

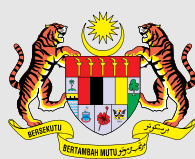


MALAYSIAN DIETARY GUIDELINES 2020



National Coordinating Committee on Food and Nutrition (NCCFN)

MINISTRY OF HEALTH MALAYSIA



MALAYSIAN DIETARY GUIDELINES 2020

National Coordinating Committee on Food and Nutrition
Ministry of Health Malaysia

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MINISTRY OF HEALTH

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National Coordinating Committee on Food and Nutrition
Ministry of Health Malaysia



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Message by Minister of Health Malaysia

Effective messaging promoting healthy eating is a critical strategy that will allow for prevention, and help control the burden of malnutrition in the country. It is for this reason the Malaysian Dietary Guidelines (MDG) were formulated in 1996 and were revised in both 2010 and 2020 to ensure that all Malaysians have access to reliable and accurate nutritional information. The Malaysian Dietary Guidelines 2020 were thoroughly reviewed, taking into consideration diet-related non-communicable diseases and dietary patterns of Malaysians from all walks of life.

The Malaysian Dietary Guidelines 2020, intended for adults aged 18 to 59 years old, provide key messages to assist healthcare practitioners in guiding Malaysians on healthy eating practices. It is also an essential resource for health professionals, academicians, non-government organisations, and other stakeholders and policymakers to design practical healthy eating recommendations for Malaysians. I hope that these MDGs are beneficial in our effort to curb malnutrition in Malaysia.

I would like to express my heartfelt gratitude and congratulations to the Malaysian Dietary Guidelines 2020 Technical Working Group members and to those who have contributed to the development of the MDGs directly or indirectly.



Khairy Jamaluddin

Minister

Ministry of Health Malaysia



Foreword by Director-General of Health

Diet-related non-communicable diseases are an undeniable consequence of an unhealthy lifestyle. Apart from sedentary or inactive lifestyles, unhealthy dietary practices have further aggravated the problems. The prevalence of these chronic diet-related diseases is increasing at an alarming rate. The non-communicable diseases burden forms a public health risk with a high financial impact and intangible losses due to decreased productivity. Therefore, it is timely for the Ministry of Health Malaysia to strengthen the advocacy of healthy lifestyles, including healthy eating to the population.

The Malaysian Dietary Guidelines were developed at the national level to assist health professionals and other stakeholders in educating the Malaysian population about healthy eating. Since 1999, this document has been reviewed periodically to ensure that it continues to be relevant to the current and future nutritional situation in the country. The Malaysian Dietary Guidelines was moulded on from the latest peer-reviewed scientific evidence to warrant substantiate and effective recommendations, and it will complement other initiatives to cultivate healthy eating practices amongst Malaysian adults.

Therefore, I envisioned the Malaysian Dietary Guidelines 2020 as the main reference in the country for healthy eating practices. Last but not least, I would like to take this opportunity to congratulate and convey my gratitude to those who were involved in the review of the document, particularly the Malaysian Dietary Guidelines Technical Working Group members.

YBhg. Tan Sri Dato' Seri Dr. Noor Hisham Abdullah
Director-General of Health, Malaysia
Ministry of Health Malaysia



Preface by

Deputy Director-General of Health Malaysia (Public Health) Malaysia

Since the past decades, Malaysia has been experiencing nutrition transition and lifestyle changes. These include a change from a traditional to a more 'westernized' or global diet and lifestyle. The National Health and Morbidity Survey (NHMS 2019) showed that about half of the adults population in Malaysia were obese, with 30.4% and 19.7% being overweight and obese, respectively. There was also an increase of other diet related non-communicable diseases such as diabetes and hypercholesterolemia. This situation is aggravated by the Covid-19 pandemic which has imposed a significant economic burden on individuals, families, and nations.

Therefore, the revised Malaysian Dietary Guidelines 2020 focuses on adults which were developed based on the recommended nutrient intake (RNI, 2017), the latest nutritional status and scientific evidence. In the Malaysian Dietary Guidelines 2020, all the 14 key messages, key recommendations and how to achieve were written by a group of nutrition experts to ensure appropriate and meaningful recommendations and achievable to be practiced.

I do hope that these guidelines would be a valuable resource for health care, personnel, academicians, non-government organisations and other stakeholders in disseminating appropriate nutrition messages. Finally, I would like to express my heartfelt gratitude to all those who have been involved in the completion of this Malaysian Dietary Guidelines 2020.

Datuk Dr. Chong Chee Kheong
Deputy Director General Of Health (Public Health)
Ministry of Health Malaysia



Preface by **Chairman of Technical Working Group on Nutritional Guidelines**

Individuals' dietary behavior are of primary interest to public health professionals, nutritionists/dietitians and food industry alike. The impact of what an individual eat on health outcomes is rarely influenced by any one eating event or single food. Instead, health outcomes related to diet are a result of complex combinations of foods eaten together over time.

