



Estimation of Salivary Glucose and Total Protein in Early Childhood Caries (ECC)

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ABSTRACT

Early Childhood Caries (ECC) is a major oral health problem, mainly in socially disadvantaged populations. It affects infants and preschool children worldwide. ECC is the presence of one or more decayed, missing, or filled primary teeth in children aged 5 years or younger. It begins as a white-spot lesion in the upper primary incisors along the margin of the gingiva. If the disease continues, caries will progress and leads to complete destruction of the crown. Even though it is a preventable condition, ECC remains one of the most common childhood diseases. The major contributing factors for the high prevalence of ECC are improper feeding practices, familial socioeconomic background, lack of parental education, and lack of access to dental care. Oral health plays an important role in children to maintain the oral functions and is required for eating, speech development, and a positive self-image. The aim of the study is to determine the total protein and salivary glucose in children with early childhood caries. Eighteen saliva samples were collected from children between the age group of 5-10 years. They were divided into two groups-children with early childhood caries and children with healthy and controlled oral cavity. There was significant difference in the concentration of total protein and salivary glucose concentration between children with ECC and children with healthy oral cavity. Glucose content was found to be more in children with ECC compared to children with healthy oral cavity. Based on the results of these studies, these saliva components may be used as biomarkers for ECC. Other etiological factors, salivary components, enzymes may be assessed for further studies.

Key words: Early childhood caries, Oral health, Total protein, Glucose, Saliva

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INTRODUCTION

Primary teeth play an important role in feeding during childhood. They have a great role in maintaining space for permanent teeth [1]. Therefore, preventing caries in deciduous teeth during childhood is of great importance [2]. An especial academy in America defined early childhood caries (ECC) as the presence of carious lesions on a tooth or several teeth, with or without cavities, loss of teeth due to decay or restored teeth among children under the age of 6 years [3]. It is a chronic type of dental caries present among the incredibly young children who may have several etiologic factors [4]. The incidence of ECC has been reported to be

6-90% at a global level, inflicting a lot of costs on families and health systems. Hence, adopting beneficial measures both financially and from an individual health viewpoint is necessary to decrease the incidence and severity of ECC [5]. Dental caries is a multifactorial condition in which the role of each etiologic agent might be independent of other factors or they might exert synergistic effects on each other. Quality and quantity of saliva is one of the most important factors affecting an individual's susceptibility to the caries development. It has been observed that caries rate among patients with salivary gland disorders and metabolic conditions, which result in changes in salivary composition, is significantly higher than individual's normal saliva quality and quantity levels [6].

One of the most important ingredients of saliva is its sugar content which originates from the fermentation of simple sugars found in

foodstuffs, or in the oral cavities due to salivary secretions [7]. The saliva sugar content has an especially important role in preserving the equilibrium between microorganisms found in the oral cavity. Therefore, any change in the composition of saliva sugar content can cause increase in the activity caused by the cariogenic bacteria, increasing the rate of caries on various tooth surfaces [8]. Some previous studies have evaluated the composition of saliva among patients with systemic conditions [9] however, based on the best of our knowledge, no study to date has been conducted on the comparison of the salivary glucose levels among children with ECC and caries-free children, therefore, studies were undertaken to conduct this comparison [10]. The concentration of proteins present in saliva is important in the maintenance of oral health and homeostasis, as increased frequency and severity of oral disease are often associated with qualitative and quantitative changes of the saliva proteome [11]. Proteomic molecules regulate the microbial flora of the oral cavity by exerting direct antibacterial effects [12]. Many of the proteins present in saliva are critical for the protection of oral tissues against fungal or viral infections. Therefore, salivary protein composition may play an important role in the etiology of oral disease prevalence and dental caries development. The differences in total protein concentration of whole saliva varies among different ages groups, as salivary protein

concentration increases with increasing age [13]. The aim of the study is to determine the total protein and salivary glucose in children with early childhood caries.

