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Implications of WHO Guideline on Sugars for dental health professionals

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Abstract

The burden of oral disease is high in populations across the world. This is because of high consumption of free sugars. The WHO Guideline on Sugars Intake for Adults and Children recommended limiting free sugars to no more than 5% energy intake to protect oral health throughout the life-course. The objectives of this paper are to consider the implications of the Guideline for dental health practice, and to advocate use of the common risk factor approach when providing dietary advice.

As part of a broad range of actions needed to reduce free sugars intake, improved education for dental health professionals and supporting patients to eat less free sugars are key actions for the dental profession. All dental health professionals should have the skills and confidence to provide their patients with healthier eating advice, including how to limit free sugars intake. It is therefore important that dental health professionals receive adequate education in diet and nutrition, and there is a need for dental educational regulating bodies to define the content of the dental curriculum with respect to nutrition.

All patients, or their parents or carers, should receive dietary advice to reduce free sugars within the context of a healthy diet for the prevention of all NCDs. Dietary advice should: (1) focus on reducing the amount of free sugars consumed; (2) be tailored according to the patient's body mass status (e.g. underweight, overweight, normal weight); (3) encourage the consumption of fresh fruits and vegetables, nuts seeds and wholegrain starch-rich foods; (4) discourage the consumption of foods high in saturated fat and salt; and 5) discourage the consumption of all drinks containing free sugars.

The dental health professional has an opportunity to support patients to reduce their intake of free sugars - such advice and support will have positive impacts beyond the mouth.

Introduction

Dental caries is among the most prevalent non-communicable disease (NCD) and shows socio-economic disparities comparable to other chronic diseases ^{1,2}. Global statistics indicate that the mean dental caries experience in children aged 12 is DMFT 1.9 ³ while a mean DMFT 21.3 is found among older people aged 65 years or more ⁴. Despite a decline in dental caries severity observed in several high-income countries, a high prevalence of the disease persists as a severe health problem. In low and middle income countries, where the prevalence of the disease has now escalated dramatically, most dental caries is untreated. Importantly, at the population level, dental caries is the most expensive NCD to treat, costing 5-10% of healthcare budgets^{1,5}; prevention is therefore more appropriate and cost-effective, and the control of dietary free sugars underpins this. Many countries are, however, currently undergoing nutrition transition which results in an increasing free sugars intake; moreover, many do not have adequate fluoride exposure ^{5,6}. In order to address this global public health problem effectively, there is a need for countries to strengthen population-directed disease prevention, including restriction of free sugars consumption, and for dental professionals to apply the available evidence on the importance of reducing intake of free sugars in the dental care of populations and patients.

The WHO Guideline on Sugars Intake for Adults and Children, published in March 2015, includes a strong recommendation that the intake of free sugars be reduced in both children and adults. A strong recommendation was also made that the intake of free sugars should not exceed 10% of total energy intake. To protect oral health throughout the life course, WHO also suggested a further reduction to below 5% of total energy intake (as a ‘Conditional Recommendation’). The Guideline highlighted that, for populations currently consuming low levels of free sugars, the intake should not be increased ⁷.

The aims of this paper are: to describe the implications of the WHO Guideline on Sugars for dental health practice; outline the broad range of actions required to reduce sugars intake and the role of dental health professionals in achieving this; raise awareness of the importance of considering the common risk factor approach when providing dietary advice in dental practice; and describe how dietary advice to reduce risk of dental caries needs to comply with dietary advice for the prevention of all diet-related non-communicable diseases (NCDs). The overall aim of this paper is therefore to summarise the role of the dental health professional in implementing the WHO Guideline on Sugars and provide guidance to dental health professionals on the provision of dietary advice to patients that is in line with WHO Policy.

