

## Key Message 10



Consume foods and beverages low in sugar

Key Message 10



# Key Message 10

## Consume foods and beverages low in sugar

### 1. Terminology

#### Extrinsic sugars

Extrinsic sugars are sugars that are usually added to foods. The terms *refined*, *added* and *extrinsic* sugars are sometimes used to denote sucrose and glucose used in the food industry and in the home. Physiologically, there is no difference between the sugars that occur naturally in food and the refined sugars that are added to the diet. Foods with high added sugar content often have a lower nutrient content but are energy dense. The term *no added sugar* means no sugars have been added during the manufacturing process; it does not mean that no sugar is present, since most foods contain sugar in some form.

#### Intrinsic sugars

Intrinsic sugars refer to naturally occurring or sugar that is an integral component of whole fruit, vegetable and milk products.

#### Simple carbohydrates

Simple carbohydrates (sugar) refers to monosaccharides (glucose, fructose and galactose) and disaccharides (sucrose, lactose and maltose). Sucrose (glucose + fructose) is found in sugar cane, honey and corn syrup. Lactose (glucose + galactose) is found in milk products. Maltose (glucose + glucose) is found in malt.

#### Sugars

The term sugars are conventionally used to describe monosaccharides and disaccharides such as sucrose, glucose and fructose. These can be found naturally in foods or can be added to foods in processing. In food surveys, sugar is used to describe purified sucrose, as are the terms *refined sugar* and *added sugar*, although in some instances partly refined products such as corn syrup, molasses, caramel, brown sugar, honey, *gula Melaka* and *gula kabung* may also be regarded as added sugars. Added sugar also refers to sucrose or other refined sugars in soft drinks and incorporated into foods, fruit drinks and other beverages.

### 2. Introduction

In 1972, Yudkin pronounced sugar to be “pure, white and deadly” (Yudkin, 1972) and subsequently suggested to be associated with health problems such as obesity, heart disease, hyperactivity, diabetes and dental caries. Most of the detrimental health claims have not been substantiated while others require further investigations to provide concrete justification on their claims. Thus, there are continuing debates and discussions in the scientific community on the role of sugar in health and diseases.

There are various types of sugars with no clear definition of its categorisation

# Key Message 10

which makes it difficult to relate and discuss between studies and recommendations. A range of guidelines arises from different countries with a diverse description for sugar such as “total sugars”, “added sugars” and “non-milk” extrinsic sugars (Committee on Medical Aspects of Food Policy, Department of Health, 1989).

In recent years, the role of added sugars in human diet has gained prominence with the introduction of modern food processing methods. Introduction of new foods with high sugar content such as soft drinks, sweets, cakes and chocolates encourages the increase in sugar intake. Since then, the consumption of sugar has risen steadily. This is precipitated further by the availability of soft drinks in homes, fast food and other restaurants and vending machines in schools or universities. Awareness of the high sugar content in soft drinks and foods may encourage more moderate consumption. One of the main concerns for health is that sugar contain no other vitamins and minerals apart from calories which may lead to adverse effects if taken excessively.

### 3. Scientific basis

The focus of scientific evidence on sugar guideline in relation to health revolves around three main health issues. Sugar is the main cause of dental caries and that a lower absolute sugar intake would result in an appreciable decrease in caries incidence. Sugar could contribute to obesity, either by contributing towards excess energy or by accentuating appetite leading to overconsumption. Finally, sugar intake in excess of recommendations could displace micronutrient-dense foods from the diet, resulting in a greater risk of vitamin and mineral deficiency.

#### 3.1 Dental caries

Dental caries is a continuing public health problem in Malaysia. Prevalence of caries among Malaysian adults was found to be 90.7% (OHD, 2004) as compared to 95% in 1974 and 94.6% in 1990 (Dental Division, 1977; Dental Services Division, 1993). Caries prevalence increased with age from 15 years up to 54 years after which a downward trend was observed (Figure 10.1).

Caries prevalence was also significantly higher among females (92.0%) compared to males (89.0%) up to age 64 years however, there was no significant difference in caries prevalence between urban (90.3%) and rural (91.4%) subjects. Dental epidemiological surveys of 5 to 6-year-olds conducted in Malaysia have shown high prevalence of caries, despite a declining in trend for the last three decades.

