LAMPIRAN

Original Article

Oral Health in 4-6 Years Children with Cleft Lip/Palate: A Case Control Study

Amandeep Chopra, Manav Lakhanpal, Nanak Chand Rao, Nidhi Gupta, Shelja Vashisth

Department of Public Health Dentistry, Swami Devi Dyal Hospital and Dental College (SDDHDC), Panchkula, Haryana, India

Abstract

Background: Oro-facial clefts are a major public health problem. Children with clefts rarely escape dental complications. **Aims:** This study was to determine differences in the dental caries experience, gingival health, and prevalence malocclusion, enamel defects and oral mucosal lesions among 4-6 year old children with and without cleft in Panchkula. **Materials and Methods:** The sampling frame consisted of 4-6 year old children with clefts visiting Swami Devi Dyal Hospital and Dental College, Panchkula, India. As a control group an age (±3 months) and gender-matched sample from the same geographical areas were recruited. Dental caries status, gingival health status, developmental defect of enamel, malocclusion and oral mucosal health were assessed and compared between the two groups. **Results:** Significant differences in dental caries and gingival health status were found between children with and without cleft. Anterior open-bite, increased overjet and oral mucosal lesions ($P < 0.05$) were more prevalent among children with clefts. Children with and without clefts had similar developmental defects of enamel ($P > 0.05$). **Conclusion:** Differences of oral health status exist among 4-6 year old children with and without clefts. Children fare worse in terms of dental caries, gingival health, oral mucosal health and malocclusion.

Keywords: Cleft lip, Cleft palate, Dental caries, Oral health

Address for correspondence: Dr. Amandeep Chopra, Department of Public Health Dentistry, Swami Devi Dyal Hospital and Dental College, Golpura, Barwala, Panchkula, Haryana, India. E-mail: dramandeepchopra@gmail.com

Introduction

Oro-facial clefts are a major public health problem affecting 1 in every 500 to 1000 births worldwide.[1,2] According to World Health Organization (2001), every 2 minutes a child is born with a cleft and in India alone three infants are born every hour with clefts.[3,4] Affected children have a range of functional as well as aesthetic problems. These includes difficulties in breast feeding due to improper oral seal, swallowing and nasal regurgitation, other associated problems are hearing difficulties due to abnormalities in the palatal musculature, and speech difficulties due to nasal escape and articulation problems.[4,5]

Access this article online

Quick Response Code:

Website: www.najms.org

DOI: 10.4103/1647-2714.134871

Children with clefts rarely escape dental complications. Since these children and their parents give more importance to the surgical correction of their clefts and neglect their dental health they tend to have more decayed and missing teeth, and poor oral health as compared to that of normal children.[6,7] However, reports on the oral health status of children affected by clefts have for the most part been limited to clinical samples, have lacked control comparison groups and have been very selective in terms of oral health aspects studied.

This initiated our present study to determine differences in the dental caries experience, gingival health, and prevalence malocclusion, enamel defects and oral mucosal lesions among 4-6 year old children with and without cleft in Panchkula.

Materials and Methods

Sample

The sampling frame consisted of 4-6 year old children with clefts visiting Swami Devi Dyal Hospital and Dental College, Panchkula, India, during January-December

Original Article

Oral health status among cleft lip and palate patients in South India: A profile

Chitta Ranjan Chowdhury, Shahnawaz Khijmatgar, Nanda P. Kishore[1], Vikram Shetty[1]

Access this article online

Website: www.jcpca.org

DOI: 10.4103/jcpca.jcpca_43_17

Quick Response Code:

ABSTRACT

Background: Cleft lip and palate (CLP) is one of the identified anomalies in India. Many of the CLP cases have compromised oral health status which relates to their quality of life (QoL). Therefore, it is a need to assess their oral health status in terms of dental caries, periodontal disease, hypodontia, malocclusions, etc. Hence, the objective of this study is to investigate the oral health status among CLP cases. **Material and Methods:** A questionnaire survey was designed for a total of 300 CLP cases that came to the Nitte Meenakshi Institute of Craniofacial Surgery of Nitte University, India, were included in the study. A questionnaire was designed and pretested, and informed consent from the cases and carers was taken. **Results:** The average mean age of the patients with CLP was 17.48 (3–47). There were 47% males ($n = 141$) and 53% females ($n = 159$). 63% ($n = 170$) of them came from low socioeconomic background. Out of 300 cases, 31.0% ($n = 90$) had cleft lip, 1.0% ($n = 3$) had cleft palate, and 67.8% ($n = 196$) of them had both CLP. Most of the cases, i.e., 65.4% ($n = 196$) were unilateral CLP and 52.7% ($n = 158$) had right-sided clefts. The literacy status of the parents, their socioeconomic status, and occupation had a significant interrelation for the occurrence of CLP ($P < 0.05$). Similarly, diminutive or peg-shaped tooth, hypodontia, facial profile, and absence of lateral incisors in the line of cleft showed a significant association of this CLP condition. There was also strong interrelation between the presence of postoperative intraoral scarring in patients affected with the CLP ($P < 0.05$). The score for decayed missing and filled teeth (DMFT/dmft) was 5.16 for 6–12 years old and >9 in >13 years old, community periodontal index was between 0 and 2, and the simplified oral hygiene index was 0.9–1.41. There were cases of ADI hypodontia, hypomineralization, and malocclusion. The statistical test was performed using ANOVA. **Conclusion:** We conclude that, there was a moderate dental caries risk. The periodontal status was fair. There was association of occurrence of hypodontia and malocclusions in craniofacial anomalies. This affects their QoL.

Key words: Cleft lip, cleft palate, oral health status, quality of life

INTRODUCTION

Orofacial cleft is the most common anomaly occurring in the craniofacial region. The estimated prevalence is 1.7 in 1000 live births in India.[1] The incidence of cleft lip and palate (CLF) in India ranges between 0.25 and 2.29 per 1000 births. Thirty-five thousand new cleft patients are born in India every year and 1 million cases remain untreated.[2] The data from international registries between 1993 and 1998 suggest that a variation in prevalence of cleft lip with or without cleft palate (CL ± P) is 3.4–22.9 per 10,000 births and an even more pronounced variation for isolated cleft palate (CP) with the prevalence of 1.3–25.3 per 10,000 births.[3]

Dental caries is found to be most prevalent oral ailments among CLP cases; gingivitis, periodontal disease, hypodontia, hypoplasia, and maintenance of poor oral hygiene are also prevalent among CLP cases.[3–5] The prevalence of associated systemic diseases and those are detected postnatally is 25% among CLP and CL ± P.[6] Several studies have found that the CP also associated

Department of Oral Biology and Genomic Studies, A.B. Shetty Memorial Institute of Dental Sciences, Nitte Meenakshi Institute of Craniofacial Surgery, Nitte University, Mangalore, Karnataka, India

Address for correspondence:
Dr Shahnawaz Khijmatgar,
Department of Oral Biology and Genomic Studies, A.B. Shetty Memorial Institute of Dental Sciences, Nitte University, Deralakatte, Mangalore - 575 018, Karnataka, India.
E-mail: Khijmatgar.s@gmail.com

Cite this article as: Chowdhury CR, Khijmatgar S, Kishore NP, Shetty V. Oral health status among cleft lip and palate patients in South India: A profile. J Cleft Lip Palate Craniofac Anomal 2017;4:S152-9.

International Journal of Dental Hygiene

Official Journal of the International Federation of Dental Hygienists

ORIGINAL ARTICLE

AM Hazza'a
MA Rawashdeh
K Al-Nimri
R Al Habashneh

Dental and oral hygiene status in Jordanian children with cleft lip and palate: a comparison between unilateral and bilateral clefts

Authors' affiliations:
AM Hazza'a, MA Rawashdeh, Department of Oral Medicine and Oral Surgery, Jordan University of Science and Technology, Irbid, Jordan
K Al-Nimri, R Al Habashneh, Department of Preventive Dentistry, Jordan University of Science and Technology, Irbid, Jordan

Correspondence to:
Dr Abdalla M Hazza'a
PO Box 3030
Irbid 22110
Jordan
Tel.: +962 795585947
Fax: +962 27279962
E-mail: hazza@just.edu.jo

Dates:
Accepted 29 September 2009

To cite this article:
Int J Dent Hygiene 9, 2011; 30–36
DOI: 10.1111/j.1601-5037.2009.00426.x
Hazza'a AM, Rawashdeh MA, Al-Nimri K, Al Habashneh R. Dental and oral hygiene status in Jordanian children with cleft lip and palate: a comparison between unilateral and bilateral clefts.

Abstract: *Objectives:* The purpose of this study was to assess and compare the dental health and oral hygiene status of subjects with unilateral and bilateral cleft lip and palate (BCLP). *Methods:* Oral and dental examinations were carried out in 98 children with cleft lip and palate and 98 unaffected subjects matching in gender and age, using the standard dental indices dmft and DMFT. Plaque and gingival indices were scored using the plaque and gingival indices of Silness and Löe. *Results:* The prevalence of dental caries was significantly higher in children with cleft lip and palate than their control in both permanent and deciduous teeth. Patients with BCLP experienced more dental caries than unilateral cleft lip and palate (UCLP) patients in both dentitions. Similarly, plaque accumulation and gingivitis were significantly higher in the cleft lip and palate patients compared with their controls. Only plaque accumulation was significantly higher in the BCLP patients than in the UCLP patients. *Conclusion:* Bilateral cleft lip and palate patients appear to be at a higher risk of caries experience and poorer in oral hygiene than those with UCLP patients. These findings not only provide a baseline for oral health parameters in patients with cleft lip and palate but also emphasize the need for intensive preventive measures of oral disease to optimize clinical outcome.

Key words: caries risk; cleft lip and palate; oral hygiene

Introduction

Clefting of the lip, cleft palate or both is the most common orofacial congenital malformation found amongst live births.

Published online: 23.09.2019

Original Article

Dental anomalies in children with cleft lip and palate in Western Australia

Wendy Nicholls[1]

Correspondence: Ms. Wendy Nicholls
Email: wendy.nicholls@health.wa.gov.au

[1]Dental Department/Cleft Lip and Palate Unit, Princess Margaret Hospital for Children, Perth, Western Australia

ABSTRACT

Objective: The purpose of this paper was to describe the prevalence and type of dental anomalies in the primary and permanent dentition in children with a cleft condition at Princess Margaret Hospital in Perth, Western Australia. **Materials and Methods:** The details of 162 current dental patients extracted from the main dental database through their year of birth for the period 1998–2001 were selected consecutively. Dental records and X-rays were examined by one examiner (WN) and verified by a second examiner (RJB) to determine dental development. The mean age of the subjects was 10.8 years with equal numbers of males and females. Subjects were further divided into cleft type, unilateral cleft lip (UCL) and palate, bilateral cleft lip (BCL) and palate, UCL, BCL, and cleft palate. **Results:** One hundred sixty-two subjects were grouped into 21 categories of anomaly or abnormality. Prevalence rates for the categories were calculated for the overall group and for gender and cleft type. **Conclusion:** Overall, 94% of patients were found to have at least one dental anomaly, with fifty-six (34%) patients having more than one anomaly or abnormality.

Key words: Cleft lip and palate, dental anomalies, Western Australia

INTRODUCTION

The occurrence of dental anomalies may result from both environmental and genetic factors. Previous studies indicate that there is a higher prevalence of dental anomalies in children with a cleft condition than in the general population.[1,2] Studies have also demonstrated that both genetics and the surgical repair of the palate influence the occurrence of dental anomalies in the cleft population.[3] Anomalies include variations in tooth size, shape, number, structure and formation, and eruption timing.[3]

Both sets of dentition may be affected and occur more frequently on the cleft-affected side of the maxilla.[4] The most common types of dental anomalies have been reported to be absent or supernumerary teeth, enamel dysplasia and discoloration and delayed root development. In children with cleft lip and palate, the lateral incisor in the alveolar cleft region has the highest prevalence of dental developmental disorders.[5] This may cause functional and esthetic issues for the child and complicating factors for dental and orthodontic treatment.

This paper will report the prevalence and type of dental anomalies in the primary and permanent dentition in children with a cleft condition at Princess Margaret Hospital in Perth, Western Australia.

Subjects

The details of current dental patients were selected consecutively from the main dental database via their

Access this article online

Quick Response Code:

Website: www.eurjdent.com

How to cite this article: Nicholls W. Dental anomalies in children with cleft lip and palate in Western Australia. Eur J Dent 2016;10:254-8.
DOI: 10.4103/1305-7456.178317

Comparison of risk indicators of dental caries in children with and without cleft lip and palate deformities

Rubina Shaheni, Ashima Goyal, Krishan Gauba, Ashok Kumar Utreja, Pallak Rai, Ashok Kumar Jena

Abstract

Objective: To test the hypothesis that there are no differences in various risk factors of dental caries among children with cleft lip and palate when compared to non-cleft high caries risk and non-cleft caries free children. **Design:** Seventy-three children in the age range of 4–9 years comprised three groups; Group-I (*n* = 23, children with cleft lip and palate), Group-II (*n* = 25, non-cleft high caries risk children) and Group-III (*n* = 25, non-cleft caries free children). Various risk factors for dental caries like type of oral hygiene practice, sugar exposures/day, developmental defects of enamel, caries activity, salivary streptococci mutans levels and lactobacilli levels were evaluated and compared among the three groups of children. **Results:** The mean deft score among Group-II children was significantly more ($P < 0.01$) as compared to the Group-I children. The mean deft + DMFT score among Group-I and Group-II children was comparable ($P = 0.149$). Developmental enamel defects were more among Group-I children as compared to Group-II and Group-III children ($P < 0.01$). Hypoplasia of the maxillary anterior teeth was more common among Group-I children as compared to Group-II ($P < 0.05$) and Group-III children ($P < 0.001$). The association between hypoplastic teeth and dental caries was significant ($P < 0.05$). The salivary acidogenic potential as evaluated by Snyder test was comparable among Group-I and Group-II children. The salivary streptococcus mutans levels in Group-I and Group-II children were higher when compared to lactobacillus counts. **Conclusion:** The risk factors of dental caries among children with cleft lip and palate were more as compared to non-cleft high caries risk and non-cleft caries free children.

Keywords: Cleft lip and palate, dental caries, risk factors

Introduction

Children with cleft lip and palate require a multidisciplinary approach in their management. In majority of the standard protocols designed for the management of children with cleft lip and/or palate, globally, the role of pediatric dentist has not been referred to, in spite of the high prevalence of dental caries, gum diseases and developmental defects reported in these children. These children are at high risk of developing dental caries,[1-3] with a reported deft score ranging between 2.35 and 13.5 among different communities around the world.[4,5] The high prevalence of dental diseases in children with cleft lip and/or palate has been attributed to irregularity of teeth, anatomy of cleft area, tight repaired lip with a tendency for food to accumulate in the cleft area, nasal discharge through cleft which acts as a feast for cariogenic microorganisms, hypoplastic defects, prolonged feeding especially at night time and increased consumption of sugary foods.[1,4]

In spite of reported high caries prevalence, a few studies[1a,2,6] have been conducted to evaluate the cariogenic risk factors in these children for planning and implementing an effective primary preventive oral health regimen, at an early age and also to give pediatric oral health care its due position in management of these children. The present study evaluated various risk factors of dental caries viz. sugar exposures/day, hypoplastic defects in teeth, salivary acidogenic potential, brushing frequency and salivary levels of cariogenic bacteria in children with cleft lip and palate and compared these parameters with age-matched non-cleft high caries risk children and non-cleft caries free children.

Materials and Methods

Seventy-three children in the age range of 4–9 years were distributed into three groups. Group-I included 23 children with cleft lip and palate who were selected from among

Department of Pedodontics, ACPM Dental College, Dhule, Maharashtra, [1]Unit of Pediatric Dentistry, Oral Health Sciences Centre, [2]Unit of Orthodontics, Oral Health Sciences Centre, [3]Department of Microbiology, Post Graduate Institute of Medical Education and Research, Chandigarh, [4]Unit of Orthodontics, Department of Dental Surgery, All India Institute of Medical Sciences, Bhubaneswar, Odisha, India

Correspondence: Prof. Ashima Goyal,
Unit of Pediatric Dentistry, Oral Health Sciences Centre,
Post Graduate Institute of Medical Education and Research,
Chandigarh, India.
E-mail: ashimapgi@yahoo.in

Access this article online
Quick Response Code:
Website: www.contempclindent.org
DOI: 10.4103/0976-237X.149283

Sundell et al. BMC Oral Health (2015) 15:85
DOI 10.1186/s12903-015-0067-x

BMC Oral Health

RESEARCH ARTICLE Open Access

Comparing caries risk profiles between 5- and 10- year-old children with cleft lip and/or palate and non-cleft controls

Anna Lena Sundell[1*], Christer Ullbro[2], Agneta Marcusson[3] and Svante Twetman[4]

Abstract

Background: Previous studies have suggested that children with oral clefts may have higher caries prevalence in comparison with non-cleft controls but the relative importance of the potential risk factors is not clear. The aim of this study was to compare the caries risk profiles in a group of cleft lip and/or palate (CL(P)) children with non-cleft controls in the same age using a computerized caries risk assessment model.

Methods: The study group consisted of 133 children with CL(P) (77 subjects aged 5 years and 56 aged 10 years) and 297 non-cleft controls (133 aged 5 years and 164 aged 10 years). A questionnaire was used to collect data concerning the child's oral hygiene routines, dietary habits and fluoride exposure. Oral hygiene was assessed using Quigley-Hein plaque index and the caries prevalence and frequency was scored according to the International Caries Detection and Assessment System. Whole saliva samples were analyzed for mutans streptococci, lactobacilli, buffering capacity and secretion rate. The risk factors and risk profiles were compared between the groups with aid of Cariogram and the estimated risk for future caries was categorized as "high" or "low".

Results: Children with CL(P) (the entire study group) had significantly higher counts of salivary lactobacilli ($p < 0.05$) and displayed less good oral hygiene ($p < 0.05$). More 10-year-old children in the CL(P) group had low secretion rate but this difference was not significant. The average chance to avoid caries ranged from 59 to 67 % but there were no significant differences between the groups. The odds of being categorized with high caries risk in the CL(P) group was significantly elevated (*OR* = 1.89; 95 % *CI* = 1.25–2.86). In both groups, children in the high risk category had a higher caries experience than those with low risk.

Conclusion: Children with CL(P) displayed increased odds of being categorized at high caries risk with impaired oral hygiene and elevated salivary lactobacilli counts as most influential factors. The results suggest that a caries risk assessment model should be applied in the routine CL(P) care as a basis for the clinical decision-making and implementation of primary and secondary caries prevention.