MATERIALS AND METHOD

Twenty saliva samples were collected from children between the age group of 5-10 years. They were divided into two groups-Group A which consisted of total protein in children with early childhood caries and children with healthy and controlled oral cavity (Figure 1). Group B consisted of salivary glucose in children with early childhood caries and children with healthy oral cavity (Figure 2). The total protein concentration in the two groups was estimated using the Biuret method. Salivary glucose was estimated using Glucose Oxidase Peroxidase - Amino Antipyrine method. The concentration of glucose and total protein was estimated using colorimetric method.

RESULTS AND DISCUSSION

The value obtained from the group A and B was entered in excel sheets and graphs were generated. Table 1 represents the values of total protein and table 2 represents the values of salivary glucose.

In this study, the values were obtained for glucose content and total protein in the saliva.

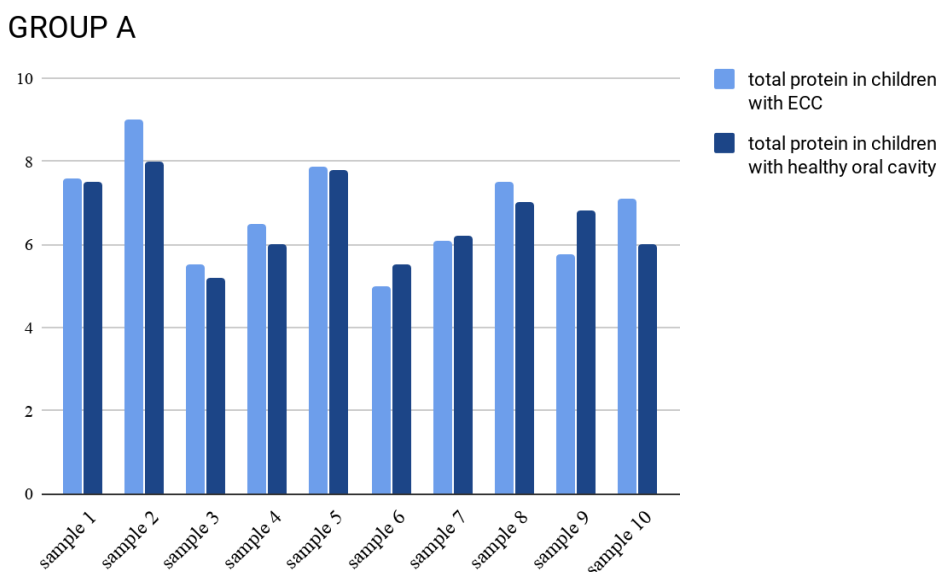


Figure 1: Bar diagram showing samples of group A and the total protein between children with ECC and controlled groups. X axis represents the total samples and Y axis represents the concentration of total protein in children with ECC and controlled groups. Total protein appears to be higher in children with ECC when compared to the control group.

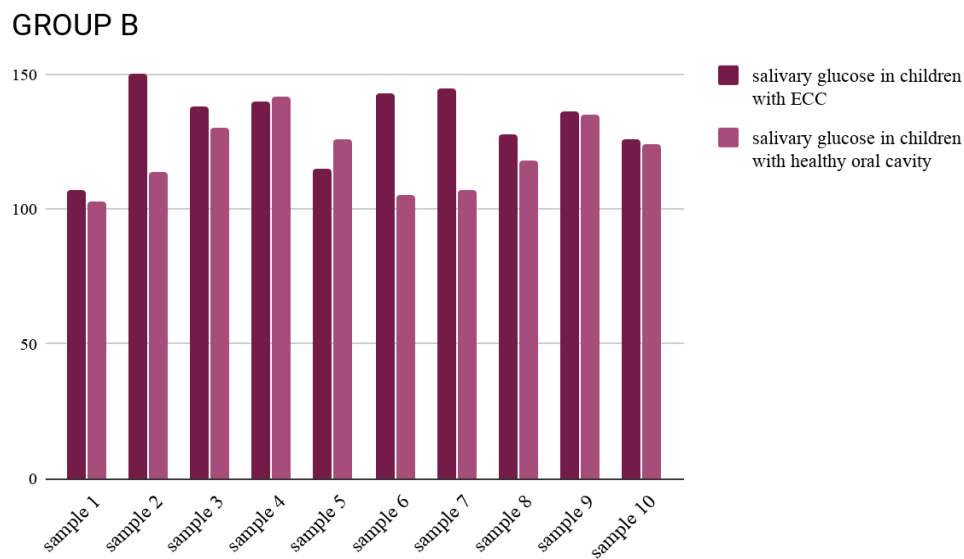


Figure 2: Bar diagram showing samples of group B and the salivary glucose between children with ECC and controlled groups. X axis represents the total samples and Y axis represents the concentration of salivary glucose in children with ECC and controlled groups. Salivary glucose appears to be higher in children with ECC when compared to the control group.

