



## COMPARATIVE EVALUATION OF SALIVARY TOTAL PROTEINS AND FEW ELECTROLYTES IN CHILDREN WITH DOWN'S SYNDROME AND HEALTHY CHILDREN OF MIXED DENTITION AGE GROUP.

### Dental Science

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### ABSTRACT

In relation to the oral manifestations of Down's syndrome an autosomal disorder, some authors have reported a relationship between low prevalence of dental caries and high prevalence of periodontal disease compared to healthy children. Aim of this study was to evaluate & compare salivary Total Proteins and few electrolytes: Sodium, Potassium, Chloride, Calcium, Zinc in children with Down's syndrome and healthy children of mixed dentition age group. For this study, detailed clinical examination and un-stimulated whole saliva specimens were collected from 20 children with Down's syndrome - Group A & healthy children - Group B. The samples were studied for estimation of total proteins and electrolytes content by mass spectrometry and plasma emission spectroscopy. Unpaired t-test was carried out. Concentration of salivary TP, Na, K, Cl, & Ca was higher in Group A when compared with Group B which was converse with the concentration of Zn. On examination low dental caries and higher prevalence of periodontal disease was observed in Group A when compared to Group B. Also, the concentration of TP and Na, K, Cl & Ca was higher in Group A and concentration of Zn was higher in Group B suggesting probable correlation between the oral health.

### KEYWORDS

Down's syndrome, Salivary Total Proteins, Sodium, Potassium, Chloride, Calcium, Zinc.

### INTRODUCTION

Saliva is a complex fluid in body, 93% is secreted by salivary gland and minor glands secrete rest 7%. Acinar and ductal cells make up the salivary gland. These gland produce alpha-amylase, and it has less calcium than submandibular gland. These glands are located in mouth. Saliva is sterile when it leaves the salivary glands but it mixes with crevicular fluid making a mix of food, microorganisms, desquamated oral mucous cells, etc.<sup>1,2</sup> The minor salivary glands are essentially mucous. 500- to 700 ml of saliva on an average is daily secreted. Around 1.1 ml of the saliva is in the oral cavity. Activity of controlled secretion of saliva function is by autonomous nervous system.<sup>3</sup> The greatest volume of saliva is produced before, during and after meals, reaching its maximum peak at around 12 a.m., and falls considerably at night, while sleeping. Around 99% of the saliva is water content. Rest 1% is organic and inorganic molecules. Saliva is a good indicator of the plasma levels of various substances such as hormones and drugs and can therefore be used as a non-invasive method for monitoring plasma concentrations of medicines or other substances. Protection of the dental caries is achieved because saliva dilutes and eliminates sugars and other substance.<sup>4,5,6</sup>

Down's syndrome (DS) is an autosomal disorder caused by extra chromosome 21. It is also known as trisomy 21, trisomy G, and mongolism.<sup>7</sup> Down's syndrome is a naturally occurring chromosomal arrangement that has always been a part of the human condition, being universally present across racial, gender or socio-economic lines, and affects approximately one in 800 births worldwide, causing intellectual and physical disability and associated medical issues. It is detected during pregnancy or soon after birth.<sup>8</sup> Short stature, facial feature and tongue protruding characterized, learning difficulties, gastrointestinal disorder, labial forms of tooth crown, partial anodontia is seen. Many oral manifestation and characteristic features have been associated such as low incidence of dental caries as there is delay in eruption of teeth and high incidence of periodontal diseases, mouth breathing which causes dry mouth, lips and high incidence of mucosal ulcers, gingivitis.<sup>9,10</sup> DS results in congenitally missing teeth and microdontia, delay in eruption of teeth and changes in saliva composition, morphology of teeth and oral cavity is seen. Saliva's one of the major role is to protect dentition against dental caries. This is due to maintenance and buffer capacity of saliva, pH ranges from 6.3 to 6.9, but this invariable change in DS individual. Thus, reduces protection function of saliva on tooth surface.<sup>11</sup>