Evidence underpinning the WHO Guideline on Sugars

The recommendations in the WHO Guideline on Sugars Intake for Adults and Children were based on systematic reviews of the evidence pertaining to the intake of sugars and the risk of overweight and obesity, ⁸ and the risk of dental caries ⁹. Evidence from randomized controlled trials in adults showed that reduction of free sugars intake was associated with reduced body weight and that an increased intake of free sugars was associated with a comparable increase in undesirable weight gain. Data from prospective cohort studies in children showed that those with the highest intakes of sugar-sweetened beverages (SSB) had a higher risk of being overweight or obese than children with low intakes of SSB.

The evidence for an association between intake of free sugars and risk of dental caries was provided from epidemiological studies including cohort studies in children which showed a positive association between amount of free sugars consumption and dental caries experience. Five cohort studies that enabled comparison of the levels of dental caries when intake of free sugars was above compared with below 10% of energy intake showed that dental caries experience was higher when the intake of free sugars intake was more than 10% of energy intake than when it was less than 10% of energy intake. However, dental caries still occurred at levels of free sugars intake below 10% and, even low levels of dental caries in childhood are significant since caries is a cumulative and progressive disease. Accordingly, the systematic review also compared data on dental caries when the intake of free sugars was below 5% with when it was between 5 and 10% of total energy intake. These data were from population-based ecological studies and showed lower levels dental caries rates when the intake of free sugars was at a level equivalent to approximately 5% of total energy intake compared with when it was above 5% but below 10%.

Classification of free sugars

Free sugars include all monosaccharides and disaccharides added to foods by the manufacturer, cook or consumer, and sugars naturally present in honey, syrups, fruit juices and fruit juice concentrates. The term ‘free sugars’ excludes sugars which are naturally present in liquid milk and milk products along with the sugars naturally present in whole fruits, vegetables and grains (Figure 1).

Current sugars availability in different regions

It is estimated that the total consumption of sucrose alone is 173 million tonnes per annum – an average of 24 kg per person per year (10kg per person per year is approximately 5% of energy intake for an adult). Africa and Asia have the lowest consumption, averaging respectively 16.8 and 17.3 kg per person per year; America and Europe have the highest averaging respectively 43.8 kg and 36.7kg per capita. Sucrose consumption in developed countries is high and stable, whereas in developing countries (particularly in Asia, and, to a lesser extent, in the Middle-East and Africa), the intake of sugar is rapidly increasing ¹⁰.

Data on the availability of sucrose per capita of population do not, however, provide a true picture of the level of intake of free sugars consumed from all sources; sugars contained in sweeteners such as corn syrups, fruit juices and honey, and mono and di-saccharides other than sucrose will be excluded from these data. There are very few data on the levels of intake and sources of *free* sugars in diets of populations, and most available data come from nutritional surveys in high-income countries such as the US and UK. NHANES data from the US indicate that added sugars provide (on average) 14.6% of total energy intake, ranging from 13.4% in children aged 2-5 years to 17.3 % in adolescents ¹¹. However, these figures exclude free sugars found in 100% natural fruit juices. Data from the National Diet and Nutrition Survey in the UK shows free sugars provide 14.7% of total energy in 4-10-year-olds, 15.5% of total energy in 11-18-year-olds and ~12% of total energy in adults ¹². There is a pressing need for more comprehensive data on the levels of free sugars intake by populations, especially those living in low and middle income countries where the intake of sucrose, other free sugars and SSB is markedly increasing.

Actions to reduce sugars intake

In order to bring the levels of free sugars consumed more in line with WHO recommendations, both upstream and downstream approaches to reducing consumption are needed. These include; adjustment of agricultural policies that lead to less sugars production and more sustainable crops; less use of sugars at a national level through reformulation of food products and reduced portion size; selling less sugars through introduction of taxes on items high in free sugars, controlling of food-based promotions and procurement; introduction of more stringent control of marketing of products high in sugars; recommending less sugars use by appropriate food based dietary guidelines and through health marketing initiatives; improved education for health professionals and all professionals involved in provision of food; and supporting

individuals to eat less free sugars through better provision of information on sugars and health and use of appropriate behavioural change techniques to motivate people to change. It is therefore recognised that, to successfully reduce free sugars consumption by populations and individuals within populations, considerable action is required. Success will not come through approaches that rely on individuals changing their eating behaviour alone, or by the provision of dietary information to individuals¹³. Upstream approaches to tackle high levels of sugars exposure are required. Nonetheless, the role of dental health professionals in the health education of individuals and patients about their food intake is an important part of a broader range of actions to reduce free sugars intake.

