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Correlation between Salivary Constituents of a Mother and Child.

Rahul R Deshpande[1, 2], Vishwas Patil[1], Mayuri Mutha[1]*, Megha Jadhav[1], Bhavana S Metha[1], Rajdeep Singh Chhabra[1], and Tushar V Gadkari[3]

[1]Dr. D.Y. Patil Dental College And Hospital, Pimpri, Pune-411018, Maharashtra, India.
[2]Deenanath Mangeshkar Hospital, Pune-411004, Maharashtra, India.
[3] Sai Advantium, Plot-2, Building-1, Chrysalis Enclave, Hinjewadi Phase-II, Pune 411017, Maharashtra, India.

ABSTRACT

Saliva is one of the most important factors in regulating oral health, with flow rate and composition changing throughout development and during disease. sialochemistry play an increasingly important role in the early detection, the monitoring and progression of the systemic and oral diseases and serve as a tearless diagnostic tool. The objective of the study was to find out the correlation between the salivary amino acids and electrolytes in saliva of the mother and the child. Saliva was collected from nine mother and child pairs. Qualitative amino acids analysis and electrolyte analysis of the salivary samples was done by LCMS (shimadzu 2010, single quadrupole detector with electrospray ionization). Sodium a marked difference with mean being almost twice as higher in mother's saliva. Potassium concentration did not show a significant difference, but was on a higher side in child's saliva (5.44 ppm) as compared to mother's saliva(4.44 ppm). The cations that were present in maximum concentration in both groups (mother and children) were sodium, potassium and calcium.The amino acids arginine, histidine and tryptophan were found to be in maximum concentration in mother's group while glycine, phenyl alanine and tryptophan were maximum in children. But no corelation could be established between mother and child's salivary biomolecules.

Keywords: mother, child, salivary pH, salivary total proteins, salivary electrolytes

Corresponding author

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INTRODUCTION

Saliva is a unique fluid and has the potential to become the choice of diagnostic sample because of the advancements in detection technologies and a combination of clinically relevant biomolecules. Saliva is one of the most important factors in regulating oral health, with flow rate and composition changing throughout development and during disease.[1] human saliva contains a plethora of compounds that can be informative in monitoring overall health and well being. Components of saliva, therefore, may serve as biomarkers because the composition of oral fluid is responsive to behavioural, mechanical, genetic or ontogenetic stimuli [1,2]. Saliva reflects the body's state of well being; but its use as a diagnostic aid has been negatively affected because of our lack of understanding of the salivary biomolecules and their relevance to disease etiology combined with lack of highly sensitive detection systems. Diagnosis of disease *via* the analysis of saliva is potentially valuable for children and older adults, since collection of the fluid is associated with fewer compliance problems as compared with the collection of blood. The protein composition of saliva reflects cellular signal processing that results from day-to-day environmental influences as well as from acute or chronic stress [3]. This study aims at using saliva as a diagnostic tool and finding, if any, correlation exists in major salivary components of a mother and her child.

MATERIALS AND METHOD

Material List

- Diagnostic instruments-
  - Sterile mouth mirrors
  - Sterile probe.
  - Sterile explorers
  - Sterile tweezers
  - Sterile kidney trays
  - Sterile cotton
  - Disposable gloves, mouth mask, head caps.
  - Disinfecting solutions
- Instruments for saliva collection-
  - Disposable plastic funnel.
  - Sterile glass vials.
  - Saliva collection tubes (Tarsen tubes).
  - Ice box for storing saliva during transportation to laboratory.
- Equipments for salivary analysis-
  - PH strips.
  - Measurement of salivary total protein done in laboratory using Light Chromatography coupled with Mass Spectrometry- Shimadzu LC 2010-CHT.
  - Measurement of salivary trace elements done by Inductively coupled plasma emission spectroscopy- Lab Pro Nich.

Method

Subjects were instructed not to eat or drink at least 1 hour prior to collection of the samples. Rinse mouth with tap water before sample collection. Wait at least 10 minutes after rinsing before collecting saliva to avoid sample dilution. The resting whole saliva of the subjects was collected by passive drooling into sterile glass tube, in a quiet well lit room in the morning time [4]. (Colin Dawe's method). Ph of the collected salivary samples was measured using pH strips.5 ml of saliva sample was then transferred to sterile vials. The saliva containing vials were stored in an icebox and carried within 60 minutes to the laboratory where it was stored in deep freeze below -20 degree Celsius until biochemical assays are performed. The salivary total proteins was analysed in the laboratory using Light Chromatography coupled with Mass Spectrometry. The salivary trace elements was analysed in the laboratory using inductively coupled plasma emission spectroscopy.

RESULTS

Analysing the salivary samples reveled the presence of sodium, potassium and calcium ions. The salivary samples of both the mother and their child had these cations in concentration of more than 1 ppm.

Comparing between the mother's and child's saliva, sodium had a marked difference, with mean being almost twice as higher in mother's saliva. Potassium concentration did not show a significant difference ,but was on a higher side in child's saliva (5.44 ppm) as compared to mother's saliva(4.44 ppm).

Calcium ions were equally present in both the groups.

Execpt tryptophan, the commonly detected amino acids in mother's and child's saliva were found to be different. Mothers saliva detected arginine and histidine whereas the child's saliva detected glycine and phenylalanine in abundance.

The pH of salivary samples of both the age groups also had a significant difference. Mother's saliva was at neutral ph (7-8) whereas child's saliva was acidic(ph 3-4).