Keywords: Cleft lip, Cleft palate, Cleft lip and/or palate, Caries risk, Cariogram, Children

Background

Cleft lip and/or palate (CL(P)) is the most common congenital craniofacial deformity, affecting nearly two in every 1.000 newborns in Sweden [1]. The association between CL(P) and dental caries in children is not fully clear but a number of studies indicate a higher caries prevalence in children with different oral clefts in comparison with non-cleft controls [2–6]. Several factors can contribute to this higher susceptibility such as impaired oral hygiene [2, 5, 7, 8], enamel hypoplasia [9, 10] and early colonization of caries-associated microorganisms [11]. Furthermore, parents to children with CL(P) tend to overindulge the children and offer them sucrose-containing food and snacks as a compensation for their medical condition [12, 13]. The prolonged oral clearance time in children with oral clefts may also contribute to a cariogenic environment [14]. The role and relative importance of the potential risk factors are however not

* Correspondence: annalenasundell@gu.se
[1]Department of Pediatric Dentistry, Institute for Postgraduate Dental Education, Box 1030, SE 551 11 Jönköping, Sweden
Full list of author information is available at the end of the article

Int J Clin Exp Med 2015;8(9):16322-16327
www.ijcem.com /ISSN:1940-5901/IJCEM0008794

Original Article

The caries prevalence of oral clefts in eastern China

Wen-Lin Xiao[1,2], Dai-Zun Zhang[1,2], Yao-Xiang Xu[1,2]

[1]*Department of Stomatology,* [2]*The Key Laboratory of Oral Clinical Medicine of Shandong Province, The Affiliated Hospital of Qingdao University, Qingdao 266003, China*

Received April 5, 2015; Accepted September 2, 2015; Epub September 15, 2015; Published September 30, 2015

Abstract: Little information is available concerning the prevalence of caries among patients with oral clefts in Eastern China. Consecutive patients aged 6-18 with oral clefts were recruited. Patients were stratified into 2 groups according to their ages, namely Group I with aged 6-12 and Group II with aged 13-18. For each age group, the children were further divided into three subgroups according to the types of oral clefts they had: cleft lip/cleft lip and alveolus (CL), cleft palate only (CP), and cleft lip and palate (CLP). Dental caries were examined by using the decayed, missing, and filled index for primary teeth (dmft) and Decay, Missing and Filled index for Permanent teeth (DMFT) according to criteria of the World Health Organization. 284 eligible patients with oral clefts were included in the study. The mean DMFT for Group I was 1.77 (SD2.56) while that for Group II was 6.86 (SD4.35). The mean DMFT was statistically significant different between the age group I and age group II (t=12.21, P<0.05). In Group I, the dmft scores was 4.84 (SD3.87) for CL group, while that for the CP group was 7.38 (SD3.83), and that for the CLP group was 5.72 (SD 3.47). The mean dmft was no statistically significant different among cleft types (F=3.13, P>0.05). Also in Group I, the mean DMFT was 1.58 (SD2.18) for CL group, while that for the CP group was 1.24 (SD 1.81) and that for the CLP group was 2.01 (SD2.86). There were no statistically significant different in mean DMFT among different cleft types (F=1.09, P>0.05). In Group II, the mean DMFT was 8.06 (SD3.87) for CL group while that for the CP group was 7.71 (SD 4.84) and that for the CLP group was 7.05 (SD4.32). No significant difference was shown in the mean DMFT among different cleft groups (CL, CP, and CLP) (F=0.55, P>0.05). During access the prevalence of dental caries among Eastern Chinese with oral clefts; the study confirmed that the prevalence of caries was increased with increasing age for oral clefts patients. It was also demonstrated that there was no significant difference in the mean dmft/DMFT scores among different cleft types.

Keywords: Dental caries, oral clefts, epidemiology

Introduction

Oral clefts are one of the most common congenital malformations of orofacial structures and constitute approximately 65% of the anomalies affecting the head and neck [1]. Oral clefts are the most common major congenital orofacial abnormalities and occur in approximately 1:700 to 4:1000 live births with significant racial and geographic variation [2, 3]. The prevalence rate varies with different ethnic backgrounds and countries. In China, the prevalence of oral clefts was reported to be 1.8% [4]. Of these patients with oral clefts, they often requires complex and individualized treatment spanning from birth to adulthood, thus warranting an interdisciplinary care provided by orthodontists, plastic surgeons, pediatric dentists, maxillofacial surgeons, speech pathologists, psychologists, social workers and so on.

Apart from the obvious orofacial gaps, these cleft patients have some other oral diseases such as dental & arch segment irregularities, together with postoperative scar problems, resulting in higher incidence of dental caries. In fact, even in modernized societies, dental caries is still a global public health problem causing a major threat to oral health of these cleft patients. Although the prevalence of dental caries in different countries around the world is reducing [5], patients with oral clefts remain at high risk for dental caries [6, 7]. Bian et al. [8] examined 3- to 5-year-old patients with cleft lip, cleft palate or both cleft lip and palate in Central China. He found that seventy-five percent of them had rampant caries. Zhu et al. [9] examined 3- to 25-year-old patients with clefts in Western China and revealed that the caries prevalence was significantly higher in patients with cleft palate. However, little information is

Anatomy & Physiology: Current Research

Allam and Stone, Anat Physiol 2014, 4:3
DOI: 10.4172/2161-0940.1000150

Review Article Open Access

Cleft Lip and Palate: Etiology, Epidemiology, Preventive and Intervention Strategies

Eman Allam[1,2*], L Jack Windsor[1] and Cynthia Stone[3]

[1]*Department of Oral Biology, Indiana University School of Dentistry, Indianapolis, IN, USA*
[2]*Oral and Dental Research Division, National Research Centre, Cairo, Egypt*
[3]*Department of Health Policy and Management, School of Public Health at IUPUI, Indianapolis, IN, USA*

*Corresponding author: Eman Allam, Department of Oral Biology, Indiana University School of Dentistry, 1121 West Michigan Street, DS 271, Indianapolis, IN 46202, USA, Tel: 317-274-1445; Fax: 317-278-1411; E-mail: eallam@iu.edu

Rec date: Jun 24, 2014, Acc date: Jul 29, 2014, Pub date: Jul 31, 2014

Abstract

Cleft lip and palate represent a major public health problem due to the possible associated life-long morbidity, complex etiology, and the extensive multidisciplinary commitment required for intervention. It affects about 1.5 per 1000 live births (250,000 new cases per year) worldwide, with tremendous variations across geographic areas and ethnic groups. It is considered a debilitating condition that is associated with significant feeding, hearing, speech, and psychological impairments. The wide surgical, dental, speech, social, and medical involvement emphasize the importance of understanding the underlying determinants of these defects to allow optimizing the treatment options and predicting the long-term course of the affected individuals development. Optimal and early surgical intervention is necessary and folic acid supplementation proved to be a highly efficient preventive strategy. However, there are still many challenges to be addressed for cleft care especially in the developing parts of the world.

Keywords: Cleft lip and palate; Genetics; Epidemiology; Intervention

Introduction

Cleft lip and palate are considered one of the most common birth defects that possess significant medical, psychological, social, and financial implications on the affected individuals and families. Clefts have a complex etiology with both genetics and environment playing a role. Risk factors such as folic acid deficiency, maternal age, and maternal smoking have been linked to the development of clefts. In addition to the aesthetic disfigurement, a child with cleft lip and/or palate suffers substantial functional morbidity such as restricted maxillofacial growth, speech anomalies, swallowing and feeding difficulties, hearing loss and/or recurrent ear infections. Although not generally life-threatening, living with a cleft elicits a significant health burden [1,2].

Orofacial clefts (OFCs) describe a range of neonatal anomalies that involve structures around the oral cavity and may extend to the surrounding facial structures resulting in extensive craniofacial deformity. The main categories are isolated cleft palate (CP) and cleft lip with or without cleft palate (CLP). Both types may present either isolated or as part of a syndrome or other associated abnormalities. Affected children suffer a range of medical problems that include feeding difficulties at birth due to problems with oral seal, swallowing and nasal regurgitation, hearing difficulties due to abnormalities in the palatal musculature, and speech difficulties due to nasal escape and articulation problems. These cleft defects have a long term, adverse influence on the health and social integration of affected individuals because even though they can be surgically repaired early in childhood, residual deformity due to scarring and abnormal facial development results in continuing functional and psychosocial problems [3,4].

A multidisciplinary approach to the OFC treatment is widely accepted all over the world. The multidisciplinary team usually includes plastic surgeons, oral surgeons, otolaryngologist, speech therapist, audiologist, orthodontists, psychologist, social worker, and a specialist nurse. The optimum treatment plan includes primary surgery to close the defect, ongoing speech therapy and orthodontic plan, and secondary and tertiary surgeries to refine the initial surgical results. In most cases the primary surgery has to be planned within the first six months after birth. However, in most developing countries the shortage of the qualified surgeons and other specialists as well as financial disparities and the unavailable equipped facilities result in inappropriate case management and sometimes many OFC children even remain untreated [5].

Etiology

CL/P is etiologically heterogeneous with both genetics and environmental contributions. With the advent of the genomics era and advances in both quantitative and molecular analysis techniques, there have been great improvements in the identification of causative genetic mutations and associations underlying syndromic forms of CL/P (Table 1). On the other hand, there is currently little progress in identifying and understanding of the genetic etiology of isolated (non-syndromic) CL/P cases [6-9].

A variety of genetic polymorphisms have been studied in population based association studies and candidate genes studies. Results have suggested a role for genes responsible for growth factors (e.g. TGFα, TGFβ3), transcription factors (e.g. MSX1, IRF6, TBX22), factors which influence xenobiotic metabolism (e.g. CYP1A1, GSTM1, NAT2), nutrient metabolism (e.g. MTHFR, RARA), and immune response (e.g. FVRL1, IRF6). TGFα and MTHFR genes have been amongst the most widely investigated variants over the years. A comprehensive survey of chromosomal deletions and duplications was

Bekele et al. BMC Pediatrics (2019) 19:254
https://doi.org/10.1186/s12887-019-1624-2

BMC Pediatrics

RESEARCH ARTICLE Open Access

Anatomical patterns of cleft lip and palate deformities among neonates in Mekelle, Tigray, Ethiopia; implication of environmental impact

Konjit K. Bekele, Peter E. Ikanem* and Berhanu Meberate

Abstract

Background: Cleft lip and palate deformities are considered one of the most common birth defects of the head and neck that pose significant medical, psychosocial and financial burdens on the affected individuals and families, especially in low income communities. The etiology and pathogenesis of cleft lip and palate is complex and is known to involve genetic and/or environmental factors.

Objective: To assess the patterns of anatomical cleft lip and palate deformities among neonates in Mekelle and Ayder Comprehensive Specialized hospitals, Tigray, Northern Ethiopia.

Methods: A hospital-based retrospective study was conducted from May 2017 to June 2017 at Mekelle and Ayder Comprehensive Specialized hospitals, both in Mekelle city. Data was collected from all medical charts of neonates registered from 2011 to 2016 and analyzed using SPSS version 21.0 and OpenEpi software. Results were presented using tables and graphs; Chi-square test was used to look for an association between variables, odds ratio to determine the strength of association of selected variables using multinomial logistic regression model, while Fisher Exact (Clopper-Pearson) was used to compare yearly prevalence.

Results: Of 37,152 neonatal charts analyzed, 119 (0.32%) cases were identified as having cleft deformities. 38.7, 17.6, and 43.7% of this figure had cleft lips, cleft palates and both cleft lip and palate respectively. 46 (38.7%) neonates had lateral patterns of cleft lip deformities with 56.5% located unilaterally on the right and 43.5% unilaterally on the left. Of 52 (43.7%) neonates with cleft lip and palate deformities, 40.4% were located bilaterally while 38.5 and 21.2% were located unilaterally on the left and right, respectively. Associated malformations were cardiac (3.4%), central nervous system (1.7%) and limb deformities (5.9%). The overall prevalence of cleft deformities was found to be 3.11 per 1000 live births.

Conclusion: The study showed a higher prevalence of cleft deformities than that reported in Addis Ababa and some other African countries. A higher occurrence of left unilateral pattern of cleft lip and palate was observed whereas a higher right unilateral pattern of cleft lip was identified. The higher prevalence of cleft lip and palate recorded in this region of Ethiopia may reflect an environmental impact.

Keywords: Anatomical patterns, Cleft lips, Cleft palate, Neonates

*Correspondence: almaipan@gmail.com
Department of Anatomy, College of Health Sciences, Mekelle University, P.O. Box 1674, Mekelle, Ethiopia

Available online at www.ijmrhs.com

ISSN No: 2319-5886

International Journal of Medical Research & Health Sciences, 2018, 7(9): 132-136

Selected Salivary Physicochemical Properties among Cleft Lip and Palate Children in Iraq

Mais M. Almaeeni and Abeer Mohammed Hassan*

Department of Pedodontics and Preventive Dentistry, College of Dentistry, University of Baghdad, Baghdad, Iraq

**Corresponding e-mail: abeerzwain@yahoo.com*

ABSTRACT

Objective: *To investigate selected salivary properties in children with cleft lip and palate and to compare them with non-cleft children.* ***Setting:*** *The study was conducted in Dentistry College, University of Baghdad and Alwasity and Ghazi Alhareery Teaching Hospitals, Baghdad, Iraq.* ***Patients and methods:*** *A total of 36 children with non-syndromic repaired cleft lip and palate, aged 4 to 10 years, and a total of 37 non-cleft children were investigated for flow rate, pH, total antioxidant, uric acid, and total proteins.* ***Results:*** *Salivary total antioxidant capacity and total protein were significantly different between cleft lip and palate children and non-cleft children, while for salivary flow rate and total antioxidant were significantly lower in children with cleft lip and palate than in non-cleft children. Concerning pH and uric acid, there were no significant differences.* ***Conclusion:*** *Some salivary chemical constituents and some physical parameters deviated from the norm in children with cleft lip and palate.*

Keywords: Cleft lip and palate, Salivary flow rate, pH, Total antioxidant, Uric acid, Total proteins

INTRODUCTION

Orofacial cleft (OFC) is a congenital abnormal space or gap due to incomplete fusion of the embryologic prominences in the upper lip alveolus and/or palate during facial development which results in severe facial, morphological and functional impairment of sucking, swallowing and breathing. OFC is the most common craniofacial birth defects in humans [1,2]. The craniofacial structures development is a coordinated process involving the growth of multiple independently derived embryologic prominences called primordial. Incomplete fusion of these facial structures during the 4th to 12th week of embryologic life results in a gap which leads to cleft lip, cleft of the primary or secondary palate, or a combination of them [3,4]. Elevated infant mortality and significant lifelong morbidity are associated with OFC such as cosmetic deformities, feeding problems, swallowing difficulties, failure to gain weight, change in nose shape, recurrent ear infections, poor growth of the maxilla, speech difficulties, misaligned teeth and dental abnormalities [2,5,6].

Saliva has many essential functions such as lubrication, protection, buffering action, clearance and antibacterial activity so that saliva plays an important role in regulating and maintaining the integrity of the oral hard and soft tissues and in oral health monitoring [7]. The whole saliva offers an alternative to serum as a biologic fluid that can be analyzed for diagnostic purposes, so saliva has been investigated as a source of specific biomarkers for human disease such as cancer, periodontitis and in cleft lip palate children [8,9]. Saliva collection is a simple, inexpensive and non-invasive method [2].

Antioxidants are present in saliva, which constitutes the first line of defense against oxidative stress and has protective effects against microorganisms, toxins, and oxidants. The imbalances in free radical levels and reactive oxygen species with antioxidants may play a key role in the onset and development of several inflammatory oral pathologies [10]. Saliva has an antioxidant system that includes macromolecules, enzymes and an array of small molecules [11]. Uric acid is the most important antioxidant molecule, contributing approximately 70% of the total salivary antioxidant capacity. The antioxidant properties of uric acid have been attributed to its ability to chelate transition metals and to react with biological oxidants [8].

The protein and peptides composition of saliva play an important role in preserving the integrity and stability of the saliva and providing defense against infections and diseases such as periodontal disease or head and neck squamous

Original Paper

Caries Research

Caries Res 2013;47:406–413
DOI: 10.1159/000349911

Received: December 13, 2012
Accepted after revision: February 10, 2013
Published online: May 3, 2013

Caries Prevalence in Non-Syndromic Patients with Cleft Lip and/or Palate: A Meta-Analysis

G.S. Antonarakis[a] P.-K. Palaska[b] G. Herzog[c]

[a]The Hospital for Sick Children, Toronto, Ont., Canada; [b]Tufts University School of Dental Medicine, Boston, Mass., USA; [c]CHUV University Hospital, Lausanne, and University of Geneva Dental School, Geneva, Switzerland

Key Words
Caries prevalence · Cleft lip and/or palate · Meta-analysis

Abstract

Aim: To evaluate caries prevalence in non-syndromic patients with cleft lip and/or palate (CLP) in comparison with a matched non-CLP population. ***Methods:*** A literature search was conducted in order to identify articles reporting on the prevalence of caries in CLP versus non-CLP individuals. The related citations function in PubMed and reference lists of retrieved articles were used to expand the search. Only studies with a suitable matched control group were included. From each included study, study and sample characteristics were extracted, as were results. The main outcome was the score given for caries prevalence in each study, using a well-defined index. The data were entered into meta-analysis software and a meta-analysis performed using the random-effects model. ***Results:*** From the 592 articles initially identified, 7 were chosen according to preset inclusion and exclusion criteria. All of the studies were cross-sectional in nature, and used the decayed, missing, and filled (DMF/dmf) indices as the final outcomes. The included studies involved a total of 474 CLP patients aged 1.5–29 years. When looking at permanent teeth, data from 5 studies suggest that CLP patients have a higher number of DMF teeth than the controls (mean difference 1.38; p = 0.003). For deciduous teeth, data from 4 studies suggest that CLP patients have a higher number of dmf teeth than the controls (mean difference 1.51; p = 0.03). ***Conclusion:*** Non-syndromic patients with CLP tend to have higher caries prevalence, both in the permanent and the deciduous dentition, in comparison with matched non-CLP controls.

According to a recent Centers for Disease Control and Prevention [CDC, 2006] report, cleft lip and/or palate (CLP) is the second most common birth defect, occurring in 1 in 575 live births. Children born with CLP may be affected by a combination of various facial differences, disturbances of the dentition and growth of the jaws, as well as swallowing, speech, and hearing disorders [Klassen et al., 2012]. A healthy dentition is of principal importance for reasons such as the desire to preserve bone, and to maintain a satisfactory occlusion. Dental caries is one of the most common preventable diseases [Selwitz et al., 2007] and their prevention and early detection should thus be an important aspect of the multidisciplinary management of CLP patients.

One of the earliest studies performed on the dentition of CLP children found that caries experience of these children did not differ markedly from that of normal children [Lauterstein and Mendelsohn, 1964]. Many studies have been carried out since, looking into caries in CLP patients,

KARGER

E-Mail karger@karger.com
www.karger.com/cre

0008–6568/13/0475–0406$38.00/0

Gregory S. Antonarakis
Department of Dentistry, The Hospital for Sick Children
555 University Avenue
Toronto, ON M5G 1X8 (Canada)
E-Mail Gregory.Antonarakis@sickkids.ca

The Cleft Palate-Craniofacial Journal 50(4) pp. 448-455 July 2013

ORIGINAL ARTICLE

Caries Experience of Chinese Children With Cleft Lip and Palate

Nigel M. King, B.D.S., M.Sc., Ph.D., Wai Lan Wong, B.D.S., M.D.S., Hai Ming Wong, D.D.S., M.D.Sc., AdvDipPaediatrDent, Ph.D.

Objective: **This study evaluated the caries experience in the primary teeth of children with and without cleft lip and palate (CLP).**
Design: **Observational study.**
Setting: **Dental hospital clinic.**
Patients: **The sample consisted of 132 pairs of Chinese children with and without CLP matched by gender, age, ethnicity, and socioeconomic status. Their ages were between 2 and 7 years.**
Methods: **The children were dichotomized into 2- to 4-year-old (n = 71) and 5- to 7-year-old groups (n =61). The oral examination was performed by one trained and calibrated dentist, and the caries experience was determined using the dmft (decay missing filled teeth) index.**
Results: **For the 2- to 4-year-old group, the dmft values were 1.5 for the cleft group and 1.6 for the non-CLP group, but the difference was not statistically significant. For the 5- to 7-year-old group, the dmft indices were 5.2 for the cleft group compared with 2.9 for the control group; this difference was statistically significant ($p = .0006$). The caries rate for the various tooth types in the 5- to 7-year-old group was higher in the CLP group than in the non-CLP group; the most marked difference was for the lateral incisors, mandibular molars, and maxillary left first molars ($p = .0001$).**
Conclusions: **The 5- to 7-year-old children with CLP had a higher caries experience in the primary dentition than the children without CLP.**

KEY WORDS: *caries, children, cleft lip and palate*

The high prevalence and severity of malocclusion among children with cleft lip and palate (CLP) has been well documented (Philip, 1990; Shaw and Semb, 1990; Hongal et al., 2010). In Hong Kong, problems of malocclusion and dental anomalies have been shown to manifest themselves in the primary and permanent dentitions (Tang and So, 1992; Lai et al., 2009). The irregularity of the teeth has been said to result in a higher prevalence of dental caries in children with CLP than in children without CLP (Shah and Wong, 1980). It is recommended that regular dental care, both preventive and therapeutic, is implemented as early as possible during childhood to minimize morbidity due to the lost of teeth (King et al., 1996). However, there are a limited number of studies that have been conducted on the occurrence of caries in children with CLP. Consequently, is there adequate scientific evidence to support the hypothesis that children with CLP have a higher caries risk?

