

Role of the refined carbohydrates in caries development
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Роль свободных углеводов в развитии кариеса
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Abstract: in the course of the research work we questioned students of medical and non-medical universities and based on the results we calculated the average amount of sugar consumption by one European student, and estimated the constant of the maximum permissible amount of sugar consumption during snacks.

Аннотация: в ходе данного исследования было проведено анкетирование студентов медицинских и немедицинских вузов и на основе результатов опроса рассчитано среднее количество потребления сахара одним европейским студентом и выведена константа максимально допустимого количества потребления сахара во время снэков.

Keywords: caries, sugar, snacks.

Ключевые слова: кариес, сахар, снэки.

Relevance. Sugar consumption increases every year because people do not know the maximum permissible norm of sugar consumption, so it is important to calculate the maximum permissible norm of sugar consumption during snacks and find new methods of dealing with the excessive sugar consumption.

Objective: to investigate the consequences of excessive sugar consumption and the ways to protect dental tissues from negative bacterial effect.

Tasks:

1. To find explanations of the detrimental effect of sugar on the teeth.
2. To describe the etiology of caries.
3. To offer a method of dealing with excessive sugar intake.

Materials and methods. We carried out the analysis of the native and foreign literature, collected statistical data, and questioned students of Medical and non-Medical Universities about the frequency of their visits to the dental polyclinic per year and the amount of sugar consumed with snacks.

Sugar is a legal drug people crave for; the pleasure center in the brain lights up when people consume sugar just like it does when people use cocaine (Figure 1).

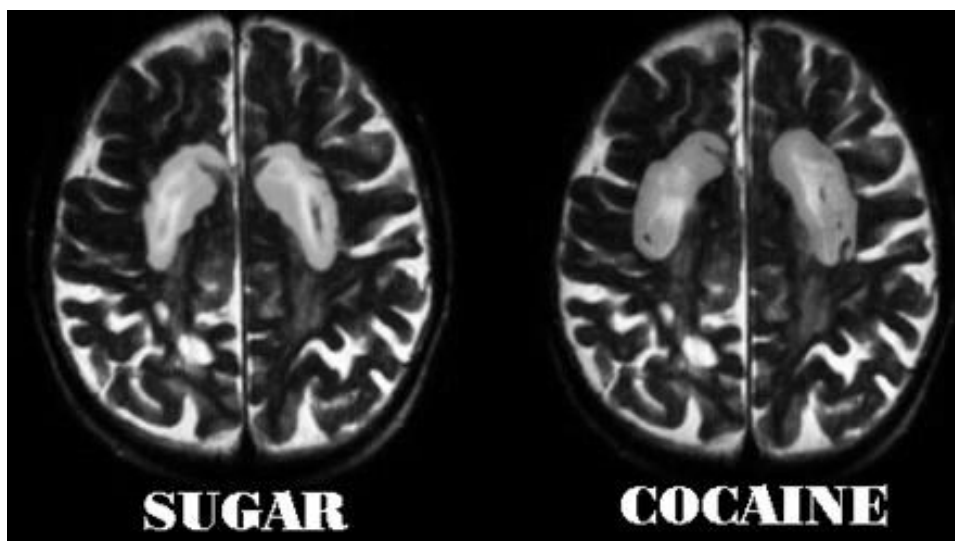


Fig. 1. Activation of the brain centers during the sugar and cocaine use

Research studies show that, much like other addictive drugs, we develop a “tolerance” to sugar, meaning that we need more and more sugar to have the same effect. There is strong evidence that sugar is not only a major

causative factor of oral diseases but can also result in obesity, diabetes, cardiovascular diseases and reduces the strength of the immune system.

Currently, the most common diseases of the oral cavity are gingivitis, caries, pulpitis and periodontal abscess caused by the pathogenic action of bacteria, such as streptococci (*Streptococcus oralis*). These bacteria produce acid that destroy oral tissues and cause the above mentioned diseases. The main substrate for the formation of the acids is refined carbohydrates, sugar being the main representative of this group.

