



## **Cross Sectional Survey on the Amount of Sugar Content in Cakes on Sale in Chennai and Its Correlation with Dental Caries**

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### **Authors' contributions**

*This work was carried out in collaboration between both authors. Authors RP and DG designed the study. Author RP performed the statistical analysis. Authors RP and DG wrote the protocol. Author RP wrote the first draft of the manuscript. Authors RP and DG managed the analyses of the study. Author RP managed the literature searches. Both authors read and approved the final manuscript.*

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### **ABSTRACT**

Cakes are one of the most commonly consumed product by kids and adults and are consumed even more during special occasions. Packaged cake products have a lot of sugar content in them and sugar is one of the main factors causing dental caries in children. Keeping all this in mind this research was done to evaluate the correlation between the amount of cakes consumed and the incidence of dental carie in children. The data was collected from products packaging nutrition labelling provided by the company and also included the products name, pack weight, serving size, total sugars per 100 gms as well as per suggested serving size. A questionnaire was used to obtain the information on the correlation with dental caries. The data was collected and tabulated in excel sheet. The data analysis was done using SPSS software by IBM. A total of 40 products were collected and tabulated. The average sugar content in cakes was 22.5 g. There was a large

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variation in sugar content between different cakes of the different categories within the same categories. Among the 40 products, 36 products showed a high sugar content when compared to the normal recommended dose for children. The study showed that the sugar content present in cakes was high and there can be a reduction in the amount of sugar present in it and thus reduce the risk of obesity and dental caries.

*Keywords: Sugar; cakes; caries; reduction; recommended dose; dental caries.*

## 1. INTRODUCTION

Tooth decay, also known as dental caries or cavities, is a demineralisation process due to the acids which are produced by the bacteria [1]. The carious lesions may be a number of different colors ranging from light brown to black. Symptoms may include pain and difficulty while eating [2]. Complications may include inflammation of the tissue around the tooth, tooth loss, and infection or abscess formation [3]. The cause of cavities is acid from bacteria dissolving the hard tissues of the teeth (enamel, dentin and cementum). This acid is produced by the bacteria when they break down food debris or sugar on the tooth surface. Simple sugars in food are these bacteria's primary energy source and thus a diet high in simple sugar is a risk factor [4].

Sugar is a simple carbohydrate that belongs to a class of chemically related sweet-tasting substances. It is available in many different forms. The three main types of sugar are sucrose, lactose, and fructose. Even though cells need glucose to survive, excess can cause health problems. The average sugar intake in adults is 30g/day and 19g for 4-6 year-old [5,6,7]. The AHA (American Health Association) says that added sugars contribute zero nutrients and are empty calories "that can lead to extra pounds, or even obesity, thereby reducing heart health." Being aware of the existing and added sugar content in foods and drinks is vital to overall health. Many products have sugar added to them that, in the modern food market, people must take extra steps to avoid consuming more than the recommended amount. The various ill healths caused by excess sugar consumption are diverse such as early childhood caries, obesity, diabetes mellitus (juvenile in case of children) and various other systemic problems [8,9].

Our department is passionate about child care, we have published numerous high quality articles in this domain over the past 3 years [10–28]. With this inspiration we planned to pursue research on the amount of sugar content present

in cakes on sale in Chennai and its correlation with dental caries.

Any study related to sugar content in cakes has its own challenges. This could be due to the limited studies documented and vast number of products sold in Chennai. The aim of this project is to evaluate the amount of sugar content in cakes on sale in Chennai and to evaluate the correlation with dental caries in children below the age of 18 years.

## 2. MATERIALS AND METHODS

This study was conducted within a time range of 6 months from December 2019 to June 2020. The data was collected from the packaging and nutritional labels of 40 cake products bought from the local stores present in Chennai. For each cake, the data collection also included the company name, brand name, product name, pack weight, serving size and total sugars (g). Data was collected from the local supermarkets present in Chennai. Each product was bought and the nutritional table was tabulated. The per serving size data included the different sugar content present per suggested serving size. The maximum sugar content was compared with maximum daily recommendation for sugar intake for children. The products without nutrition information such as in store self serve bakery products were excluded from the study.