Dietary guidelines remain a useful tool in providing nutrition information and advice for the public that is credible from a scientific perspective and easy to understand and follow.

The Malaysian Dietary Guidelines 2020, a revised version on MDG 2010 comprise of 14 Key messages with 52 key recommendations and how to achieve, prepared by the Technical Working Group Nutritional Guidelines provide valuable information to related stakeholders to help individuals make healthier food choices.

The Technical Working Group are hopeful that the guidelines will be widely used as a reference and we look forward for feedback from stakeholders and end users to help us update and improve the guidelines from time to time.

I would like to thank members of the Technical Working Group, the writers, the Focus Discussion Group, the Editorial team, the Consensus Workshop participants, the TWG Secretariat and all those who assisted this valuable document for their hard work and dedication.

Emeritus Prof. Dr. Mohd Ismail Noor

FASc, FIUNS, FCFAM.

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Acknowledgement

Individuals from various Departments and Institutes, the Ministry of Health Malaysia, academicians from local universities, nutritionists, dietitians, representatives from related professional bodies, representatives from the food manufacturing and trading industry, and consumer bodies are all acknowledged by the Technical Working Group on Nutritional Guidelines. Their invaluable contributions and dedication to completing this document successfully are sincerely appreciated.

A word of gratitude is also conveyed to the:

- Director of National Institutes of Health
- Director of Disease Control Division
- Director of Food Safety and Quality Division
- Directors of State Department of Health (all over Malaysia)
- Dean of Allied Health Sciences Faculty, Universiti Kebangsaan Malaysia
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for their generous support and cooperation.

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Achieve and maintain a healthy body weight

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Key Message 3 :

Be physically active every day

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Key Message 5 :

Eat plenty of vegetables and fruits everyday

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Key Message 6 :

Eat adequate amounts of rice, other cereals, whole grain cereal-based products and tubers

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Consume moderate amounts of fish, meat, poultry, egg, legumes and nuts

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Reduce intake of foods high in fat and limit saturated fat intake

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Choose and prepare foods with less salt, sauces and flavour enhancers

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Coordination and Documentation

The documentation of the Malaysian Dietary Guidelines (MDG) 2020 was coordinated by the Technical Working Group (TWG) on Nutritional Guidelines, which is under the purview of the National Coordinating Committee on Food and Nutrition (NCCFN), Ministry of Health Malaysia. The Nutrition Division, Ministry of Health Malaysia served as the secretariat for the MDG 2020.

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MALAYSIAN DIETARY GUIDELINES 2020

EXECUTIVE SUMMARY

Malaysian Dietary Guidelines (MDGs) are government endorsed documents intended to provide specific recommendations and advice on healthy diets and lifestyles. They are intended to influence consumer food choice based on latest scientific findings on food and nutrient intakes, food supplies, prevalence and public health importance of diet-related health and nutrition outcomes, cultural preferences, and other considerations. It forms the basis for educational programmes and the national food and nutrition policies. The challenge for any dietary guidelines would be to have a coherent policy that take into consideration not only the healthy dietary choices and personal health but also the wider social and environmental impact towards achieving a global environmental sustainability.

The first Malaysian Dietary Guidelines was published in 1999 and revised in 2010. Over the last decade, our population continues to face the double burden of malnutrition by the coexistence of undernutrition problems (e.g. anaemia, stunting and wasting) along with overweight, obesity and diet-related non-communicable diseases (e.g. hypertension, diabetes mellitus, cardiovascular diseases and certain forms of cancers). The recent NHMS (2019) revealed 50% (1 in 2) of adult population are either overweight or obese. It has been shown that the traditional diets have been replaced by diets higher in fats, salt, sugar and low fiber as well as increase in sugar-sweetened beverages consumption; lower intakes of vegetables and fruits as well as higher weekly frequency of eating out. Therefore, the need to review and update the MDG 2010 in line with the latest review of Recommended Nutrient Intakes (RNI), 2017 was undertaken by the Technical Working Group for Nutritional Guidelines under the auspices of the National Coordinating Committee for Food and Nutrition (NCCFN), Ministry of Health Malaysia.

The MDG 2020 is written by a group of experts from the academia, Ministry of Health Malaysia and related professional bodies who have extensive knowledge of Nutrition and Health Science. Several drafts were reviewed, validated and approved by the TWG Nutritional Guidelines. The Key Messages, Key Recommendations and how to achieve were then vetted through Focus Group Discussion on 5-7 February 2020 comprising of Public Health personal (end-users) to determine the relevance and clarity of the statements. The final draft was then presented in a 3-day Consensus Workshop on 22-24 July 2020 involving relevant stakeholders from various Ministries, Government Agencies, Academia, Professional bodies, Industries and Consumer Associations for revision and approval.