The incidence of dental caries is mainly determined by:

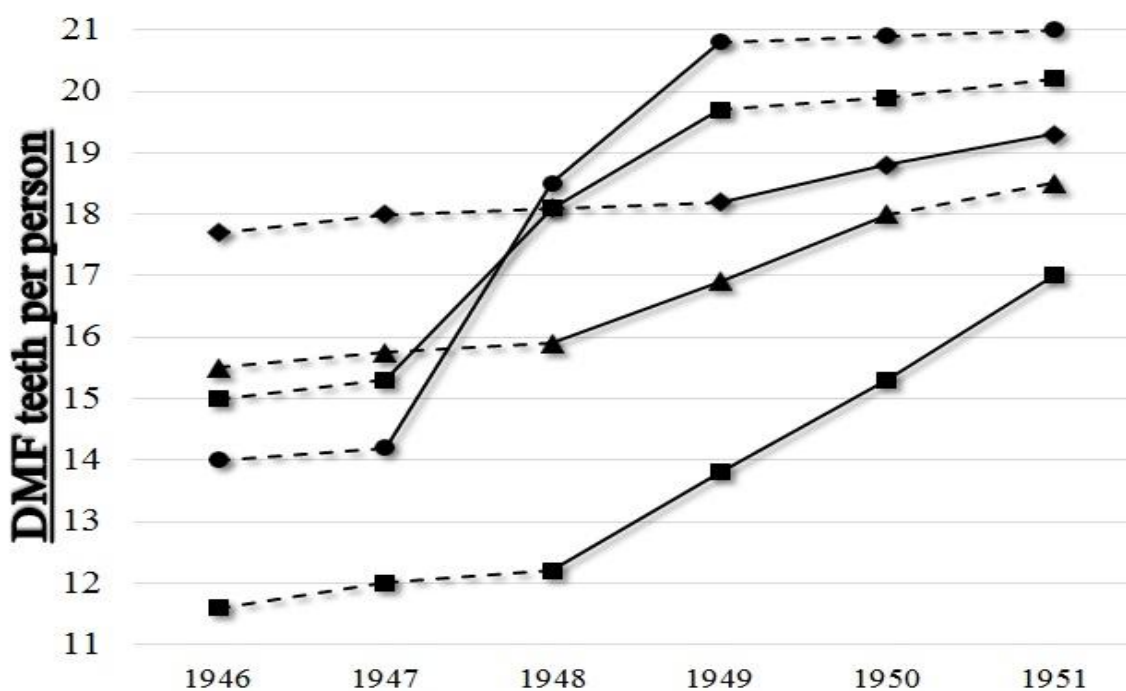
1) the frequency of sugar intake; 2) the total amount of sugar consumed.

These two factors are highly interrelated. Most often, an increase in one factor will lead to an increase in the other factor.

The sequence of consuming cariogenic food during and between meals affects the incidence of dental caries. For example, if snacks containing sticky carbohydrates are frequently taken between meals there will be a corresponding increase in the number of acid attacks on the teeth and as a result in the incidence of dental caries. The DMFT index per person also increases (Figure 2).

The DMFT index per person also increases with an increased frequency of sugar consumption.

These data were clearly confirmed by the Vipeholm experiments, carried on in Vipeholm Mental Hospital in Lund, Sweden. The purpose of the experiments was to determine whether carbohydrates affected the development of cavities. In the course of the experiments mental patients were fed with large amounts of sweets to provoke dental caries (1945-1955) [3]. The experiments showed a clear link between sugar intake and the incidence of dental caries (Figure 2).



2) 8-toffee group

3) 24-toffee group (male)

Chocolate group

4) 24-toffee group (female)

Caramel group

Fig. 2. DMFT index per person depending on the type and time of consuming various sugars and sugar containing products

— — — — — Sugar consumed at meals
 —●— Sugar consumed at and between meals

According to the World Health Organization (WHO) the daily rate of sugar consumption should be not more than 50 grams of sugar (10-12 teaspoons) per day.

The problem is that many people know about the adverse effects of excessive consumption of sugar on the oral cavity (Figure 3) but few people know what quantity of sugar is the maximum permissible for a person per day.

Studies by Takeuchi (1961) [2] and Sreebny (1982) [1] show an S-shaped (sigmoidal) relationship between dental caries and amounts of sugar consumed. Dental caries increases abruptly when the intake of sugar is increased to 40 g/person/day (14,6 kg/person/year), and correspondingly when it reaches a plateau of 100 g/person/day (35 kg/person/year).

