Concept of Relationship of Ionic Beverages with Caries

According to the Survey of Dental Diseases by the Ministry of Health and Welfare (conducted in 1999 and 2008), the number of children with dental caries has been steadily decreasing over the past 17 years. In 1999, dental caries incidence was 36.4% in children aged 3 years and 64.0% in those aged 5 years, while in 2016 those rates were found to be reduced to 8.6% and 39.0%, respectively. This is considered be a result of increased interest in oral health by caregivers and others, though a new problem has arisen. When children are divided into two groups, those with good and poor oral hygiene, in the latter group, the lower front teeth, which are normally less susceptible to caries, are more likely to be affected by caries. This tendency has been observed not only in infants but also school children. One of the causes is thought to be related to the way sports drinks are consumed.

Although sports drinks are considered as ionic beverages, they are typically characterized by a high sugar content as compared to oral rehydration fluid, which is also classified as an ionic beverage.

While there are many possible causes of dental caries, following is a summary of problems associated with the consumption of ionic beverages as well as countermeasures to prevent associated dental caries.

1. Problems and background

1) Infants and ionic beverages

Many parents consider that ionic beverages available on the market are good for the body, due to TV commercials and other media. They tend to give them to their children when they are active and sweating, after taking a bath, or feeling thirsty. In addition, these drinks are also consumed for mild dehydration due to diarrhea or vomiting. However, if given to an infant eating a normal diet, the electrolyte content will be too high and the child will become more thirsty, leading them to constantly drink ionic beverages.

There are two types of tooth demineralization (dissolution) leading to caries development, one caused by acid produced by cariogenic bacteria and the other involving acid erosion caused by frequent intake of an acidic diet. Ionic beverages, especially sports drinks, are likely to be habit

forming, because they have a higher concentration of sugar and stronger sweet taste than oral rehydration solutions, thus can cause caries. Ionic beverages have a low pH ranging from 3.6-4.6, and enamel demineralization tends to occur at pH 5.4 or lower, thus causing acid erosion. When an ionic beverage is left in the mouth, it can cause not only tooth decay but also acid erosion. This tendency is further amplified by giving an ionic beverage before bedtime or when the child wakes up in the middle of the night, because of a decrease in secretion of saliva secretion, which has an ability to buffer against acidity and inhibit the activity of caries-causing bacteria.

Another factor is that when a patient visits a medical institution for diarrhea or vomiting, the doctor may recommend over-the-counter ionized beverages if mild dehydration that does not require an infusion is found. However, often little guidance is given regarding the fact that rehydration with an ionic beverage is not necessary after dehydration has improved. As a result, parents not only think that ionic beverages are good for the body no matter how much they give them as a substitute for water, but children also want them, so they actively give them to their children afterwards and make that a habit.

As compared to oral rehydration fluid, sports drinks have a low sodium concentration and high sugar content, which slows down absorption of electrolytes, which may cause hyponatremia, especially when given to a dehydrated infant.

Consumption of large amounts of ionic beverages not only causes obesity, but may also have adverse effects on the whole body such as anorexia.

2) School children and ionic beverages

Sports: When children exercise and sweat by participating in sports, they tend to drink ionic beverages. This leads them to carry plastic bottles of such beverages, especially sports drinks, and develop a habit of drinking them frequently. As a result, immature permanent teeth that have just erupted become carious, the same as seen with deciduous teeth.

Cram school commuting: School children who go to cram school after regular school often buy a drink along with food while on their way. If they have developed a habit of regularly drinking ionic beverages since childhood, that is likely what they will choose instead of water. They develop a habit of drinking while riding the train or walking down the street.

Schoolchildren, such as in the cases noted above, tend to buy beverages as much as they want, which causes not only tooth decay but also obesity if they drink too much. Furthermore, should obese schoolchildren with impaired glucose tolerance drink the wrong kind of beverage heavily without being aware of the presence of diabetes, they are at risk of developing "PET bottle syndrome", which can lead to ketoacidosis and coma.

2. Countermeasures

1) For infants

Give plain water except in situations of extreme exercise or excessive sweating.

Do not give an ionic beverage in place of water.

If dehydration is present due to diarrhea or vomiting, give an oral rehydration solution. After symptoms improve, give plain water when thirsty.

Do not give an ionic beverage before or while sleeping. Give water when they are thirsty at night.

Give water after taking a bath.

Brush their teeth before bedtime. If you have no choice but to give the child something to drink before or while sleeping, have the child drink water. Or, wipe their mouth with a cotton swab or gauze wrapped around your fingertip after giving a beverage.

2) For school children

Encourage them to drink an oral rehydration solution when sweating during exercise, then plain water after exercise.

Teach them to avoid the habit of carrying a plastic bottle with an ionic beverage, as well as drinking such a beverage often or while eating.

Encourage them to drink water when thirsty.

References

Concepts on ionic beverages and dental caries. Committee for Pediatrics and Pediatric Dentistry (January 16, 2004)

Toyota H: Correctly understand the differences between sports drinks and oral rehydration solution! Clinical Pediatric Dentistry, 21(8):55-60 2016