One of the pioneering studies on caries prevalence in children with CLP was performed by Lauterstein and Mendelsohn (1964). They reported that the caries experience in the permanent dentition of these children did not differ markedly from that of their control group. However, this study was performed in an era when the prevalence of caries in the community was much higher than in the current decade. By contrast, more recent studies reported a higher caries prevalence in the permanent dentition of their children with CLP than other children (Ishida et al., 1989; Al-Wahadni et al., 2005; Al-Dajani, 2009). Other studies, however, have shown that there was no difference in the caries experience of children with CLP compared with other children (Lucas et al., 2000; Hewson et al., 2001).

Although Hewson and his colleagues (2001) did not find an increased prevalence of caries in the permanent dentition, their results showed that the significant difference in the caries experience between CLP and control groups was more evident in the primary dentition. Bokhout and her co-workers (1997) also recorded as high as 3.5 times more decayed surfaces in children with CLP than without CLP. Johnsen and Dixon (1984) reported that children with

Professor Nigel King is Winthrop Professor in Pediatric Dentistry, School of Oral Health Centre of Western Australia, University of Western Australia, Perth, Australia. Dr. Wai Lan Wong formerly was postgraduate student in Paediatric Dentistry, Faculty of Dentistry, The University of Hong Kong, Hong Kong, Pokfulam, SAR, China. Dr. Hai Ming Wong is Assistant Professor in Paediatric Dentistry, Faculty of Dentistry, The University of Hong Kong, Pokfulam, Hong Kong SAR, China.
Submitted June 2011; Accepted January 2012.
Address correspondence to: Dr. Hai Ming Wong, Paediatric Dentistry & Orthodontics, Faculty of Dentistry, The University of Hong Kong, 2/F Prince Philip Dental Hospital, 34 Hospital Road, Hong Kong SAR, China. E-mail: wonghm@hkucc.hku.hk.
DOI: 10.1597/11-133

The Cleft Palate-Craniofacial Journal 49(5) pp. 519–523 September 2012

ORIGINAL ARTICLE

Comparative Salivary Proteomics of Cleft Palate Patients

Gyula Tamas Szabo, M.D., Reka Tihanyi, M.D., Fruzsina Csulak, M.D., Eva Jambor, M.Sc., Agnes Bona, M.Sc., Gyula Szabo, M.D., D.Sc., Laszlo Mark, Ph.D.

Objectives: **To investigate salivary proteins with proteomic technologies to evaluate protein composition differences between samples with cleft lip and palate and healthy controls.**

Design, Participants: **Matrix-assisted laser desorption/ionization tandem time-of-flight (MALDI TOF/TOF) mass spectrometry was used as a high-throughput analytical technique for identification of nonsyndromic cleft lip and palate stimulated salivary proteins. The samples consisted of two groups: 31 cleft lip and palate patients and a control group with 20 healthy volunteers.**

Results: **The presence of cleft lip and palate stimulated the expression of several proteins, included adaptor-related protein complex 3, dermokine, nidogen 1 precursor, transforming growth factor-β3, and a zinc finger RAN-binding domain containing 2.**

Conclusions: **The salivary proteome of cleft lip and palate patients differs from the protein composition of healthy control saliva samples. Several common secreted proteins such as actins, salivary cystatins, and keratins were upregulated by cleft; increased levels of TGF-β3 and dermokine were detected in the pathologic samples. The current proteomic results suggest keratinocyte activation among patients with cleft lip and palate. The score of our preliminary results suggests the hypothesis that identified salivary proteins are of vital clinical importance in tissue regeneration and the molecular repair mechanism seen in patients with cleft lip and palate.**

KEY WORDS: *birth defect, cleft lip and palate, MALDI TOF MS, salivary proteins*

Cleft lip and palate is the fourth most common birth defect and the most common facial birth defect. The cleft condition is identified during the fourth to eighth week of pregnancy, when a gap in facial structures results from incomplete fusion of the embryologic prominences during facial development (Schutte and Murray, 1999).

Clefting is associated with many problems such as cosmetic deformities, dental abnormalities, and speech, swallowing, and growth difficulties. Symptoms include a change in nose shape (amount of distortion varies), failure to gain weight, feeding problems, flow of milk through nasal passages during feeding, misaligned teeth, poor growth of the maxilla, recurrent ear infections, and speech difficulties (Jugessur et al., 2009).

The prevalence of orofacial cleft is related to genetic and environmental factors, geographic origin, and socioeconomic status. Multifactorial inheritance plays a major role in etiology because problems with genes are passed down from one or both parents. Environmental factors (teratogens) may also be associated with defts: viral and bacterial infections, toxins, drugs, lack of oxygen during development, maternal smoking, maternal alcohol use, irradiation, and vitamin and other nutrient deficiencies all can cause such birth defects. Cleft lip and palate may occur along with other syndromes or birth defects (Murray, 2002).

Studies have attempted to identify the predisposing genes, but because of the complexity of the disorder, most studies have failed to identify major risk factors. One of these is identified as the gene that encodes interferon regulatory factor 6 (IRF6)—mutated in a rare condition called van de Woude syndrome—as a candidate gene on the basis of its involvement in an autosomal dominant form of clef lip with or without cleft palate (Ingraham et al., 2006).

Over the past decade, saliva has been investigated as a source of specific biomarkers for human disease. Numerous studies have validated the use of saliva as an analysis

Dr. G.T. Szabo is Assistant Professor, Department of Dentistry, Oral and Maxillofacial Surgery, Medical School, University of Pecs, Pecs, Hungary. Dr. Tihanyi is resident, Department of Dentistry, Oral and Maxillofacial Surgery, Medical School, University of Pecs, Pecs, Hungary. Dr. Csulak is resident, Department of Dentistry, Oral and Maxillofacial Surgery, Medical School, University of Pecs, Pecs, Hungary. Dr. Jambor is doctoral student, Institute of Biochemistry and Medical Chemistry, Medical School, University of Pecs, Pecs, Hungary. Dr. Bona is doctoral student, Institute of Biochemistry and Medical Chemistry, Medical School, University of Pecs, Pecs, Hungary. Dr. G. Szabo is Professor, Department of Dentistry, Oral and Maxillofacial Surgery, Medical School, University of Pecs, Pecs, Hungary. Dr. Mark is Associate Professor, Institute of Biochemistry and Medical Chemistry, Medical School, University of Pecs, Pecs, Hungary.

Submitted June 2010; Revised October 2010; Accepted March 2011.

Address correspondence to: Dr. Laszlo Mark, Institute of Biochemistry and Medical Chemistry, Faculty of Medicine, University of Pecs, Szigeti str. 12, H-7624 Pecs, Hungary. E-mail: laszlo.mark@aok.pte.hu.

DOI: 10.1597/10-135

JOMFP

REVIEW ARTICLE
Year : 2012 | Volume : 16 | Issue : 2 | Page : 228–232

Etiopathogenesis of orofacial clefting revisited

Sudeendra Prabhu[1], Rekha Krishnapillai[2], Maji Jose[1], Vishnudas Prabhu[1],
[1] Department of Oral Pathology, Yenepoya Dental College, Mangalore, Karnataka, India
[2] Department of Oral Pathology, Annoor Dental College, Muvattupuzha, Kerala, India

Correspondence Address:
Sudeendra Prabhu
Department of Oral Pathology, Yenepoya Dental College, Yenepoya University, Deralakatte, Mangalore, Karnataka India

Abstract

The cleft anomaly may be more ancient than the man himself. It is one of the most common developmental malformations reported in the literature. There are number of intriguing theories regarding its etiopathogenesis, each of which has some evidence in its favor. This review highlights all the genetic and environmental etiologic factors and focuses on its pathogenesis.

How to cite this article:
Prabhu S, Krishnapillai R, Jose M, Prabhu V. Etiopathogenesis of orofacial clefting revisited. J Oral Maxillofac Pathol 2012;16:228-232

How to cite this URL:
Prabhu S, Krishnapillai R, Jose M, Prabhu V. Etiopathogenesis of orofacial clefting revisited. J Oral Maxillofac Pathol [serial online] 2012 [cited 2019 Dec 24];16:228-232
Available from: http://www.jomfp.in/text.asp?2012/16/2/228/99074

Full Text

Introduction

A 'cleft' is a congenital abnormal space or gap in the upper lip, alveolus or palate. [1] The formation of the face and oral cavity is complex in nature and involves the development of multiple tissue processes that must merge and fuse in a highly orchestrated fashion. Disturbances in the growth of these tissue processes or their fusion may result in the formation of orofacial clefts. [2] Cleft lip (CL) and cleft palate (CP) are the single most common congenital deformity affecting the orofacial structures in man and constitute about 13% of all reported anomalies. [3][4]

CL and CP are complex multi-factorial disorders, where in both genetic and/or environmental factors are responsible for its occurrence. [5] Although the mode of inheritance of cleft lip-palate (CLP) has been investigated for many years, the results appear to be controversial. [4] It is said that genetic and/or environmental factors that inhibit the flow of neural crest cells or decrease their number so that contact between the facial prominences is inadequate or impossible, resulting in clefts. [6]

The zones affected by common orofacial clefts are upper lip, alveolar ridge, hard palate, soft palate, nose (not so common) and eyes (not so common). [7] The cleft may be syndromic, where the patient has more than one malformation or involving more than one developmental field and non-syndromic, if there is only a single malformation or if multiple anomalies are limited to a single developmental field. [8] In this treatise, an attempt has been made to review the etiopathogenesis of CL and CP.

Formation of Orofacial Clefting

Precious [9] summarizes the major processes and events whose disruption, if not compensated for, would lead to the development of clefts. They are as follows: abnormal migration of neural crest cells, altered rates of cell division and/or cells death, abnormal localization of post-migratory neural crest cells, defective epithelial-mesenchymal interactions, gene defects in the production of cell specific molecules such as collagen types I and II or cartilage-specific proteoglycan, defective synthesis, deposition, and/or degradation of extracellular matrices, inability to maintain the differentiated cell state, impaired interactions between skeletal, muscular, nervous, and/or vascular components (impaired functional matrices) because of defective development in one or more of these systems, abnormal hormonal environment because of either defective production of a hormone or impaired receptor function, delays or accelerations in the timing of development, leading to uncoupling of normally coupled processes. [10]

Cohen, [11] summarizes embryonic basis of orofacial clefting may because of the following factors: genetic and/or environmental factors that inhibit the flow of neural crest cells or decrease their number may affect their masses so that contact between the facial prominences are inadequate or impossible, the epithelium that covers the mesenchyme may not undergo programmed cell death so that fusion cannot take place, any change in the position of nasal placodes or abnormal direction of growth of the facial prominences may result in CL. It has been suggested that the tip of the tongue becomes wedged in the labial cleft, thus not allowing the tongue to drop, which would inhibit palatal contact and fusion, resulting in CL and CP.

The embryological development of the face and more specifically the oral region relies on the interplay of different types of cells (ectoderm and endoderm) in a vast range of factors encompassing cell differentiation, growth, apoptosis, cell-cell adhesion and inter- and intra-cellular signaling. So the etiology of clefting may be due to disruption of a gene controlling one or more of these factors, inhibition of cell function by environmental teratogens and combination of the two. Thus CL, CP and CLP are complex, multi-factorial in nature and are likely outcome of several developmental and biochemical events. [12]

Genetics

Much of the evidences support the view that genetic factors are associated with orofacial clefting. Sibling risk for CLP is approximately 30 times higher than that for the normal population prevalence. In twins with CLP, concordance is far greater for monozygotic twins (40%) than for dizygotic twins (4.2%). [8][12][13] Thus orofacial clefting is heterogeneous and variation in liability is probably determined by a number of factors such as: major genes, minor genes, environmental factors and a developmental threshold. [14]

Genetic hypotheses for the etiology of CL and CP have evolved considerably, despite numerous extensive investigations; however, no simple Mendelian pattern of inheritance is readily apparent. This has led to the proposal by different authors of a variety of genetic modes of inheritance including: dominance, recessiveness, sex linkage and various conditions such as incomplete penetrance and variable expressivities.

Autosomal dominant gene

The Journal for Dentistry. Photon 111 (2015) 255-259
https://sites.google.com/site/photonfoundationorganization/home/the-journal-of-radiology
Original Research Article. ISN: 5472-8618: Impact Index: 4.47

The Journal for Dentistry — Photon

Comparative Evaluation of Salivary Total Protein Levels in Patients with Cleft Lippalate to Healthy Children in Mixed Dentition Age Group

Rahul R. Deshpande[a*], Samrat Sabhlok[a], Vishwas Patil[a], Shreya Dasgupta[a*], Ankit Kumar[a], Shubham Singh[a]

[a] Dr. D. Y. Patil Dental College and Hospital, Pimpri, Pune -18, Maharashtra, India
[b] Deenanath Mangeshkar Hospital, Pune, India

Rahul R. Deshpande, Samrat Sabhlok, Vishwas Patil, Shreya Dasgupta, Ankit Kumar and Shubham Singh are conferred with International Prodeomics Research Award-2014

Article history:
Received: 12 December, 2014
Accepted: 14 December, 2014
Available online: 13 April, 2015

Keywords: saliva; total proteins, cleft lip and palate (CLP), mixed dentition, saliva

Corresponding Author:
Dr. Dasgupta S.*
B.D.S.
Email: shreya_writeme@yahoo.co.in

Dr. Deshpande R. R.
M.D.S. Pedodontics and Preventive Dentistry

Dr. Sabhlok S.
M.D.S. Oral and Maxillofacial Surgery

Dr. Patil V.
M.D.S. Pedodontics and Preventive Dentistry

Dr. Kumar A.
B.D.S.

Dr. Singh S.
B.D.S.

Abstract

Cleft lip and palate is a common developmental defect which disfigures the happy smile of a new born. The commonly used laboratory diagnostic procedure involves the analysis of cellular and chemical constituents of blood, which is an invasive. This study focuses on a non-invasive method to compare the levels of total proteins in saliva of children with cleft lip and palate and healthy children to aid as a bio-marker for further studies. The procedure involves the analysis and comparison of salivary total protein levels in healthy individuals with those with cleft lip and palate in mixed dentition age group. The saliva was allowed to drool into the funnel held to the lower lip. Diluted saliva sample were subjected to inductively coupled plasma emission spectroscopy. The total proteins and free amino acids were detected by liquid chromatography coupled with mass spectrometry (LC-MS). Physical properties of saliva in healthy and in cleft lip and palate showed a marked difference. The salivary total protein levels demonstrated higher levels of total proteins in patients with the cleft lip and palate defect than healthy children. Saliva offers an alternative to serum as a biologic fluid that can be analyzed for diagnostic purposes.

Citation:
Deshpande R.R., Sabhlok S., Patil V., Dasgupta S., Kumar A., Singh S., 2015. Comparative Evaluation of Salivary Total Proteins Levels in Patients with Cleft Lippalate to Healthy Children in Mixed Dentition Age Group. The Journal for Dentistry. Photon 111, 255-259.

Photon Igniter: ISN5472861820764713042015

1. Introduction

1.1 Importance of Saliva

Saliva is one of the most important protective body fluids but remains the least understood (Bhalla et al., 2010). Saliva has various functions in the oral environment like clearing of food debris and bacteria, buffering capacity on tissue damaging strong bases and acids, providing saturated solution of calcium needed in re mineralization of teeth; it also has antibacterial, anti fungal and antiviral capacity (Kauffman et al., 2002).

1.2 Saliva as a Diagnostic tool

Components of saliva, therefore, may serve as biomarkers because the composition of oral fluid is responsive to behavioural, mechanical, genetic or ontogenetic stimuli (Sivakumar et al., 2009). The recent development of saliva as a diagnostic medium has placed dentistry at the forefront of monitoring systemic health and disease and has served saliva as a ' Tearless' diagnostic tool. The most commonly used laboratory diagnostic

Prevalence of caries in Brazilian children with cleft lip and/or palate, aged 6 to 36 months

Agda Maria de Moura
Marcia André
Margareth Torrecillas Lopez
Reinaldo Brito e Dias

Department of Maxillofacial Surgery, Prosthesis and Traumatology, Faculdade de Odontologia, Univ de São Paulo - USP, São Paulo, SP, Brasil.

Declaration of Interests: The authors certify that they have no commercial or associative interest that represents a conflict of interest in connection with the manuscript.

Corresponding Author:
Agda Maria de Moura
E-mail: agdamoura@usp.br

Submitted: Aug 28, 2012
Accepted for publication: Jan 28, 2013
Last revision: Feb 09, 2013

Abstract: The aim of this study was to assess the prevalence of caries in children with cleft lip and/or palate aged 6–36 months of life. This study was conducted at the University of São Paulo School of Dentistry, Brazil. A total of 143 children were selected (73 male, 70 female), all of whom had at least two erupted teeth. The children were distributed as follows: 88 had cleft lip and palate, 35 had cleft palate, 20 had cleft lip. Dental caries disease was diagnosed according to criteria set by the World Health Organization. It was observed that 18.9% of the study children had caries. No correlation between prevalence of caries and gender or type of cleft was observed. Mean dmf-t was 0.47. The prevalence of caries was higher in the upper arch, and the most affected tooth was the central incisor ($p = 0.001$). Children with cleft lip and/or palate did not have high caries indices.

Descriptors: Dental Caries; Prevalence; Cleft Lip; Cleft Palate; Infant.

Introduction

Cleft lip and/or palate are among the most prevalent congenital malformations in humans, and are influenced by complex genetic and environmental factors, with relative recurrence.[1] The international literature reports epidemiological indices of cleft lip and/or palate ranging from 0.87 to 1.03 per 1000 births.[2] These indices are similar to those reported in studies carried out in Brazil.[3]

Although not a major cause of mortality in developed countries, cleft lip and/or palate (CL/P) does cause considerable morbidity among affected children and imposes a substantial financial risk for families with a concomitant societal burden.[4]

CL/P is correlated with esthetic, functional and psychological problems, and calls for early preventive interventions involving a multidisciplinary team.[5]

The parents of cleft patients have higher expectations regarding the effectiveness of surgical treatment. They fail to realize the close connection between oral health or speech rehabilitation and correction of the malocclusion. Therefore, it is difficult to make them understand that early caries and dental loss can affect the success of surgical treatment, orthodontic treatment and speech therapy.[5]

Studies have reported that children with cleft lip and/or palate are at a high risk of dental caries. Zhu *et al.*[6], Al-Wahadni *et al.*[7], and Stec-Slonic

WJD
10.5005/jp-journals-10015-1455
ORIGINAL RESEARCH

Dental Caries and Dental Anomalies in Children with Cleft Lip and Cleft Palate in Bengaluru City, India

[1]Seema Kamble, [2]Shivalinga S Hiremath, [3]Manjunath P Puranik, [4]Rahul Gaikwad, [5]Ashwini Biradar [6]Amol R Gadbail, [7]Sachin C Sarode [8]Gargi S Sarode, [9]Shankargouda Patil

ABSTRACT

Aim: The aim of this study was to assess the association of dental caries and dental anomalies among 5- to 15-year-old children with cleft lip and cleft palate.

Materials and methods: A cross-sectional study was conducted among 500 children with cleft lip and/or cleft palate and 500 children without cleft of the age group 5 to 15 years. The clinical examination was carried out using decayed, missing, and filled teeth (DMFT) by Klein Palmer and Knutson, and dmft by Grubbel and 1997 World Health Organization (WHO) pro forma.

Results: The results showed a statistically significant increase in the prevalence of dental caries in children with cleft lip and/or cleft palate. The mean DMFT was found to be significantly higher in operated children than in the children who were not operated. Other dental abnormalities included an increased frequency of enamel hypoplasia ($p < 0.001$), hypodontia ($p < 0.014$), anterior, unilateral and bilateral cross-bite ($p < 0.001$), and open bite ($p < 0.001$).

Conclusion: The results of this study show that children with cleft have higher prevalence of dental anomalies than the normal children. With increased occurrence of hypoplasia in children with cleft, reduced access for cleaning upper anterior teeth after surgical repair leads to poor oral hygiene status, leading to increased risk to dental caries.

Clinical significance: Given the high caries experience among the children with cleft lip and cleft palate, it is necessary to advocate a more rigorous approach to the prevention of dental disease in these high-risk children. They should therefore, be subjected to regular checkups, oral hygiene advice, diet advice, appropriate fluoride supplementation, and, when required, appropriate referral for secondary care.