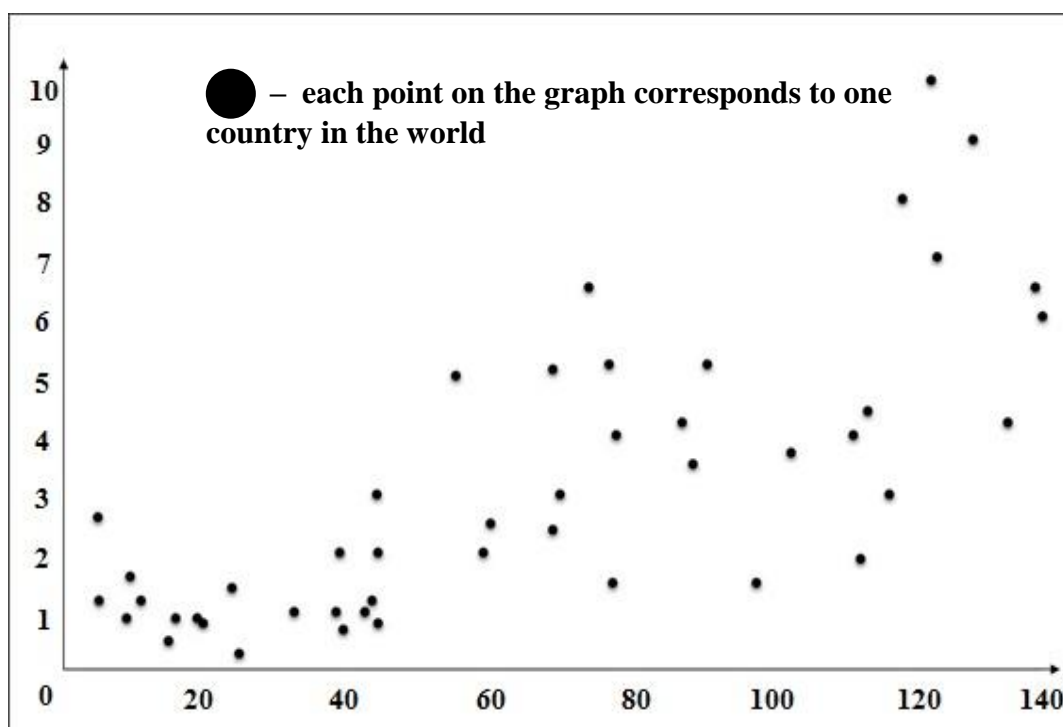


Fig. 3. Influence of total amount of sugar consumed on the incidence of dental caries

People, whose sphere of activity is not connected with medicine are usually less aware of these data, therefore we decided to conduct a survey among students of medical and non-medical universities to determine the relationship between an individual's awareness of the amount of sugar consumed with a food product, the frequency of sugar consumption and the corresponding increase in the frequency of oral disease.

Results and their discussion.

Note. It is not possible to measure the total daily intake of sugar consumed by the respondents, because this requires a complete diet control of the respondents. Therefore, we measured the daily intake of sugar consumed with snacks.

One of the key factors for caries development along with the amount of sugar consumed is fear of dentists because regular visits to the dentist can prevent the complications of caries, therefore we found it necessary to include this question into the questionnaire.

Findings of the survey.