Several systemic manifestations such as cardiac anomaly, recurrent

infections, and hypothyroidism are linked to the Down's syndrome. In relation to the oral manifestations of this syndrome some authors have reported a relationship between the Down's syndrome and low prevalence of dental caries and high prevalence of periodontal disease.<sup>12,13</sup> In the study carried out by Winer et al. suggested high risk of dental caries among type 1 diabetes mellitus in 10 to 15 years old children.<sup>14</sup>

Mohamed A et al also reported high caries prevalence in autistic children in age group 6-16 years old children.<sup>15</sup> In a comparative study carried out by Viviana et al, suggested that Portuguese children with Down's syndrome had lower caries prevalence than their siblings.<sup>16</sup> Down's syndrome patients suffer from many physical disabilities and associated medical issues but surprisingly their oral cavity is resistant to dental caries. Saliva being an esoteric and therapeutic body fluid, lacks the drama of blood, but contains all the composition that of blood. It is in contact with hard and soft tissue of oral cavity. It contains electrolytes, total proteins, immunoglobulin, hormones etc., of clinical relevance. Thus, saliva can be used for assessment, development and diagnosis of a disease status.<sup>13</sup> Recently, it was found that, there was a significant decrease in dental caries in primary and permanent dentition of Down's syndrome patients with the increase in their salivary electrolyte levels.<sup>12</sup>

In this study, saliva is used as a therapeutic tool, to discover the correlation between children with Down's syndrome and healthy children with regards to caries by investigating the salivary total protein and electrolyte concentration in these populations.

Thus the aim of this pilot study was to evaluate and compare concentration of salivary total protein, electrolytes- sodium, potassium, calcium, chloride and zinc along with pH and amylase activity in healthy children and children with Down's syndrome of mixed dentition age group.

### SUBJECTS AND METHODS:

#### Criteria for patient selection:

In the present study, Group A-10 children with Down's syndrome of mixed dentition age group from Ankur Vidyamandir, Pune were selected (there were more than 15 subjects but due to subjects variability and consent issues we could manage 10 for this study). Group B-10 healthy children of mixed dentition age group, were randomly selected from the population attending for check-up from Dr. D. Y. Patil Dental College and Hospital Pimpri- 18. Informed

consent forms were obtained from the custodial parent or guardian of the subject after explaining the procedure to them

**Method of saliva collection:**

To minimize the effect of circadian rhythms, all whole saliva samples were collected one hour after lunch for the unstimulated condition.<sup>14</sup> The child was seated in a well-ventilated and well-lit room. The head was kept at 45 degrees flexion with one hand holding onto a 4ml cryoprecipitation vial with a funnel inserted into it, in a calm atmosphere to simulate unstimulated conditions. The saliva was allowed to drip into the funnel held to the lower lip. For each trial, the collection continued for 2 minutes but if the saliva sample was insufficient within 2 minutes, the collection was continued until 2 ml of saliva per subject was obtained. Later, these samples were transported in dry ice box stored at -80 degree Celsius for further studies.

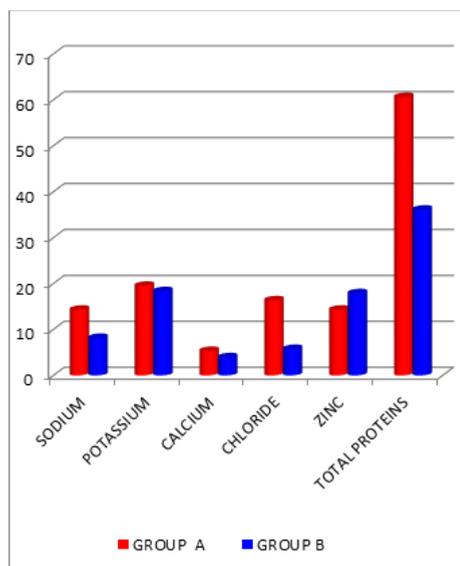
**Methods of laboratory analysis:**

For detection of trace elements in saliva, the saliva samples obtained from each subject were diluted with distilled water in a proportion of 1:4. This diluted saliva sample was then subjected to inductively coupled plasma emission spectroscopy. The basic aim of analytical atomic spectroscopy is to identify elements and quantify their concentrations in various media. The machine used was Varian Vista Pro with detection limits of 1 ppm for each element.