There is a continuous downward trend in the proportion of 6-year-olds with one or more carious teeth in the deciduous dentition from 95.4% in 1970 to 88.6% in 1988 and 80.6% by 1997 (OHD, 2003; OHD, 1997; Dental Service Division, 1988; Dental Division, 1972). A similar trend was seen in 12 and 16 years old as well. However, despite having these declining trend, dental caries remain as an important health problem among Malaysian children and adults.

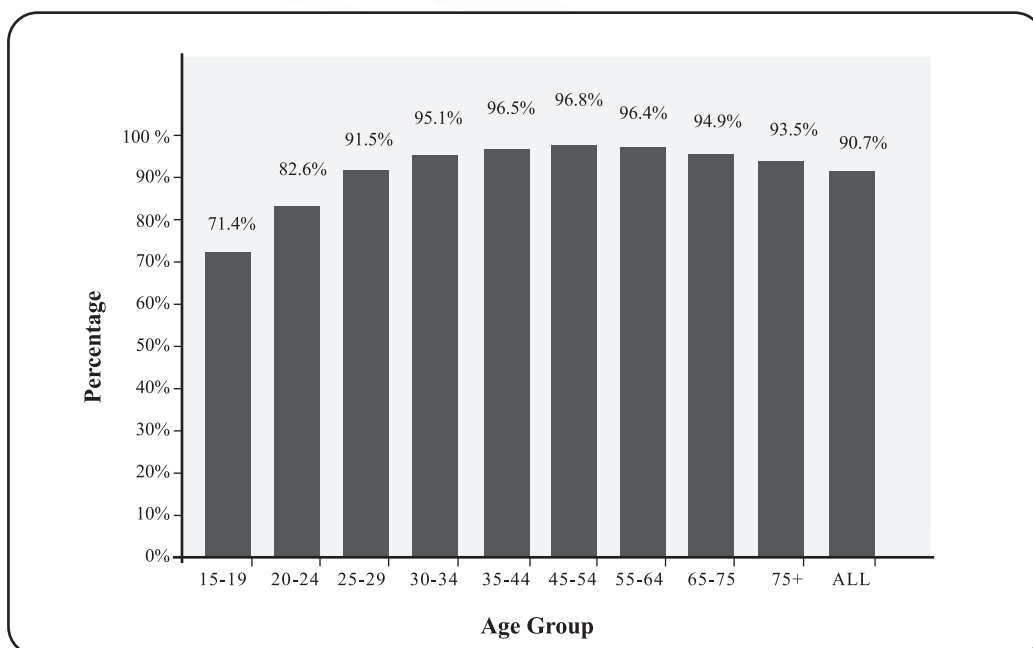
Sugar is an essential component in the development of dental caries (Newbrun *et al.*, 1980). There is evidence linking the risk of dental caries and dietary intake of sugars in the presence of fermentable sugar and specific bacteria. It is also important to note that poor oral hygiene and the absence of fluoride contributed to higher incidence of dental caries (Cunningham, 1998; Gibson & Williams, 1999).

# Key Message 10

Frequency of sugar consumption was suggested to have greater detrimental effect as compared to the amount taken per day (Stecksen-Blicks & Borssen, 1999; Tinanoff & Palmer, 2000).

Researchers have illustrated a dose-response relation between the level of

dental caries and the intake of sugars (Sheiham, 1987, Woodward & Walker, 1994, Miyazaki & Morimoto, 1996). A rise in the prevalence and severity of caries is seen as the intake of sugar increased from around 15 kg (40g/day) to 50 kg (136 g/day or 25tsp) per person per year.



**Figure 10.1. Caries prevalence by age group (Oral Health Division, Ministry of Health, 2004)**

# Key Message 10

## 3.2 Obesity

The rising trend in the prevalence of obesity in many countries has been attended by an increase in the proportion of fat energy in the diet, an increase in sugar consumption, an increase in dietary energy density and a decrease in the intake of less digestible forms of carbohydrates (Mazlan *et al.*, 2006). Some epidemiological studies reveal a positive correlation between sucrose consumption and daily energy intakes (Ruxton, 2003). Other observations, on the other hand, suggest that high levels of carbohydrate per se are protective against obesity because an increasing intake of sugars may displace fat energy from the diet. Given the widescale changes in the composition of food products currently available to consumers, these are important issues. Consumers have been exposed to a large increase in the range of low-fat but energy-dense foods, rich in sugar or readily assimilated starches.

