

## Role of Nutrition in Oral Health

Neeraja Turagam\* and Durga Prasad Mudrakola

<sup>1</sup>Department of Prosthodontics, Aimst University, Malaysia

<sup>2</sup>Department of Periodontists, Aimst University, Malaysia

**\*Corresponding Author:** Neeraja Turagam, Department of Prosthodontics, Aimst University, Semeling, Jalan Bedong, Kedah Darul Aman-08100, Malaysia.

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### Abstract

Nutrition and diet affects the development and integrity of the oral cavity as well as progression of diseases of the oral cavity, and are major multifactorial environmental factors in the aetiology and pathogenesis of oro-facial diseases and disorders. Oral health and nutrition have a synergistic relationship. Oral infectious diseases, as well as acute, chronic and terminal systemic diseases with oral manifestations, impact on the functional ability to eat while also having an impact on diet and nutrition status. Oral health should not be viewed in isolation from general health. Nutrition plays a major role on craniofacial development and prevention of oral infections and oral cancers. Dental diseases show an impact on quality of life and are very expensive when treated. major problems in providing nutritional advice relating to health is that for the prevention of specific conditions particular aspects of the diet are emphasized, more often the exclusion of other elements essential for overall health by which we can therefore help to improve not only the oral health but also the general health of the population [1]. The objective of this paper is to review the evidence for an association between nutrition, diet and dental diseases and to present dietary recommendations for their prevention.

**Keywords:** Dental Caries; alcopops; fromagefrais; Erosion; acid attack

### Introduction

Dental decay continues to be a significant public health problem all over the world, for children in particular: The most important dietary factors in relation to dental health are the amount and the frequency with which sugar containing foods and drinks are consumed. Practically, lesser intake frequency lessens total sugar intake. When sugars are consumed they should therefore be taken as part of a meal rather than between meals [1].

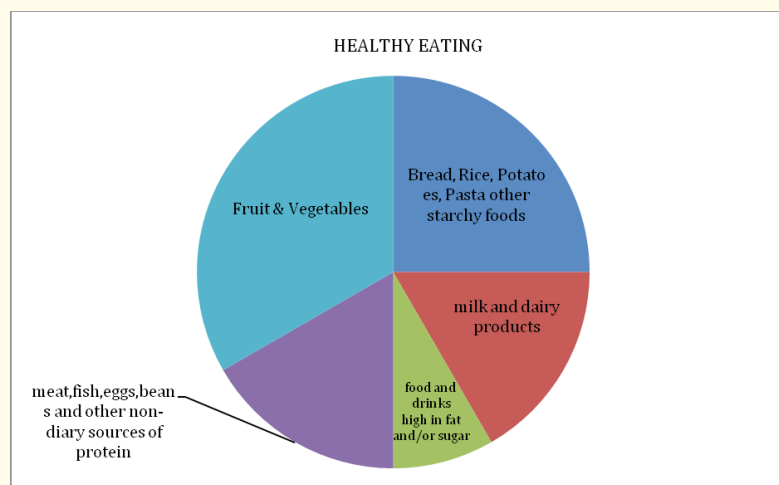
### Based on the relationship between dental caries and the consumption of sugars scientifically

The scientific evidence relating free sugars to dental caries is indisputable [1-14]. The two important issues are (1) determining the safest levels of sugar consumption consistent with good dental health and (2) determining the 'safe' frequency of sugar consumption consistent with good dental health.

Newbrun has suggested that the dose-response relationship between sugars and dental caries is an S-shaped curve on which low levels of sugar consumption relate to low caries experience and increased consumption relates to an increase in dental caries [15].

Studies during World War II have demonstrated that as sugar consumption fell to 0.2 kg per person per year and so did the incidence of dental caries. As the sugar intake increased from 0.2 to 20 kg per person per year there was an equivalent increase in caries risk, suggesting that reduced sugar consumption connected with healthy dentition are identifiable [16].

Sreenby has examined sugar intake using data from the World Health Organization. He demonstrated that where sugar intake was low the caries risk remained low, indicating that the safe amount of dietary sugar commensurate with dental health was within a range of 0.2 kg per person per year and 16 to 18 kg per person per year [17].



**Figure 1:** Healthy Eating.

### Determining the 'safe' frequency of sugar consumption

COMA has recognized the importance of the relationship between frequency of sugar intake and caries. The findings show that frequent consumption of soft drinks was significantly associated with high caries rates [3,11,18].

Another study [19] demonstrates that caries experience was significantly related to the frequency of consumption of confectionery, biscuits and pastries. The relationship between the frequent consumption of free sugars and dental caries has also been confirmed [15,20]. These studies show that a high frequency of dietary sugars pushes the dose-response curve towards the left, which means lesser and more frequent sugar intake are associated with high caries experience.

Milk and cheese have been shown to be protective against demineralization of enamel. Especially Cheese stimulates salivary flow and raise plaque calcium levels to promote remineralization [13].