A questionnaire was designed to find the correlation between the amount of sugar content in cakes and the incidence of dental caries. The questionnaire was carried out among the parents of children between the ages of 6-12 years. The questionnaire contained 10 questions to find the relation between cakes and dental caries. The questionnaire was uploaded on an online survey platform and the link was shared among parents hence the results obtained were from the self report of parents [29]. Part 1 of the questionnaire included questions related to the child's age, sex and if the child consumed any cakes. Part 2 of the questionnaire included questions about the number, frequency and the type of cakes consumed by the child in a day. Part 3 of the

questionnaire included questions such as the parents' awareness on their child oral health status, presence of dental caries, presence of missing teeth and frequency of brushing and if the child has visited the dentist.

The results were collected and tabulated in the excel sheet. The data analysis was done using SPSS software by IBM. The statistical test used was the Chi square test. The output was then represented in the form of Chart and table.

### 3. RESULTS AND DISCUSSION

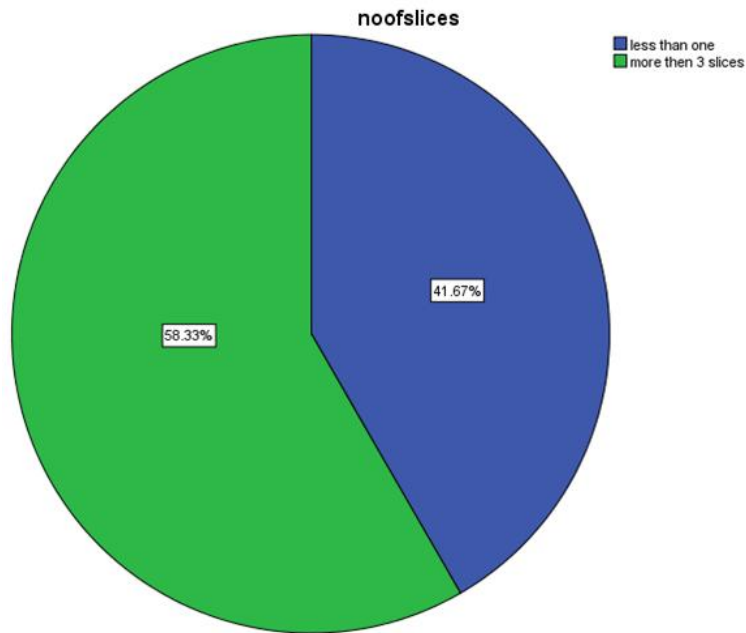
A total of 40 cakes were collected from the local stores in chennai and the sugar content was tabulated (Table 1). The 40 cake products provided the nutritional value per suggested serving size which was 100 grams. The average sugar content present in cakes was 22.5 g/100 gms. There was a huge difference in the sugar content in different cakes, the highest amount of sugar content was found in swiss roll filled with jam cake (Brand- Ethnic pride/ Winkies company) which was 41.72 gms and the least amount of sugar content found was present in lava cake (Brittania brand) which was 11 gms. According to the survey conducted, most of the cakes had a higher sugar content than the daily recommended dose for a child.

The designed questionnaire link was sent to 70 children and those who responded were 53 in numbers.

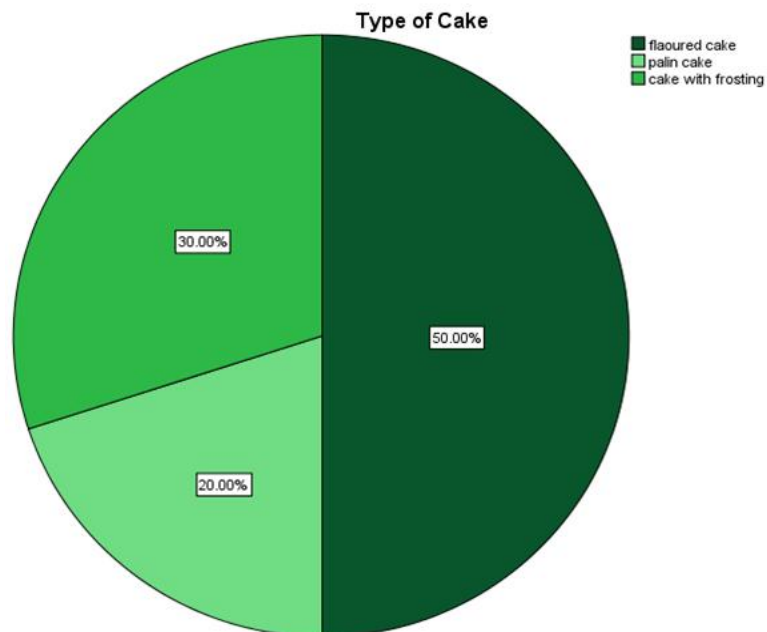
According to the study, 58.33% of the children consume more than three slices of the cake and only 41.87% of the children consume one slice of cake (Chart 1). Children who consumed more number of cake slices had an increased incidence of caries compared to the children who consumed a lesser number of slices. Chi square test was done and it was found to be statistically significant between the two groups. Pearson value was 2.731, df=2 and the p value was 0.01 <0.05 Hence statistically significant suggesting that the number of slices and the incidence of dental caries are correlated with each other. (Graph 1). The most common type of cake consumed by the children was found to be flavoured cakes (50%) followed by cakes with frosting (30%) (Chart 2). 65% of the parents were not sure of their child's oral health status (Chart 3). Most of the children present in the study had presence of dental caries (40%) and 32% of them were not sure of the presence of caries (Chart 4) The percentage of children visiting the dentist were lesser (46%) compared to those who did not visit the dentist. (54%) (Chart 5).