Ludwig, Peterson & Gortmaker *et al.*, (2001) showed that in a 19-month prospective study of 548 ethnically diverse Boston schoolchildren aged 11 to 12 years, an increase in consumption of sweetened soft drink was linked to increasing body mass index and risk of obesity. They found that for each sugar-sweetened drink consumed daily, both body mass index and frequency of obesity increased (odds ratio, 1.60), even after adjustment for confounding variables. This may be related to the reduced effect on satiety of sugar in a liquid medium.

In an intervention study, increasing intake of high-sugar snacks to the diet led to a progressively higher daily energy intake (Mazlan *et al.*, 2006). The increase in energy intake was mainly caused by the sugar incorporated into the snacks. The study noted that high-sugar snacks easily promoted overconsumption. While commercially

available snacks that are high in fat are more energy dense than those which are high in sugar, both tend to be foods of a high energy density.

## 3.3 Micronutrient deficiency/dilution

Diet high in sugar may affect the intake of micronutrients. Children in the Bogalusa Heart Study (Farris *et al.*, 1998) and in the United Kingdom were found to demonstrate decreased trend in their nutrient intake as the total sugar intake increased. The most comprehensive findings on the effects of added sugar was observed in more than 14000 people from the US Department of Agriculture's 1994 to 1996 Continuing Survey of Food Intakes by Individuals (Bowman, 1999). The participants in the highest sugar intake group (>18% of total energy intake) had the lowest mean absolute intakes of all micronutrients. This group also had the lowest proportion of people that met the recommended dietary allowances.

## 3.4 Heart disease

The US Nurses Health Study showed that women consuming diets high in glycemic load had increased coronary heart disease (CHD) risk during a 10 year follow up (Liu *et al.*, 2000). Several short term studies have also shown inverse association between dietary sucrose and HDL cholesterol (Ernst *et al.*, 1980; Archer *et al.*, 1998; Howard & Wylie-Rosett, 2002). A diet high in sucrose is also suggested to be associated with an elevation of plasma triglyceride concentrations (Frayn & Kingman, 1995; Parks & Hellerstein, 2000; Howard & Wylie-Rosett, 2002) although it may vary according to the amount of sugar and interaction with other nutrients (Frayn & Kingman, 1995).



# Key Message 10

## 3.5 Diabetes

Evidence is still inconclusive on the association between sugar consumption *per se* and diabetes. Four prospective cohort studies have shown that a history of consumption of foods with high glycemic load predicts the development of type 2 diabetes in women and men (Salmeron *et al.*, 1997a; Salmeron *et al.*, 1997b; Hodge *et al.*, 2004; Schulze *et al.*, 2004; Zhang *et al.*, 2006). Other cohort studies (Meyer *et al.*, 2000; Steven *et al.*, 2002) however found no association between glycemic index and glycemic load and the incidence of diabetes. The disparity was suggested to be due to differences in dietary assessment method and research design (Barakatun Nisak, 2009). None of the studies reported any significant association between the amount of carbohydrate consumed per day with the development of type 2 diabetes (Barakatun Nisak, 2009). Dietary studies, however, found that total carbohydrate intake is inversely associated with diabetes incidence (Feskens & Kromhout, 1990; Marshall *et al.*, 1994). Their findings were suggested to be confounded by the effect of high fat intake (Howard, 1997; Howard & Wylie-Rosett, 2002).

## 3.6 Behaviour and cognitive function

The relationship between dietary sugar with behaviour and cognitive function has also been studied. The association between sugar intake and hyperactivity was suggested to be based on two hypotheses. The first was a possible allergic response. The second was that hyperactive children might experience functional reactive hypoglycemia (Howard & Wylie-Rosett, 2002). However a meta-analysis of 16 randomised trials in hyperactive children found that reducing sugar content of the diet did not reduce the

degree of hyperactivity (Wolraich, Wilson & White, 1995).