The Malaysian Dietary Guidelines 2020 are intended for health professionals, policy makers, educators, food manufacturers, and researchers. It applies to all healthy adult Malaysians, as well as those with common health conditions such as being overweight. They do not apply to people who need special dietary advice for a medical condition.



The revised MDG 2020 features some of the following key updates:

- The MDG use the Recommended Nutrient Intakes for Malaysia (2017) that provide nutrient intake requirements for adults and suggested individual foods from various food groups that can be combined within diets to meet these requirements.
- The MDG 2020 is based on foods that are available, accessible and culturally appropriate for the population. These are used to construct recommended diet patterns that meet nutrient intake requirements and address our nutrition concerns including the excessive consumption of ultra-processed foods and drinks.
- It is primarily designed for adults population aged 18-59 years old.
- However, the Malaysian Food Pyramid 2020 is not just targeted for adults but it can be a reference of daily food intakes for the healthy population starting at the age of 7 and above. The recommended servings of each food group in the food pyramid is within a calorie range of 1500 – 2300 kcal.
- The Malaysian Food Pyramid 2020, maintained the five food groups which are placed at four levels however, it differs from the previous MDGs, in which, vegetables and fruits groups form the base of the new pyramid replacing the Carbohydrate food group. It is reconstructed taking into consideration the number of servings contributed by vegetables and fruits which constitute the most as compared to other food groups. Pictorial representation of the food pyramid has been improved to appreciate the relative portion size of each food group.
- The introduction of Malaysian Healthy Plate helps complement the Food Pyramid and guide users to create a healthy balanced meal.
- The 14 Key messages in the MDG 2020 are quite similar to the 2010 version however, each key message in the Malaysian Dietary Guidelines (MDG) 2020 have been revised and updated with recent scientific evidence.
- In view of a very high prevalence of “eating out” among adults, a new key message *“Cook Nutritious Food at Home More Often and Choose Healthier Options When Eating Out”* has been introduced to replace key message on “Breastfeeding” found in MDG 2010.
- The Malaysian Dietary Guidelines 2020 provide many options in their recommendations. The advice focuses on dietary patterns that promote health and wellbeing. It offers approximately 52 Key Recommendations and 244 statements on “how to achieve” to help users make informed choices toward healthier eating habits.

Key Messages of the Malaysian Dietary Guidelines 2020

- KM1** Eat a variety of foods within the recommended servings.
- KM2** Achieve and maintain a healthy body weight.
- KM3** Be physically active every day.
- KM4** Cook nutritious foods at home more often and choose healthier options when eating out.
- KM5** Eat plenty of vegetables and fruits every day.
- KM6** Eat adequate amount of rice, other cereals, whole grain cereal-based products and tubers.
- KM7** Consume moderate amount of fish, meat, poultry, egg, legumes and nuts.
- KM8** Consume adequate amounts of milk and milk products.
- KM9** Reduce intake of foods high in fat and limit saturated fat intake.
- KM10** Choose and prepare foods with less salt, sauces and flavour enhancers.
- KM11** Limit sugar intake in foods and beverages.
- KM12** Drink plenty of water daily.
- KM13** Consume safe and clean foods and beverages.
- KM14** Make effective use of nutrition information on food labels.



**Limit sugar intake in
foods and beverages**



KEY MESSAGE

11



LIMIT SUGAR INTAKE IN FOODS AND BEVERAGES

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11.1 Terminology

Total Sugars

Total sugars consist of all mono- and disaccharides present in food, derived from any source including naturally occurring and free sugars. These include sucrose (table sugar), fructose, glucose (dextrose), and lactose (milk sugar). Naturally occurring sugar is sugar that exists as an integral component of food, e.g., sugar in whole fruits, vegetables and dairy products. In the ingredient list of the food labeling of prepackaged foods, sugars appeared as a different name such as agave nectar, brown sugar, corn syrup, fructose, fruit juice concentrate, golden syrup, high-fructose corn syrup (HFCS), honey, icing sugar, invert sugar, lactose, malt syrup, maltodextrin, maltose, maple syrup and molasses (Erickson & Slavin, 2015).

Free sugars

Free sugars include all sugars added by the manufacturer, cook, or the consumer as well as sugars that are naturally present in honey, syrups, fruit/ vegetable juices and fruit/ vegetable juice concentrates. These exclude sugar which is present in whole (intact, cooked, or dried) fruit and vegetables or dairy products (Erickson & Slavin, 2015).

