

Sugar Intake and Risk Assessment in Chinese Urban Residents

(Overview)

Sugar has diverse physiological functions. In addition to provide energy, it is also a component of antibodies, enzymes, cells and tissues in the body. Sugar can ensure adequate oxidation of fats and constitute glycogen that serves as a form of carbohydrate stored in the muscle and liver cells. Furthermore, sugar has a variety of sensory and food processing specific effects. Our love for sugar is innate. In recent years, the relationship between sugar intake and adverse health effects has received much attention, with findings showing that high sugar intake is associated with an increased risk of obesity, dental caries, and type 2 diabetes. At the same time, the consumption of sugar and sugary foods by Chinese population is increasing. The World Health Organization (WHO) recommends controlling and reducing dietary sugar intake and recommends keeping free sugar intake below 10% of total energy (TE) throughout the life cycle. The Chinese Dietary Guidelines in 2016 recommends that Chinese people should not consume more than 50 g of added sugars per day, preferably controlled at less than 25 g.

"Sugar reduction" is listed as an important content in all important government documents, such as "National Nutrition Plan (2017-2030)", "Health China Action (2019-2030)", and "Guidelines for Prevention and Treatment of Chronic Diseases in China (2017-2025)". Still, there is a lack of systematic risk assessment of sugar intake in China. To support the implementation of these important health policies, as well as the current "three reductions" initiative, and to provide scientific information for popularization and education, the National Experts Committee for Food Safety Risk Assessment conducted an assessment of sugar intake and its risks among the Chinese population (in this assessment, the definition of sugar follows the WHO definition as free sugars referring to monosaccharides and disaccharides added to food and beverages during food production and processing, food catering or consumer cooking at home, as well as sugars naturally occurring in honey, syrups, fruit juices and fruit juice concentrates).

The objectives of this assessment are: (1) to obtain the sugar content in the main commercially available sugary foods in China (beverages, baked goods, confectionery, chocolate, dairy and products); (2) to assess the dietary sugar intake of urban residents in China and its energy supply ratio, and to analyze the contribution of main sugary foods to sugar intake; (3) to propose targeted recommendations for dietary sugar intake and "sugar reduction" actions for various population groups in China.

1. Sugar Intake Assessment Data Sources and Methods

The assessment was based on two types of data, namely, the sugar content of various sugary foods and the consumption of sugary foods and other foods among urban residents aged 3 years and above in China. A simple distribution model was used to calculate the sugar intake, the energy provided by it and the ratio to total dietary energy intake (energy supply ratio) The sugar intake among urban residents aged 3 years and above at each age and sex group was evaluated based on the ratio of sugar supply up to 10% of total energy as recommended by WHO. At the same time, the sugar intake of each population group was also compared with the upper limit of 50 g or 25 g of sugar intake per person per day recommended by the Chinese Dietary Guidelines.

2. Principle Results

2.1 Sugar intake

The average daily¹ intake of sugar for urban residents aged 3 years and above (total N=13,083) in China was 9.1 g per person. The three age groups with the highest average intake were the 3-6 years group (17.1 g), the 7-12 years group (13.5 g) and the 13-17 years group (13.1 g), all of which showed average intake lower than the recommended value of up to 50 g per day for added sugar intake as stipulated in the Chinese Dietary Guidelines. There is an overall decreasing trend in sugar intake with increasing age. The average intake of sugar is generally higher for women than for men. Among high consumers, the P97.5 of males in the 3-6, 7-12, 13-17, and 18-29 years groups exceeded 50 g, with the highest P97.5 of 66.0 g for males in the 3-6 years group. Among the 13,083 respondents, only 238 had a daily sugar intake of more than 50 g/person/day, accounting for 1.8% of the total respondents, with the highest in the 3-6 years group (5.8%), followed by the 7-12 years group (3.3%). Using 25 g as the benchmark, the proportion of urban population aged 3 years and above with sugar intake ≥ 25 g/person per day was 10.4%, while it reached 27.2%, 18.0% and 16.8% in the 3-6 years, 7-12 years and 13-17 years groups, respectively.

2.2 Energy supply ratio of sugar intake

The average energy intake ratio of sugar² for urban residents aged 3 years and above (total N=13,083) was 1.9%, which was far below the upper limit of 10% recommended by WHO, and the highest ratio was 3.4% in 3-6 years group. The energy intake ratio of sugar decreased with increasing age. Among the high consumers, the P95 of the 3-6 years old group and the 13-17 years old group was 9.8% and 9.6% respectively, which were close to

¹ The abbreviation of standard person/day, the same below.

² Sugar supply ratio: the percentage of sugar energy to total dietary energy.

10%; the P97.5 of the four age groups of 3-6 years old, 7-12 years old, 13-17 years old, and 18-29 years old exceeded 10%, while the 3-6 years old group had the highest value of 12.3%. Among the 13,083 respondents, only 244 individuals had sugar supply ratio over 10%, accounting for 1.9% of the total respondents, of which the 3-6 years old group and 13-17 years old group accounted for the highest proportion, 4.8% and 4.1%, respectively.

Among the 11,912 consumers of sugary foods, the proportion of individuals with a sugar supply ratio of more than 10% was 2.0%, and the value was highest in the 3-6 and 13-17 age groups, at 5.0% and 4.4%, respectively. Since the proportion of sugary food consumers among all survey respondents was as high as 91.0%, the population of sugary food consumers can basically represent the total population for urban residents.