## 4. Current status

Malaysia is only about 5 % self-sufficient in domestic sugar production. Industry estimates domestic consumption to grow at the rate of 3% in 2006. Raw sugar imports are mainly from Thailand, Brazil and Australia, while exports of refined sugar are mainly to Indonesia, the Philippines, Singapore and Taiwan (GAIN Report, 2006). Malaysian sugar consumption per caput basis has increased from 37.6 kg in 1985 to 51.2 kg in 1995, which is among the highest in the Asia Pacific region (FAO, 1997). However the consumption of sugars seems to reach a plateau at around 50 kg since then, as shown in Figure 10.2 (ABARE, 2005). Based on food balance sheet data for Malaysia, the available sugars in the country was estimated to be about 86 g/ day or 13% of total energy in 1985 which then rose to 104 g/ day or 14 % of total energy in 2002 (NCCFN, 2005; FAO, 2008).

Quantitatively, the Malaysian Adults Nutrition Survey (MANS), 2003 reported 59% of the population consumed sugar daily. Mean sugar intake was about 4 teaspoons per day which is about 21 grams. MANS study also indicated that consumption of sugar was higher in rural areas (69.1% consumed daily, 2.1 times per day) as compared to urban population (51.4% consumed daily, 1.8 times per day) (Norimah *et al.*, 2008). The data represents sugar that is usually added to beverages such as tea, coffee and chocolate-based drinks (Table 10.1). Sugars from sweetened beverages and local *kuih* dishes are not quantified in this study which could contribute a substantial proportion to dietary energy. Sugar content of selected local foods and beverages are listed in Table 10.2 and 10.3.

# Key Message 10

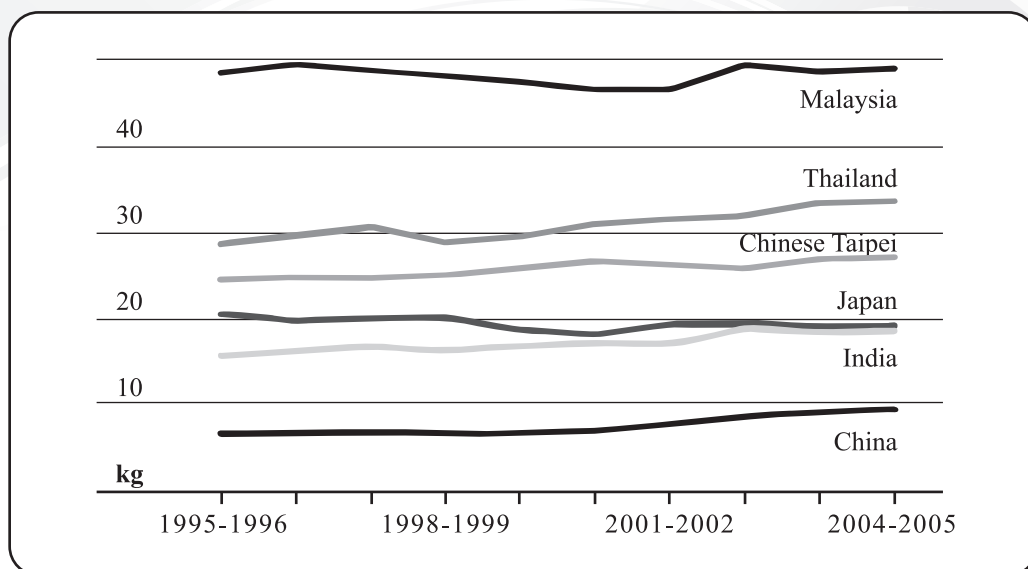


Figure 10.2. Sugar consumption per person in Asia (ABARE, 2005)

Table 10.1. Mean intake of selected beverages and foods among Malaysians

Type of food	Estimated mean intake (g/day)	Household measurement
Condensed milk	30	6 teaspoons
Tea	247	1¼ cups
Coffee	171	¾ cup
Chocolate drinks	128	½ cup
Cordial syrup	102	½ glass
Carbonated drinks	57	1/5 can
Local <i>kuih</i>	22	¾ piece
ABC ice	26	1/8 bowl
Jam	6	½ teaspoon
Sugar	21	3 teaspoons

Sources : Ministry of Health Malaysia (2006)