Added sugars

Added sugars are sugars that are not naturally found in the food product and are added to foods during processing, culinary preparation, or during meals. These include brown sugar, corn sweeteners, corn syrup, dextrose, fructose, glucose, sucrose, high-fructose corn syrup, honey, invert sugar, lactose, maltose, malt syrup, molasses, and raw sugar (Erickson & Slavin, 2015). In the pre-packaged foods, no added sugar does not mean that no sugar is present, it just means that no sugars have been added during the manufacturing process, since most foods contain sugars in some form (Rachel *et al.*, 2017)

Hidden sugar

Hidden sugars are the ingredients in foods and drinks, although they are not seen as 'sugar'. The hidden sugars can be identified by reading the food label. Some foods may not have the word 'sugar' in the ingredients list on the food and beverages products packaging, but the products still have sugar with labeled in a different name such as sucrose, dextrose, maltose, fructose, lactose, glucose and honey (US FDA, 2014). Major sources of hidden sugar are soft drinks, sweets and candies, cakes, fruit drinks and juices (not homemade), flavoured waters, dairy desserts and several milk products, soups and sauces (not homemade), processed breakfast foods and smoothies, tea and coffee drinks, canned vegetables, industrial breads, hamburger buns, salad dressings, noodles and some alcoholic beverages (Marí, 2017).

Sugar Sweetened Beverages (SSBs)

Sugar-sweetened beverages (regular soft drinks) include carbonated and noncarbonated beverages, which are usually sweetened with HFCS or sucrose. These beverages have relatively high calorie and sugar contents, but no or a very small amount of other nutrients (Chen, 2013).

Artificial Sweeteners

Artificial sweeteners also known as non-nutritive sweeteners are defined as food additives that when added to food can impart a sweet taste (Yebra-Biurrun, 2005). The permitted artificial sweeteners include saccharin (2-sulphobenzoic imide), sodium saccharin (sodium salt of 2-selphobenzoic imide), acesulfame potassium, neotame and aspartame which contain low or no calorie (MOH, 1985).



11.2 Introduction

Sugars are a type of carbohydrate which provide energy. Sugar are commonly used in food and beverages to enhance the taste. However, excessive sugar intake can lead to health problems, such as increasing the risk of weight gain, diabetes, dental caries, and an increased risk of non-communicable diseases (NCDs) or metabolic diseases. In addition, overconsumption of added sugar can result in a poor diet quality (Fidler, Kobe & Štimec, 2012).

On average, Malaysian Adults consumed about 18.5 g or 4 teaspoons of sugar per day (IPH, 2014). The sources of sugar were sweetened beverages and local *kuih*. The WHO (2015) guidelines recommends that free sugars intake should not exceed 10% of total energy intake which equals to 50 g of sugar per day for the average adult (at a calorie intake of 2000 kcal).

Therefore, recently the government introduced sugar sweetened beverage tax, to encourage foods and beverages industries to reformulate their products into less sugar content. On top of that, the industries are mandatory to declare total sugars on the nutrition information panel (NIP) of their food products. The NIP may increase awareness of consumers about sugar content in the products (James *et al.*, 2013)

11.3 Scientific basis

The focus of scientific evidence on sugars guidelines 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 increases overall energy intake, leading to an unhealthy diet and may cause weight gain and increased risk of NCDs or metabolic diseases such as cardiovascular disease (CVD), type 2 diabetes (T2DM), and non-alcoholic fatty liver disease (NAFLD). Finally, overconsumption of sugar may reduce the intake of foods containing more nutritionally adequate calories and could displace micronutrient-dense foods from the diet, resulting in a poor diet quality.

In addition to the above, this section also discusses the benefit of artificial sweeteners or artificial sweeteners on health. Foods and beverages containing artificial sweeteners become more popular because of their calorie-free sweet taste and the current need to substitute sugar as a strategy in weight and T2DM management.

11.3.1 Dental caries

Dental caries is the most prevalent non-communicable chronic disease worldwide and affects all age groups from infants to older adults (Moynihan, 2016). Undeniably, it is also a continuing public health problem in Malaysia. The National Oral Health Survey of Adults (NOHSA) 2010 showed that nine in ten of Malaysian adults experienced dental caries and it was significantly higher in rural areas (OHD, 2013). Dental caries prevalence among 12-year-old school children was 33.3% in 2017 as compared to 41.5% in 2007 (OHD, 2017a). The same trend was observed among the preschoolers where 71.3% experienced dental caries in 2015, while in 2005 it was 76.2% (OHD, 2017b). Although there was a declined trend of dental caries observed throughout the years, however it showed slow reduction for all target groups. Among adults, dental caries severity as measured by mean DMFT was 11.66 and was significantly higher among females and those in rural (OHD, 2013).

Untreated dental caries may cause severe pain and infection, which affects children's school attendance and performance and adult's productivity at work (Kauseebum, 2015). Higher oral health impacts were found among adults with dental caries as compared to caries free adults (OHD, 2013). In addition, dental caries is costly to health care systems and is a lifelong progressive and cumulative disease that tracks to adulthood, even with exposure to fluoride through water or mouth-care products (Bernabé & Sheiham, 2014).