Keywords: Cleft lip, Cleft palate, Dental anomalies, Dental caries.

How to cite this article: Kamble S, Hiremath SS, Puranik MP, Gaikwad R, Biradar A, Gadbail AR, Sarode SC, Sarode GS, Patil S. Dental Caries and Dental Anomalies in Children with Cleft Lip and Cleft Palate in Bengaluru City, India. World J Dent 2017;8(4):304-308.

Source of support: Nil

Conflict of interest: None

[1]Department of Public Health Dentistry, Nair Hospital Dental College, Mumbai, Maharashtra, India

[2]Department of Public Health Dentistry, The Oxford Dental College & Hospital, Bengaluru, Karnataka, India

[3]Department of Public Health Dentistry, Government Dental College and Research Institute, Bengaluru, Karnataka, India

[4]Department of Community Dentistry and Oral Epidemiology College of Dentistry, Qassim University, Buraydah, Kingdom of Saudi Arabia

[5]Department of Public Health Dentistry, SB Patil Dental College and Hospital, Bidar, Karnataka, India

[6]Department of Dentistry, Indira Gandhi Government Medical College & Hospital, Nagpur, Maharashtra, India

[7,8]Department of Oral Pathology and Microbiology, Dr. D. Y. Patil Dental College & Hospital, Dr. D. Y. Patil Vidyapeeth, Pune Maharashtra, India

[9]Department of Oral and Maxillofacial Surgery, Division of Oral Pathology, College of Dentistry, Jazan University, Jazan Kingdom of Saudi Arabia

Corresponding Author: Sachin C Sarode, Department of Oral Pathology and Microbiology, Dr. D. Y. Patil Dental College & Hospital, Dr. D. Y. Patil Vidyapeeth, Pune, Maharashtra, India Phone: +919922491465, e-mail: drsachinsarode@gmail.com/ sachin.sarode@dpu.edu.in

INTRODUCTION

Cleft lip and cleft palate are one of the most common congenital craniofacial anomalies. In India, these birth defects affect approximately 1:500 or 1:800 live births. The presence of cleft lip or palate has been associated with developmental anomalies. Numerous surgeries are required to repair oral clefts, and the timing for these surgeries depends on the child's stage of development. For this reason, there has been a great interest in the dental development and the possible differences in the development in the cleft population.[1]

Children with an oral cleft require extra care for their oral health and dentition status.[2] They often need complex and extensive treatment, usually provided by an interdisciplinary team of orthodontists, plastic surgeons, pedodontists, maxillofacial surgeons, speech therapist, and others. Following surgical repair of the cleft, the long-term oral health management of patient revolves around dental caries, malocclusion, and hypoplasia.[3]

Dental caries is still a global public health problem that constitutes the main threat to the children's oral health today.[4] With the presence of cleft in the oral cavity, the maintenance of good oral hygiene is difficult, and the children are more at risk of developing dental caries. Hence, this study was carried out to assess the prevalence

Research Reports: Biological

Massively Increased Caries Susceptibility in an *Irf6* Cleft Lip/Palate Model

Journal of Dental Research 2017, Vol. 96(3) 315–322

DOI: 10.1177/0022034516679376
journals.sagepub.com/home/jdr

B. Tamasas[1,2] and T.C. Cox[2,3,4]

Abstract

Patients with cleft lip/palate (CLP) have been reported, in some studies, to exhibit an increased prevalence of caries, although the underlying cause for this increase is unknown. In genetically defined mouse models, studies of postnatal sequelae associated with CLP have been hampered by neonatal lethality. Using a conditional targeting approach, we ablated the major CLP gene *Irf6* only in the late embryonic oral epithelium (*Irf6 cKO*), bypassing the role of the gene in lip and palate morphogenesis and thus ensuring survival to adulthood. We report that *Irf6* cKO mice present with 1) dysplastic salivary glands due to disruptions of epithelial junctional complexes, likely secondary to elevated activation of RHO GTPases, and 2) increased salivary cell proliferation. These changes result in significantly reduced saliva flow rate and buffering capacity and increased mucus acidity. A marked decrease in expression of CCL27, one of the major mucosal and skin cytokines, was found that correlated with increased bacterial colonization of the oral cavity with the cariogenic pathogen *Streptococcus mutans* and other bacteria. When placed on a high-sugar diet, Irf6 cKO mice show a 25-fold increase in presentation and severity of dental caries as compared with wild-type control mice. Strikingly, within the 8-wk test period, many molars extensively dissolved, and there was progressive loss of the alveolar bone, likely as a result of increased colonization of periodontal pathogens. These data provide the first mechanistic insight into the heightened caries susceptibility associated with CLP and indicate a direct role for the major CLP gene Irf6 in salivary gland development and a significant role in regulating oral immunity. Our data suggest that careful evaluation of salivary gland function and the implementation of early oral health preventive strategies are warranted to reduce the burden of dental care in this at-risk population.

Keywords: orofacial cleft(s), dental caries susceptibility, mucosal immunity, craniofacial biology/genetics, periodontal disease/periodontitis, salivary antimicrobial proteins

Introduction

Cleft lip with or without cleft palate (CLP) requires a multidisciplinary approach to treatment that typically involves developmental age-dependent reconstructive operations and extensive dental management that can last well past puberty (Dixon et al. 2011). Aside from occlusion issues related to the cleft itself, dental anomalies frequently encountered in CLP patients include hypoplastic teeth, supernumerary teeth, microdontia, and enamel hypoplasia (Jagsoor et al. 2009; Walker et al. 2009). Patency between the oral and nasal regions causes the most significant morbidity in patients, compromising feeding as well as breathing. Oronasal patency is also thought to perturb the normal oral flora at a critical time when the teeth are erupting. In addition, the challenges of maintaining oral hygiene secondary to the abnormal teeth and the cleft itself, as well as the prolonged bottle-feeding times required to ensure adequate nutrition, have been proposed to contribute to the increase in caries incidence in this population that has been observed in some studies (Ahluwalia et al. 2006; Wells 2014). Other studies, by contrast, have found no difference in caries risk in patients with nonsyndromic CLP when compared with the general population (Jindal et al. 2011; Tanmure et al. 2012). However, the highly variable expressivity and relatively low penetrance of CLP, the significant diversity in genetic contributions, and the poorly understood gene × environment interactions in both the syndromic and nonsyndromic forms of CLP pose significant challenges to resolving what, if any, biological or behavioral factors might be at play in this population.

Common variants in *IRF6* represent the greatest genetic contribution to nonsyndromic forms of CLP, while more severe mutations cause Van der Woude syndrome (VWS) and popliteal pterygium syndrome (Zucchero et al. 2004). Patients with VWS, the most common syndromic form of CLP, frequently exhibit tooth anomalies and an anecdotally increased prevalence of caries. However, the pathognomonic feature of VWS is paramedian

[1]Departments of Oral Health Sciences, University of Washington, Seattle, WA, USA
[2]Center for Developmental Biology and Regenerative Medicine, Seattle Children's Research Institute, Seattle, WA, USA
[3]Department of Pediatrics (Craniofacial Medicine), University of Washington, Seattle, WA, USA
[4]Department of Anatomy and Developmental Biology, Monash University, Clayton, Victoria, Australia

A supplemental appendix to this article is available online.

Corresponding Author:
T.C. Cox, Center for Developmental Biology and Regenerative Medicine, Seattle Children's Research Institute, MS CW-8, 1900 9th Avenue, Seattle, WA 98101, USA.
Email: tccox@uw.edu

10.5005/jp-journals-10015-1244
REVIEW ARTICLE

A Critical Review of Dental Caries in Individuals with Cleft Lip

Edu Cassiano Hugo Pinto, Elda Garbo Pinto, Simone Soares, Thais Marchini Oliveira, Ana Lucia Pompéia Fraga Almeida, José-Roberto Magalhães Bastos, Roosevelt Silva Bastos

ABSTRACT

Introduction: People with cleft lip and palate (CLP) often have problems with oral hygiene due to the difficulty of obtaining appropriate mechanical biofilm control.

Objectives: To review the literature and to seek an epidemiological profile of dental caries in individuals with CLP.

Materials and methods: In the PubMed database and Web of Knowledge, using the keywords 'dental caries' and 'cleft lip,' 58 studies were collected, of which 13 were selected. After collection of the epidemiological data of dental caries from each paper, the age of the study subjects, the severity of dental caries (DMFT/dmft), and kappa statistics were gathered.

Results: The cross-sectional studies totaled four papers, and there were nine case-control studies; six of them showed a more severe caries index in the case group (CLP), two studies showed the control group (without CLP) having higher caries severity, and one only paper with one age (14 years) indicated higher severity in the control group.

Conclusion: Overall, the rate of dental decay found in individuals with CLP was higher than among people without this condition in the studies evaluated.

Keywords: Dental caries, Cleft lip, Epidemiology.

How to cite this article: Pinto ECH, Pinto EG, Soares S, Oliveira TM, Almeida ALPF, Bastos JRM, Bastos RS. A Critical Review of Dental Caries in Individuals with Cleft Lip. World J Dent 2013;4(4):272-275.

Source of support: Nil

Conflict of interest: None declared

INTRODUCTION

An epidemiology study aims to investigate the frequency and distribution of diseases and health problems in a population as well as their biological and social determinants of health. That is why it becomes possible to plan actions aimed to prevent and control the health problems of population groups. Based on this concept, tooth decay has been combated; however, it is still an important public health problem and the main threat to the oral health of children and, consequently, to adults.[1]

The cleft lip and palate (CLP) comprise a group of craniofacial malformations with an incidence of about one in every 500 to 1,000 births worldwide.[2,3] These individuals often present poor oral hygiene due to the difficulty of obtaining proper dental biofilm control associated with dental anomalies.[4] Many authors[5-15] have reported the prevalence of dental caries in individuals with CLP, taking into account the implications that these malformations may contribute to the incidence of the disease, perhaps due to the difficulty of cleaning and to the lack of guidance and oral histophysiology. Because CLP anomalies have low incidence in any population, few studies have shown the relationship between oral diseases and this congenital condition. This study aimed to perform a review of the literature to identify the dental caries epidemiology profile in individuals with CLP.

MATERIALS AND METHODS

To carry out this literature review, the PubMed database and Web of Knowledge were carried out using keywords registered in Health Sciences Descriptors (DeCs), dental caries and cleft lip, which yielded 58 papers. Of these, 18 journal articles were selected and 13 met the inclusion criteria.

The inclusion criteria adopted were articles containing epidemiological studies with data on the prevalence or incidence of dental caries. The articles excluded were not presenting the control group in case-control studies, used no dental caries index or did not mention the age of the volunteer participants.

Some epidemiologic indicators were collected in this literature review and organized by dental caries data for individuals with CLP in each article. Therefore, the information collected included the geographic location (country), epidemiological design, index criterion, population studied, age of each group and kappa statistics. The odds ratio analyses are not present because the great majority of the authors did not present this important measure.

RESULTS

The cross-sectional studies amounted four papers, and there were six case-control studies; six of them showed a more severe caries index in the case group (CLP), two studies showed the control group (without CLP) having higher caries severity, and one only paper with one age (14 years) showed higher severity in the control group (Table 1). All of the case-control studies presented statistical analyses except for the research conducted by Lucas et al (2000), where other oral health indicators were used to present statistical analyses.

Dental Caries in Children with Cleft Lip and Palate

Wilasrusmee Warasarchakul DDS*,
Wiboon Warasarchakul MD**

*Department of Community Dentistry, Faculty of Dentistry, Khon Kaen University, Khon Kaen, Thailand
**Department of Pediatrics, Faculty of Medicine, Khon Kaen University, Khon Kaen, Thailand

Previous studies have shown that the prevalence of dental caries were high in children with cleft lip/palate. The objective of this present study was to review epidemiology of dental caries and oral health care for preventive measures of dental caries in children with cleft lip/palate. The factors influencing caries risk in cleft children included poor oral hygiene, oral fistula, removable and orthodontic devices, dental anomalies, prolonged night time feeding and consumption of sugary foods. Children and their parents should receive adequate preventive advice about oral health care and the availability of dental treatment. Closer cooperation between pediatric dentists and parents can improve dental health for these children.

Keywords: Dental caries, Cleft lip, Cleft palate

J Med Assoc Thai 2017; 100 (Suppl. 6): S131-S135
***Full text. e-Journal:** http://www.jmatonline.com*

Orofacial clefts (OFC) are very common worldwide with an incidence of 1.7 per 1,000 babies being diagnosed with OFC[1]. The incidence of cleft deformities varies among different races around the world[1]. In Southern Thailand, the prevalence of oral clefts was 1.44 per 1,000 live births, and 15% of the cases had congenital anomalies or a recognized syndrome[2]. Patients with cleft lip (CL), cleft palate (CP), or both (CL/P) generally require extensive treatment by an interdisciplinary team of medical and dental specialists to rectify their cosmetic, speech, hearing, psychosocial, and dento-orthopedic problems. A healthy primary dentition in cleft children is essential for the successful outcomes of orthodontic treatment, oral function, speech development, and space maintenance for dentition. However, achieving optimal dental health in cleft lip/palate children may be difficult, due to the anatomy of the cleft area, malpositioned teeth, scarring, and the consequences of surgical repair that cause immobility of the lip. Early extraction would result in loss of the bone preserved by primary teeth bordering the alveolar cleft and may also hinder good speech development[3].

Dental caries is still a global public health problem and at present, constitutes the main threat to children's oral health. It is commonly believed from studies conducted worldwide that children with cleft lip and palate have an increased risk for caries, an elevated incidence and more untreated cavities, especially in the primary dentition[4,5]. The objective of this paper was to review epidemiology of dental caries and oral health care for preventive measures of dental caries in children with cleft lip/palate. It aimed to alert health care professionals about the importance of oral health care so that appropriate preventive programs may be integrated into the management protocol of the children with cleft lip/palate.

Correspondence to:
Warasarchakul W, Department of Community dentistry, Faculty of Dentistry, Khon Kaen University, 40002, Thailand.
Phone: +66-89-8419615
E-mail: wilwee@kku.ac.th

Epidemiology of dental caries in cleft patients

Dental caries, otherwise known as tooth decay, is one of the most prevalent chronic diseases of people worldwide. Individuals are susceptible to this disease throughout their lifetime. Dental caries forms through a complex interaction over time between acid-producing bacteria and fermentable carbohydrate, and many host factors, including teeth and saliva. *Streptococcus mutans* are important bacteria in the initiation of enamel demineralization. Parisotto et al also undertook a systematic review and concluded that the salivary mutans streptococci level is a strong risk indicator for dental caries[6]. The disease develops in both the crown and root of teeth, and it can arise in early childhood as an aggressive tooth decay that affects the primary teeth of infants and toddlers. Risk for caries includes physical, biological, environmental, behavioral, and lifestyle-related factors such as high numbers of cariogenic bacteria, inadequate salivary flow, insufficient fluoride

DOI Number: 10.5958/0976-5506.2018.00611.3

Association between Maternal Folate Intake and Polymorphism MTHFR A1298C as Risk Factor of Non-Syndromic Cleft Lips

Yayun Siti Rochmah[1], Stefani Harumsari[2], Agung Sosiawan[3], Isni Rajiani[4]

[1]Departement of Oral and Maxillofacial Surgery Faculty of Dentistry, [2]Departement of Biology Faculty of Medicine, Sultan Agung Islamic University, Semarang, Indonesia; [3]Department of Dental Public Health, Faculty of Dental Medicine, Universitas Airlangga, Surabaya Indonesia; [4]Deputy to Chairman, STIAMAK Barunawati, Surabaya, Indonesia

ABSTRACT

Background: Methylenetetrahydrofolate reductase (MTHFR) is often associated with the incidence of orofacial clefts. Folic acid deficiency has gained considerable attention because of its promising role in modulating diverse clinical condition such as cleft. The objective of the study is to describe the association of MTHFR A1298C polymorphism and maternal folate intake with an orofacial cleft in Sasak Population.

Method: This study used control case design, the number of the subjects were 148 who were divided into case groups and their mother (70 issues) and control groups and their mother (78 items). The detection of Polymorphism MTHFR A1298C used PCR-RFLP and sequencing for confirmation. The information on the dietary pattern and folic acid intake used FFQ (Food Frequency Questionnaire).

Results: MTHFR A1298C polymorphism was associated with maternal folic acid intake in Sasak (p = 0,001), OR = 14,7 CI 95% (2,49-85,53) for cases and (p= 0,041), OR = 4,4 CI 95%(0,9-19,16) for control group. Maternal folic acid intake was associated with cleft (p=0,037) OR= 2,7 CI 95% (1,06-6,94) in Sasak Population.

Conclusion: Maternal folic acid was as the risk factor cleft lip/palate in Sasak population and association with MTHFR A1298C Polymorphism.

Keywords: Polymorphism MTHFR A1298C, folic acid, orofacial clefts

INTRODUCTION

The incidence of nonsyndromic cleft lip with or without cleft palate (NS CL/P) remains high in all over the world. In Indonesia, there will be 3000 to 6000 new cases of cleft lip annually accounting for 2.4% or 1.7 per 1,000 live births[1]. In Asian countries such as India, the incidence of cleft lip is high in which 35. 000 babies were born with the cleft[2]. In Africa, the number of people with cleft lip tends to be less (1: 2,500 births)[3]. Multifactorial factors including genetic and environmental are contributing in cleft lips[4]. Methyltetrahydrofolate Reductase (*MTHFR*) A1298C is *MTHFR* genotype variants that are thought to contribute to cleft lip, or palate[5]. *MTHFR* is an enzyme that converts 5, 10methylenetetrahydrofolate from folic acid into 5-methyltetrahydrofolate in folate cycle. The endogenous folate cycle is a predominant methyl donor to remethylate homocysteine (Hcy) into methionine[6]. Pregnant women with MTHFR polymorphism have a higher risk to get folate deficiency[7]. The food sources that rich in folate are liver, fish, and meat, mushroom, green leafy vegetables such as spinach, bean leaves, nuts, and yeast. Food processing can destroy 50-90% of folate content by heating, oxidation, and exposure to ultraviolet light[8]. Dietary folates are conjugated by Gamma-*glutamyl hydrolase*/folate into monoglutamate assisted by Zink[9]. Folate deficiency and abnormal metabolism of folic acid and Hcy play a significant role in the incidence

Corresponding Author:
Yayun Siti Rochmah,
Jl Raya Kaligawe Km.4,
PO BOX 1054, Semarang Central Java of Indonesia.

Caries Experience in Individuals With Cleft Lip and/or Palate in China

Wan Chun Zhu, M.S., Jin Xiao, Ph.D., Yuan Liu, Ph.D., Jun Wu, Ph.D., JiYao Li, Ph.D.

Objective: **To determine the levels of dental caries in subjects with cleft lip and/or palate in China in comparison with controls.**
Design: **A total of 380 subjects with cleft lip and/or palate and 339 noncleft control subjects were examined for dental caries using the decayed-missing-filled-teeth (DMFT/dmft) and decayed-missing-filled-surfaces (DMFS/dmfs) index. A questionnaire was used to acquire subjects' living habits and family socioeconomic status.**
Setting: **West China Stomatology Hospital, Sichuan University.**
Subjects: **Individuals between 3 and 25 years of age.**
Results: **Caries prevalence and scores for dmft/DMFT and dmfs/DMFS were significantly higher in subjects with cleft palates when compared with the noncleft control group ($p < .05$), except 3- to 5-year-old children ($p > .05$). However, in the 3- to 5-year-old group, children with cleft lip and/or palate had significantly more caries than children of the same age with only a cleft lip with or without alveolus ($p < .05$). Children whose clefts had been surgically repaired had a lower dmft and dmfs than those whose clefts had not been surgically repaired ($p < .05$).**
Conclusion: **Individuals with oral cleft are at an increased risk for dental caries. The types of cleft and the surgical repair are two important factors for dental caries.**

KEY WORDS: *cleft lip and/or palate, dental caries, investigation*

The prevalence of cleft lip and/or palate has been reported as 1.80‰ (Qiu Weilin, 2002) in China. Cleft lip and cleft palate is the most common congenital malformation in China. Few studies have been carried out investigating the prevalence of caries among children with cleft lip and/or palate. Furthermore, findings on caries experience in children with cleft lip and/or palate have been inconsistent.