**Table 1. Table shows the different cakes available and the amount of sugar content in each of the cakes per serving of 100 grams. The highest amount of sugar was found to be in swiss roll filled with jam cakes and the least amount of sugar was found in lava cake**

Cakes	Sugar content per 100 gms
Lava Cake	11
Britannia Dates Cake	13
Choc Chip Muffins	16.65
English Tea Cake	22.5
Swiss Roll	23.01
Orange Cake	24.87
Winkies Fruit Cake	26.1
Fruit And Nut Cake	27
Marble Cake	27.5
Coconut Cake	30
Milk Cake	30
Plum Cake	31
Eggless Veg Cake	31
Caramel Cake	31.6
Nut And Raisin Cake	32
Butterscotch Cake	32
Cake With Vanilla Cream	33.81
Cherry Berry Plum Cake	35
Swiss Roll Filled With Jam	41.72



**Chart 1. Chart shows the number of cake slices consumed by a child during one meal. Most of the children consume more than 3 slices of cake at a time (58.33%) indicated in green compared to the rest of the children who consume only one slice at a time (41.67%) shown as blue colour**



**Chart 2. Chart shows the type of cake consumed by children. The most common type of cake preferred by the children was found to be flavoured cakes (50.0%) followed by cakes with frosting (30.0%)**

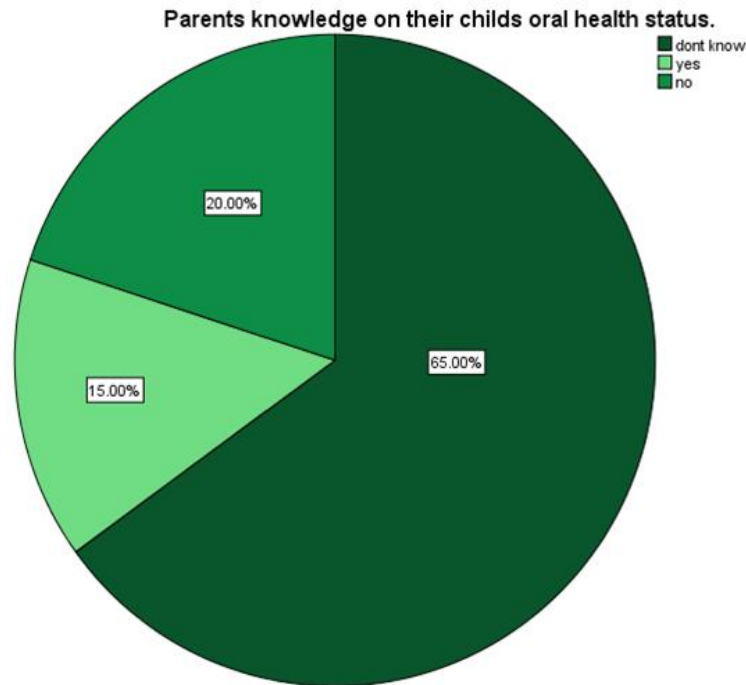


Chart 3. Chart shows the knowledge of parents on their children's oral health status. The Chart infers that many of the parents ie. 65.0% of them were not sure about their child's oral health status. 20.0% of the parents were aware of their child's oral health