Free sugars are the essential dietary factor in the development of dental caries because dental caries do not occur in the absence of dietary sugars. Dental caries

develops when bacteria in the mouth metabolize sugars to produce acid that demineralizes the hard tissues of the teeth (enamel and dentine) (WHO, 2017). The consumption of sugar containing foods imposes a risk on the dental caries. The actual risk of a certain food is modulated by many factors that are divided in food-related factors such as the release of the sugars, the stickiness of the product, the type and concentration of the sugar and consumer-related factors such as the frequency of sugar consumption, the drinking and chewing habits, the chewing and swallowing efficiency, salivary flow and composition, the presence of cariogenic dental plaque and the use of fluorides (Van Loveren, 2019).

Both the amount of sugars and the frequency with which they are consumed is a risk factor for the development of dental caries. Limiting free sugars intake to less than 10% of total energy intake and ideally even further, to less than 5% may minimizes the risk of dental caries throughout the life course (WHO, 2017).

11.3.2 Obesity

The global prevalence of obesity has increased significantly over the past 40 years. Worldwide, obesity has nearly tripled since 1975 where 39% of adults aged 18 years and above were overweight and 13% were obese in 2016 (Jaacks *et al.*, 2019). Malaysia is no exception to that, with rising obesity rates and about one in two adults in Malaysia were overweight or obese, Malaysia is now the most overweight and obese nation in the south-east Asian region (Mariapun, Ng & Hairi, 2018; IPH, 2020). This is alarming because overweight or obesity increases the risk of major chronic diseases such as cardiometabolic diseases and cancers (Ryan *et al.*, 2016). While complex interactions of genetic, metabolic, cultural, environmental, socioeconomic and behavioural factors contribute to obesity, dietary factors remain as major determinants of obesity (Hruby & Hu, 2015). An excessive energy intake, the frequency of daily meals, eating alone and snack and beverage consumption were associated with obesity (Taillie *et al.*, 2015).



Along with the rapid economic development, food and the Malaysian's eating culture has undergone some form of transformation. The practice of eating-out and preferences to Western diet which is higher in sugar from processed foods had become a trend (Noraziah & Azlan, 2012; Lipoeto, Khor & Angeles-Agdeppa, 2013). Sugar-containing foods that contributed most to energy intakes of Malaysian adults were added sugars from beverages (i.e., cordial syrup, tea, coffee, chocolate flavoured beverages), condensed milk (added to beverages) and local *kuih* (starchy traditional cakes). Less than 1.2% of the daily caloric intake was obtained from jam, carbonated drinks, and "ABC ice" (shaved ice topped with syrup, nuts and beans). On average, Malaysians consumed 30 g (3 teaspoons) of sweetened condensed milk (equivalent to approximately 16 g sugar), and 21 g (4 teaspoons) of table sugar which were habitually added to beverages such as *teh tarik*, *kopi*, and chocolate flavoured beverages (Amarra, Khor & Chan, 2016).

Several studies investigated the association of sugar intake with weight gain or obesity. Studies proved that regular sugar sweetened beverages (SSB) consumption has been positively associated with increased body weight and risk of obesity (Hu, 2013). Based on a systematic review of 32 experimental studies published until December 2013 in peer-reviewed journals shows that the majority of studies with strong methodology indicated a positive association between SSB consumption and risk of obesity or obesity, especially among overweight children (Della Torre *et al.*, 2016). Besides, a review of thirteen reviews and meta-analyses concluded that there was a direct association between SSB consumption and weight gain, overweight, and obesity in children and adolescents (Keller & Bucher Della Torre, 2015). Besides, consumption of high-sugary snacks has been associated with weight gain (Romieu *et al.*, 2017).

A systematic review and meta-analysis investigated the association between consumption of ultra-processed food and noncommunicable disease risk, morbidity and mortality. Forty-three observational studies were included (N = 891,723) demonstrated consumption of ultra-processed food was associated with increased risk of overweight, obesity, abdominal obesity, all-cause mortality, metabolic syndrome and depression in adults as well as wheezing but not asthma in adolescents. In addition, consumption of ultra-processed food was associated with cardiometabolic diseases, frailty, irritable bowel syndrome, functional dyspepsia and cancer (breast and overall) in adults while also being associated with metabolic syndrome in adolescents and dyslipidaemia in children (Lane *et al.*, 2020).

11.3.3 Diabetes

Evidence is still inconclusive on the association between sugar consumption *per se* and T2DM. There is evidence to suggest that diets high in added sugar promote directly and indirectly the development of T2DM. Directly, the fructose component of sugar causes dysregulation of lipid and carbohydrate metabolism. Indirectly, sugar promotes

positive energy balance, thus body weight and fat gain, which also cause dysregulation of lipid and carbohydrate metabolism. Due to the direct and indirect pathway, Stanhope, Schwarz & Havel (2013) have suggested that risk for T2DM is increased when added sugar is consumed with diets that allow for body weight and fat gain.

However, Tsilas *et al.* (2017) conducted a systematic review and meta-analysis of prospective cohort studies of the relation between intake of sugars and incident T2DM. The analyses showed that intakes of total sugars and fructose were not associated with T2DM, but intake of sucrose was associated with an 11% decrease in T2DM. The systematic reviews and meta-analyses also failed to show that sugar-sweetened beverages are associated with an increase in the risk of T2DM.

