Evaluation of Blood Sugar Level in Children Between Age Group of 1- 6 Years: A Cross Sectional Study

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ABSTRACT

Diabetes is a metabolic disorder which is characterised by high blood sugar level which results from defect in action of insulin. Diabetes is considered as the third most common disease in children as well as adolescents. It is observed that Type 1 diabetes mellitus is more common in children below 10 years of age whereas Type 2 Diabetes Mellitus is observed more in children between 10-17 years of age. This study was done to assess levels of Random blood sugar level in children with early childhood caries. Data collection from patient management software. 86 children were included in the study whose blood sugar level was compared to the normal range of blood sugar level in children. (80-140mg/dl) The children were divided into three groups- below normal range, normal range and above normal range. There was no statistically significant difference between the three groups($p>0.05$). Out of eighty-six children, twelve children and blood sugar level below the normal range, seventy-three children had blood sugar levels within the normal range and one child had blood sugar level above normal range. There is no significant correlation between random blood sugar level and dental caries in 1-6 years old children. It is recommended that in future more research should be performed with a larger sample size in order to establish better clarification with respect to the topic.

KEY WORDS: RANDOM BLOOD SUGAR LEVEL, EARLY CHILDHOOD CARIES, DIABETES, CHILDREN.

INTRODUCTION

Diabetes is a metabolic disorder which is characterised by high blood sugar level which results from defect in action of insulin. Diabetes is considered as the third most common disease in children as well as adolescents. It is observed that Type 1 diabetes mellitus is more common in children below 10 years of age whereas Type 2 Diabetes Mellitus is observed more in children between 10-17 years of age. Diagnosis of diabetic condition is done by assessment of the fasting blood glucose level. If the fasting blood glucose level exceeds 126mg/dl the child is considered to be hyperglycemic (National Diabetes Education Program, 2001; Association

et al., 2011; Ekoé and Zimmet, 2012; Pachoński et al., 2020; Mizia et al., 2021).

Few epidemiological studies correlating prevalence of dental caries with diabetes mellitus have derived contradictory results. According to Wegner et al., the frequency of caries in diabetic children is higher than those without the metabolic disorder. Early childhood caries (ECC) is a health condition developing globally. It can begin early in life and the condition tends to get severe if it goes untreated. It affects the quality of life of the child as the child may have severe issues like inability to chew, speech defects and unesthetic appearance (Wegner, 1971; Lin et al., 1999; Moore et al., 2001; Twetman et al., 2002; Somasundaram et al., 2015; Govindaraju et al., 2017; Ravikumar et al., 2017; Jeevanandan and Govindaraju, 2018; Panchal et al., 2019; Abdelseed, 2021).

Diet and feeding practices also play an important role in acquisition of the infection and development of caries. Previously our team has a rich experience in working on various research projects across multiple disciplines (Govindaraju et al., 2017a; Jeevanandan, 2017; Mahesh,

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2018; Gheena and Ezhilarasan, 2019; Ke et al., 2019; Malli Sureshbabu et al., 2019; Mehta et al., 2019; Samuel et al., 2019; Sharma et al., 2019; Varghese et al., 2019; Venu et al., 2019; Vignesh et al., 2019; Jain et al., 2019; Jose et al., 2020; Krishnaswamy et al., 2020; Muthukrishnan et al., 2020; Samuel et al., 2020; Sathish and Karthick, 2020). Now the growing trend in this area motivated us to pursue this project.

There is no literature focussing on the correlation between blood sugar level and early childhood caries. The purpose of this study is to assess if the random blood sugar level of the child has any correlation with early childhood caries.

MATERIAL AND METHODS

The study was based on a university setting. The ethical approval was given by the Institutional Scientific Review Board, Saveetha Dental College and Hospitals. There were three reviewers involved in the study. One of the reviewers was an external reviewer. The data for the study was collected from patient management software. Inclusion criteria: Child with early childhood caries (based on DMFT score), Age group: 1-6 years old. A total of eighty-six children were included in the study from whom consent was taken prior the study. The procedure was explained to the parents or the guardian. The included children were sent for a blood test. The data was segregated and tabulated. The parameters assessed were, age and blood sugar level of children. Grouping of parameters was done on the excel sheet. The data was then copied into the SPSS 2.0 software and statistical analysis was done.

Statistical analysis: Descriptive statistics was used for the analysis. Chi square test was performed to correlate the three groups of blood sugar levels. All analysis was performed using statistical software (SPSS inc version 2.0, Chicago IL, USA) and p value less than 0.05 was considered statistically significant.

RESULTS AND DISCUSSION

Out of a sample of eighty-six children included in the study, forty-four children were boys and forty-two children were girls (Figure 1). Twelve children had blood sugar level below the normal range. Seventy-three children had blood sugar level well within the normal range. Only one child had blood sugar level above the normal range (Figure 2). There was no statistically significant difference between the three groups. No significant correlation was found between random blood sugar level and early childhood caries in 1-6 years old children.