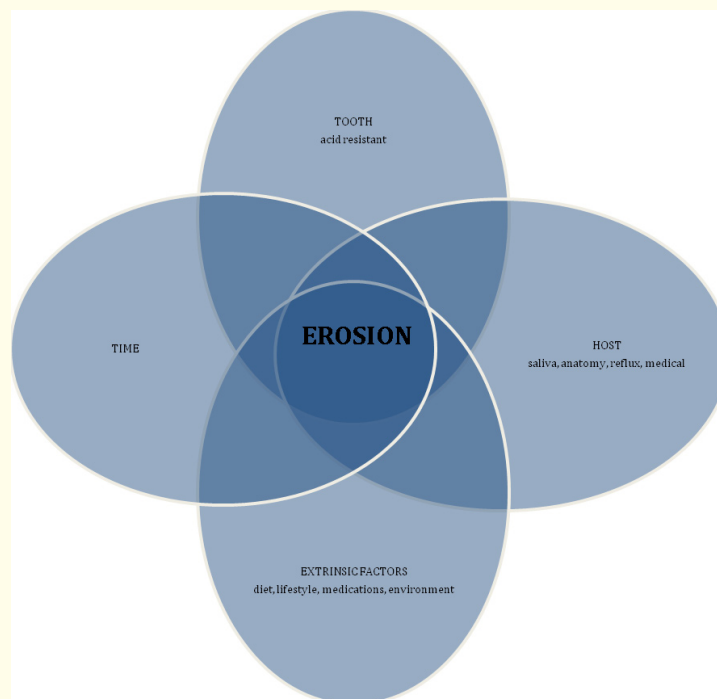
Chewing sugar-free gum may also help by stimulating salivary flow and reducing acidity in the oral cavity [1,21]. For the promotion of dental health, twice daily tooth brushing with fluoride toothpaste should be widely encouraged to further support these dietary recommendations [1].

### Based on the relationship between dental erosion and diet scientifically

Dental erosion has been described as: "the irreversible loss of dental hard tissues by a chemical process not involving bacteria; this differentiates it from [dental] caries" [5].

Erosion is classed as a type of tooth wear, which, if allowed to progress, results in sensitivity to foods, hot and cold as well as acidic drinks. It can cause persistent pain and discomfort in extreme conditions [1].

The etiology of dental erosion is said to be multifactorial. This means it is recognized that intrinsic factors (tooth resistance, saliva, and anatomy of the mouth, gastro-esophageal reflux and medical conditions) and extrinsic factors (food, lifestyle, drugs and surrounding environment) may all act to increase an individual's susceptibility to dental erosion.



**Figure 2:** Multi-factoral etiology of dental erosion.

It has been well established that all acids (both intrinsic and extrinsic) have the potential to cause dental erosion through the process of enamel demineralization [5-7].

#### **Infants, toddlers and dental erosion**

The issue of erosion is important in early childhood because of the thinner dental enamel and its greater acid solubility. Erosion of the dentition is associated with the use of fruit drinks taken in feeding bottles in infants.

For toddlers, erosion has been linked to the frequent consumption of carbonated (fizzy) drinks and insufficiently diluted fruit juices. Hence, milk and water are the preferred in between meals for young children.

#### **Children, adolescents, adults and dental erosion**

In recent years there have been significant changes in the dietary patterns of children, adolescents and adults. Frequent consumption of drinks such as soft drinks and diet drinks has contributed to an increased prevalence of dental erosion in adolescents. The sports drinks, are often consumed after physical exercise when the mouth is dry have high acidic content [5,22]. As a result they have a greater erosive potential, as the buffering effect of the saliva is reduced. Acidic drinks such as fruit juices, squashes and carbonated drinks are taken prior to bedtime causes reduced salivary flow which is experienced while sleeping which means that the erosive potential of these drinks is greater [13].

The popularity of 'alcopops' among under 18's has introduced another potential problem because of the acidity of these drinks. Studies prove that these drinks have low pH (< 4) which is the cause of erosive effect on the dental enamel [23]. Another problem associated with dental erosion is linked the oral hygiene which includes brushing of teeth, cleaning mouth immediately after consuming acidic drinks, when demineralization of enamel will have occurred, leading to abrasion. Using mouthwashes with acidic proprietary and saliva substitutes can contribute to dental erosion. There is a consensus of professional opinion that tooth brushing should be delayed for up to one hour after consumption of acidic drinks and that a low abrasion, high fluoride toothpaste should be used. The use of fluoride

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mouthwashes or the topical application of fluoride varnishes or gels may also be recommended in erosion with sensitive teeth [1,13,24]. The method of drinking acidic drinks and temperature is considered to influence their erosive potential. It has been suggested that they should be taken ice-cold to reduce their erosive effect; they should not be sipped slowly or swished around the mouth; and, they should be taken through a straw to reduce contact with the teeth [1,13,24]. In addition it is thought that taking milk or cheese after acidic foods or drinks may be beneficial [1,13].