# Key Message 10

**Table 10.2. Example of sugar content in some local beverages and snacks**

Food (g/ml)	Sugar content (g)	Household measurement equivalent (teaspoon)
Chocolate bar (19 gram)	5-10	1-2
Cookies (29 gram)	5-10	1-2
Cereals, sweetened (29 gram)	10	2
Ice cream (60 gram)	5-15	1-3
Energy drinks (250 ml)	20-40	4-8
Carbonated drinks (240 ml)	15-30	3-6

**Source :** Nutrition Information Panel (NIP) of selected food labels in Malaysia (unpublished)

**Table 10.3. Sugar content in local *kuih***

Local Kuih	Weight (g) per piece	Sugar content (g) per piece	Teaspoon Equivalent 1 tsp (5g)
<i>Bingka ubi kayu</i>	70 - 90	18 -25	4 ¼
<i>Kuih koci</i>	40 - 50	10-13	2 ¼
<i>Kuih keria</i>	55 - 65	10 -13	2 ¼
<i>Lepat pisang</i>	65 - 75	10 -13	2 ¼
<i>Kuih kosui</i>	70 - 80	10 -13	2 ¼
<i>Kuih seri muka</i>	110 -120	10 -13	2 ¼
<i>Onde-onde</i>	25 - 45	8 -10	2
<i>Kuih kasturi</i>	120 -135	8 -10	2
Doughnut (plain)	45 - 55	7-10	1 ¾
<i>Puding jagung</i>	70 - 80	7-10	1 ¾
<i>Apam</i>	40 - 50	6 - 8	1 ½
<i>Kuih lapis</i>	120 -140	5 - 7	1 ¼

**Source:** NCCFN (1999)



# Key Message 10

## 5. Key recommendations

### Key recommendation 1

**Eat foods low in sugar.**

#### How to achieve

1. Choose or prepare *kuih* and cakes with less sugar.
2. Replace sweet desserts such as *kuih* and cakes with healthier options such as fruits.
3. Consume foods containing sugar less frequently.
4. Avoid consuming sugary foods in between meals and close to bedtime.
5. Check food labels for sugar content focusing on the position of sugar on the ingredient list. If sugar is listed at the beginning of the list, it indicates that sugar constitutes one of the main components of the ingredients.

# Key Message 10

## Key recommendation 2

**Drink beverages low in sugar.**

### How to achieve

1. Choose plain water rather than carbonated and non-carbonated sugary drinks (such as soft drinks, syrup and cordial).
2. Limit intake of table sugar or sweetened condensed milk or sweetened condensed filled milk to one teaspoon per cup of drink.
3. When ordering drinks, ask for less sugar or less sweetened condensed milk or sweetened condensed filled milk.
4. Check nutrition information panel on labels of beverages for sugar content.
5. Reduce the consumption of beverages containing sugar such as carbonated drinks, cordial, *cendol* and *air batu campur (ABC)*.
6. Avoid consuming sugary drinks in between meals and close to bedtime.



# Key Message 10

## References

- ABARE (Australian Bureau of Agricultural and Resource Economics) (2005). Forecast and Issues. *Australian Commodities* 12(1): 42-47.
- Archer SL, Liu K, Dyer AR, Ruth KJ, Jacobs DR Jr, Van Horn L, Hilmer JE & Savage PJ (1998). Relationship between changes in dietary sucrose and high density lipoprotein cholesterol: the CARDIA Study. Coronary Artery Risk Development in Young Adults. *Ann Epidemiol* 8(7): 433-438.
- Barakatun Nisak MY (2009). A randomized control trial of low glycemic index against conventional carbohydrate exchange diet of glycemic control and metabolic parametes in patients with type 2 diabetes mellitus. PhD Thesis, Universiti Kebangsaan Malaysia.
- Bowman SA (1999). Diets of individuals based on energy intakes from added sugars. *Family Economics and Nutrition Review* 12:31-38.
- Committee on Medical Aspects of Food Policy, Department of Health (1989). Dietary Sugars and Human Disease: Report of the Panel on Dietary Sugars. Report on Health and Social Subjects no. 37. H. M. Stationery Office, London.
- Cunningham K (1998). Sugar and Diet. What is the latest scientific knowledge? Leatherhead Food RA Food *Ind Journal* 1:25-32.
- Dental Division, Ministry of Health Malaysia (1972). Dental Epidemiological Survey of School Children in West Malaysia August 1970-May 1971. Government Printers, Kuala Lumpur.
- Dental Division, Ministry of Health Malaysia (1977). Dental Epidemiological Survey of School of Adults in Peninsular Malaysia. September 1974-April 1975 . Ketua Pengarah Percetakan, Kuala Lumpur.
- Dental Services Division, Ministry of Health Malaysia (1988). Dental epidemiological survey of school children in Peninsular Malaysia. Government Printers, Kuala Lumpur.
- Dental Services Division, Ministry of Health Malaysia (1993). Dental epidemiological survey of Adults in Malaysia, 1990. Percetakan Nasional Malaysia Berhad, Kuala Lumpur.
- Ernst N, Fisher M, Smith W, Gordon T, Rifkind BM, Little JA, Mishkel MA & Williams OD (1980). The association of plasma high-density lipoprotein cholesterol with dietary intake and alcohol consumption. The Lipid Research Clinics Program Prevalence Study. *Circulation* 62: 41-52.

