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Salivary Characteristics of Down's Syndrome Children- A Review

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Abstract

A positive correlation between salivary characteristics and Caries resistance in Children has been reported in literature. Such a correlation is also observed in Down's syndrome population. The aim of this study is to gather recent information about various salivary characterestics of Down's syndrome children. It includes physical, chemical and ionic properties. Characteristics like Amylase and peroxidase, Protection and Lubrication, Buffering Capacity and pH of saliva, salivary flow, sIgA, Antimicrobial peptides and ionic composition.

Keywords: Buffering capacity; Down's syndrome; Saliva; Salivary pH

Introduction

Down syndrome (DS) is a genetic disorder caused by a trisomy of chromosome 21 with an incidence of 1: 800 to 1:1000 births [1]. In India, it has been reported that the incidence of Down's syndrome occurs in 1 per 700 births [2,3]. The syndrome is characterized mainly by mental retardation, cardiovascular, hematopoietic, and musculoskeletal and nervous system anomalies, as well as other phenotypic abnormalities [4,5]. Numerous oral manifestations have been described in DS individuals including low incidence of dental caries, high incidence of periodontal diseases, mouth breathing resulting in dry mouth, fissured tongue and lips, high incidence of mucosal ulcers, candidiasis and acute necrotizing ulcerative gingivitis [6]. Children with Down syndrome may have different dental characteristics such as congenitally missing teeth and microdontia. Often, the teeth are in Angle's class III relationship with posterior cross bites due to underdeveloped midfacial region. The tongue has deep fissures and appears large with a short and narrow maxilla [7]. Based on literature review worldwide caries prevalence in Down syndrome is low compared with other individuals. This may be due to factors such as delay in eruption of teeth, changes in saliva composition, teeth morphology with less pronounced pits and fissures and different in microbiota associated to dental biofilm [7].

One of the major functions of human saliva is to protect dentition against dental caries. The saliva pH level is ranged between 6.3 and 6.9. Flow rate and buffering capacity of saliva play an important role in the organization of oral microbiota because they maintain the saliva pH. However, in Down syndrome individuals, there may be physiological alterations in the saliva flow rate and its composition which are fundamental to colonization of the microorganisms. These changes will reduce the protective function of saliva on the tooth surfaces [7].

Salivary Characteristics in Children with Down's Syndrome

Amylase and peroxidase

Amylase, a metallo-enzyme that catalyzes the hydrolysis of the glucosidic linkages from starch, comprises about 50% of the protein produced by salivary glands. The disaccharide maltose, which is the product of amylase action, may be used by microorganisms of the oral cavity to form acids as polysaccharides, as well as is a contribuent of the acquired pellicle and therefore, could be available to act as a receptor for the adhesion of microorganisms to tooth surfaces. Thus salivary amylase may play an important role in the colonization and metabolism of streptococci leading to the formation of dental plaque and caries [8]. Peroxidase is an enzyme with antimicrobial properties. In the mouth, it is secreted by salivary gland and catalyzes the oxidation of thiocyanate by hydrogen peroxide to produce oxidized forms of thiocyanate. The product of the reaction catalyzed by peroxidase inhibits bacterial growth and, in addition, by consuming hydrogen peroxide, it prevents the accumulation of this toxic substance. According to the study done by Siqueira Jr. and Nicolau showed a reduction of 45% amylase and 45% peroxidase activity in Down's syndrome children [8].

Protection and Lubrication

Saliva forms a seromucosal covering that lubricates and protects the oral tissues against irritating agents. This occurs due to mucins (proteins with high carbohydrate content) responsible for lubrication, protection against dehydration, and maintenance of salivary viscoelasticity. Xerostomia (dry mouth) is a condition that occurs when there is not enough saliva to hydrate the oral tissues. In Down syndrome patients it is usually caused by mouth breathing. Mouth breathing is common in Down syndrome because patients often have difficulty breathing because of smaller nasal passages and a large protruding tongue. Often present is a fissured/cracked tongue, lips, and other oral tissues. Increase in sticky plaque and hard bacterial deposits due to dry mouth and decreased dexterity with tooth brushing and flossing [9].