Among high sugar consumers (those with sugar intake \geq P97.5, N=591), the average energy supply ratio of sugar intake in the 3-17 years group was 10.6%, and the proportion of individuals with sugar intake energy supply ratio $>10\%$ was 46% (N=58), while high consumers accounted for only 5% of the total population.

2.3 Contribution of different categories of sugary foods to sugar intake

Among urban residents aged 3 years and above, the following four food groups contributed most to sugar intake: table sugar (28.2%), sugary dairy products (24.4%, including 21.9% sugary yogurt), beverages (17.7%), and baked goods (19.9%). The contribution of candy and honey with high sugar content³ to sugar intake was 1.3%, while preserved fruit contributed only 0.8%. Among the major sugary food categories and subcategories, the contributions in descending order were as follows: sugar 28.2%, sugary yogurt 21.9%, pastries 9.5%, bread 8.7%, carbonated beverages 7.1%, fruit and vegetable juices and beverages 3.8%, and tea beverages 2.5%, for a total of 81.7%.

Among the high consumers of sugary foods (those with sugar intake \geq P97.5, N=126) in the 3-17 years group, the four sugary food groups with the highest to lowest contributions were sugary dairy products 35.7% (including yogurt 35.0%), beverages 25.5% (carbonated beverages 9.4%, fruit juices and beverages 5.7%, and tea beverages 3.8% were the top three contributors), sugar 18.3%, and baked foods 13.3% (7.2% for pastries and 5.0% for bread, a total of 12.2%). Among the high consumers of sugary foods (those with sugar intake \geq P97.5, N=465) in the 18 years and older group, the four types of sugary foods with the highest to lowest contributions were sugar (35.3%), beverages 22.3% (carbonated beverages 8.6%, juice drinks 5.9%, and solid drinks 3.0% were the top three contributors), sugary dairy products

³ Candy and honey category, including 3 subcategories, i.e. candy, chocolate, and honey.

17.1% (including yogurt 16.1%), and baked foods 12.7% (pastry 7.2%, bread 4.5%).

3. Conclusions and Recommendations

Sugar is an important flavoring in traditional Chinese diets and a major ingredient in many processed foods. It has an important function in satisfying the needs of the tongue. However, in nutrition, sugar provides "empty energy", i.e. it does not contain other essential nutrients such as protein, fat, vitamins and minerals, but only provides energy. Excessive energy provided by sugar will affect the intake of other foods and nutrients. If the total energy intake exceeds the energy consumed, it can lead to overweight or obesity. Therefore, controlling or reducing the amount of sugar added to food is an important issue for health. Especially with an unhealthy lifestyle (eating more and moving less), controlling dietary energy intake (including empty energy derived from added sugars) is critical to maintain energy balance.

The average sugar intake of urban residents aged 3 years and above in China is 9.1 g/person per day, with an average energy supply ratio of 1.9%, which is lower than the upper limit of 50 g (or 25 g) per person per day recommended by the Chinese Dietary Guidelines, and far lower than the upper limit of 10% of the total energy (energy supply ratio) provided by sugar intake as recommended by WHO. At the same time, the energy supply ratio of sugar intake among Chinese residents is much lower than that of other countries in the world. Nevertheless, we cannot be blindly optimistic, because in the past 20 years, the per capita consumption⁴ of sugar in China has increased from 16 g/d to 35 g/d. It should be noted that the sugar intake of Chinese residents aged 3 to 29 years is higher than the average intake (in terms of energy supply ratio). In particular, 4.1% to 4.8% of children and adolescents aged 3 to 17 have an individual energy supply ratio of more than 10%, and the sugar consumption of this age group is still increasing year by year. These results indicate the attention to be paid on the sugar intake among youth. It is recommended that the relevant departments and the society take effective measures for adolescents and develop science-based and realistic "sugar reduction" strategies and measures as a concrete action to implement the relevant national health policies.

High sugar intake in children and adolescents is due to high consumption of sugary foods, including sugary drinks, sugary yogurt, and baked goods. Therefore, focus needs to be placed on children and adolescents, and targeted measures need to be taken accordingly, including scientific awareness in the health and education systems, and sugar reduction

⁴ Per capita consumption refers to non-actual intake: (production + imports - exports)/total population.

measures in the food industry.

The food groups that contribute significantly to the sugar intake of urban residents in China are, from high to low, sugar (for cooking), sugar-containing dairy products, and sugar-containing beverages and baked goods. For the above-mentioned food products, it is recommended that the authorities should strengthen the management of nutrition labeling of sugar and widely publicize the importance of reducing the use of sugar in cooking. Also, based on the assessment that sugary yogurt contributes up to 21.9% to the sugar intake of Chinese residents, it is recommended that dairy producers take practical measures to increase sugar reduction efforts.

Based on the contribution of the major categories/sub-categories of sugary foods to the energy intake of sugar and the sugar content of foods, we recommend the following foods as the focus of "sugar reduction": carbonated beverages, fruit and vegetable juices, tea beverages, dairy beverages; yogurt; baked pastries, cold-processed pastries, and Sachima; puff breads, seasoned breads, and other breads; cookies, omelets, pancakes, and sandwich cookies, as well as wafer cookies, egg round cookies, and cookies.

The reduction of dietary sugar intake should be based on the results of scientific assessment and be implemented gradually with the whole society engaged. On the one hand, various stakeholders (government, industry, scientists, media) should strengthen sustainable science education to raise the awareness of healthy diet and thus to change food consumption behavior, including the selection of taste. On the other hand, food-related industries (production and processing, catering) should strengthen their research and development capabilities to gradually reduce the amount of sugar in their products while keep them accepted by most consumers.