11.3.4 Cardiovascular disease and other metabolic diseases

Too much added sugar can be one of the greatest threats to cardiovascular diseases and other metabolic diseases including non-alcoholic fatty liver disease. The data reported by Yang *et al.* (2014) suggested that the higher the intake of added sugar, the greater the risk of CVD. They also show that the average level of added sugar consumption in 15% of daily calories, is associated with an 18% increase in risk for CVD mortality. Recent study showed that risk of death increased among adults who consumed more sugary drinks. Sugary drinks were also associated with higher mortality rates from cardiovascular disease (CVD), as well as higher cancer rates (Malik *et al.*, 2019).

The meta-analyses conclude that fructose and/ or sugar consumption increase total and LDL-C (Zhang *et al.*, 2013), TG, total and LDL-C, and blood pressure (TeMorenga *et al.*, 2014), and have significant effects on most components of metabolic syndrome (increased systolic blood pressure, fasting glucose and TG, decreased HDL) (Kelishadi, Mansourian & Heidari-Beni, 2014). Another meta-analysis concludes that the available evidence is not sufficiently robust to draw conclusions regarding the effects of fructose, high fructose corn syrup (HFCS), or sucrose consumption on NAFLD (Chung *et al.*, 2014). In addition, Wang *et al.* (2012 & 2014) concluded that there were no relationships between fructose consumption and levels of uric acid or postprandial triglycerides.

11.3.5 Behaviour and cognitive function

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 randomized trials in hyperactive children found that reducing sugar content of the diet did not reduce the degree of hyperactivity (Wolraich, Wilson & White, 1995).

The recent meta-analysis suggests that an unhealthy diet can increase the risk of attention deficit hyperactivity disorder (ADHD), whereas a healthy diet, would protect against these outcomes. The unhealthy dietary pattern, characterized by the consumption of saturated fat and refined sugar was associated with the risk of hyperactivity or ADHD occurrence (Del- Ponte *et al.*, 2019).

11.3.6 Poor dietary quality

Diet high in sugar may affect the intake of micronutrients. A high-sugar content of food/ beverages was found to contribute significantly to the total caloric intake, but it does not satisfy nutrient requirements (Fidler, Kobe & Štimec, 2012). The intake of sugar displaces foods that are rich in micronutrients. Therefore, diets that are rich in sugar may be poorer in micronutrients. Foods high in added sugar tend to have lower nutrient densities, and thus, provide little nutritional value. By contrast, foods with naturally occurring sugars tend to be higher in nutrients (Langlois & Garriguet, 2011).

11.3.7 Relationship between artificial sweeteners consumption and health outcomes

Foods and beverages containing artificial sweeteners become more popular in recent years especially due to their calorie-free sweet taste and the current need to substitute sugar as a strategy to tackle weight gain and other health problems. There are a number of artificial sweeteners that are deemed to be permitted according to Malaysian Food Regulation 1985 (MOH, 1985). While these can be consumed, their potential health benefits

and adverse health effects, including risk for cancer, diabetes, dental caries and obesity should also be evaluated.

Based on a systematic review that analyzed the relationship between artificial sweetener consumption and cancer involving 599,741 participants, no conclusive evidence to suggest artificial sweeteners cause cancer (Mishra *et al.*, 2015). In another scoping review, it was concluded that in healthy subjects, there is also inconclusive evidence for beneficial and harmful effects of artificial sweeteners and the risk for cancer, diabetes, dental caries, weight gain and obesity (Lohner, Toews & Meerpohl, 2017).

Recently, a more comprehensive systematic review was published investigating the association between intake of non-sugar sweeteners (NSS) and various health outcomes. In this review, it was indicated that intake of NSS in adults had a small beneficial effect on body mass index and fasting blood glucose. However, this evidence is considered very low and low certainty of evidence from a limited number of small studies. On the contrary, no differences were found on oral health, mood, behaviour, cancer and kidney disease when comparing between intake or no intake as well as between lower and high doses of NSS (Toews *et al.*, 2019).

In essence, there is no sound scientific evidence 1 to date that suggests the use of permitted artificial sweeteners are not safe. While this could be true, the potential future risk may not be entirely excluded. There is a need for both further primary research and high quality comprehensive systematic reviews including meta-analyses to inform future recommendations about the health benefits and risks of artificial sweeteners.



11.4 Current status

The cultivation of sugarcane in Malaysia has significantly declined over the past 20 years and in such a situation, the country has to depend on imports for two-thirds of its requirements. In 2018, Malaysia had imported 2.1 million tonnes of sugar of which mainly from Brazil (76%), Australia (14%) and Thailand (5%) (GAIN, 2017). In terms of consumption, sugar consumption per capita among

Malaysian has increased from 38.5 kg in 1991 to 51.8 kg in 2012, which was among the highest within the neighbouring countries (Figure 11.1). The overall domestic consumption of sugar in Malaysia has also increased from 1.7 million tonnes in the year 2014/2015 to 2 million tonnes as of May 2019/2020 (Figure 11.2).