Lauterstein and Mendelsohn (1964) found no statistically significant difference in caries experience between cleft subjects and noncleft subjects. Lucas et al. (2000) also found no significant difference in caries between children with cleft palate and a noncleft group.

However, more studies have shown that cleft lip and/or palate patients have a higher percentage of carious teeth than control subjects. Dahllof et al. (1989) found that Scandinavian children with clefts experienced significantly more caries than did children in a control group, but no significant difference in caries experience was observed among children with different cleft types. Al-Wahadni et al. (2005) found that the scores for the decayed-missing-filled-teeth index (DMFT) were significantly higher in subjects with cleft lip and/or palate than in control subjects. Similar results have been shown by several investigators in other countries (Bokhout et al., 1997; Turner et al., 1998; Besseling and Dubois, 2004; Kirchberg et al., 2004).

In China, Bian et al. (2001) examined 3- to 6-year-old Chinese children with cleft lip and/or palate and found that 75% of them had some caries experience, and 26% had rampant caries. The children with cleft palate had a higher prevalence of rampant caries compared with the children with cleft lip. However, there was no control group.

The aim of this study was to describe the levels of caries in subjects with cleft lip or palate and to compare them with matched noncleft healthy control subjects.

Materials and Methods

Subjects

This investigation was carried out during January and December of 2006 in the Chengdu area. Three hundred eighty individuals with cleft lip and/or palate attending the West China Stomatology Hospital, Sichuan University and 339 noncleft individuals in Chengdu City, between the ages of 3 and 25 years were included in the study. Subjects with multiple abnormalities or recognized syndromes were excluded from this study. Informed consent was obtained from the subject or the parent accompanying each subject.

Mr. Zhu is a student at the Key Laboratory for Oral Biomedical Engineering, Ministry of Education, Chengdu, China, and is now at the Department of Dentistry, North Sichuan Medical College, Nanchong, China. Dr. Xiao, Dr. Liu, and Dr. Wu are students at the Key Laboratory for Oral Biomedical Engineering Ministry of Education, Chengdu, China. Dr. Li is Professor, Department of Operative Dentistry, West China College of Stomatology, Sichuan University, Chengdu, China.
Submitted January 2009; Accepted June 2009.
Address correspondence to Dr. JiYao Li, 14 Ren Ming South Street, Chengdu, Sichuan 610041, China. E-mail: jiyao_li@yahoo.com.cn.
DOI: 10.1597/07-076.1

International Journal of Basic and Applied Medical Sciences ISSN: 2277-2103 (Online)
An Open Access, Online International Journal Available at http://www.cibtech.org/jms.htm
2014 Vol. 4 (1) January-April, pp.338-355/Muhamad et al.
Review Article

CLEFT LIP AND PALATE; A COMPREHENSIVE REVIEW

Abu-Hussein Muhamad, Abdulgani Azzaldeen and Nizar Watted
**Al-Quds University, School Of Dentistry, Jerusalem-Palestine*
**Author for Correspondence*

ABSTRACT

Congenital cleft-Lip and cleft palate has been the subject of many genetic studies, but until recently there has been no consensus as to their modes of inheritance. In fact, claims have been made for just about every genetic mechanism one can think of. Recently, however, evidence has been accumulating that favors a multifactorial basis for these malformations.

Cleft lip and palate (CLP) are birth defects that affect the upper lip and the roof of the mouth. CLP has a multifactorial etiology, comprising both genetic and environmental factors. In this review we discuss the recent data on the etiology of cleft lip and palate.

The etiology of CLP seems complex, with genetics playing a major role. Several genes causing syndromic CLP have been discovered. Three of them—T-box transcription factor-22 (*TBX22*), poliovirus receptor-like-1 (*PVRL1*), and interferon regulatory factor-6 (*IRF6*)—are responsible for causing X-linked cleft palate, cleft lip/palate–ectodermal dysplasia syndrome, and Van der Woude and popliteal pterygium syndromes, respectively; they are also implicated in nonsyndromic CLP. The nature and functions of these genes vary widely, illustrating the high vulnerability within the craniofacial developmental pathways. The etiological complexity of nonsyndromic cleft lip and palate is also exemplified by the large number of candidate genes and loci. To conclude, although the etiology of nonsyndromic CLP is still largely unknown, mutations in candidate genes have been identified in a small proportion of cases. Determining the relative risk of CLP on the basis of genetic background and environmental influence (including smoking, alcohol use, and dietary factors) will be useful for genetic counseling and the development of future preventive measures.

The purpose of the present paper is to present the etiology of cleft lip and cleft palate both the genetic and the environmental factors. It is suggested that the genetic basis for diverse kinds of common or uncommon congenital malformations may very well be homogeneous, whilst, at the same, the environmental basis is heterogeneous.

Keywords: *Cleft Lip, Cleft Palate, Etiology, Genetic, Multifactorial*

INTRODUCTION

A short review of the normal embryonic development of the facial primordia is necessary before reviewing the factors that may interfere with this development leading to clefts of the lip and the palate.

In the developing embryo migration of cell masses, fusion of facial processes and the differentiation of tissues are three important events that lead eventually to an adult appearance. The pattern of development as well as cells respond to environmental signals. Since both factors are present and interact, it is difficult to ascertain the exact role of each of them. Table 1.

The facial primordia (a series of small buds of tissue that forms around the primitive mouth) are made up mainly of neural crest cells that originate from the cranial crest (Ferguson, 1988). Neural crest cells migrate to the primitive oral cavity where, in association with ectodermal cells, form the maxillary processes. Palatal shelves from these processes arise at embryonic day 45 in humans. An intrinsic force, mainly produced by the accumulation and hydration of hyaluronic acid-1, is progressively generated within the palatal shelves and reaches a threshold level which exceeds the force of resistance factors (e.g. tongue). Synthesis and hydration of hyaluronic acid by palatal mesenchyme is stimulated by epidermal growth factor and transforming growth factor beta. The erectile shelf elevating force is partly directed by bundles of type I collagen which runs down the center of the vertical shelf from its base to its tip. Moreover the epithelial covering and associated basement membrane of the palatal shelf exhibit

IJHSR International Journal of Health Sciences and Research
www.ijhsr.org ISSN: 2249-9571

Original Research Article

The Relationship between Salivary IgA Level and Dental Caries in Healthy School-Aged Children in Makkah Al-Mukarramah

Ghofran Mohammed Badabsan[1], Dr. Abla A. Arafa[2]

[1]6th-year Dental Student at College of Dentistry, Umm Al-Qura University, Makkah, Saudi Arabia.
[2]Assistant Professor at Pediatric Dentistry and Dental Public Health Department, Faculty of Dentistry, Misr International University, Egypt at Sabbatical Leave to Umm Al-Qura University, Saudi Arabia.

Corresponding Author: Ghofran Mohammed Badabsan

ABSTRACT

Introduction: Dental caries is considered to be a multifactorial disease, and it affects 60-90% of school-aged children worldwide. Salivary IgA is considered the first line of defense against pathogenic bacteria and their secretions.

Controversial conclusions have been reported regarding the relationship between salivary IgA and dental caries activity; some studies demonstrated high concentrations of salivary IgA in a lower caries activity. Other studies showed high levels of salivary IgA with an increase in caries activity. Some authors did not observe any correlation.

Aim: The aim of the present study is to assess the relation between the level of salivary IgA and dental caries in healthy children living in Makkah city.

Materials and Methods: The study included a total of 90 children of both genders, age range from 7- to 12-year-old. Dental caries was assessed. Stimulated whole salivary samples were collected after dental examination in the morning (from 9 to 11 A.M.) and Saliva flow rates of the subjects were measured. The samples were transported then stored in saliva collection tubes. The salivary IgA levels were measured using Human IgA ELISA kit.

Results and Conclusion: There is a negative correlation between the increase in the mean levels of salivary IgA with the reduction in dental caries activity in children. This would reflect the salivary IgA protective mechanism against dental caries and streptococcus mutans in the whole saliva of low caries-active children.

Keywords: Dental caries, DMFT, deft, salivary IgA, ELISA.

INTRODUCTION

Dental caries is defined as a localized, post-eruptive, pathological process of external origin that involves dissolving of the hard tooth tissue and progressing to the formation of a cavity. [1] Dental caries is considered the most common childhood chronic disease in children aged from 5- to 17-years old and is five times more common than asthma and seven times more common than hay fever. [2] Dental caries is a multifactorial disease, and it affects 60-90% of school-aged children worldwide. [3]

Saliva is a dilute fluid composed of more than 99% water, therefore considered a unique biological fluid. [4] Various components of saliva both organic (peptides and proteins) and inorganic (electrolytes and water) may have a role in protecting teeth from dental caries. [5] Salivary immunoglobulin's include IgA, IgG, and IgM. Salivary IgA contributes almost 60% of the total immunoglobulin count in the saliva. [6]

Original Article

Correlation between dental caries and salivary immunoglobulin in adult Indian population: An *in vivo* study

Mithra Hegde, Darshana Devadiga, Chitharanjan Shetty, Aditya Shetty

Department of Conservative Dentistry and Endodontics, A. B. Shetty Memorial Institute of Dental Sciences, NITTE University, Mangalore, Karnataka, India

Address for correspondence: Dr. Mithra Hegde, Department of Conservative Dentistry and Endodontics, A. B. Shetty Memorial Institute of Dental Sciences, NITTE University, Mangalore, Karnataka, India. E-mail: drmeghdentist@gmail.com

ABSTRACT

Aim: To evaluate the relationship between dental caries and salivary immunoglobulins (S-Igs) in unstimulated saliva of young adults between the age group of 20 and 30 years from South Canara district, Karnataka with varying caries experience as determined by their Decayed Missing Filled Teeth (DMFT) scores. **Materials and Methods:** The study was conducted on 80 healthy adult subjects with age group between 20 and 30 years. The healthy subjects without any chronic diseases were selected. The patients were divided into four groups according to DMFT status (WHO, 1997) as G-I, DMFT 0; G-II, DMFT 1-5; G-III, DMFT 6-10; and G-IV, as DMFT above 10. Unstimulated saliva samples were collected from each subjects and checked for S-IgA and IgG. The obtained data was statistically analyzed using one-way ANOVA and Tukey's Honestly Significant Difference test. **Results:** Correlation of DMFT with S-IgA showed that as the S-IgA levels decreased in the saliva, there was increase in the DMFT levels. With intergroup comparison of S-IgA, there is no significant difference between group I and group II. There was no significant correlation seen between the S-IgG G levels and dental caries experience. **Conclusion:** The S-IgA increases with decrease in caries activity and S-IgG does not show any correlation with dental caries.

Keywords: Dental caries, decayed missing filled teeth, saliva, salivary IgA, salivary IgG

INTRODUCTION

Dental caries is one of the most common microbial infection, but rarely it is a critical disease.[1] Caries is characterized by a localized, transmissible, microbial infectious process that ends up in the destruction of hard dental tissue.[2] There are many factors which can cause dental caries; among which, poor dental hygiene and oral care, family history of dental caries, greater concentration of bacteria in oral cavity with acidophilic activity, decreased salivary flow, more cariogenic diet, and reduced level of fluoride in drinking water are the important factors.[3]

Immunoglobulins (antibodies) are produced by B cells, which are plasma proteins. They are active in the defence against bacterial and viral infections. In the late 19th century, the action of immunoglobulin was first studied by Von Behring and Kitasato. They found that the serum taken from rabbits immune to tetanus toxin could protect nonimmune rabbits from infection.[4] An immunoglobulin is typically a Y-shaped structure consisting of four polypeptide chains–two heavy chains and two light chains. An antigen-binding site is present in each arm.

Access this article online

Quick Response Code:

Website: www.jrsedent.org

ATLANTIS PRESS

Advances in Health Science Research, volume 8

International Dental Conference of Sumatera Utara 2017 (IDCSU 2017)

Original Article

sIgA and Lisozim as Biomarker of Early Childhood Caries Risk

Essie Octiara
Doctoral Student
Faculty of Dentistry, Universitas Sumatera Utara
Medan, Indonesia
eoctiara@gmail.com

Heriandi Sutadi
Department of Pediatric Dentistry
Faculty of Dentistry, Universitas Indonesia
Jakarta, Indonesia

Yahwardiah Siregar
Department of Biochemistry
Faculty of Medicine, Universitas Sumatera Utara
Medan, Indonesia

Ameta Primasari
Department of Oral Biology
Faculty of Dentistry, Universitas Sumatera Utara
Medan, Indonesia

***Abstract*—Caries in children under 6 years old (Early Childhood Caries) is still a major oral health problems in many countries. The high prevalence of ECC should be prevented immediately based on the cause of caries. Saliva is one of the factors that play role in dental caries process, also play a role as caries prevention. This article describes the relationship between sIgA and salivary lysozyme to the incidence of ECC and the development of that protein as one of the caries biomarkers. Several studies reported that sIgA in caries-free children had higher concentrations than in ECC children. Lysozyme concentrations in unstimulated saliva are also significantly higher in the caries-free group compared with the ECC group. Determination of lysozyme and sIgA level in saliva may be helpful in diagnosing caries diseases and infections. It is concluded that the development of sIgA and salivary lysozyme can be used as one of the biomarkers for dental caries detection, risk assessment, diagnosis, prognosis and disease monitoring, and evaluation in ECC.**

Keyword –ECC, sIgA, salivary lysozyme, biomarker

I. INTRODUCTION

Dental caries is still a major oral health problem in many countries including Indonesia. The unique caries lesions in infants, toddlers and preschoolers children are called Early Childhood Caries (ECC). The definition of ECC according to the American Academy of Pediatric Dentistry (AAPD) is the presence of carious lesions on the surface of deciduous teeth (cavity or not cavity), teeth lost by caries or restored teeth in children under 6 years old [1].

ECC epidemiological data from various countries shows varying numbers. In America, ECC incidence in 1 years old children has high prevalence which is 21% and increases in preschoolers age 5 years old by 75% [1,2]. Study in India found that the prevalence of ECC varied by 27.5% [3] to 56.6% [4], while in Northern Thailand, it has higher prevalence which is 68.5% [5].

National data in 2007 and 2013 found that there was an increased in the caries prevalence in Indonesian children, it was reported that caries prevalence in children age 1-4 years old was 6.9% [6], and increased by 3.5% to 10.4% [7]. Prevalence of ECC in children 3 years old and under in Surabaya and Medan was higher than the national data in Surabaya that reported 30.8% [8], while in Medan it was found higher by 57.7% [9].

The high prevalence of ECC in various countries must be prevent immediately based on the caries etiology. Caries occurs not because of one event but due to a series of processes over several periods, therefore caries is expressed as a multifactorial disease. There are three main factors that play role in caries disease which are host factors (teeth and saliva), agents (microorganisms) and substrates or diet and added with time factor. Caries will occur when each factor is mutually supportive [10].

Saliva is one of the factor that play role in dental caries process, also play a role as caries prevention [11]. Therefore, it is possible that saliva is used as a biomarker to assess a person's caries risk. Biomarkers serve to detect, risk assessment, diagnosis, prognosis and disease monitoring and health evaluation [12,13]. Biomarkers can be antibodies, microbes, DNA, RNA, lipids, metabolites and proteins. The change in concentration, structure, function, or action in analyte can be attributed to the onset, developmental regression of a particular disorder or the outcome of how the body responds [14]. Biomarkers are assessed through quantitative tests to determine specificity, sensitivity and reproducibility [13].

Increased use of saliva as a non-invasive diagnostic tool has been developed recently. Non-invasive methods will avoid patient's discomfort or fear in detecting the disease, because in sampling does not cause any pain. Besides economical, saliva is easily collected, delivered, and stored so that there is a decrease in overall costs for patients and healthcare providers [15].

Saliva protein that can be used as dental caries biomarkers which serve as immune and nonimmune antimicrobial factors [16]. The main salivary immune factor is secretory IgA (sIgA) [17], while non-immune factors in saliva include lysozyme, lactoferrine, salivary peroxidase, aglutinin, histatine, cystatine, secretory

jurnal material kedokteran gigi
ISSN 2302-5271

Secretory iga sebagai bagian reaksi sistem imunitas mukosa oral akibat aplikasi material kurang tepat

Winny Yohana
Bagian Oral Biologi Fakultas Kedokteran Gigi Universitas Padjadjaran

Abstrak

Kesehatan rongga mulut tergantung pada integritas mukosa. Dalam sistem pertahanan tubuh termasuk kulit, mukosa, saluran nafas merupakan garis pertahanan terdepan terhadap infeksi. Mikroorganisme dan dental material yang masuk dalam rongga mulut merupakan benda asing yang dapat menimbulkan reaksi sistem imun. yang dikoordinasi oleh sel limfosit. Reaksi sistem imun berguna untuk mempertahankan keutuhan tubuh terhadap antigen, mengeliminasi komponen tubuh yang sudah tua (homeostatis), dan sebagai fungsi pengawasan dengan menghancurkan atau mematikan sel. Reaksi sistem imun yang terjadi dapat alamiah atau spesifik. Faktor yang penting dalam imunitas rongga mulut adalah integritas mukosa oral dan fungsi komponen salivary. Imunoglobulin A sekretori (sIgA) adalah imunoglobulin yang paling penting dalam saliva, dan memberikan peran perlindungan yang sangat besar bagi mukosa oral dari infeksi.

Kata kunci: sIgA, mukosa oral

Abstract

Oral health depends on the integrity of the mucosa. In the immune system, including skin, mucosa, respiratory tract is a leading of defense against infection. Microorganisms and dental materials in the oral cavity are foreign objects that can cause immune system reactions. The immune system coordinated by lymphocytes. The reaction of the immune system allows you to maintain the integrity of the body to an antigen, eliminating the aged cell (homeostasis), and to control death cell. The reaction of the immune system can occur naturally or specific. An important factor in the immunity of the oral cavity is a function of the integrity of the oral

Korespondensi:

Winny Yohana
Bagian oral Biologi fakultas Kedoktetergan gigi, Universitas Padjadjaran.
Jl. Sekeloa Selatan No. 1 Bandung

PERAN IMUNOGLOBULIN A (SIgA) DALAM MENGHAMBAT PEMBENTUKAN BIOFILM STREPTOKOKUS MUTANS PADA PERMUKAAN GIGI

(ROLE OF IMMUNOGLOBULIN A (SIgA) IN INHIBITING BIOFILM FORMATION OF STREPTOCOCCUS MUTANS ON THE TOOTH SURFACES)

Maulida Hayati, Herry Herman, Andri Rezano

Pascasarjana Program Magister Ilmu Kedokteran Dasar (Oral Biologi)
Fakultas Kedokteran Universitas Padjadjaran
Jl. Prof. Eyckman No. 38 Bandung 40161
E-mail: maulidahayati81@gmail.com

Abstract

Secretory IgA (SIgA) is an antibody class present in the saliva. It is formed as dimeric IgA by local plasma cells (PCs) in the stroma of salivary glands and subsequently transported through secretory epithelia by the polymeric Ig receptor (pIgR), otherwise called membrane secretory component (SC). On the mucosal surface, SIgA antibodies together with mucous performed immune exclusion of antigen. The article was to determine the role of SIgA in improving oral mucosal defense against pathogenic bacteria Streptococcus mutans. These bacteria are the major etiology of dental caries, through its ability to adhere to a solid surface. Adhesion allows colonization of the tooth surface through the formation of the protective biofilm. Adhesion is inhibited by SIgA by interfering with bacterial adhesion protein called Ag I/II. This ability allow SIgA to prevent adhesion, hence, prevent the initiation of caries. In conclusion, secretory of SIgA saliva to Ag I/II of Streptococcus mutans has shown to be able to prevent colonization in human oral cavity.

