drug Discov Ther. 2019; 13(1):28-33. https://doi.org/10.5582/ddt.2019.01010
30. Rigo L, Dalazen J, Garbin RR. Impact of dental orientation given to mothers during pregnancy on oral health of their children. Einstein (Sao Paulo). 2016; 14(2):219-25. https://doi.org/10.1590/S1679-45082016AO3616
31. Chi DL. The science and art of evidence-based pediatric dentistry. Dent Clin North Am. 2017; 61(3):xi-xii. https://doi.org/0.1016/j.cden.2017.04.001
32. Olatosi OO, Onyejaka NK, Oyapero A, Ashaolu JF, Abe A. Age and reasons for first dental visit among children in Lagos, Nigeria. Niger Postgrad Med J. 2019; 26(3):158-63. https://doi.org/10.4103/npmj.npmj_60_19
33. Jayaraman J, Dhar V, Donly KJ, Priya E, Innes NPT, Clarkson J, et al. Reporting stAndards for research in PedIatric Dentistry (RAPID): a development protocol. Int J Paediatr Dent. 2020; 30(1):96-103. https://doi.org/10.1111/ipd.12569
34. Grassi A, Sgherri G, Chorna O, Marchi V, Gagliardi L, Cecchi F, et al. Early intervention to improve sucking in preterm newborns: a systematic review of quantitative studies. Adv Neonatal Care. 2019; 19(2):97-109. https://doi.org/10.1097/ANC.0000000000000543
35. Merglova V, Koberova-Ivancakova R, Broukal Z, Dort J. The presence of cariogenic and periodontal pathogens in the oral cavity of one-year-old infants delivered pre-term with very low birthweights: a case control study. BMC Oral Health. 2014; 14:109. https://doi.org/10.1186/1472-6831-14-109
36. Arweiler NB, Netuschil L. The oral microbiota. Adv Exp Med Biol. 2016; 902:45-60. https://doi.org/ 10.1007/978-3-319-31248-4_4
37. Davé V, Street K, Francis S, Bradman A, Riley L, Eskenazi B, et al. Bacterial microbiome of breast milk and child saliva from low-income Mexican-American women and children. Pediatr Res. 2016; 79(6):846-54. https://doi.org/10.1038/pr.2016.9
38. Xiao J, Fiscella KA, Gill SR. Oral microbiome: possible harbinger for children's health. Int J Oral Sci. 2020; 12(1):12. https://doi.org/10.1038/s41368-020-0082-x
39. Cornejo Ulloa P, van der Veen MH, Krom BP. Review: modulation of the oral microbiome by the host to promote ecological balance. Odontology. 2019;107(4):437-48. https://doi.org/10.1007/s10266-019-00413-x
40. Pineda-Martínez S, Hernández-Islas JL, Escobedo-Torres MP, Paredes-Alonzo IE, Candiani AC, Correa D, et al. Immunoglobulin concentrations in plasma and saliva during the neonatal period. Pediatr Neonatol. 2016; 57:213-8. https://doi.org/10.1016/j.pedneo.2015.06.005
41. Zou J. [Oral health management for children]. Hua Xi Kou Qiang Yi Xue Za Zhi. 2018;36(5):465-8. [Chinese]. https://doi.org/10.7518/hxkq.2018.05.001
42. Shaghaghian S, Bahmani M, Amin M. Impact of oral hygiene on oral health-related quality of life of preschool children. Int J Dent Hyg. 2015; 13(3):192-8. https://doi.org/10.1111/idh.12129

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