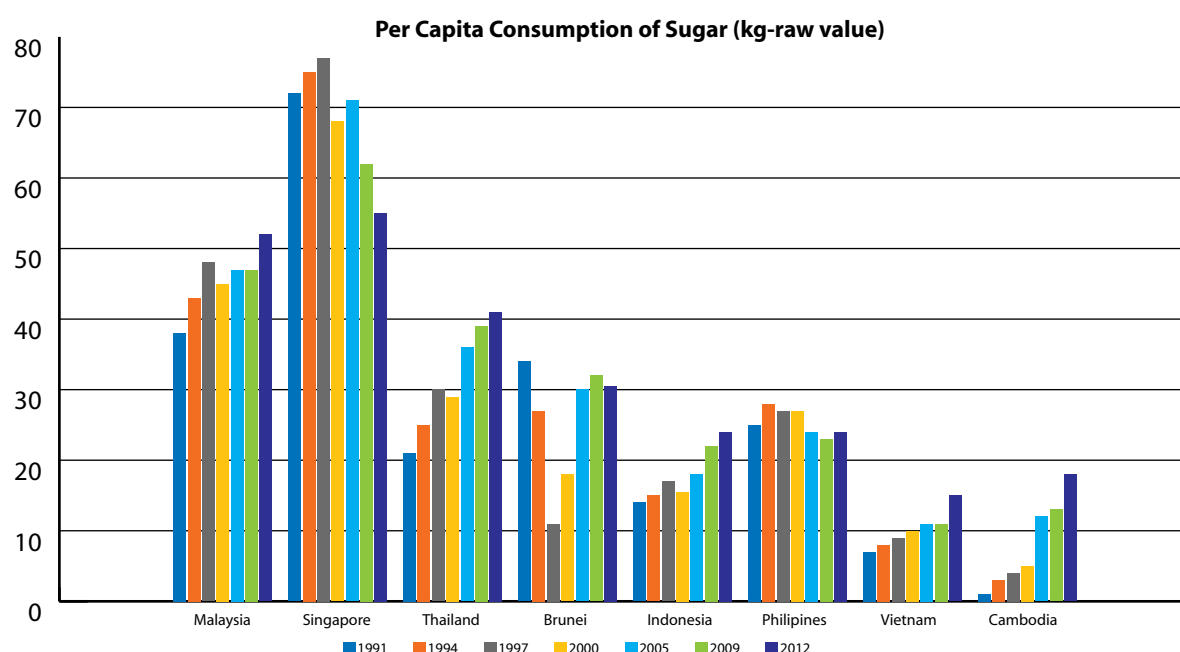


Figure 11.1. Per capita consumption of sugar (kg-raw value) in Asian countries
Source: Malmö University (n.d)