# Key Message 10

FAO Corporate Document Repository (1997). Proceedings of the Fiji/FAO 1997 Asia Pacific Sugar Conference.

FAO (2008). Food balance sheet for Malaysia 1961-2002. Food and Agriculture Organisation, Rome. Accessed from [www.faostat.fao.org](http://www.faostat.fao.org). (Accessed on 16 April 2008).

Farris RP, Hyg MS, Nicklas TA, Myers L & Berenson GS (1998). Nutrient intake and food group consumption of 10-year-olds by sugar intake level: The Bogalusa Heart Study. *J Am Coll Nutr* 17(6): 579-585.

Feskens EJ & Kromhout D (1990). Habitual dietary intake and glucose tolerance in euglycemic men: the Zutphen Study. *Int J Epidemiol* 19: 953-959.

Frayn KN & Kingman SM (1995). Dietary sugars and lipid metabolism in humans. *Am J Clin Nutr* 62(suppl): 250-261.

GAIN Report - Global Agriculture Information Network Report (2006). Malaysia Sugar Annual 2006. USDA Foreign Agricultural Service, US Department of Agriculture.

Gibson S & Williams S (1999). Dental caries in pre-school children: associations with social class, tooth brushing habit and consumption of sugars and sugar-containing foods. Further analysis of data obtained from the national diet and nutrition survey of children aged 1.5-4.5 years. *Caries Res* 33(2):101-113.

Hodge AM, English DR, O'Dea K & Giles GG (2004). Glycemic index and dietary fibre and the risk of type 2 Diabetes. *Diabetes Care* 27:2701-2706.

Howard BV (1997). Dietary fatty acids, insulin resistance, and diabetes. *Ann N Y Acad Sci* 827:215-220.

Howard BV & Wylie-Rosett J (2002). Sugar and cardiovascular disease: A statement for healthcare professionals from the committee on nutrition of the council on nutrition, physical activity and metabolism from the American Heart Association. *Circulation* 106: 523-527.

Liu S, Willett WC, Stampfer MJ, Hu FB, Franz M, Sampson L, Hennekens CH & Manson JE (2000). A prospective study of dietary glycemic load, carbohydrate intake, and risk of coronary heart disease in US women. *Am J Clin Nutr* 71:1455-1461.