Buffering Capacity and pH of saliva

The ability of saliva to buffer acids is essential for maintaining pH values in the oral cavity. The salivary buffering system facilitates neutralization of acids produced by bacteria in the oral cavity [8]. The buffering capacity of both stimulated and unstimulated saliva involves three major buffering systems, namely the bicarbonates, phosphates and proteins. Buffering capacity of Down's syndrome group was significantly higher probably this could have been the reason for the low prevalence of caries in Down's syndrome children [9]. The results by Siqueira et al., shows buffering capacity was found to be high in Down's syndrome children compared to control group [10]. The pH values are higher in Down's syndrome subjects. These results coincided with the study done by Yarata in Down's syndrome children [11]. Salivary pH of children who were immune to caries was higher than in those who were susceptible. This showed an inverse correlation between DMF and pH value. The statistically significant inverse correlation between pH value and DMF coincide with the work of Mandel and Zhou, as both reported a higher pH in saliva of persons immune from caries than in those who were susceptible [12,13].

Salivary flow

It is known that the constant salivary flow can efficiently dilute and eliminate the products of the bacterial metabolism within oral cavity. Low salivary flow has been associated with high caries prevalence [14]. The data found in the study of Siqueira et al and yarat et al confirmed the results that salivary flow values were significantly smaller for Down syndrome individuals [13-16]. In this context, special care should be given to Down syndrome individual, since low salivary flow, sugar consumption and the natural motor impairment can contribute for caries development.

sIgA

Bacterial colonization was shown to be inhibited by salivary sIgA. In Down syndrome children, significantly higher levels of salivary sIgA and a marked lower prevalence of tooth caries were reported [17].

Antimicrobial peptides

Antimicrobial peptides are considered to play a major role in the first line of oral defense. These molecules have a direct bactericidal activity and indirectly stimulate the immune system through chemotactic activity as well as induction of cytokines [18]. A deficiency in salivary antimicrobial peptides has not been reported in Down syndrome subjects, while salivary LL-37, a cationic antimicrobial peptide, was found to be normally secreted in those subjects. However, salivary LL-37 at a normal secretory level may be insufficient to prevent periodontitis when accompanied with deficiencies in the oral mucosal acquired immunity (IgA) and systemic immunity encountered in Down syndrome patients [19].

Ionic composition

The factors that regulate the hydroxyapatite balance are free calcium and phosphate ions [20]. Calcium is found in greater quantities in unstimulated saliva. Calcium and phosphorus should be supersaturated in saliva to have effect on demineralization and remineralization [21]. It was found that the salivary calcium level were significantly higher in control group compared to Down's syndrome group. In the study of Raurale et al. [2] salivary calcium was determined by photometric method like other investigators and phosphorus by phospomolybdate/UV method [21,22]. However the salivary phosphorus level was statistically higher in Down's syndrome children group than control group. These results coincide with the study done by Winer and Feller [14] in mongoloid patients but in contradiction to results obtained by study done by Siqueira et al [23].

Conclusions

- The trisomy in Down's syndrome manifests itself in the salivary glands. As a result, a different salivary environment of electrolytes is created, that interferes in the caries process, leading to lower caries rates among Down's syndrome children.
- The low caries index observed in Down's syndrome children compared to normal healthy children is associated to the higher pH, lower St. mutans count and higher concentration of salivary electrolytes.
- Higher pH level, increased inorganic ions and high buffering capacity could be attributed for low DMFT in Down's syndrome children.