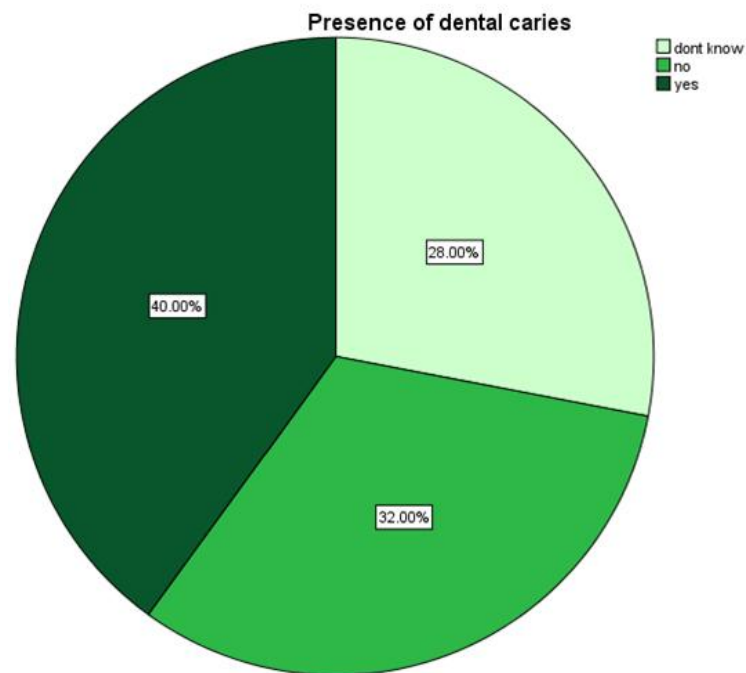


Chart 4. Chart shows the presence of dental caries. The Chart infers that many of the children had the presence of caries

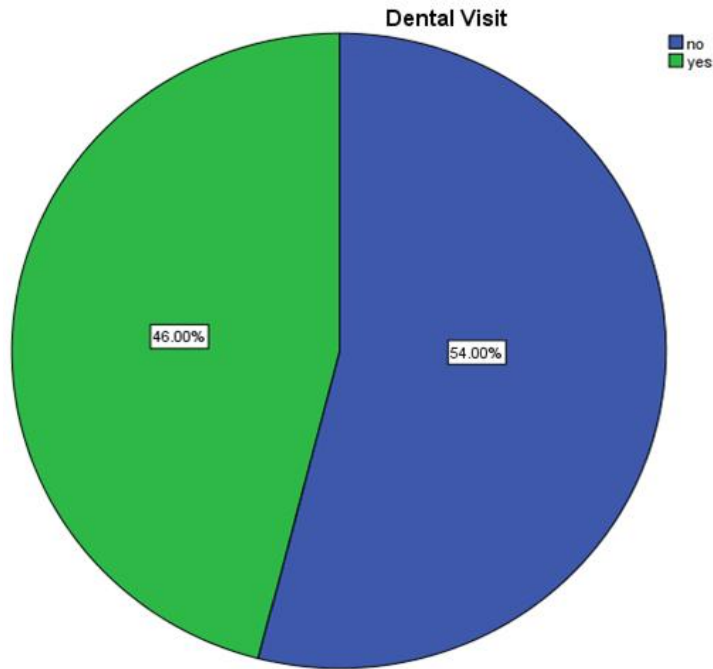
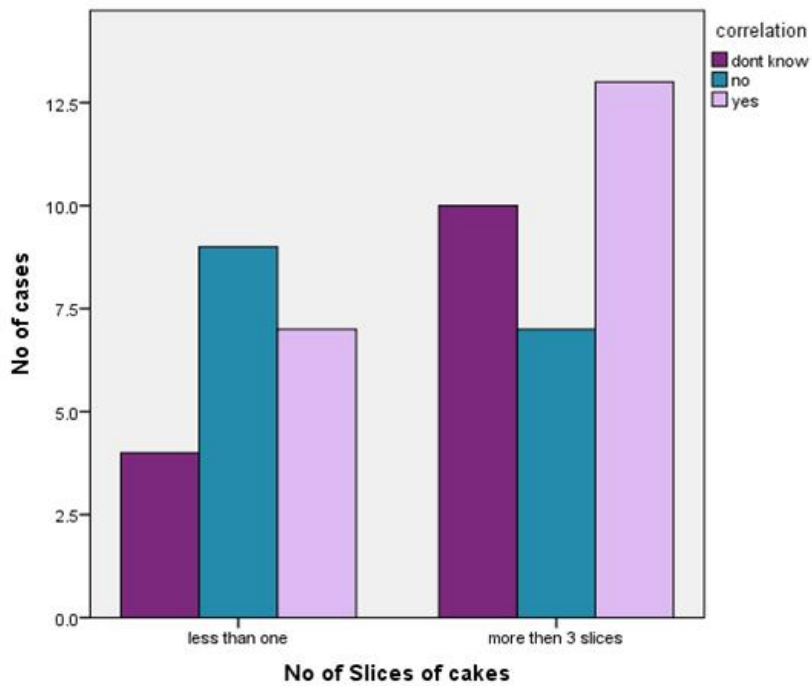