Action for the dental health profession

Education in nutrition

It is important that all health professionals (including dental health professionals) receive adequate education in nutrition and therefore there is a need for dental educational bodies to define the core content of the dental curriculum with respect to nutrition. This should include the evidence base on the impact of dietary sugars on both general and dental health, information on current dietary guidelines for health (including dental health), an understanding of nutrition labelling, and an adequate knowledge base in behavioural change theories to support dietary modification in individuals seen in dental practice. Improving education of dental health professionals and for other health professionals in diet and oral health is essential so that all dental health professionals have the skills and confidence to provide their patients with general healthier eating advice, including how to limit free sugars intake. Table 1 summarises key areas to consider including in the curriculum for nutrition education for dental health professionals.

Dietary advice in dental practice

Dental health professionals need to provide individuals and or their parents/carers with clear consistent dietary information that does not conflict with advice from other health professionals. This means that all patients should receive advice on diet as part of their dental care. Ideally, all patients, or their parents or carers, should receive dietary advice at the time of dental examination based on current food-based dietary guidelines. Although the primary goal in protecting dental health will be to reduce the intake of free sugars, this needs to be achieved in line with other dietary recommendations for the prevention of NCDs. Patients should therefore be provided advice on-and encouragement to consume-a diet that is beneficial to both

general and dental health which is one that is low in free sugars, saturated fat and salt, and high in fresh fruits, vegetables, nuts and seeds, wholegrain carbohydrates with modest amounts of legumes, fish, poultry and lean meat and plenty of fluids, preferably water and milk.

It is important that dietary advice is tailored to the needs of the patient and that appropriate behavioural change techniques considered, including providing the patient with feedback on current practice, goal setting, reinforcement methods, planning change and monitoring achievement of goals. Advice given to reduce free sugars to individuals who are overweight or at risk of overweight or obesity should focus on reducing sugars **and** lowering total energy intake – which can be achieved by removing sources of free sugars from the diet. However, advice to limit intake of fat, especially saturated fat, and salt and to ensure adequate intake of fruits and vegetables and foods rich in fibre such as wholegrain varieties of breads and cereals, is also warranted. However, when advising individuals who are of normal weight to reduce free sugars intake, it is important that they are advised how to maintain adequate energy intake and ensure that sugars are not replaced with energy from fat and or foods high in salt (such as fries and salty corn snacks). Ideally, any energy deficit from free sugars reduction should be replaced with starch-rich staple carbohydrate foods (bread, cereals, rice, pasta), preferably wholegrain varieties, and fresh fruits and vegetables. WHO is currently reviewing recommendations on the intake of dietary carbohydrates and so revised guidance is forthcoming. People who are undernourished or show signs of undernutrition should be referred to a general medical practitioner or a dietitian for specialist advice.

The importance of limiting and or reducing intake of free sugars should be explained to patients; this explanation should include both the general (that is undesirable weight gain) and dental health benefits of limiting consumption. Patients or their carers should receive information about the amount of free sugars in commonly consumed foods and drinks. For an average adult requiring 2000kcal/day, 5% of energy equates to approximately 25g per day, and 10% of energy equates to approximately 50g. However, for children, this value is considerably less; for a child aged 5-6 years, the average energy requirement is 1573kcal, ¹⁴ and so 5% of energy equates to 20g, and 10% is equivalent to 40g/day. Table 2 illustrates the free sugars content of some commonly consumed food and drinks. Raising patient awareness of thresholds for sugars intake and what they mean in terms of popular foods and drinks is an important part of total patient care.