1. Are you afraid of visiting the dentist?

Average number of decayed teeth per person in different countries

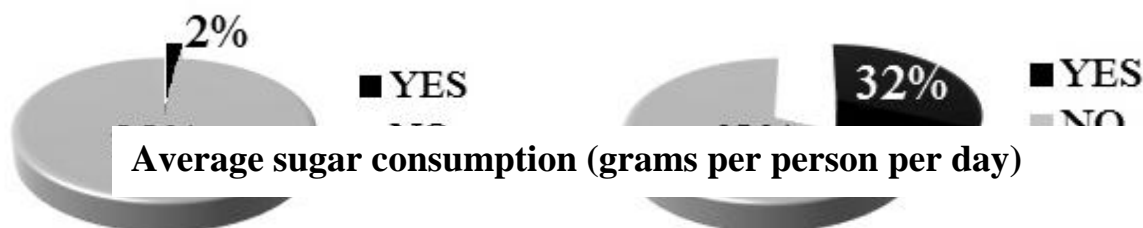


Fig. 4. Students of Medical Universities

Fig. 5. Students of non-Medical Universities

2. Do you know how much sugar per day is the maximum permissible norm according to WHO?



Fig. 6. Students of Medical Universities



Fig. 7. Students of non-Medical Universities

3. Do you think that you exceed the maximum permissible amount of sugar consumption?

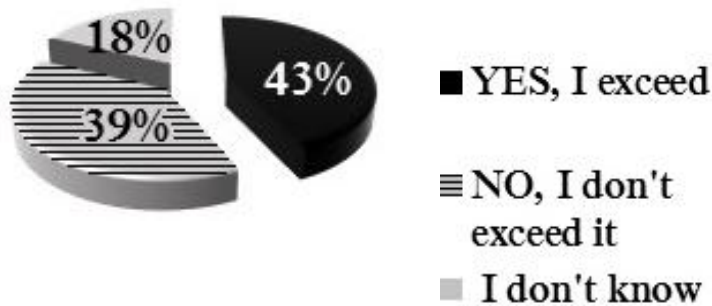


Fig. 8. Students of Medical Universities



Fig. 9. Students of non-Medical Universities

4. The average consumption of sugar with snacks (grams per person per day)

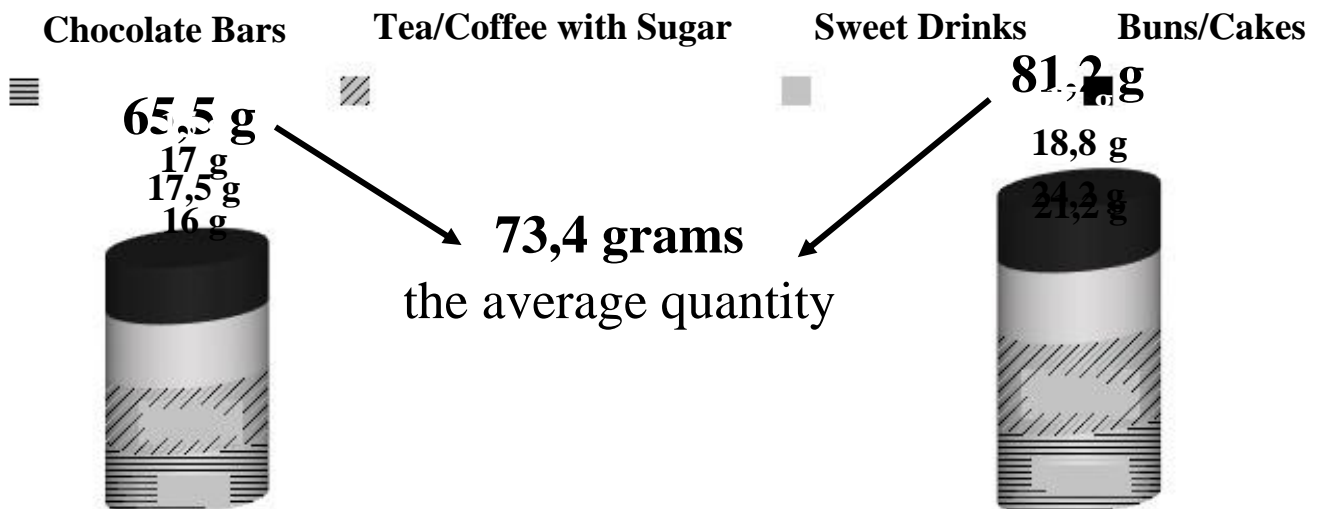


Fig. 10 – Students of Medical

Fig. 11 – Students of non-Medical

From the last diagrams one can see that BSMU students consume on an average 15 grams of sugar with buns and cakes, 17 grams of sugar with sweet drinks, 17,5 grams of sugar with tea or coffee and 16 grams of sugar with chocolate buns per person per day. Their average sugar consumption is equal to 65,5 g/person/day. Students of non-medical universities consume on an average 17 grams of sugar with buns and cakes, 18,8 grams of sugar with sweet drinks, 24,2 grams of sugar with tea and coffee and 21,2 grams of sugar with chocolate buns per person per day. Their average sugar consumption is equal to 81,2 g/person/day.

After calculating the average amount of sugar consumption we can observe that students of non-medical universities consume up to 15,7 grams more sugar than BSMU students. It means that the awareness of sugar consumption norms plays a significant role in the daily selection of diet.

As it can be seen from the diagrams, many students believe that they do not exceed the norm. However, based on the analysis of data obtained, one can conclude that many students consume excessive amounts of sugar without realizing it.

On average, the respondents consume 73,4 grams of sugar per day with snacks, while according to WHO data, the average amount of daily sugar consumption in Belarus amounts to 101 grams per person daily. Consequently, about 73% of daily sugar intake accounts for snacks. It turns out that only 27,6 grams of sugar per person per day are consumed with regular meals. As the daily norm of sugar consumption according to WHO amounts to 50 grams/person/day, **THE AMOUNT OF SUGAR CONSUMED WITH SNACKS FOR ONE BELARUSIAN RESIDENT PER DAY MUST BE 22,4 GRAMS.**

Conclusion:

1. Snacks have a higher cariogenic effect than the regular meals.
2. Our suggestion for solving the problem of excessive sugar consumption and lack of awareness of the population about the norms of its consumption is to indicate the amount of sugar contained in the product on the package. Knowing the fact that it is desirable to consume no more than 22,4 grams of sugar with snacks the population would be able to select the daily diet more correctly. As a result, each person would be able to control individual sugar intake, thereby reducing the risk of oral diseases.

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