Key words: antigen I/II, Streptococcus mutans, secretory IgA (SIgA)

Abstrak

Sekretori IgA (SIgA) adalah salah satu kelas antibodi yang terdapat dalam saliva, yang dihasilkan dalam bentuk dimerik IgA oleh sel plasma lokal (PCs) pada stroma glandula saliva dan kemudian ditransportasi melalui epitel sekretori oleh polimer Ig reseptor (pIgR), yang disebut juga dengan membran komponen sekretori (SC). Pada permukaan mukosa SIgA bersama dengan mukus akan mengakibatkan antigen-antigen. Tujuan penulisan artikel ini adalah untuk mengetahui peran SIgA dalam meningkatkan pertahanan mukosa mulut terhadap bakteri patogen Streptokokus mutans. Bakteri ini merupakan penyebab utama terjadinya karies gigi, karena kemampuannya untuk melekat pada permukaan gigi, yang memungkinkan terbentuknya kolonisasi pada permukaan gigi melalui pembentukan biofilm. Perlekatan Streptokokus mutans ini akan dihambat oleh SIgA dengan mengganggunya protein perlekatan bakteri yang disebut Ag I/II. Hal ini memungkinkan SIgA untuk mencegah perlekatan bakteri pada permukaan, sehingga dapat mencegah inisiasi terjadinya karies gigi. Sebagai kesimpulan, sekresi SIgA saliva terhadap Ag I/II Streptokokus mutans telah terbukti dapat mencegah kolonisasi bakteri tersebut di rongga mulut manusia.

Kata kunci: antigen I/II, Streptokokus mutans, sekretori IgA (SIgA)

PENDAHULUAN

Masalah kesehatan gigi dan mulut terutama karies gigi di Indonesia masih memiliki angka prevalensi yang tinggi, hal ini dapat dilihat dari data RISKESDAS (Riset Kesehatan Dasar) tahun 2013, yang menyatakan bahwa prevalensi karies tertinggi terjadi pada usia produktif. Pada usia 35-44 tahun terdapat prevalensi karies sebesar 30,5% dan pada usia 45-54 tahun sebesar 31,9%. [1]

Karies gigi pada manusia merupakan penyakit infeksi yang menyerang jaringan keras rongga mulut yaitu gigi, yang melibatkan bakteri. Streptokokus mutans adalah salah satu bakteri patogen rongga mulut yang merupakan agen etiologi utama karies gigi.[2] Bakteri ini telah disepakati sebagai agen utama etiologi karies gigi pada manusia dan binatang coba, karena bakteri ini ditemukan pada populasi yang

Clinical, Cosmetic and Investigational Dentistry

Dovepress

open access to scientific and medical research

Open Access Full Text Article

ORIGINAL RESEARCH

The role of salivary sIgA as protection for dental caries activity in Indonesian children

This article was published in the following Dove Press journal:
Clinical, Cosmetic and Investigational Dentistry

Pratiwi Soesilawati[1]
Hari anto Notopuro[2]
Yuliati Yuliati[1]
Maretaningtias Dwi Ariani[3]
Muhammad Alwino Bayu Firdauzy[4]

[1]Department of Oral Biology, Faculty of Dental Medicine, Universitas Airlangga, Surabaya, Indonesia; [2]Department of Biochemistry, Faculty of Medicine, Universitas Airlangga, Surabaya, Indonesia; [3]Department of Prosthodontics, Faculty of Dental Medicine, Universitas Airlangga, Surabaya, Indonesia; [4]Faculty of Dental Medicine, Universitas Airlangga, Surabaya, Indonesia

Purpose: The aim of this study is to asses the relationship between the level of sIgA and dental caries experience in healthy children who are 6- to 9-years-old from Indonesia. The case-control study is conducted to determine the protective role of salivary secretory immunoglobulin A (sIgA) levels in the stimulated whole saliva of dental caries-active and caries-free children.

Methods: This research was done by stimulating the whole saliva which had been collected from 6- to 9-years-old children with the index *dgf-t*≥3 of 30 children as the caries-active children group and 30 children with *dgf-t*<3 as the low caries-active children group. Saliva samples were collected in sterile vials between 10 am-12 pm due to the circadian rhythm, which is at least one hour after last meal. 1,5 ml of collected salivary sample was centrifuged, then the supernatants was transferred to other tube and stored immediately to the laboratory at a temperature of –20°C. The estimation of sIgA concentration was done by using ELISA. The differences in the level of sIgA between the two groups with caries were analyzed using the *t*-test afterward.

Results: The total salivary concentration of sIgA was statistically significantly higher in the low caries-active children group than in the caries-active children group.

Conclusion: The total salivary concentration of sIgA was statistically and significantly higher in the low caries-active children group than caries-active children Group. There is a negative correlation between sIgA level and dental caries activity of 6 to 9-years-old children.

Keywords: sIgA level, ELISA, dental caries, Indonesia

Introduction

Dental caries is an infectious disease that causes health problems in some developed and developing countries. Based on Republic of Indonesia Basic Health Research in 2018, the *dgf-t* index in Indonesian children who are 6- to 9-years-old is 92,746.[1]

The risk of dental caries is controlled by saliva due to the presence of *Secretory Immunoglobulin A* (sIgA) as an antibacterial substance. Factors that play a role in the development of dental caries are the host response, bacteria in plaque as antigen, quality and quantity of diet, and time. Genetic and environmental factors are considerated to contribute to an increased risk of dental caries. A previous research has shown that there is a relationship between the genetic aspect and the immune response to dental caries.[2] Genetic factors have an impact on the introduction of antigen, immune response and dietary patterns. A research on humans and animals proves that genetic differences causes immunomodulatory deviations from antigens in which they play a role in dental caries.[3–11]

Correspondence: Pratiwi Soesilawati
Department of Oral Biology, Faculty of Dental Medicine, Universitas Airlangga, Jl. Prof. Dr. Moestopo No. 47 Surabaya, East Java, Indonesia
Tel +62 31 503 0255
Email pratiwi-s@fkg.unair.ac.id

RESEARCH BRIEF

Salivary SIgA and Dental Caries Activity

JYOTI G CHAWDA, NANDINI CHADUVULA, HEMALI R PATEL, SHIKHA S JAIN AND ARTI K LALA

From the Department of Oral Pathology, Government Dental College and Hospital, Ahmedabad, India.

Correspondence to:
Dr Nandini Chaduvula,
Room number 12,
Dental PG Hostel,
Civil hospital campus, Asarwa,
Ahmedabad, India.
nandini_srt@yahoo.com
Received: September 5, 2010;
Initial review: October 07, 2010;
Accepted: December 14, 2010

This case-control study was conducted to determine the protective role of salivary secretory immunoglobulin A (SIgA) levels in the unstimulated whole saliva of dental caries active (Group I and II) and caries free children (Group III). Thirty children aged 4-8 years were selected. Their DMFT (Decayed Missing Filled teeth for permanent teeth) and/or df-t (decayed, filled teeth for deciduous teeth) scores were determined and the salivary SIgA levels were measured using Immunoturbidometry. SIgA levels of all three groups were in the the normal range of 4-30 mg/dL. The SIgA levels for both Group I and II were less than that in Group III (*P*=0.018 and *P*=0.0013, respectively).

Key words: *Child, Dental caries, Immunoglobulin A, India.*

Dental caries is a multifactorial disease and one of the major contributing factors is saliva [1]. Secretory immunoglobulin A (SIgA) is the prominent immunoglobulin in whole saliva and is considered to be the main specific defense mechanism in the oral cavity. SIgA helps in prevention of dental caries by inhibition of bacterial adherence, reduction of hydrophobicity, aggluti-nation of bacteria and inactivation of bacterial enzymes and toxins [2-4]. Several studies on the role of SIgA in prevention of dental caries showed contradictory results [5-7]. We compared the SIgA levels in the unstimulated whole saliva of caries free and caries active children to determine the role of SIgA in protection from dental caries.

Methods

Thirty children of both sexes, aged 4-8 years were selected randomly, from those who were enrolled. Their DMFT (decayed missing filled teeth for permanent teeth) and/or df-t (decayed, filled teeth for deciduous teeth) scores were determined and were then divided into three groups. Group I: 10 children with DMFT and/or df-t=1-5 (Low caries activity), Group II: 10 children with DMFT and/or df-t=6-10 (high caries activity), and Group III: 10 caries free children. For the children with mixed dentition, the sum total of DMFT and df-t was considered [8]. The inclusion criteria for subject recruitment were: co-operative behavior, normal growth and development, and good oral hygiene. The exclusion criteria were: congenital or systemic disease, protein energy malnutrition, obesity, dental abscesses, use of antibiotics in the past 7 days, and oral exposure to food in past two hours of sample collection.

After obtaining an informed consent from the parents or guardians, unstimulated whole salivary samples were collected in sterile vials. All the salivary samples were collected between 10-12 AM in order to prevent any differences in the concentration of the saliva due to the circadian rhythm. Children were asked to pool the saliva in the floor of mouth and spit the collected saliva at an interval of 5 minutes. After collection of 0.5mL of salivary sample, it was transported immediately to the laboratory at a temperature of –70°C.

The estimation of SIgA concentration was done

Review

Future Microbiology

Role of secretory immunoglobulin A and secretory component in the protection of mucosal surfaces

Blaise Corthésy
R&D Laboratory of the Department of Immunology & Allergy, University Sitate Hospital (CHUV), Rue du Bugnon 46, 1011 Lausanne, Switzerland • Tel.: +41 213 140 783 • Fax: +41 213 140 771
• blaise.corthesy@chuv.ch

The contribution of secretory immunoglobulin A (SIgA) antibodies in the defense of mucosal epithelia plays an important role in preventing pathogen adhesion to host cells, therefore blocking dissemination and further infection. This mechanism, referred to as immune exclusion, represents the dominant mode of action of the antibody. However, SIgA antibodies combine multiple facets, which together confer properties extending from intracellular and sensorial neutralization of antigens, activation of non-inflammatory pathways and homeostatic control of the endogenous microbiota. The sum of these features suggests that future opportunities for translational application from research-based knowledge to clinics include the mucosal delivery of bioactive antibodies capable of preserving immunoreactivity in the lung, gastrointestinal tract, the genito-urinary tract for the treatment of infections. This article covers topics dealing with the structure of SIgA, the dissection of its mode of action in epithelia lining different mucosal surfaces and its potential in immunotherapy against infectious pathogens.

Mucosal surfaces comprising the gastrointestinal, respiratory and urogenital mucosae represent a large port of entry (400 m² in humans) [1] for many pathogens and thus have to be efficiently protected. This goal is achieved by a combination of constitutive, innate factors (e.g., mucus, lysozyme, lactoferrin and defensins) and induced, specific immune mechanisms involving cellular and antibody responses [2]. The chief antibody at mucosal surfaces is secretory IgA (SIgA) [3,4], a multimeric structure made of polymeric IgA (pIgA) produced by activated B cells [2,5] in the mucosal epithelium and of secretory component (SC), which is derived from the polymeric Ig receptor (pIgR) and ensures selective transcytosis of pIgA across the epithelial cells of mucous membranes [6]. Once in secretions, SIgA binds antigens, thus preventing their adhesion and adsorption to the luminal epithelial surface and facilitating their elimination by peristalsis or mucociliary movements, a phenomenon termed immune exclusion [7].

In the gut, SIgA production depends on intricate mechanisms involving antigen sampling by M cells [8,9], processing by underlying antigen-presenting cells including dendritic cells [10] and B cell switching in the Peyer's patch and neighboring lamina propria [11–15]. Multiple cytokines, including TGF-β, IL-4, IL-5, IL-6 IL-10, are instrumental to intestinal SIgA production, yet discrepancies between *in vitro* and *in vivo* data remain, leading to controversy as to their physiological function. The same set of cytokines are required for maintaining tolerance and IgA switch and production, thus establishing a link that can partly explain why mucosal SIgA are considered as non-inflammatory in the mucosal environment [16].

Structural features of secretory IgA

In humans, there are two IgA subclasses, IgA1 and IgA2, which differ in the hinge region where IgA2 lacks a proline-rich sequence of 13 amino acids present in the IgA1 antibody. This difference confers resistance to proteases produced by a variety of bacteria to IgA2 [15]. IgA2 has three allotypes referred to as IgA2m(1), IgA2m(2) and IgA2m(3); the latter is a hybrid molecule resulting from gene shuffling involving combination of IgA2m(1) and IgA2m(2) Cα domains [16]. The overall domain organization of IgA (Figure 1) resembles IgG in that it is comprised of three constant domains (Cα1, Cα2 and Cα3) with the hinge region separating Cα1 and Cα2. In IgA1, the light chains are disulfide bridged to the heavy chain via Cys133 in the Cα1 domain. In IgA2m(1), the light and heavy chains are not disulfide-linked [17], due to the presence of an aspartic acid at this position [18]. However, IgA2m(2) and IgA2m(3) form heavy chain–light chain disulfide bonds through another cysteine in Cα1 domains. The Cα3 domain carries an additional 18 amino acid C-terminal portion, the tail piece, which enables the formation of pIgA upon incorporation of the joining (J)

Keywords
• commensal • epithelium • homeostasis • infectious agent • mucosal immune defence • secretory immunoglobulin A

future medicine part of fsg

Original Article

Correlation of total salivary secretory immunoglobulin A (SIgA) and mutans specific SIgA in children having different caries status

Soumen Pal, Malay Mitra[1], Jiban Mishra[2], Subrata Saha[3], Bhaswar Bhattacharya[3]

Departments of Pedodontics and Preventive Dentistry, Anadh Dental College and Hospital, Jamshedpur, Jharkhand, [1]Dr. R. Ahmed Dental College and Hospital, [2]Burdwan Dental College and Hospital, Kolkata, West Bengal, India

ABSTRACT

Background: Relation between secretory immunoglobulin A (SigA) and dental caries still imprecise. Studies have been conducted either for total SigA or mutans specific SigA with bizarre results. **Aim:** The aim of this study is to find out the relationship between mutans antigen specific SigA and total salivary SigA and its influence in caries status in children. **Materials and Methods:** A total of 45 children aged between 6-14 years were divided based on their caries index (decayed, missing, filled, extracted tooth) score in high moderate and no caries group and their saliva were analyzed with enzyme linked immunosorbent assay for total SigA and mutans specific SigA. **Results:** High caries group showed high mutans specific SigA, but less total SigA, whereas low caries group showed the reverse. **Conclusion:** The mutans specific SigA and total SigA has a weak, but negative correlation in children potentiating caries inhibitory action of SigA.

KEYWORDS: Antigen, caries, saliva, secretory immunoglobulin A, Streptococcus mutans

Address for correspondence:
Dr. Soumen Pal,
Departments of Pedodontics and Preventive Dentistry, Jamshedpur, Jharkhand, India.
E-mail: drsoumenpal@gmail.com

Access this article online
Quick response code
Website: www.jisppd.com
DOI: 10.4103/0970-4388.121831
PMID: ——

Introduction

Salivary secretory immunoglobulin A (SIgA) has an immunological control over dental caries and persuambly prevents the adherence of cariogenic microorganisms to hard surfaces and may also inhibit the activity of glucosyltransferases.[1,2] Studies, which evaluated the role of total salivary SIgA and caries prevalence or mutans antigen specific SIgA and prevalence of caries in children showed variant relationship between them. However,this leads to some confusion. With total salivary SigA, there have been results of positive, negative even no correlation with dental caries status of the children.[3] The same thing can be noticed with mutans specific SIgA also. Since total SIgA in saliva can be formed against other common oral pathogens,[4] so it can not be conclusive to evaluate its role against specifically in caries protection. On the other hand, it is also true that the amount of total salivary SIgA will determine the immunity status of the patient.[5] Again the amount of mutans specific SIgA in the same patient will give evidence of protection of salivary SIgA against that particular pathogen. However only a few studies have evaluated the interrelation between the total SIgA of saliva and mutans specific SIgA of saliva in the same patient having different caries status. Hence,aim of this study is to evaluate the interrelation of total salivary SIgA and mutans specific SIgA in children having different caries status in mixed dentition by enzyme linked immunosorbent assay (ELISA).

Materials and Methods

In this cross-sectional analytical study, 45 children in the age group of 6-14 years were selected with caries index ranging from 0 to 15 (decayed, missing, filled, extracted tooth) based on the criteria that they should not be immune compromised and having a good quality to expectorate.

10.5005/jp-journals-10024-2314

ORIGINAL RESEARCH

Evaluation of Total Salivary Secretory Immunoglobulin A and *Mutans*-specific SIgA among Children having Dissimilar Caries Status

[1]Sunil Pandey, [2]Mahima Goel, [3]Ravi Nagpal, [4]Ankita Kar, [5]Eliezer Rapsang, [6]Priya Matani

ABSTRACT

Introduction: The occurrence of dental caries has become quite a common phenomenon nowadays. The varying levels of salivary secretory immunoglobulin A (SIgA) usually determine the progression of caries. The present study was aimed to determine the correlation between SIgA and *mutans*-specific antigen SIgA in children having different caries status. Scanning electron microscopic analysis was also completed to correlate the results.

Materials and methods: This study comprised 60 subjects, who were divided into three groups depending on caries status. In all, saliva was collected to determine the level of SIgA and *mutans*-specific antigen SIgA using enzyme linked immunosorbent assay (ELISA). The World Health Organization (WHO) criteria and method were used to evaluate dental caries. Bradford reagent was used to evaluate the levels of protein in the antigen. Furthermore, 20 sections of enamel were randomly obtained to estimate the severity of caries development among groups.

Results: Categorical characteristics among all groups were compared by basic statistical analysis and Chi-squared test. Mean age (years) was found to be 9.214 ± 2.28, 9.5 ± 2.51, and 10.2 ± 2.35 in groups I, II, and III respectively. *Mutans*-specific IgA level (µg/mL) was 34.63 ± 7.46, 28.24 ± 4.52, and 23.56 ± 1.62 in groups I, II, and III respectively. Total SIgA (µg/mL) was 142.53 ± 22.4, 186.10 ± 24.70, and 214.8 ± 27.56 in groups I, II, and III respectively. Caries Index was 6.74 ± 2.16, 2.32 ± 0.66, and 0 ± 0 in groups I, II, and III respectively.

Conclusion: Immunoglobulin A is dominantly present in saliva and it plays a significant role in prevention of dental caries. Hence, dental caries is more likely to develop in subjects with low level of salivary IgA (high caries index).

Clinical significance: A low level of IgA may be associated with a high risk of developing dental caries. This association may possibly be useful in predicting the future caries status. Accordingly, suitable caries-preventive measures can be selected and employed.

Keywords: Bradford reagent, Dental caries, Enzyme linked immunosorbent assay, Immunoglobulin, Scanning electron microscopy.

How to cite this article: Pandey S, Goel M, Nagpal R, Kar A, Rapsang E, Matani P. Evaluation of Total Salivary Secretory Immunoglobulin A and *Mutans*-specific SIgA among Children having Dissimilar Caries Status. J Contemp Dent Pract 2018;19(6):651-655.

Source of support: Nil

Conflict of interest: None

INTRODUCTION

Dental caries is defined as an irreversible microbial disease of calcified tissue characterized by demineralization of inorganic and destruction of the organic portion of the tooth. It is a common condition in children. It is characterized by the presence of bacteria, such as *Streptococcus mutans*, *Streptococcus aureus*, etc., on the surfaces of teeth, thus leading to destruction and resulting in dental caries.[1] Various studies have reported on the defensive role of salivary SIgA against dental caries in both children and adults. Dental caries is caused by acid production due to degradation of the carbohydrates present in the food by the microorganisms. Thus, the role of salivary SIgA in preventing progression of dental caries

[1]Department of Pedodontics and Preventive Dentistry Government Dental College, Raipur, Chhattisgarh, India

[2]Department of Oral and Maxillofacial Surgery, Maharaja Ganga Singh Dental College & Research Centre, Sri Ganganagar Rajasthan, India

[3-6]Department of Conservative Dentistry and Endodontics Maharaja Ganga Singh Dental College & Research Centre, Sri Ganganagar, Rajasthan, India

Correspondence Author: Sunil Pandey, Department of Pedodontics and Preventive Dentistry, Government Dental College, Raipur, Chhattisgarh, India, Phone: +919424259047 e-mail: drsunilpandeymds@gmail.com

Original Article

Analysis of Salivary IgA, Amylase, Lactoferrin, and Lysozyme Before and After Comprehensive Dental Treatment in Children: A Prospective Study

Akhilesh Sharma, Priya Subramaniam, Shebin Moiden

Department of Pedodontics and Preventive Dentistry, The Oxford Dental College and Hospital, Bengaluru, Karnataka, India

Abstract

Objective: This study aimed to evaluate the levels of salivary IgA, amylase, lactoferrin, and lysozyme before and after comprehensive dental treatment in children with early childhood caries. **Design:** Thirty children aged 36–60 months, with a deft score ≥5, were selected for the study. Before dental treatment, paraffin-stimulated whole saliva was collected in a sterile graduated cup for a period of 5 min. The saliva samples were quantitatively analysed for levels of IgA, amylase, lactoferrin, and lysozyme using enzyme-linked immunosorbent assay. Comprehensive dental treatment was carried out in all the children including caries preventive procedures. A second sample of saliva was collected at 3 months following completion of dental treatment. Data obtained was subjected to statistical analysis using Student's *t*-test. **Results:** The mean levels of salivary IgA was significantly reduced from 59.60 µg/ml to 36.42 µg/ml after dental treatment ($P < 0.05$). There was a significant reduction in the levels of salivary amylase from 115.78 µg/ml to 113.33 µg/ml ($P < 0.001$). Following dental treatment, salivary lactoferrin and lysozyme levels were significantly reduced from 3.76 µg/ml and 10.62 µg/ml to 3.44 µg/ml and 10.27 µg/ml, respectively ($P < 0.001$). **Conclusions:** Levels of salivary IgA, amylase, lactoferrin, and lysozyme were reduced significantly at 3 months following comprehensive dental treatment.