Amount versus frequency of sugars consumption

In the past, dental health professionals have tended to focus dietary advice on reducing the frequency of intake of sugars. Despite pioneering animal studies showing that frequency¹⁵⁻¹⁷ as well as amount^{18, 19} of intake of sugars is a risk factor for dental caries, the epidemiological evidence is less clear. A recent systematic review reported an association between the number of daily or weekly servings of sugars-containing foods and risk of dental caries in the mixed and permanent dentition but found no association with the frequency of sugars intake from all sources (number of times sugars are consumed per day). However, this conclusion was based on a limited amount of evidence. Moreover, the authors concluded that there was insufficient evidence to explore the association between frequency of sugars intake and risk of dental caries in the primary dentition²⁰. Human epidemiological studies are the only type of study that directly measures the impact of diet on the development of dental caries in man. Only studies that measure both variables simultaneously can determine the relative importance of amount and frequency, and those which have done so have found amount only^{21, 22} or both²³ to be important. When considering dietary recommendations, the common risk factor approach must be considered. There is evidence linking the amount of intake of free sugars intake with obesity risk which is associated with a higher risk of NCDs such as Type 2 diabetes mellitus, cardiovascular disease and some cancers^{8, 24}. Reducing sugars frequency alone will not reduce the risk of NCDS related to excess free sugars, and such advice is therefore inappropriate. Goals set in terms of frequency may, however, be more tangible for patients to follow, and therefore it is appropriate to advise patients first and foremost to reduce the amount of sugars consumed but to also emphasise that reducing the number of times sugars are consumed in the day is one way to help lower intake.

Reducing the amount of free sugars consumed

Sugars in drinks

The dietary sources of free sugars vary by country, but SSBs are recognised as a universal major source in most populations. SSBs vary in free sugars content, with many popular carbonated beverages containing over 10g/100ml, meaning that the ‘small’ carbonate drink (soda) available in many fast food outlets (470ml) contains 47g free sugars. Natural 100% fruit juices are also high in free sugars, containing approximately 8-10g per 100ml on average. Over half the sugars found in sweetened milk drinks are added, and sweetened condensed milks can contain over 55g sugars per 100g. Condensed milk is commonly added to drinks especially by South East Asian populations. It is therefore advisable to clarify the type of milk that the patient adds to their drinks. Reducing or avoiding the consumption of these drinks will help to lower

intake of dietary free sugars. Dental health professionals should therefore promote the consumption of water and or milk, to which no sugars have been added, as drinks that are safe for teeth. Tea and coffee without added sugars are also safe for teeth. Ensuring access to clean safe drinking water is of paramount importance for both general and dental health.

Sugars in foods

Primary sources of free sugars in foods are: confectionery (sweets, candies, and chocolates); biscuits (cookies) and cakes; breakfast cereals; sweetened yoghurts and milks (condensed milk); desserts, including ice cream; jams, jellies and preserves; table sugar, honey and syrups; sweetened savoury sauces; and commercially produced salad dressings. The average free sugars content of these items is illustrated in Table 2 ²⁵.

Fresh fruit and dental caries

The WHO Fruit and Vegetable Promotion Initiative ²⁶ concluded that up to 2.7 million lives could be saved annually with sufficient fruit and vegetable consumption, and that a low intake of fruit and vegetables is among the top 10 selected risk factors for global mortality. Promoting an adequate (>400g per day) intake of fruit and vegetables is therefore a key dietary goal. Fresh fruit is a source of intrinsic natural sugars but does not contain free sugars. There is little evidence from epidemiological studies to show fresh whole fruit to be an important factor in the development of dental caries, and, based on the best available evidence, it is probable that there is no association between whole fresh fruit consumption and dental caries ²⁷. The WHO report ‘Diet, nutrition and the prevention of chronic diseases’ also concluded that despite the acidic nature of some fresh fruit, there was insufficient evidence to link whole fruit consumption to a higher risk of dental erosion ²⁷. As habitually consumed, whole fruit does not pose significant risk to dental health, and replacing foods high in free sugars with fresh fruit is likely to reduce dental decay. By contrast, a serving of fruit juice contains more energy, free sugars and fruit acids than whole fruits and so its consumption may contribute to both undesirable weight gain and dental caries.