Diabetes is usually characterised by the deficiency in the level of insulin and dysfunctioning of the pancreatic beta cells. It has been proved in the past that diabetes poses risk for the cardiovascular and the renal system. Diabetes leads to disturbance in the glucose metabolism. This might lead to severe hyperglycemia and insulin deficiency. Certain disorders of the oral cavity have been associated with diabetes. Caries, gingival inflammation, periodontal inflammation, altered salivary function, taste dysfunction,

oral mucosal diseases and infections such as lichen planus, aphthous stomatitis and candidiasis are associated with diabetes (Ferrannini, 1998; Siudikiene et al., 2005; Lamster, 2012; Abdelseed, 2021).

Figure 1: Bar chart representing the gender of the children included in the study. Blue represents boys included in the study and red represents girls included in the study. X axis represents the gender of the children and Y axis represents the total number of children included in the study. Out of the total sample of 86 children 52% were boys and 48% were girls.

Figure 2: Bar chart representing level of blood sugar level in different age groups where blue represents below normal range, red represents normal range and green represents above normal range. X axis represents the age of the child and Y axis represents the number of children. Children in the age group of 3-4 years had normal and below normal range of random blood sugar level than that of children in the age group of 1-2 years and 5-6 years, however it is not statistically significant. Chi-square test, $p=0.246$ ($p<0.05$ which is not statistically significant).

Assessment of blood sugar level in children is one of the ways to identify if the child is able to balance insulin from food and exercise. Abnormality in blood sugar levels produces symptoms associated with hyperglycemia as well as hypoglycemia. The relationship between diabetes and dental caries is complicated. Children suffering from type 1 diabetes are recommended a carbohydrate free diet along with restriction of cariogenic food. Children affected with type 2 diabetes tend to have a greater exposure to cariogenic food. Diet for children with diabetes includes intake of fat

and protein and carbohydrates upto 50-60% of the daily calorie intake. Dental caries prevalence in diabetic children is due to interaction of genetic factors, oral microflora, diet and oral hygiene practices. Diabetic children tend to have increased prevalence of oral microflora like streptococcus mutans and lactobacilli. Salivary flow rate is reduced in children affected with diabetes (Ship, 2003; Panchal et al., 2019; Lakshmanan et al., 2020; Abdelseed, 2021)

This further leads to accumulation of microorganisms causing dental caries. Reduced salivary flow rate caused by hyperglycemia is characteristic mainly for periods of poor metabolic control of diabetes. During this period, glucose leakage into the oral cavity may occur, thereby facilitating the growth of aciduric and acidogenic bacteria and caries lesion development. A clear picture is not provided in previous literature regarding the relationship between dental caries and diabetes mellitus (Siudikiene et al., 2008; Sampaio et al., 2011; Panchal et al., 2019; Hanberger et al., 2021).

Jones et al reported an elevated risk of caries due to high blood sugar level. There is no literature correlating random blood sugar level with early childhood caries in children. Early childhood caries is defined as the presence of one or more decayed (non cavitated or cavitated lesions), missing (because of caries) or filled tooth surfaces in any primary tooth in a child aged 71 months or younger. Early childhood caries is often associated with certain factors like high sugar intake, lack of oral hygiene, lack of fluoride exposure and enamel defects. It is often associated with many oral health or systemic conditions (Jones et al., 1992; Christabel et al., 2015; Gurunathan and Shanmugaavel, 2016; Govindaraju and Gurunathan, 2017; Packiri et al., 2017; Govindaraju, 2017b; Subramanyam et al., 2018; Lakshmanan et al., 2020).

In the present study the children affected with early childhood caries were sent for a blood test where their random blood sugar level was evaluated. It was observed that most of the children (seventy-three children) affected with early childhood caries had their blood sugar level well within the normal range. Twelve children had blood sugar level below the normal range. These twelve children were further examined and their parents were questioned and a detailed history was taken. The parents were questioned about certain signs and symptoms like extreme hunger, tremors, rapid heart rate, weakness, drowsiness, confusion, headache and loss of consciousness. The parents of these children were asked to consult a child specialist immediately. One child had blood sugar level above the normal range. This child was detected with Type 1 diabetes mellitus in his first year of life. No relationship was established between blood sugar levels and early childhood caries in the present study. Reduction in salivary flow rate is usually present in children with high blood sugar levels. This further leads to caries. This has been proved by certain authors (Harrison and Bowen, 1987; Rivera Gómez et al., 2006; Jeevanandan and Govindaraju, 2018; Panchal et al., 2019; Mathew et al., 2020).

In the present study no child complained of dry mouth. Several studies have established a relationship of dental caries with blood sugar levels but no studies have been performed where blood sugar levels can be correlated with early childhood caries. In the present study random children were selected with early childhood caries. Specifically, children suffering from diabetes could have been included in the study to observe if they are affected with early childhood caries. Another limitation of the study was that the sample size included in the study was small. Further studies can be performed with a larger sample size and a more restricted inclusion criteria can be considered to establish a correlation between early childhood caries and blood sugar level. Our institution is passionate about high quality evidence based research and has excelled in various fields (Pc et al., 2018; Ramesh et al., 2018; Ezhilarasan et al., 2019; Ramadurai et al., 2019; Sridharan et al., 2019; Priyadharsini, 2019; Mathew et al., 2020).

CONCLUSION

In the present study it was proved that there was no significant correlation between blood sugar and dental caries in children between the age group of 1-6 years. It is recommended that in future more research should be performed with a larger sample size in order to establish better clarification with respect to the topic.

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