Keywords: *Amylase, dental caries, lactoferrin, lysozyme, salivary IgA*

Introduction

Dental caries is an infectious multifactorial disease caused by interplay of tooth, diet, and microorganisms. The development of dental caries requires the presence of cariogenic bacteria and fermentable sugar to form acid leading to demineralization of enamel.[1] Cariogenic microorganisms enter the dental biofilm early in life and can subsequently emerge, under favorable environmental conditions, to cause disease. Occasionally, children with early childhood caries (ECC) have moderate levels of *Streptococcus mutans*, which are generally acquired from their mothers at an early age.[2] The various adaptive host defenses in response to these infections are expressed in saliva and gingival crevicular fluid in the oral cavity.[3]

Specific immune defense against *S.mutans* is considered to be one of the factors in altering the dental caries process. Protection is provided largely by SIgA antibodies which are generated by the mucosal immune system. The various nonspecific antimicrobial agents in saliva such as immunoglobulins, cystatins, lactoperoxidase, lysozyme, and lactoferrin have also shown an interactive effect on the reduction of bacterial growth and metabolism.

The protective mechanism of saliva is necessary for the reduction and prevention of this infectious disease. Saliva has various protective functions due to its physical characteristics and chemical composition. The immune response in the oral cavity is due to the presence of an extensive and specialized mucosa-associated lymphoid tissue.[4] Antimicrobial proteins in saliva constitute immunoglobulins and nonimmunoglobulins such as lactoferrin, lysozyme, mucins, histatins, and lactoperoxidase. Many of these molecules are present in rather low concentrations in the whole saliva, and it should be considered that their effects are cumulative and/or synergistic, resulting in an efficient molecular defense network of the oral cavity.[5] These salivary immunoglobulins include IgA, IgM, and IgG.

Address for correspondence: Dr Priya Subramaniam, Department of Pedodontics and Preventive Dentistry, The Oxford Dental College and Hospital, Bommanahalli, Hosur Road, Bengaluru - 560 068, Karnataka, India. E-mail: drpriyapedo@yahoo.com

How to cite this article: Sharma A, Subramaniam P, Moiden S. Analysis of salivary IgA, amylase, lactoferrin, and lysozyme before and after comprehensive dental treatment in children: A prospective study. Contemp Clin Dent 2017;8:526-30.

Access this article online

Website: www.contempclindent.org

DOI: 10.4103/ccd.ccd_103_17

Quick Response Code:

MEDICAL SCIENCE MONITOR

PRELIMINARY REPORT

eISSN 1643-3750

© Med Sci Monit, 2014; 20: 1095-1100

DOI: 10.12659/MSM.890468

Received: 2014.01.30
Accepted: 2014.02.24
Published: 2014.06.29

The assessment of sIgA, histatin-5, and lactoperoxidase levels in saliva of adolescents with dental caries

Author Contribution: Study Design: A, Data Collection: B, Statistical Analysis: C, Data Interpretation: D, Manuscript Preparation: E, Literature Search: F, Funds Collection: G

E 1 Agnieszka Gornowicz
C 2 Grażyna Tokajuk
D 1 Anna Bielawska
A 3 Elżbieta Mazi orlowska
F 3 Robert Jabłoński
B 4 Anna Wójcicka
CE 5 Krzysztof Bielawski

1 Department of Histaching Medical University in Białystok, Białystok, Poland
2 Department of Periodontal and Oral Mucosa Diseases, Medical University in Białystok, Białystok, Poland
3 Department of Developmental Period Medicine and Pediatric Nursing, Medical University in Białystok, Białystok, Poland
4 Maxillofacial and Plastic Surgery Clinic, Medical University in Białystok, Białystok, Poland
5 Department of Synthesis and Technology of Drugs, Medical University of Białystok, Białystok, Poland

Corresponding Author: Agnieszka Gornowicz, e-mail: agnieszka.gornowicz@umb.edu.pl

Source of support: This investigation was supported by research grant 134-156/P from Medical University of Białystok, Poland

Background: Saliva contains a number of protective factors such as mucins, immunoglobulins (e.g., IgA, IgG, and IgM), and enzymes (e.g., lysozyme and lactoperoxidases) that play an important role in the maintenance of oral health. The aim of this study was to compare levels of sIgA, histatin-5, and lactoperoxidase in saliva of adolescents with dental caries.

Material/Method: Thirty-five adolescents (age 18 years) from high school were examined. Eight subjects with DMF=3 (Group I) and 27 adolescents with DMF>11 (Group II) were enrolled for this study. Clinical evaluation procedures comprised oral examination (including tooth, periodontal, and oral mucosal status) and collection of saliva samples. Saliva was collected for enzyme-linked immunosorbent assay (ELISA) and was used for determination of sIgA, histatin-5, and lactoperoxidase levels.

Results: Our results showed that adolescents with very high intensity of dental caries (DMF>11) had increased levels of sIgA, histatin-5, and lactoperoxidase compared to adolescents with lower intensity of caries. The increase was statistically significant ($p<0.05$).

Conclusions: We suggest that high intensity of caries is associated with increased levels of some salivary components – sIgA, histatin-5 and lactoperoxidase – that possess strong bactericidal or bacteriostatic effects, resulting in aggregation of oral bacteria and their clearance from the oral cavity.

MeSH Keywords: Dental Caries Susceptibility • Histatins • Lactoperoxidase • Saliva

Full-text PDF: http://www.medscimonit.com/download/index/idArt/890468

2082 3 3 26

ORIGINAL ARTICLE

The relationship between salivary IgA levels and dental caries in children

E. Ranadheer, Ullal Anand Nayak[1], N. Venugopal Reddy[1], V. Arun Prasad Rao[2]

Department of Pedodontics & Preventive Dentistry, Kamavati School of Dentistry, Gandhinagar, Gujarat, [1]Mahatma Gandhi dental college, Jaipur, Rajasthan, [2]Rajah Muthiah dental college and hospital, Annamalai University, Tamilnadu, India.

Correspondence:
Dr.E. Ranadheer, M.D.S., Department of Pedodontics & Preventive Dentistry, Kamavati School of Dentistry, 907/A, Uvarsad, Dist: Gandhinagar, Gujarat – 382 422, India.
E-mail: dranadheer@gmail.com

Abstract

Purpose: The aim of the study was to find the relationship between salivary IgA (sIgA) levels and dental caries in children. **Materials and Methods:** A total of 40 children in the age group of 8 to 12 years were selected and divided into two groups. Group I with DMFT score 0 and Group II with DMFT score ≥3. The whole unstimulated sIgA levels were estimated using ELISA method. **Results:** Whole sIgA levels were significantly higher in group II with DMFT score ≥3 as compared with group I with DMFT score 0. **Conclusions:** There was an increase in sIgA levels in cariesactive mouth to give protection mechanism against dental caries and the *Streptococcus mutans* which are active in cariesactive mouth. The sIgA antibodies can play an important role in control of dental caries.

Key words: ELISA, dental caries, DMFT, salivary IgA

Access this article online

Quick Response Code:

Website: www.jsppd.com

DOI: 10.4103/0970-4388.84681

Introduction

Dental caries is a multifactorial disease and one of the major contributing factors is saliva. Salivary components, its flow, viscosity, buffering capacity, etc., play a major role in the prevention, initiation, and progression of the disease. It helps in the prevention of the caries by its antibacterial effect.[1]

Secretory IgA is the main immunoglobulin in secretions, including saliva. It is the first line of defense of the host against pathogens which invade mucosal surfaces. Salivary IgA (s-IgA) antibodies could help oral immunity by preventing microbial adherence, neutralizing enzymes, toxins, and viruses; or by acting in synergy with other factors such as lysozyme and lactoferrin.[2]

Studies have also demonstrated a lower incidence of caries as a result of a high s-IgA concentration [3] and increase in s-IgA levels with increase in caries activity[4,5] and some authors found no correlation between dental caries and IgA levels.[6,7,8]

The aim of this study was to assess the levels of s-IgA in the unstimulated whole salivary samples of caries-free and caries-active children and to correlate the role of s-IgA in prevention of dental caries.

Materials and Methods

Study population

The study was designed and carried out in the department of Pedodontics and Preventive dentistry in collaboration with Department of Biochemistry. A total of 40 children were randomly selected from Chidambaram school children in the age group of 8 to 12 years. Children who had suffered from upper

ORIGINAL ARTICLE

A comparative study of salivary buffering capacity, flow rate, resting pH, and salivary Immunoglobulin A in children with rampant caries and caries-resistant children

Kuriakose S, Sundaresan C[1], Mathai V[2], Khosla E[3], Gaffoor FMA[4]
Department of Pedodontics and Preventive Dentistry, Sri Sankara Dental College, Varkala, Kerala, [1]Departments of Pedodontics and Preventive Dentistry, Sree Mookambika Institute of Dental Sciences, Kulasekharam, Kanyakumari, [2]Conservative Dentistry and Endodontics, Sree Mookambika Institute of Dental Sciences, Kulasekharam, Kanyakumari, [3]Department of Pedodontics and Preventive Dentistry, Mar Baselios Dental College, Kothamangalam, Kerala, [4]Department of Conservative Dentistry and Endodontics, N.I.College of Dental Sciences, Neyyantinkara, Trivandrum, India

Correspondence:
Dr. Chintu Sundaresan, Department of Pedodontics and Preventive Dentistry, 'Mangalya', Era-162, Thottam, Manacaud, Trivandrum - 695 009, India.
E-mail: chintz_dr@yahoo.co.in

Access this article online
Quick Response Code:
Website: www.jisppd.com
DOI: 10.4103/0970-4388.115697

Abstract

Purpose: This study was conducted to identify various factors in the development of rampant type of dental caries in South Kerala children, other than high sucrose intake and poor oral hygiene. This was done by comparing the salivary buffering capacity(BC), flowrate(FR), resting pH and salivary immunoglobulinA(sIgA) levels in children who are caries resistant(CR) and who have rampant dental caries. Materials and Methods: Two study groups, a rampant caries group(RC) with more than five active caries lesions in the early stages and a CR with no caries lesions were selected based on a specific criteria. Unstimulated whole mixed saliva was collected directly from the floor of the mouth for a period of 10 min and the FR was calculated. Resting pH of saliva was measured using color coded pH paper. BC was measured by calculating the amount of citric acid of pH2.5, required to lower the initial pH of saliva down to 3. sIgA levels were also estimated by immunoturbidimetric method, after forming a precipitate of sIgA with specific antisIgA antibodies. Result: The salivary BC, FR, pH and sIgA levels were significantly lower in the RC group when compared to the CR group. Conclusion: This study showed that salivary BC, flowrate, resting pH and levels of sIgA in saliva are risk factors in the development of RC in children.

Key words

Buffering capacity, caries risk, flow rate, immunoglobulin A, rampant caries, salivary parameters

Introduction

Dental caries is a unique multifactorial, infectious disease involving internal defense factors such as saliva, tooth surface morphology and mineralization, general health, nutritional and hormonal status, and a number of external factors such as diet, microbial flora colonizing the teeth, oral hygiene, and fluoride availability.[1] Rampant dental caries is an extreme form of dental caries where multiple caries lesions appear suddenly, almost all teeth are affected and the disease process reaches the pulp at very rapid pace. Affected children are often in great distress due to multiple pulp exposures, do not eat properly, and become malnourished. There is no evidence that the mechanism

JOURNAL OF ORAL BIOLOGY AND CRANIOFACIAL RESEARCH 6 (2016) 67–76
Available online at www.sciencedirect.com
ScienceDirect
ELSEVIER
Journal homepage: www.elsevier.com/locate/jobcr

Review Article

Saliva as a diagnostic tool for oral and systemic diseases

Mohammad A. Javaid[a], Ahad S. Ahmed[b], Robert Durand[c], Simon D. Tran[d,*]
[a]Resident, Periodontics at the University of British Columbia, Vancouver, BC, Canada
[b]PhD Student, Craniofacial Health Sciences, McGill University, Montréal, Québec, Canada
[c]Associate Professor, Faculty of Dentistry, Université de Montréal, Montréal, Québec, Canada
[d]Associate Professor, Faculty of Dentistry, McGill University, Montréal, Québec, Canada

ARTICLE INFO
Article history:
Received 16 July 2015
Accepted 8 August 2015
Available online 9 September 2015
Keywords:
Saliva
Diagnostics
Salivary

ABSTRACT
Early disease detection is not only vital to reduce disease severity and prevent complications, but also critical to increases success rate of therapy. Saliva has been studied extensively as a potential diagnostic tool over the last decade due to its ease and non-invasive accessibility along with its abundance of biomarkers, such as genetic material and proteins. This review will update the clinician on recent advances in salivary biomarkers to diagnose autoimmune diseases (Sjogren's syndrome, cystic fibrosis), cardiovascular diseases, diabetes, HIV, oral cancer, caries and periodontal diseases. Considering their accuracy, efficacy, ease of use and cost effectiveness, salivary diagnostic tests will be available in dental offices. It is expected that the advent of sensitive and specific salivary diagnostic tools and the establishment of defined guidelines and results following rigorous testing will allow salivary diagnostics to be used as chair side tests for several oral and systemic diseases in the near future.

1. Introduction

Early diagnosis of diseases is crucial to prevent complications that could have a negative impact on a patient's quality of life. For instance, ovarian cancer, the fifth most common cancer and cause of death in females, has a 5-year survival rate of 15% when detected at stage 4 in comparison to 93% if diagnosed at stage 1.[1] Similarly, type 2 diabetes, which affects 7% of the adult population, can be solely controlled by diet and change in lifestyle if the diagnosis is made earlier.[2] Furthermore, despite the regular screenings and check-ups, many diseases are undetected until a late phase where morbid symptoms become apparent. To overcome these challenges, researchers are unravelling biomarkers. These biomarkers include genetic material (e.g. DNA, RNA) and protein molecules that reflect the current physiological state of an individual and hence help scientists to better understand the underlying cause of a disease.[3] Over the years, studies have shown that alterations in human genetics can be detected by molecular diagnostics, and anomalies in nucleic acids and proteins present in the patient's body fluids such as blood, cerebrospinal fluid (CSF) and urine can be used as effective biomarkers for disease diagnosis.[4–6] However, many obstacles remain such as lack of

* Corresponding author.
E-mail address: simon.tran@mcgill.ca (S.D. Tran).
http://dx.doi.org/10.1016/j.jobcr.2015.08.006
2212-4268/© 2015 Craniofacial Research Foundation. Published by Elsevier B.V. All rights reserved.

Int. J. Med. Sci. 2018, Vol. 15 823
IVYSPRING INTERNATIONAL PUBLISHER
International Journal of Medical Sciences
2018; 15(8): 823-831. doi: 10.7150/ijms.25146

Review

Compliance with Saliva Collection Protocol in Healthy Volunteers: Strategies for Managing Risk and Errors

Kashi Raj Bhattarai[1], Hyung-Ryong Kim[2]✉, Han-Jung Chae[1]✉
1. Department of Pharmacology and Institute of New Drug Development, School of Medicine, Chonbuk National University, Jeonju, Republic of Korea;
2. Graduate School, Daegu Gyeongbuk Institute of Science and Technology (DGIST), Daegu, 42988, Republic of Korea.
✉ Corresponding authors: Han-Jung Chae, hjchae@jbnu.ac.kr, Tel.: +82-63-270-4454; Hyung-Ryong Kim, hrkim@dgist.ac.kr, Tel: +82-53-785-2605

Received: 2018.01.25; Accepted: 2018.04.14; Published: 2018.05.22

Abstract

Salivary bioscience technologies such as electrophoresis are widely applied for diagnosing systemic health status. Diagnosis using a saliva sample has emerged as a preferred technique since the sample is easy to collect and the method is inexpensive and non-invasive. Salivary diagnostics have even been identified as potential substitutes for serum protein biomarkers. However, the optimal protocol for collecting saliva has not yet been established. In many scientific settings, such as randomized controlled trials, sampling and statistical errors often occur when handling samples from healthy volunteers. These errors can be due to the psychological behavior of the volunteers, subject nonadherance, questionnaire characteristics, collection methods, and/or sample processing. The purpose of the review presented here is to outline the strategies for managing the risk factors and to minimize the sampling errors during saliva collection in healthy volunteers.

Key words: Saliva collection; healthy volunteers; salivary proteomics; psychological stress; sampling errors; risk management

Introduction

Saliva is an important specimen in dental research and in the oral physiology field due to its suitability as a non-invasive diagnostic tool. Saliva has been used to diagnose various autoimmune diseases, diabetes, cardiovascular diseases, dental caries, and other oral diseases [1-3]. Saliva volume and biochemical composition differ among individuals; these parameters are influenced by age [4], sex [5], and diet [6]. Age and salivary flow rate directly influence salivary alpha-amylase activity in healthy individuals [4]. Significantly less unstimulated whole saliva has been observed in unmedicated, denture-wearing healthy females compared to their male counterparts [7]. Obtaining saliva is rapid, simple, and painless, making this sample an uncomplicated tool for disease screening [8]. However, sample collection must be appropriately optimized to reduce error [9]. For example, collection technique and collection duration can both affect cortisol and salivary amylase activity measurements [9]. Collection and processing methods also affect the measured total protein concentration, as well as C-reactive protein and immunoglobulin (IgA) concentrations [8]. Various factors such as assay methods and standards used affect the results obtained by salivary fluid assessment. For instance, saliva samples clarified by centrifugation show lower concentrations of lysozyme than their whole saliva counterparts. In addition, the lysoplate assay method has been shown to yield higher lysozyme concentrations than the turbidimetric assay [10]. Moreover, the rate of saliva secretion varies among healthy individuals. Since the volume differs among individuals, salivary flow rate and other salivary biomarkers differ from individual to individual. This review focuses on the saliva collection procedure, the factors contributing to error, and strategies for error management.

Importance of salivary proteomics in biomedical technology

Research based on saliva proteomics is currently

Advanced Review

Salivary gland development and disease

Aaron Mattingly, Jennifer K. Finley and Sarah M. Knox*

Mammalian salivary glands synthesize and secrete saliva via a vast interconnected network of epithelial tubes attached to secretory end units. The extensive morphogenesis required to establish this organ is dependent on interactions between multiple cell types (epithelial, mesenchymal, endothelial, and neuronal) and the engagement of a wide range of signaling pathways. Here we describe critical regulators of salivary gland development and discuss how mutations in these impact human organogenesis. In particular, we explore the genetic contribution of growth factor pathways, nerve-derived factors and extracellular matrix molecules to salivary gland formation in mice and humans. © 2015 Wiley Periodicals, Inc.