For detection of total proteins, light chromatography coupled with mass spectrometry (LCMS) was used. Mass spectrometry (MS) is an analytical technique used for determining masses of particles, for determining the elemental composition of a sample or molecule and for elucidating the chemical structures of molecules, such as peptides and other chemical compounds.

**RESULTS:**

Concentration of salivary TP, Na, K, Cl, & Ca was higher in Group A. Concentration of Zn was found to be higher in Group B.



**FIG 1:** Comparison of Concentration of salivary TP, Na, K, Cl, Ca and Zn in Group A & Group B.

**STATISTICAL ANALYSIS:**

Above results were compared and analysed using unpaired t-test which gave a clear idea about the healthy patients and Down's syndrome individual in composition of saliva.

**TABLE 1:** Showing comparative results of Group A and Group B. pH Mean reading was obtained and Standard Deviation (S.D) was measured. Concentration of Na, Cl, Zn and TP showed statistical significance. (Unpaired t-test, Confidence interval 95%)

Electrolytes	Groups	Mean (SD)	Significance
Sodium	Down's syndrome	14.29 (1.8)	0.00*
	Healthy children	8.15 (0.9)	
Potassium	Down's syndrome	19.51 (1.6)	0.09
	Healthy children	18.34 (1.1)	

Calcium	Down's syndrome	5.32 (1.8)	0.07
	Healthy children	3.9 (1.3)	
Chloride	Down's syndrome	16.34 (2.2)	0.00*
	Healthy children	5.75 (0.48)	
Zinc	Down's syndrome	14.31 (3.6)	0.01*
	Healthy children	17.89 (2.4)	
Total protein	Down's syndrome	60.59 (13.5)	0.00*z
	Healthy children	36.1 (8.5)	

**DISCUSSION**

Human saliva contains a plethora of compounds that can be informative in monitoring overall health and wellbeing. The inorganic contents of whole saliva were analysed in this study of children with Down's syndrome and healthy children. Physicochemical properties of human saliva can vary because of variable extrinsic as well as intrinsic factors in children with Down's syndrome. Saliva being one of the intrinsic factor, it is in contact with soft and hard tissue of oral cavity and also acts as the mirror of body.

The oral cavity of Down's syndrome patients is characterized by smaller palate and maxilla when compared to the mandible. There is a delay in the eruption of deciduous and permanent dentitions as well as agenesis of teeth; a high prevalence of periodontal disease, and low incidence of dental caries is observed,<sup>17</sup> similar observations were noted during present study too. In this study unstimulated saliva was collected. Concentration of salivary total proteins, electrolytes- Na, K, Cl, Ca and Zn were detected from the saliva of both group (**FIG-1**)

Concentration of TP, Na, K, Ca, Cl was found higher in Group A when compared to Group B. (**TABLE-1**) Similar results were seen in study carried out by Singh et al wherein salivary electrolyte levels with dental caries in children with Down syndrome and salivary electrolyte levels and dental caries of these children with their siblings were compared. Concentration of Zn was found to be lower in Group A when compared to Group B. (**FIG-1**) In a study carried out by A. S. Hussein et al, concentration of Zn was found higher in children with dental caries when compared to those with caries-free.<sup>18</sup> This suggest of probable reason of low caries incidence in children with Down's syndrome when compared to healthy children. Siqueira et al<sup>19</sup>, who studied 22 children with DS and 21 without the condition ranging from 6 to 10 years of age measured salivary calcium, phosphorus and zinc levels and found no differences in these variables between children with and without Down's Syndrome.

**CONCLUSION:**

Salivary component in Down's syndrome are altered due to manifest in salivary gland. This changes the oral electrolyte environment in Down's syndrome. Hence, dental caries are lower in children with Down's syndrome. Secretion of electrolyte showed a correlational statistics with dental caries and oral hygiene. A significant correlational statistics of metal ions playing vital role in protecting cavities and study recommends increasing dietary intake of sodium, potassium and chloride, which may facilitate in reducing caries youngsters.

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