However, until further research is carried out much of the advice currently given relating to the prevention of dental erosion is based more on common sense than evidence [1,13]. Drinking acidic drinks through a narrow straw placed behind the front teeth and well to the back of the mouth reduces the risk of dental erosion. Acidic drinks should be consumed chilled and not swished around the mouth. Avoid brushing teeth for about an hour after consuming acidic drinks. Small amount of less abrasive tooth paste (gel-type paste) and a fluoride mouth wash is used. Professional application of fluoride varnishes and gels can give added benefit by increasing the acid resistance of enamel and reducing sensitivity.

#### **Clarification of dental and nutritional health education messages**

In 1989 COMA stated that “although lactose alone is moderately cariogenic, milk also contains factors which protect against dental caries, so milk without added sugars may be considered to be virtually non-cariogenic” [3]. This view is restated in recent publications [1,2].

#### **Flavoured yogurts and fromagefrais**

These tend to contain quite a lot of sugar and are therefore best taken along with meals. Yogurt or fromagefrais (with added fresh fruit if desired) are preferable snacks for in between-meal. Dietary products such as low calorie yogurt are not intended for use in babies or toddlers. Plain whole milk products (rather than low-fat varieties) should be used from six months until two years of age. Later, low-fat varieties can be gradually introduced, providing the child is eating a varied diet and has satisfactory growth [1,2].

#### **Fruit and vegetables**

The sugar content of fruit and vegetables COMA has stated that fresh fruit (and vegetables) appears to be of low carcinogenicity [3]. Currently, recommendation for consumption equates to at least five portions of fruit and vegetables daily, which includes fresh, frozen, canned, dried and juiced varieties [2,4]. The excessive consumption of citrus fruits and fruit juices has long been implicated in erosion of the teeth [25-27] especially in patterns such as the sucking of oranges or lemons over prolonged periods [25,26]. Totally avoid brushing for up to an hour after taking acidic foods or drinks.

#### **The nutrition related dental problems of pre-school children, schoolchildren and adolescents, adults and geriatric people**

COMA3 has stated that “dental caries is not age specific, it can occur at any age”. Due to changing patterns of health behaviors throughout the lifespan, the disease is more prevalent in pre-school children, schoolchildren and adolescents, adults and geriatric persons.

‘Early childhood caries’ previously known as ‘nursing bottle caries’ is found in infants and toddlers who use a feeding bottle over prolonged periods and particularly at night. Lactose, the sugar naturally occurring in milk, is considered to be relatively non-cariogenic [1,3]. Early childhood caries is also associated with the prolonged use of sweetened comforters and sugary medicines. Dental caries in childhood and adolescence remains a significant health problem, along with the increasing prevalence of overweight and obesity [2,8]. The frequent ingestion of sugary snacks and acidic drinks (including diet and sports drinks) can result in dental caries and dental erosion. These snacks and drinks also add ‘empty’ calories that may contribute to overweight and obesity. The results of the national adult dental health survey have shown that the state of dental health is changing within the adult population and that more people are expected to retain more of their teeth for longer [12]. The rate of dental caries affecting the crown of the tooth slows down with age as the mature tooth is more resistant to acid attack [15]. However the major dental problem of older age is root caries, associated with exposed root surfaces caused by gum recession. Exposed root surfaces are prone to carious attack especially in those with reduced salivary flow.

Dry mouth is associated with many prescribed medicines. People suffering from reduced salivary flow may try to increase saliva in the mouth by eating sweets or taking frequent cups of tea or coffee. If these contain sugar they further increase the risk of dental decay. High prevalence of root caries has been associated with high frequency of free sugars intake. Frequent consumption of plain water should be encouraged and the use of sweetened or acidic drinks limited to mealtimes. It has also been suggested that chewing sugar-free gum may help by stimulating salivary flow and improving the ability of salivary glands to respond to future stimuli [21].

There are a number of risk factors that can result in the erosion of tooth enamel. These are usually related to gastric reflux associated with certain medical conditions (Eg. hiatus hernia, obesity and bulimia), medicines (Eg. aspirin) or dietary factors (Eg. the consumption of acidic drinks or of citrus fruits).

### Dietary Recommendations

Watt and McGlone have reinforced the COMA recommendation that free sugars intake should not exceed 10% of the total dietary energy (calorie) intake (including alcohol) nor 11% of the total food energy (excluding alcohol), and that free sugars have been implicated as the main causative factor in caries [10]. Evidence states that a frequency of sugar intake not exceeding four times a day is consistent with good dental health [1,2,9,10]. This should be the recommended goal for the majority of the population

### Conclusion

Research shows that adequate nutrition is essential not only for overall physical health, but also for the development and maintenance of a healthy mouth-especially the teeth and gums. The relationship between diet and oral health is highly related-as good nutrition has a role in preventing tooth decay and gum disease, while the health of our teeth and gums helps determine the type of foods we can eat. Controversy exists in relation to nutritional status and denture wearing, social and economic factors, together with a reduced appetite common in later life, are probably of greater nutritional significance. Older people should be encouraged to eat a varied nutrient- dense diet, choose high fiber foods and ensure a good fluid intake. This should be combined with regular physical activity, suited to the individual's physical ability.

### Conflict of Interest

The authors deny any conflict of interest.

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