Dental health professionals should ***not*** advise patients to limit the consumption of whole fruit and vegetables, and they should encourage consumption in line with current guidelines which recommend >400g per day, including a wide variety (an exception would be individual cases where an unusual eating pattern (such as sucking of citrus fruits against teeth for a prolonged time) and/or excessive pattern of consumption has been identified as contributing to erosive tooth wear).

Dried fruit and dental caries

Some dried fruits contain free sugars and others do not. Traditional dried fruits are those to which no sugars are added during the drying process, e.g. dates, figs, prunes, raisins, apricots and pears, and are a good source of dietary fibre and micronutrients such as potassium, manganese, iron and vitamin K. However, other dried fruits contain free sugars and include: (1) an increasing range of free sugars-infused dried fruits (such as cranberries and blueberries); (2) candied dried fruits (such as mango, papaya and pineapple); and (3) processed fruit snacks formulated from fruit purees and fruit juice concentrates (such as fruit leathers and fruit centres in breakfast cereals and snack bars). These all contain appreciable amounts of free sugars. Sugar-infused dried fruit or fruit products should be avoided. There is a lack of epidemiological evidence pertaining to the impact of traditionally dried fruit on health, including dental health. However, due to the high energy density (contributing to overall energy intake) and concentrating of natural sugars in the drying process, it is prudent to advise people to limit consumption (for example, to one portion a day) and to consume it as part of a meal rather than a between-meal snack. A standard portion size of dried fruit is 30g per day.

Alternative sweeteners to free sugars

Evidence suggests that polyol sweeteners (for example, mannitol, sorbitol, xylitol) do not pose a risk to dental health; however, being caloric sweeteners, they do contribute to the energy density of the diet and are commonly added to foods that do not improve the overall nutritional profile of the diet.

WHO is currently reviewing the evidence pertaining to any association between use of non-sugars sweeteners (non-caloric sweeteners) and the risk of obesity and NCDs (including dental health), and findings are forthcoming. The use of non-sugars sweeteners does not reduce the level of sweetness of the diet; and weaning off a sweet diet may be preferable to substitution with non-sugars sweeteners. Non-sugars sweeteners also tend to be added to foods and drinks with limited nutritional value. Many drinks containing non-sugars sweeteners are also acidic in nature, which may contribute to erosive tooth wear.

Community programmes

Around the world, the school is used as a platform for promoting the oral health of schoolchildren and adolescents²⁸. However, in certain developing countries, anecdotal evidences indicates that the practice of schools providing free sugars containing food items for children during school hours is common, and that free-sugars rich foods and drinks are also

immediately available outside the school premises. Particularly in high income countries, soft drinks are offered from vending machines established in schools. These practices need to be addressed. Dental health professionals should be involved in planning or direct implementation of school-based activities to ensure that health education includes evidence-based advice to reduce free sugars consumption as part of oral health promotion. Dental health professionals should play an instrumental role in promoting a healthy diet and school environment which supports healthy food and drink choices.

Many older people who require community support or live in institutions retain their natural dentition yet dietary practices of food provision services often promote foods and drinks rich in free sugars to boost energy (calorie) intake. Free sugars do not however, provide a nutrient dense form of energy and should not be promoted. Multidisciplinary collaboration with other health professionals is urgently needed to ensure that provision of adequate nutrition considers promotion of oral health, and optimal quality of life.

Conclusions

Current data on the level of intake and dietary sources of free sugars are lacking for many countries, and approaches to national food and nutrition surveys should be revised to include assessment of sugars (free sugars) intake to provide data for planning action for change.

The dental health professional has a key role to play in achieving the broad range of actions that are required to lower free sugars intake. To enable this, there is a need for a review of the current content of the curricula for dental health professionals with respect to the teaching of nutrition to ensure dental health professionals are equipped with the knowledge and skills to provide appropriate dietary advice.