DISCUSSION

The concentrations of total proteins in saliva are co related with the development of the major salivary glands. The few of the abundantly seen amino acids in saliva are glycine, histidine, arginine, tryptophan, phenylalanine etc.

Arginine is a non- essential amino acid which plays an important role in wound healing, cell division, immune function by increasing the size and function of thymus and hormonal secretion [5].

Histidine is a semi essential amino acid. Histidine is important for maintaining myline sheath, which protects nerve cells, and is needed for production of both red and white blood cells.

Tryptophan is an essential amino acid and is needed to maintain optimum health. It is essential for production of vitamin B, niacin, which is vital for brain to manufacture the neurotransmitter: serotonin. It enhances the release of growth factor, helps control hyperactivity, and alleviates stress. It is needed for normal growth in infants and nitrogen balance in adults [6].

Glycine is a non- essential amino acid. It is a precursor to various proteins, assists in absorbtion of calcium in body, and an inhibitory neurotransmitter. It is a part of major energy producing bio chemical processes of the body.

Phenylalanine is an essential amino acid which elevates mood, aids in memory and learning. l- Phenylalanine serves as building block for various proteins that produced in the body. It further produces tyrosine which gives rise to many different essential products like aldosterone, noraldosterone, dopamine and hence involved in central nervous system functioning.

According to our studies;

Arginine, histidine and tryptophan were the three most abundant amino acids in adult saliva samples but a few previously carried out studies suggest that glycine is the most abundant amino acid in saliva as glycine has a linear co-relation to increasing age [7]. Histidine was detected in mother's saliva but could not be detected in child's salivary samples because adults generally produce adequate amounts but children may not .this is in contrast with our findings.

Electrolytes are present in our body and these electrolytes are essential for the normal functioning of our cells and organs.

Calcium, sodium, potassium, bicarbonates and phosphate ions are the few cations which are found in abundance in human saliva. These ions form the main buffering system and help maintain the tooth integrity [8].

Sodium is a major cation in fluids outside cells. It regulates the total amount of water in the body. The movement of sodium is essential of generation of electrical signals in our body.

Potassium is the major cation found inside cells. It is essential for regulation of heartbeat and functioning of muscles.

Calcium is an important signaling molecule and it exerts regulatory responses on enzymes and proteins. It acts as second messenger in biological cycles. It is also important in remineralisation if the tooth surfaces after the acid attack.

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Table I: Amino Acids And Cations Detected In Saliva Of Mothers.

		Cations in ppm			Amino acids		
	pH	Sodium	Potassium	Calcium	Arginine %	Histidine %	Tryptophan
1	7-8	6	3	6	7	8	7
2	7-8	7	5	4	7	9	6
3	7-8	5	4	5	6	7	8
4	7-8	8	6	6	8	8	6
5	7-8	6	4	7	5	6	5
6	7-8	7	5	6	7	8	7
7	7-8	6	3	5	8	9	8
8	7-8	7	6	4	6	9	6
9	7-8	9	4	5	5	7	7
total		61	40	48	59	72	60
mean		6.77	4.44	5.33	6.55	8	6.66

Table II : Amino Acids And Cations Detected In Saliva Of Children.

		Cations in ppm			Amino acids		
	pH	Sodium	Potassium	Calcium	Glycine %	Phenyl alanine %	Trptophan %
1	3-4	5	5	10	10	9	11
2	3-4	3	6	6	11	8	12
3	3-4	4	4	4	12	9	10
4	3-4	2	5	5	10	10	9
5	3-4	3	6	4	15	11	12
6	3-4	4	7	3	12	10	11
7	3-4	5	4	4	13	9	10
8	3-4	5	5	5	14	11	11
9	3-4	4	7	6	12	10	10
total		35	49	47	109	87	96
mean		3.88	5.44	5.22	12.11	9.66	10.66

According to our study;

The salivary calcium levels did not show a marked difference between both the salivary samples. The salivary potassium levels in our study were higher in children in accordance to the previous studies which also suggest higher potassium levels in mixed dentition subjects (children) than permanent dentition dentition(adults). The sodium levels were high in mother's saliva.

The salivary pH is dependent on various factors like the type of food intake, oral micro flora , the time of food intake and collection of saliva, etc. The salivary pH of children in our study was acidic (3-4); some studies done previously suggest that child's salivary pH is in the range of 6.9 to 7.5. This variation can be attributed to the fact that above factors were not considered in our study.

The major limitation of this study is its small sample size. The data obtained in this study is preliminary and expansion of the subjects is needed to obtain improved valid results.

REFERENCES

[1] Katie P. Wu, et al Salivary flow and compositions in children
[2] Thiruvanamalai Sivakumar et. al. J Oral Sci 2009;51(4):573-580.
[3] Silvia Chiappin a, Giorgia Antonelli a, Rosalba Gatti b, Elio F. De Palo, Saliva specimen: A new laboratory tool for diagnostic and basic investigation a Section of Clinical Biochemistry, Department of Medical Diagnostic Sciences and Spec. Ther., University of Padua, c/o ex Istituto di Semeiotica Medica, Via Ospedale 105-35128,
[4] Salimetrics. Saliva Collection and Handling Advice 3rd edition 2012
[5] Montac m et al. Timisora Med J 2003;3-4.
[6] Linda Vorvick. Diatery Guidelines for Americans 2005.
[7] Tanaka Shoji et al. Div of oral diagnosis changes in salivary amino acids during aging. 24:853-856(2010)
[8] http://www.nlm.nih.gov/medlineplus (last accessed on 11 sept 2013; 14:15)