How to cite this article:
WIREs Dev Biol 2015, 4:573–590. doi: 10.1002/wdev.194

FUNCTION AND MORPHOGENESIS—AN OVERVIEW

The salivary glands synthesize and secrete saliva, a viscous fluid essential for digestion, vocalization, taste, remineralization, and overall oral health and well-being.[1] There are multiple salivary glands located in similar positions in mice and humans, including the major salivary glands (1 pair each of submandibular, parotid, and sublingual) that produce 90% of saliva, as well as 600–1000 minor glands. Each of the major glands differs in regards to the composition of saliva produced due to differences in acinar (secretory) cell type.[2] The parotid gland secretes proteinacious saliva by serous acini, the sublingual gland, composed almost exclusively of mucous acini, produces mucin-rich saliva, and the submandibular gland produces a mostly mixed saliva from both acinar cell types. Saliva output from these glands is tightly controlled through the parasympathetic and sympathetic branches of the autonomic nervous system.[3–5] In general, parasympathetic and sympathetic nerves control different secretory processes.[6] Parasympathetic nerves primarily stimulate water secretion, in part, through transmembrane water channels including aquaporin 5 (AQP5)[7] as well as paracellular pathways[8,9] by activating acetylcholine muscarinic receptors (CHRM1 and CHRM3) on the acini.[10,11] Sympathetic nerves, on the other hand, govern the secretion of digestive proteins such as amylase by activating β-adrenergic receptors on the acini.[12,13] Once secreted, saliva flows through a series of water-impermeable ducts (intercalated, striated, and excretory) that create a hypotonic solution via ion absorption for delivery to the oral cavity.[14]

In order to produce the volume of saliva required for daily living (0.5–1 L in humans), yet be constrained to the craniofacial complex, salivary glands need to maximize space and surface area.[15] To achieve this, mouse and human salivary glands establish an interconnected network of secretory acini and ducts through the process of epithelial branching morphogenesis (Figure 1(a) and (b)). Although this process has been described for all salivary glands, the ability to culture the mouse embryonic submandibular gland (SG) *ex vivo* has resulted in the vast majority of our knowledge being derived from this organ and as such, this review will focus on its development. SG formation is initiated by the thickening of the oral epithelium that invaginates into a condensed mesenchyme containing an endothelial plexus (6–8 weeks in humans and embryonic day (E) 11.5 in mice).[17–19] This single epithelial bud then undergoes rounds of branching morphogenesis, defined by multiple cycles of cleft formation, expansion of end buds (pre-acini),

*Correspondence to: sarah.knox@ucsf.edu
Department of Cell & Tissue Biology, University of California San Francisco, San Francisco, CA 94143, USA

Conflict of interest: The authors have declared no conflicts of interest for this article.

RESEARCH TECHNIQUES MADE SIMPLE

Enzyme Immunoassay and Enzyme-Linked Immunosorbent Assay

Stephanie D. Gan[1] and Kruti R. Patel[2]

Journal of Investigative Dermatology (2013) **133**, e12. doi:10.1038/jid.2013.287

INTRODUCTION

Enzyme immunoassay (EIA) and enzyme-linked immunosorbent assay (ELISA) are both widely used as diagnostic tools in medicine and as quality control measures in various industries; they are also used as analytical tools in biomedical research for the detection and quantification of specific antigens or antibodies in a given sample. These two procedures share similar basic principles and are derived from the radioimmunoassay (RIA). RIA was first described by Berson and Yalow (Yalow and Berson, 1960), for which Yalow was awarded the Nobel Prize in 1977, to measure endogenous plasma insulin. RIA was then developed into a novel technique to detect and measure biological molecules present in very small quantities, paving the way for the analysis and detection of countless other biological molecules, including hormones, peptides, and proteins. Because of the safety concern regarding its use of radioactivity, RIA assays were modified by replacing the radioisotope with an enzyme, thus creating the modern-day EIA and ELISA.

GENERAL PRINCIPLES

EIA/ELISA uses the basic immunology concept of an antigen binding to its specific antibody, which allows detection of very small quantities of antigens such as proteins, peptides, hormones, or antibody in a fluid sample. EIA and ELISA utilize enzyme-labeled antigens and antibodies to detect the biological molecules, the most commonly used enzymes being alkaline phosphatase (EC 3.1.3.1) and glucose oxidase (E.C. 1.1.3.4). The antigen in fluid phase is immobilized, usually in 96-well microtiter plates. The antigen is allowed to bind to a specific antibody, which is itself subsequently detected by a secondary, enzyme-coupled antibody. A chromogenic substrate for the enzyme yields a visible color change or fluorescence, indicating the presence of antigen. Quantitative or qualitative measures can be assessed based on such colorimetric reading. Fluorogenic substrates have higher sensitivity and can accurately measure levels of antigen concentrations in the sample. The general procedure for ELISA is outlined in Figure 1.

Various types of ELISAs have been employed with modification to the basic steps described in Figure 1. The key step in the ELISA assay is the direct or indirect detection of antigen by adhering or immobilizing the antigen or antigen-specific capture antibody, respectively, directly onto the well surface. For sensitive and robust measurements, the antigen can be specifically selected out from a sample of mixed antigens via a

WHAT ENZYME-LINKED IMMUNOSORBENT ASSAY (ELISA) DOES

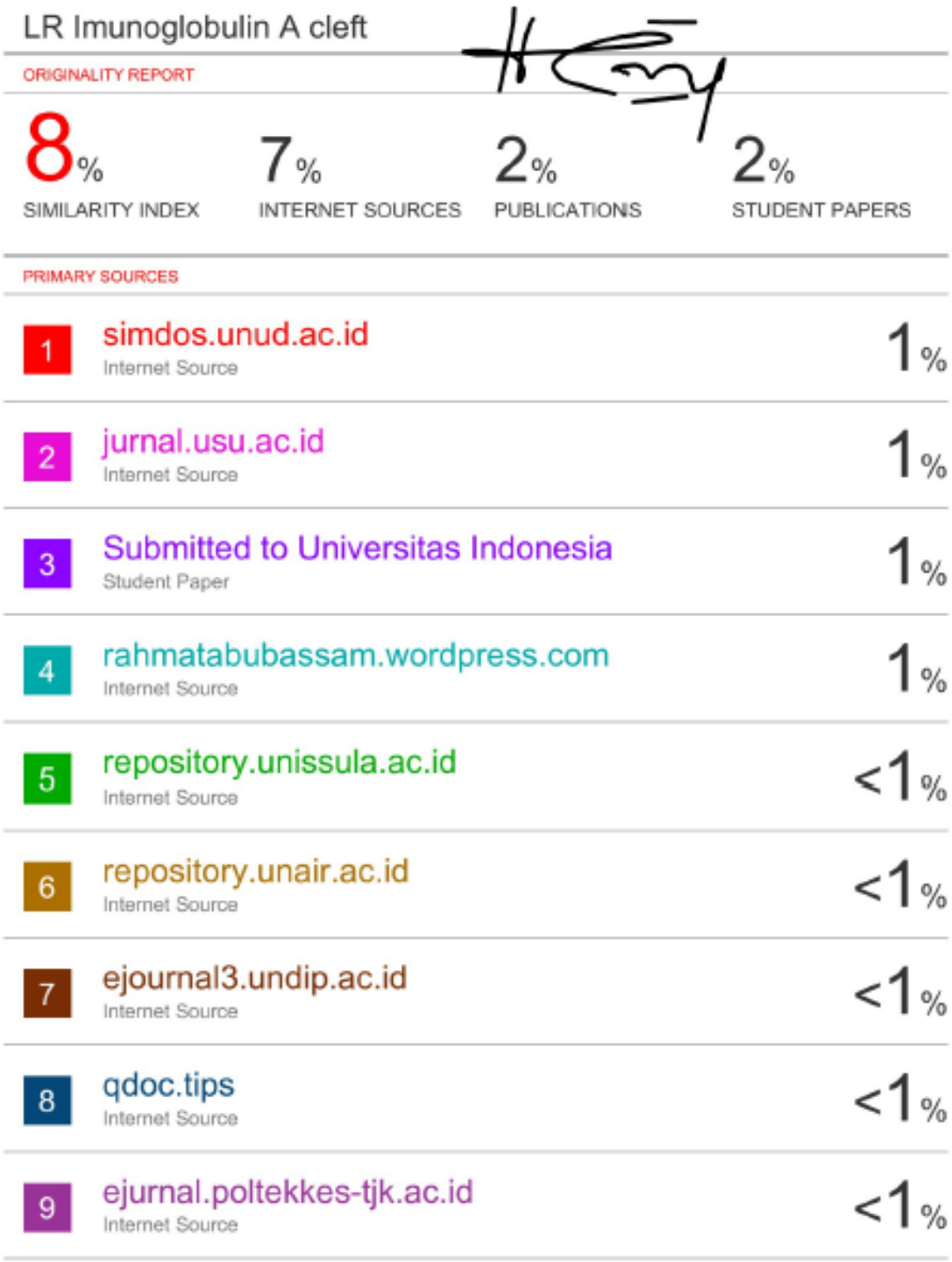
- ELISA is a biochemical assay that uses antibodies and an enzyme-mediated color change to detect the presence of either antigen (proteins, peptides, hormones, etc.) or antibody in a given sample.
- Both "indirect" and "sandwich" ELISAs allow detection of antigen or antibody at very low concentrations.
- The competitive method detects compositional differences in complex antigen mixtures with high sensitivity, even when the specific detecting antibody is present in relatively small amounts.
- Multiple and portable ELISA is a ready-to-use, low-cost lab kit that is ideal for large population screening in low-resource settings.

LIMITATIONS

- The enzyme-mediated color change will react indefinitely. Over a sufficiently long period of time, the color strength will inaccurately reflect the amount of primary antibody present, yielding false-positive results.
- To detect a given antibody or antigen, a known reciprocal antigen or antibody must be generated.
- Nonspecific binding of the antibody or antigen to the plate will lead to a falsely high-positive result.

[1]Department of Dermatology, Department of Medicine, Boston University School of Medicine and Boston Medical Center, Boston, Massachusetts, USA and [2]Program in Molecular and Translational Medicine, Department of Medicine, Boston University School of Medicine and Boston Medical Center, Boston, Massachusetts, USA
Correspondence: Stephanie D. Gan, 609 Albany Street, I-201, Boston, Massachusetts 02118, USA. E-mail: Stephanie.gan@bmc.org

Lampiran Hasil Turnitin KTI



LR Imunoglobulin A cleft

ORIGINALITY REPORT

8%	7%	2%	2%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	simdos.unud.ac.id Internet Source	1%
2	jurnal.usu.ac.id Internet Source	1%
3	Submitted to Universitas Indonesia Student Paper	1%
4	rahmatabubassam.wordpress.com Internet Source	1%
5	repository.unissula.ac.id Internet Source	<1%
6	repository.unair.ac.id Internet Source	<1%
7	ejournal3.undip.ac.id Internet Source	<1%
8	qdoc.tips Internet Source	<1%
9	ejurnal.poltekkes-tjk.ac.id Internet Source	<1%

10	www.slideshare.net Internet Source	<1%
11	es.scribd.com Internet Source	<1%
12	drajadcakep.blogspot.com Internet Source	<1%
13	docplayer.info Internet Source	<1%
14	garuda.ristekbrin.go.id Internet Source	<1%
15	Felisa E. K. Bagaray, Vonny N. S. Wowor, Christy N. Mintjelungan. "Perbedaan efektivitas DHE dengan media booklet dan media flip chart terhadap peningkatan pengetahuan kesehatan gigi dan mulut siswa SDN 126 Manado", e-GIGI, 2016 Publication	<1%
16	jurnal.fkm.unand.ac.id Internet Source	<1%
17	Ravi Nagpal, Sunil Pandey, Mahima Goel, Ankita Kar, Eliezer Rapsang, Priya Matani. " Evaluation of Total Salivary Secretory Immunoglobulin A and -specific SIgA among Children having Dissimilar Caries Status ", The Journal of Contemporary Dental Practice, 2018 Publication	<1%

18	Submitted to Universitas Airlangga Student Paper	<1%
19	Submitted to University of Muhammadiyah Malang Student Paper	<1%
20	docobook.com Internet Source	<1%
21	Sinta Silaban. "PREVALENSI KARIES GIGI GERAHAM PERTAMA PERMANEN PADA ANAK UMUR 8 – 10 TAHUN DI SD KELURAHAN KAWANGKOAN BAWAH", e-GIGI, 2013 Publication	<1%
22	news.unair.ac.id Internet Source	<1%
23	ayuseptianingsihariyani.blogspot.com Internet Source	<1%
24	jurnal.pdgi.or.id Internet Source	<1%
25	repository.upi.edu Internet Source	<1%
26	ind.acousticbiotech.com Internet Source	<1%
27	id.dralexjimenez.com Internet Source	<1%

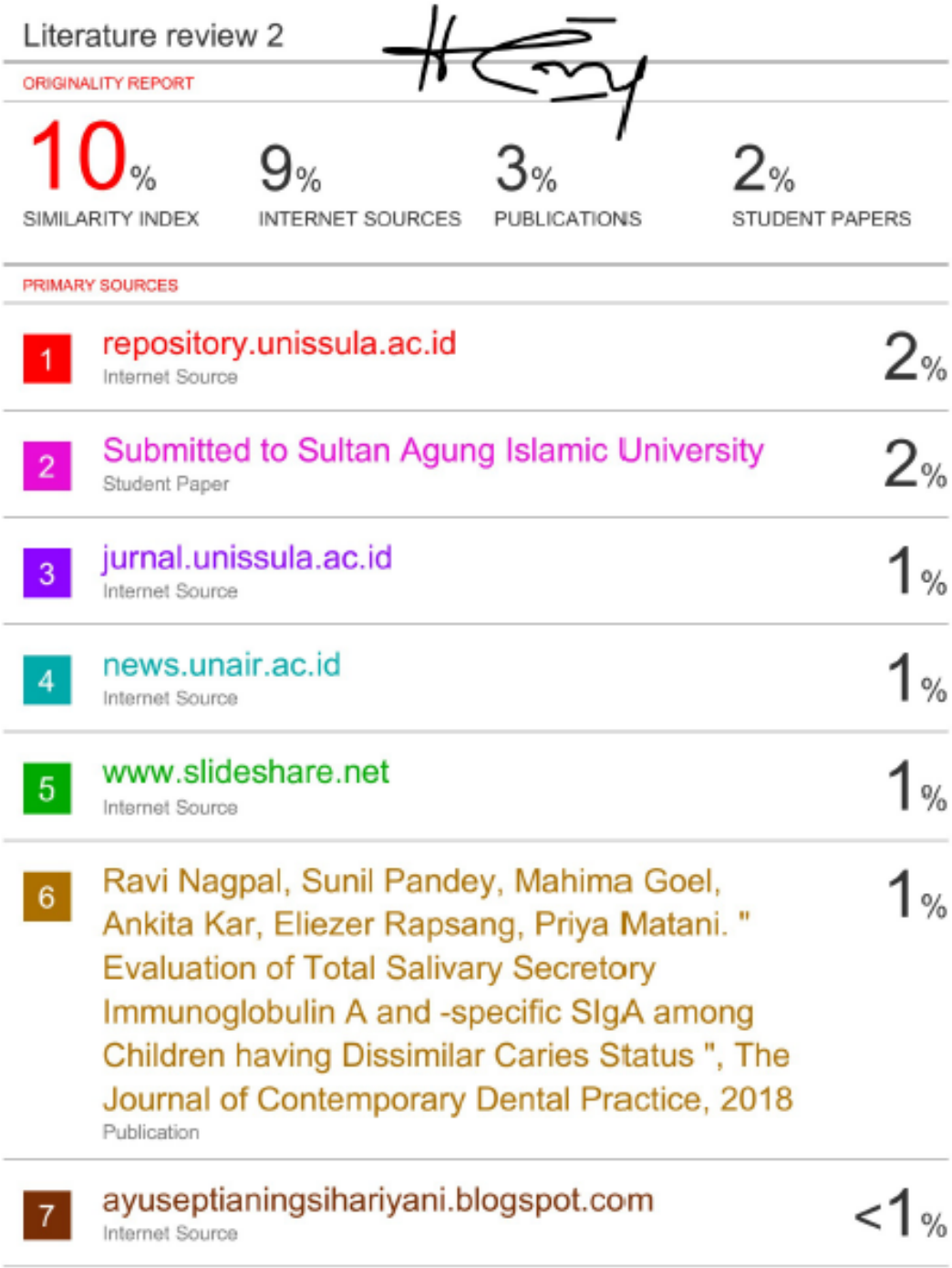
28	johannessimatupang.wordpress.com Internet Source	<1%
29	Josinta Elsiana Maryanti Tameon. "Hubungan Pengetahuan Anak Dengan karies Gigi Anak Kelas VA SDI Raden Paku Surabaya Tahun 2020", Jurnal Skala Kesehatan, 2021 Publication	<1%
30	nadyagusnitas.wordpress.com Internet Source	<1%
31	text-id.123dok.com Internet Source	<1%
32	Renny Diane Cheryl Putong. "GAMBARAN KARIES DAN KEBUTUHAN PERAWATAN RESTORASI PADA MASYARAKAT DI KELURAHAN PAPUSUNGAN KECAMATAN LEMBEH SELATAN", e-GIGI, 2013 Publication	<1%
33	id.123dok.com Internet Source	<1%
34	Indry Worotitjan, Christy N. Mintjelungan, Paulina Gunawan. "PENGALAMAN KARIES GIGI SERTA POLA MAKAN DAN MINUM PADA ANAK SEKOLAH DASAR DI DESA KIAWA KECAMATAN KAWANGKOAN UTARA", e-GIGI, 2013 Publication	<1%

35	keluargahamsa.com Internet Source	<1%
36	ejournal.poltekkes-pontianak.ac.id Internet Source	<1%
37	keziafany.blogspot.com Internet Source	<1%
38	www.cadrj.com Internet Source	<1%
39	zombiedoc.com Internet Source	<1%
40	Uswatun Khasanah, Paulina Gunawan, Herdy Munayang. "Hubungan Kecemasan terhadap Perawatan Gigi dengan Indeks DMF-T pada Anak Usia 10–12 Tahun di SD Negeri 27 Manado", e-GIGI, 2018 Publication	<1%
41	Grollemund, B.. "L'impact des fentes labiopalatines sur les relations parents-enfant", Archives de pediatrie, 201009 Publication	<1%
42	repository.radenintan.ac.id Internet Source	<1%
43	Ni Made Ari Purwaningrum, Sang Ayu Arta Suryantari, Ni Luh Putu Ratih Vibriyanti Karna. "EFEKTIVITAS TERAPI SISTEMIK DAN	<1%

TOPIKAL DALAM PENGOBATAN MELASMA",
GEMA KESEHATAN, 2020
Publication

Exclude quotes	On	Exclude matches	< 5 words
Exclude bibliography	On		

Lampiran Hasil Turnitin Naskah Publikasi



Literature review 2

ORIGINALITY REPORT

10%	9%	3%	2%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	repository.unissula.ac.id Internet Source	2%
2	Submitted to Sultan Agung Islamic University Student Paper	2%
3	jurnal.unissula.ac.id Internet Source	1%
4	news.unair.ac.id Internet Source	1%
5	www.slideshare.net Internet Source	1%
6	Ravi Nagpal, Sunil Pandey, Mahima Goel, Ankita Kar, Eliezer Rapsang, Priya Matani. " Evaluation of Total Salivary Secretory Immunoglobulin A and -specific SIgA among Children having Dissimilar Caries Status ", The Journal of Contemporary Dental Practice, 2018 Publication	1%
7	ayuseptianingsihariyani.blogspot.com Internet Source	<1%

8	id.123dok.com Internet Source	<1%
9	ramdhandwi.blogspot.com Internet Source	<1%
10	keluargahamsa.com Internet Source	<1%
11	www.kalbemed.com Internet Source	<1%
12	repository.usu.ac.id Internet Source	<1%
13	www.cadrj.com Internet Source	<1%
14	garuda.ristekbrin.go.id Internet Source	<1%
15	qdoc.tips Internet Source	<1%
16	Grollemund, B.. "L'impact des fentes labiopalatines sur les relations parents-enfant", Archives de pediatrie, 201009 Publication	<1%
17	jurnal.fkm.unand.ac.id Internet Source	<1%
18	Ni Made Ari Purwaningrum, Sang Ayu Arta Suryantari, Ni Luh Putu Ratih Vibriyanti Karna.	<1%

"EFEKTIVITAS TERAPI SISTEMIK DAN TOPIKAL DALAM PENGOBATAN MELASMA", GEMA KESEHATAN, 2020

Publication

Exclude quotes	On	Exclude matches	< 5 words
Exclude bibliography	On		