Dental diseases and oral health

Dental diseases are the most prevalent chronic diseases worldwide, and a costly burden to health care services. The treatment of dental diseases is expensive, accounting for between 5% and 10% of total health care expenditures in industrialized countries. In most developing low-income countries, the prevalence rate of dental caries is high and more than 90% of caries is untreated. An estimated 5 billion people worldwide suffer from dental caries (tooth decay).

Nutrition affects the teeth and growth of the jaw during development. While malnutrition may exacerbate periodontal and oral infectious diseases, the most significant effect of nutrition is the local action of diet in the mouth, particularly in the development of dental caries and enamel erosion. Dental caries is largely caused by sugars. Dental erosion is associated with dietary acids, a major source of which is soft drinks. A typical soft drink may contain the equivalent of up to 20 teaspoons of sugar. Despite a low mortality rate associated with dental diseases, they have a considerable impact on self-esteem, eating ability, nutrition and health both in childhood and older age.

DEFINING DENTAL DISEASE

Dental diseases include dental caries, developmental defects of enamel, dental erosion and periodontal disease.

Dental caries

Dental caries occurs due to demineralization of enamel and dentine (the hard tissues of the teeth) by organic acids formed by bacteria in dental plaque. This process is due to the anaerobic metabolism of sugars derived from the diet. When sugars or other fermentable carbohydrates are ingested, the resulting fall in dental plaque pH caused by organic acids increases the solubility of the dental hard tissues and demineralization occurs as calcium is lost. The development of caries requires sugars and bacteria to occur, but is influenced by the susceptibility of the tooth, the bacterial profile, quantity and quality of the saliva, low levels of fluoride, and the time for which fermentable dietary carbohydrates are available for bacterial fermentation (i.e. the frequency of sugar intake).

Dental erosion

Dental erosion is the progressive irreversible loss of dental hard tissue that is chemically etched away from the tooth surface by dietary extrinsic and/or intrinsic acids. Erosion is often associated with other forms of tooth wear such as abrasion and attrition (from overzealous oral hygiene, work-related exposure to industrial inorganic dust, and grinding of teeth, for example). Poor salivary flow or salivary deficiencies are thought to make some individuals more susceptible. Erosion reduces the size of the teeth and in severe cases leads to total tooth destruction.

WHY IS THIS HAPPENING?

Oral health is related to diet in several ways, for example, nutritional influences on cranio-facial development and salivary glands, oral cancer and oral infectious diseases. Diet plays an important role in dental caries, a major cause of tooth loss. Diet also plays a significant role in dental erosion, a condition which seems to be becoming more prevalent worldwide. And dietary components may also contribute to development of enamel defects. Periodontal disease, another cause of tooth loss in adults, is largely related to the use of tobacco. Oral cancer is also largely caused by the use of tobacco (smoking and chewing), as well as excessive use of alcohol.

There is convincing evidence, collectively from human intervention studies, epidemiological studies, animal studies and experimental studies, for an association between the amount and frequency of free sugars intake and dental caries. Nutritional status affects teeth pre-eruptively, though this is much less important than the post-eruptive local effect of diet. Undernutrition, coupled with a high intake of sugars, may exacerbate caries.
Periodontal disease

Periodontal disease mostly becomes apparent in middle age. Apart from severe vitamin C deficiency, which results in scurvy-related periodontitis, there is less evidence of an association between diet and periodontal disease. The main overriding factor is the presence of plaque, and the use of tobacco.

THE EXTENT OF THE PROBLEM

Despite improved trends in levels of dental caries in developed countries, the disease remains prevalent and is increasing in some developing countries undergoing nutrition transition, with limited exposure to fluorides. Within most countries, geographical and social factors influence the occurrence of dental caries and, despite improvements, caries continues to affect the majority of children, some severely. Dental caries is the most common dental disease in children and contributes to tooth loss in adults.

In most developing low-income countries dental caries prevalence is severe as more than 90% is untreated. The level of caries is higher for the primary dentition than the permanent dentition for children of several developing countries in Asia and Africa, as shown by recent studies for China, Thailand, Madagascar and Niger. Available data show that the mean number of permanent teeth affected by dental caries (DMFT) in populations at age 12 years of low-income countries is 1.9 compared with 3.3 DMFT for middle income countries and 2.1 DMFT for high-income countries. (dmft/DMFT is a count of the number of teeth in a person’s mouth that are decayed, filled or missing, widely used to indicate the prevalence of dental caries and the severity of dental caries in primary teeth (dmft) or permanent teeth (DMFT).

Dental diseases have a detrimental effect on quality of life both in childhood and older age. The second WHO International Collaborative Study of Oral Health Systems (ICSII) revealed that in all countries covered by the survey, substantial numbers of children and adults reported impaired social functioning due to oral disease, such as avoiding laughing or smiling due to poor perceived appearance of teeth.

Dental decay also results in tooth loss, which reduces the ability to eat a varied diet. It is in particular associated with a diet low in fruits, vegetables and non-starch polysaccharides (NSP), and with a low plasma vitamin C level. NSP intakes of less than 10g per day and fruit and vegetable intakes of less that 160g per day have been reported in a study of edentulous people (i.e., with no teeth at all). Tooth loss may therefore impede the achievement of dietary goals related to the consumption of fruits, vegetables and NSP.

WHAT CAN WE DO ABOUT IT?

In low-income countries, the cost of traditional restorative treatment of dental disease is disproportionately expensive. The large financial benefits of preventing dental diseases should be emphasized. It is important that countries with a low intake of free sugars do not increase intake, as the available evidence shows that when free sugars consumption is < 15-20 kg/year (~6-10% energy intake), dental caries is low. Other countries should aim towards a maximum of 10% of total calorie intake per day in free sugars. In addition, the frequency of consumption of foods containing free sugars should be limited to a maximum of four times per day and adequate exposure to fluoride should be promoted.

FOCUS ON THE YOUNG

Effective prevention should focus in particular on young people. Needed actions include:

• Promoting healthy nutrition and oral hygiene practices through school health programmes.
• Providing nutritionally sound school lunches, which factor in the protective factors in milk and cheese.
• Banning soft drink and snack vending machines, and the sale of sweets and unhealthy foods inside or just outside school premises.
• Discourage linkages between sports and soft drinks.
• Promoting pre-natal good nutrition and breastfeeding for at least six months.
• Encouraging caregivers to support healthy dietary habits in children and the elderly.