Chart 5. Chart represents the percentage of children visiting the dentist



Graph 1. Graph shows the correlation between the number of slices consumed and the occurrence of dental caries in children. The x axis represents the number of slices of cakes and the Y axis represents the who were reported to have caries

This study creates a basic data line of the sugar content in the cakes sold in Chennai. This study also reveals that the amount of sugar used to prepare these cakes can be reduced significantly since there was a variation in the daily recommended dose for adults and children versus the per suggested size [30,31,32]. The excess amount of sugar present in the cakes can produce many kinds of problems for the growing child such as dental caries if the oral hygiene is not maintained properly, obesity and many other system problems like diabetes mellitus, hypertension etc at an early stage causing even more harmful effects in the older age. Dietary habits have a big influence on childhood obesity. Diet is an important environmental factor in the etiology of childhood overweight This increased intake of sugar can be controlled by the parents [33].

Dietary habits, that is, when and how the beverage or food is consumed, can modify this risk with frequent consumption of sugars thought to increase risk [34] Children at highest risk for dental caries are disproportionately from minority households and/or live in poverty [35] Both the prevalence of decay and the lack of dental treatment increase with minority status and decreasing resources. Food choices, dietary habits and socioeconomic status (SES) are interrelated; these interactions have not been investigated with respect to caries etiology [36].

Several studies identified that the frequent sugar consumption was associated with caries development in children [37,38]. Sugary foods and drinks between-meals are considered to be particularly harmful and should be avoided. According to the modern dietary advice the soft drinks and other sugar containing sweets should be replaced with those containing non-cariogenic sweeteners [39,40].

The limitations of the study include study done based on sugar and energy content data provided on cake product packaging labels in store; hence, we relied on the accuracy of the data provided on the label. the next being small scale short term study with results obtained by self report of parents based on the questions in the questionnaire. Further studies have to be conducted as a prospective study or on a long term large scale basis to attain reliable correlation between cake consumption and dental caries.

#### **4. CONCLUSION**

The results of this study suggest that certain dietary factors, such as frequent consumption of sweet snacks such as cakes have an impact on caries development in children. Furthermore oral hygiene practices also play a role. Hence from this study we can conclude that there is a correlation between the consumption of cakes and incidence of caries. However, further studies should be conducted using long term studies on a larger scale or a prospective study should be carried out.

#### **DISCLAIMER**

The products used for this research are commonly and predominantly used products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

#### **CONSENT**

As per international standard or university standard, respondents' written consent has been collected and preserved by the author(s).

#### **ETHICAL APPROVAL**

The research was approved by the ethical board committee, Saveetha Dental College and Hospitals.

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#### **COMPETING INTERESTS**

Authors have declared that no competing interests exist.

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Available: <https://doi.org/10.1161/circulationaha.109.192627>

## QUESTIONNAIRE

1. Email address
2. Age of the child
3. Gender
4. Does your child consume cakes? a) yes b)no
5. How many slices of cakes does your child consume in a day a) 1-3 slices b)more than 3 slices?
6. Does your child have dental caries? a) yes b) no c) don't know
7. Has your child visited a dentist? a) yes b) no c) don't know
8. Does your child have missing teeth? a) yes b) no c) don't know
9. What type of cake does your child consume? a) plain cakes b) flavoured cakes c)cakes with frostings
10. How many times does your child brush his/her teeth in a day? a) once a day b)twice a day c) never

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