Dietary advice to reduce free sugars intake is a vital part of patient care but such advice should be given within the context of a healthy diet for the prevention of all NCDs. With respect to this, advice provided by dental health professionals should: (1) focus on reducing the amount of free sugars consumed by patients (advice to reduce frequency alone will not benefit the general health of the patient); (2) consider the general health of the patient, tailoring advice to the patient's body mass status (underweight, normal weight, overweight); (3) encourage the consumption of all types of fresh fruits and vegetables, nuts seeds and wholegrain starch-rich foods; (4) discourage the consumption of foods high in fats, especially saturated fats and salt (replacing sugars-rich foods with savoury snacks high in fat is inappropriate); (5) encourage the consumption of water and milk without added sugars; (6) discourage the consumption of

all drinks containing free sugars; (7) discourage the consumption of beverages sweetened with artificial sweeteners due to risk of acid erosion; and (8) be patient-tailored and employ the use of evidence based behavioural change techniques to motivate patients to change.

The dental health professional has an opportunity to support patients in reducing intake of free sugars and to promote a healthy balanced diet as part of preventive care. Such advice and support will have positive impacts beyond the mouth - dental health professionals should recognise their important role in promoting the total health and wellbeing of patients.

Notes

The authors alone are responsible for the views expressed in this article and they do not necessarily represent the views, decisions or policies of the institutions with which they are affiliated.

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Table 1. Suggested core topics for the educational curriculum for nutrition for dental health professionals

Core topic	Areas to include
Main nutrient classes and the core functions and dietary sources	Carbohydrates, protein, fat, micronutrients: vitamin and minerals
Dietary recommendations for specific sub-population groups	Young children, adolescents, adults and older people, pregnancy and lactation
Evidence base pertaining to intake of key macronutrients and risk of non-communicable diseases	Overweight and obesity Diabetes Mellitus Cardiovascular disease Cancer, including oral cancer Osteoporosis
Evidence base pertaining to sugars intake and risk of dental caries	Types of studies Evidence from systematic review of the epidemiological evidence Impact of fluoride exposure on risk of dental caries
Evidence base pertaining to intake of other carbohydrates (starch, oligosaccharides, polyols), fruits, milk and risk of dental caries	Evidence from different types of studies including systematic review of the evidence
Current national food based dietary guidelines	Food pyramids, 'Eatwell Guide' Advice on intake of specific food groups
Recommendations for infant feeding practices and risk of dental caries	Breast vs bottle feeding and health including dental health Complementary feeding and health including dental health
Behavioural change theory	Effective behavioural change techniques to support change in dietary behaviour
Dietary advice in dental practice	Dietary assessment of patients and approaches to giving dietary advice and changing dietary behaviour

Table 2. Free sugars content of common dietary sources

Dietary item	Average portion size	Free sugars per average portion
Table sugar	5g rounded teaspoon 4g level teaspoon or sugar cube	5g 4g
Honey	heaped teaspoon 17g	13g
Maple syrup	55g serving (e.g. amount to top waffles or pancakes)	33g
Cola drink	Average 'small' serving at food outlet 470ml	49g
Chocolate milk	300ml mug	32g
Lemonade	Average 'small' serving at food outlet 470ml	23g
Orange juice	200ml individual carton	20g
Condensed milk	25g (average serving added to coffee)	15g
Muffin cake	75g	24g
Sweet biscuit	14g one biscuit	5g
Plain ring doughnut	60g	11g
Plain chocolate bar	54g average small bar	15g
Ice cream	75g average serving	15g
Fruit flavoured yoghurt	125g small pot	13g
Granola bar	One average	14g
Sweet chilli sauce	32g average serving	10g
Salad dressing	15g (tablespoon)	6g
Tomato ketchup	1 portion pack 20g	5g
Bran flake style breakfast cereal	1 medium portion 40g	8g

Sugar coated corn flake style breakfast cereal	1 medium portion	17g
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Calculations based on the methods of Kelly et al ²⁵. All values are approximate as sugars content may vary according to brand.

Figure 1. Classification of dietary sugars

Figure 1. Classification of dietary sugars