Table 1: Table showing values of total protein obtained by Biuret method between children with ECC and controlled groups.

Sample	ECC (Total Protein g/dl)	Control group (Total Protein g/dl)
Sample 1	7.6	7.5
Sample 2	9	8
Sample 3	5.5	5.2
Sample 4	6.5	6
Sample 5	7.85	7.8
Sample 6	5	5.5
Sample 7	6.1	6.2
Sample 8	7.5	7
Sample 9	5.75	6.8
Sample 10	7.1	6

Table 2: Table showing values of salivary glucose obtained by glucose oxidase peroxidase-Amino antipyrine method between children with ECC and controlled groups.

Sample	ECC (Glucose mg/dl)	Control group (Glucose mg/dl)
Sample 1	107	103
Sample 2	150	114
Sample 3	138	130
Sample 4	140	142
Sample 5	115	126
Sample 6	143	105
Sample 7	145	107
Sample 8	128	118
Sample 9	136	135
Sample 10	126	124

In children with early childhood caries and in children with healthy oral cavity, the parameters were depicted in the form of bar graphs as seen in figure 1 and figure 2. It was observed that the total protein and salivary glucose was significantly higher in children with ECC compared to the control groups.

A few studies have been carried out on the possible relationship between salivary glucose concentration and dental caries like this study. Lenander et al. [14] studied the possible relationship between salivary glucose levels and dental caries. The results showed an increase in the dental caries index with an increase in salivary glucose levels. In addition, there was an increase in dental caries rate with age. Sometimes important etiologic factors for ECC among children are the mother’s oral health and the child’s nutrition must also be considered in this case. Dental caries is a complex process that is affected by internal factors like saliva, the tooth surface morphology, general health, and hormonal and nutritional statuses, and external factors like diet, microbial flora, oral hygiene and fluoride. Saliva has various functions, including protection of the tooth surfaces and oral mucosa [15]. Some studies on the salivary composition have evaluated the secretory immunoglobulin A (SIgA) concentration in the saliva. The results of these studies have shown significantly higher salivary SIgA levels among children with ECC compared to healthy subjects [16]. A study by Siudikiene et al. [9] showed that the salivary glucose levels change over time by controlling the diabetic status of the individual and does not remain at a specific level. It was reported that subjects with poor metabolic control were more susceptible to dental caries [17]. The results of a study by Cury et al showed that the plaque

formed in the presence of sucrose was much more cariogenic than the plaque formed in the presence of glucose and fructose. Therefore, it is necessary to conduct a study to investigate the relationship between other sugars found in saliva with the rate of dental caries among children with ECC [18]. Studies show a highly significant correlation between higher caries prevalence in preschool children with higher levels of microbials and salivary proteins, including IgA, IgG immunoglobulins, PRP and histatin peptides, in saliva compared with caries-free individuals [19]. Therefore, these saliva components may be used as biomarkers for ECC. In a study by Goldberg, other salivary protein components had no association with caries risk prediction [20]. It is possible that the lack of association between salivary proteins and dental caries is due to the different levels of structure and function redundancies found in saliva. The relation between dental caries in children with ECC and total salivary protein concentration is established but, further studies are required to ascertain the value of total salivary protein concentration as a caries risk predictor in young children [21].

CONCLUSION

From this study it is seen that there was a significant difference observed in total protein between children with ECC and control groups as well as salivary glucose levels between children with ECC and control groups. The total protein and salivary glucose were increased in children with ECC. This shows the association of total protein and salivary glucose in ECC and can be used as a risk predictor for caries. Other etiological factors, salivary components, enzymes may be assessed for further studies.

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CONFLICT OF INTEREST

Nil.

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