# Key Message 10

- Ludwig DS, Peterson KE & Gortmaker SL (2001). Relation between consumption of sugar-sweetened drinks and childhood obesity : a prospective, observational analysis. *Lancet* 357:505–508.
- Marshall JA, Hoag S, Shetterly S & Hamman FR (1994). Dietary fat predicts conversion from impaired glucose tolerance to NIDDM: the San Luis Valley. *Diabetes Study. Diabetes Care* 17 (1): 50–56.
- Mazlan N, Horgan G, Whybrow S & Stubbs J (2006). Effects of increasing increments of fat- and sugar-rich snacks in the diet on energy and macronutrient intake in lean and overweight men. *Br J Nutr* 96(3): 596-606.
- Meyer KA, Kushi LH, Jacobs Jr. DR, Slavin J, Sellers TA & Folsom AR (2000). Carbohydrates, dietary fibre and incident type 2 diabetes in older women. *Am J Clin Nutr* 71: 921-930.
- Miyazaki H & Morimoto M (1996). Changes in caries prevalence in Japan. *Eur J Oral Sci* 104: 452-458.
- MOH (2006). Food Consumption Statistic of Malaysia 2003 for Adult Population Aged 18 to 59 years. Vol 1. Ministry of Health Malaysia, Putrajaya.
- NCCFN (National Coordinating Committee of Food and Nutrition (1999). Malaysian Dietary Guidelines. Ministry of Health Malaysia, Kuala Lumpur.
- NCCFN (National Coordinating Committee on Food and Nutrition) (2005). Recommended Nutrient Intakes for Malaysia (RNI). A Report of the Technical Working Group on Nutritional Guidelines. Ministry of Health Malaysia, Putrajaya.
- Newbrun E, Hoover C, Mettraux G & Graf H (1980). Comparison of dietary habits and dental health of subjects with hereditary fructose intolerance and control subjects. *J Am Dent Assoc* 101(4):619-626.
- Norimah AK, Safiah MY, Zuhaida H, Fatimah S, Rohida SH, Siti Haslinda MD & Siti Norazlin MN (2008). Malaysian Adult Nutrition Survey 2003. Vol 7. Habitual food intake of adult aged 18 to 59 years. Ministry of Health Malaysia, Putrajaya.
- Oral Health Division, Ministry Of Health Malaysia (1998). National Oral Health Survey of School Children in 1997. (NOHSS, 97). MOH/GIG/6.98(RR).

# Key Message 10

- OHD (Oral Health Division) (2003). Guidelines on Oral Health Care for Pre-School Children. Oral Health Division, Ministry of Health Malaysia, Putrajaya.
- OHD (Oral Health Division) (2004). National Oral Health Survey of Adults 2000 (NOHSA, 2000). Oral Health Division, Ministry of Health Malaysia, Putrajaya.
- Parks EJ & Hellerstein MK (2000). Carbohydrate-induced hypertriacylglycerolemia : historical perspective and review of biological mechanisms. *Am J Clin Nutr* 71:412–433.
- Ruxton CHS (2003). Dietary guidelines for sugar: the need for evidence. *Br J Nutr* 90: 245–247.
- Salmeron J, Manson JE, Stampfer MJ, Colditz GA, Wing AL & Willet WC (1997a) Dietary fiber, glycemic load, and risk of non-insulin-dependent diabetes mellitus in women. *JAMA* 277(6):472–477.
- Salmeron J, Ascherio A, Rimm EB, Colditz GA, Spiegelman D, Jenkins DJ, Stampfer MJ, Wing AL & Willet WC (1997b). Dietary fiber, glycemic load and risk of NIDDM in men. *Diabetes Care* 20(4): 545–550.
- Schulze MB, Liu S, Rimm EB, Manson JE, Willet WC & Hu FB (2004). Glycemic index, glycemic load and dietary fibre intake and incidence of type 2 diabetes in younger and middle aged women. *Am J Clin Nutr* 80: 348-356.
- Sheiham A (1987). Sucroce and dental caries. *Nutr Health* 5: 25-29.
- Stecksen-Blicks C & Borssen E (1999). Dental caries, sugar-eating habits and toothbrushing in groups of 4-year-old children 1967–1997 in the City of Umea, Sweden. *Caries Res* 33(6):409–414.
- Steven J, Ahn K, Juhaeri Hounstan D, Steffan L & Couper D (2002). Dietary fibre intake and glycemic index and incidence of diabetes in African-American and white adults. *Diabetes Care* 25: 1715-1721.
- Tinanoff N & Palmer CA (2000). Dietary determinants of dental caries and dietary recommendations for preschool children. *J Public Health Dent* 60 197–206.
- Wolraich ML, Wilson DB & White JW (1995). The effect of sugar on behavior or cognition in children : a meta-analysis. *JAMA* 274:1617–1621.



# Key Message 10

Woodward M & Walker AR (1994). Sugar consumption and dental caries : evidence from 90 countries. *Br Dent J* 176:297-302.

Yudkin J (1972). *Pure, White and Deadly : The Problem of Sugar*. Davis-Poynter, London.

Zhang C, Liu S, Solomon CG & Hu FB (2006). Dietary fibre intake, dietary glyceic load and the risk for gestational diabetes mellitus. *Diabetes Care* 29: 2223-2230.