References

1. Davidovich E, Aframian DJ, Shapira J, Peretz B (2010) A comparison of the sialochemistry, oral pH, and oral health status of Down syndrome children to healthy children. Int J Paediatr Dent 20: 235-241.
2. Raurale A, Viddyasagar M, Dahapute S, Joshi S, Badakar C, et al., (2013) Evaluation Of Oral Health Status, Salivary Characteristics and Dental caries experience in Down's Syndrome Children. NJIRM 4: 59-65.
3. Lenander-Lumikari M, Loimaranta V (2000) Saliva and dental caries. Adv Dent Res 14: 40-47.
4. Desai SS (1997) Down syndrome: a review of the literature. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 84: 279-285.
5. Shapira J, Stabholz A, Schurr D, Sela MN, Mann J (1991) Caries levels, Streptococcus mutans counts, salivary pH, and periodontal treatment needs of adult Down Syndrome patients. Spec Care Dentist 1: 248-251.
6. Gullikson JS (1973) Oral findings in children with Down's syndrome. ASDC J Dent Child 40: 293-297.
7. Normastura AR, Norhayani Z, Azizah Y , Khairi M (2013) Saliva and Dental Caries in Down Syndrome Children ; Sains Malaysiana 42: 59-63.
8. Siqueira WL, Nicolau J (2002) Stimulated whole saliva components in children with Down syndrome. Spec Care Dentist 22: 226-230.
9. Practical Oral Care for People With Down Syndrome
10. de Almeida Pdel V, Grégio AM, Machado MA, de Lima AA, Azevedo LR (2008) Saliva composition and functions: a comprehensive review. J Contemp Dent Pract 9: 72-80.
11. Horton K, Marrack J, Price I (1929) The relation of calcium in the saliva to dental caries. Biochem J 23: 1075-1078.
12. Yarat A, Akyüz S, Koç L, Erdem H, Emekli N (1999) Salivary sialic acid, protein, salivary flow rate, pH, buffering capacity and caries indices in subjects with Down's syndrome. J Dent 27: 115-118.
13. Sylvester CJ, Rosen S, Hoppert CA, Hunt HR (1964) a comparison of certain properties from specific major salivary glands of caries-resistant and caries-susceptible rats. J Dent Res 43: 528-535.
14. Winer RA, Feller RP (1972) Composition of parotid and submandibular saliva and serum in Down's syndrome. J Dent Res 51: 449-454.
15. Zijnge V, van Leeuwen MB, Degener JE, Abbas F, Thurnheer T, et al. (2010) Oral biofilm architecture on natural teeth. PLoS One 5: e9321.
16. Siqueira WL, Bermejo PR, Mustacchi Z, Nicolau J (2005) Buffer capacity, pH, and flow rate in saliva of children aged 2-60 months with Down syndrome. Clin Oral Investig 9: 26-29.
17. Lee SR, Kwon HK, Song KB, Choi YH (2004) Dental caries and salivary immunoglobulin A in Down syndrome children. J Paediatr Child Health 40: 530-533.

18. Gorr SU (2012) Antimicrobial peptides in periodontal innate defense. Front Oral Biol 15: 84-98.
19. Bachrach G, Chaushu G, Zigmond M, Yefenof E, Stabholz A, et al. (2006) Salivary LL-37 secretion in individuals with Down syndrome is normal. J Dent Res 85: 933-936.
20. Leone CW, Oppenheim FG (2001) Physical and chemical aspects of saliva as indicators of risk for dental caries in humans. J Dent Educ 65: 1054-1062.
21. Becks H, Wainwright WW (1943) Further studies of the calcium and phosphorus content of resting and activated saliva of caries free and caries active individuals. J Dent Res 22: 139-46.
22. Loesche WJ, Rowan J, Straffon LH, Loos PJ (1975) Association of Streptococcus mutants with human dental decay. Infect Immun 11: 1252-1260.
23. Siqueira WL, de Oliveira E, Mustacchi Z, Nicolau J (2004) Electrolyte concentrations in saliva of children aged 6-10 years with Down syndrome. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 98: 76-79.