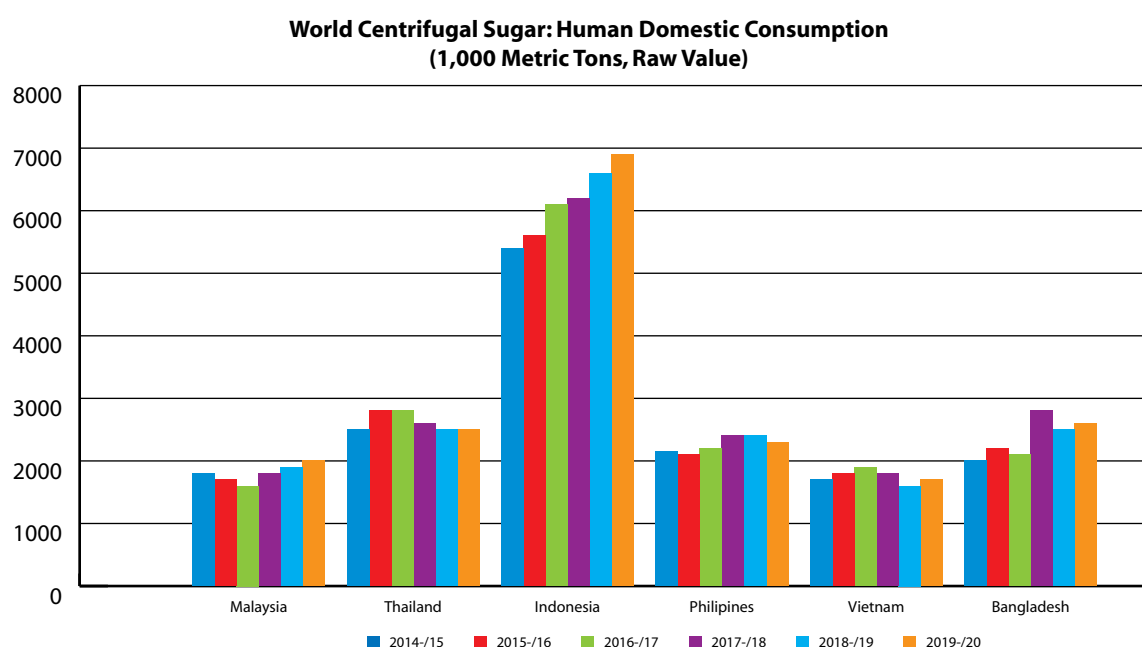


Figure 11.2: World centrifugal sugar: Human domestic consumption (1,000 metric tonnes, raw value)
Source: USDA Foreign Agriculture Service (2019)

According to Malaysian Adults Nutrition Survey (MANS) 2014, approximately 55.9% of the population consumed sugar (white, brown and palm sugar) daily while the mean sugar intake was about 18.5 g or 3.7 teaspoons per day (Noraida, 2018). MANS 2014 also indicated that the consumption of sugar was higher in rural areas (68.1% consumed daily, 4 teaspoons per day) and in men (58.2% consumed daily, 4 teaspoons per day) compared to urban areas (50.5% consumed daily, 3.4 teaspoons per day) and women (53.3% consumed daily, 3.2 teaspoons per day), respectively. In addition, approximately 23.5% of the population consumed sweetened condensed milk/ creamer daily amounting 24.3 g per day. Men appeared to have consumed more servings of sweetened condensed milk compared to their women counterparts (Noraida, 2018).

It can be concluded that the mean added sugar intake based on MANS 2014 (IPH, 2014) was about 31.5 g per day (taking into account that 24.3 g condensed milk contains about 13 g sugar). However, it is important to note that the data of sugar mentioned above is the sugar that is usually added to beverages such as tea, coffee and chocolate-based drinks. Sugar added into carbonated beverages and local *kuih* as well as natural sugar in fruits and vegetables were not quantified which could result in underreporting in total daily sugar intake. The list of commonly consumed beverages by Malaysian adults is shown in Table 11.1 (IPH, 2014).

Table 11.1: Percentage and mean intake of top ten beverages consumed daily among Malaysian adult population

No.	Beverages	Percentage (%)	ml/day	No. of servings (cup)/day
1.	Tea	70.30	326	1.81
2.	Malted drink (Milo, Horlick, etc.)	59.10	315	1.57
3.	Coffee	53.20	357	1.78
4.	Soya milk	51.40	274	1.36
5.	Carbonated drink	45.70	186	0.93
6.	Fruit juice	41.10	273	1.36
7.	Cordial syrup	34.40	153	0.76
8.	Ready to drink beverage	30.80	287	1.43
9.	Pre-mixed drink (3 in 1)	28.80	315	1.57
10.	Energy drink	12.60	680	3.48

Source: IPH (2014)

Surprisingly, the sugar intakes among Malaysians based on two other studies were much higher than those reported in MANS 2014 (IPH, 2014). A study conducted by Nik Shanita, Norimah & Abu Hanifah (2012) found that mean intake of added sugar of adults in Klang Valley was approximately 44.2 g per day or 9 teaspoons/day. In a more recent and relatively large study, total sugar intake among Malaysian senior citizen aged 60 years and above who live in Johor, Perak, Kelantan and Selangor was 40.5 g per day (8 teaspoons/day) from which added sugar intake was 33 g per day (6 teaspoons/day) (NurZetty *et al.*, 2018). The sources of sugar that were most consumed among them were sweetened beverages which included added sugar and sweetened condensed milk that were mixed in tea or coffee and also in local *kuih* (NurZetty *et al.*, 2018).

As mentioned earlier, the new WHO (2015) guidelines recommends that free sugars intake should not exceed 10% of total energy intake. Based on findings from MANS 2014 (IPH, 2014) and Nik Shanita, Norimah & Abu Hanifah

(2012), the sugar intake among Malaysians were within the recommended range at 8.6% and 9.4%, respectively. Nevertheless, it is strongly recommended that free sugar intake should remain below 10% of total energy intake to prevent excess of calories intake which may lead to obesity and NCDs. However, WHO (2015) recommend the intake ideally less than 5% which would provide additional health benefits in the form of reduced dental caries.

Information about sugar content of foods commonly consumed by Malaysians is rather limited. In fact, the national nutrient database, the Malaysian Food Composition Database (MyFCD), first published by Tee *et al* (1997), has yet to publish a sugar database. Hence, the sugar content of selected foods and beverages presented in Table 11.2 to Table 11.6 were obtained from recently published local articles (Sabeetha, Amin & Barakatun Nisak, 2017; Norhayati *et al.*, 2018; Rosmawati *et al.*, 2018; Chong *et al.*, 2019).

11.5 Key Recommendations

Key Recommendation 1

Limit intake of sugar in foods.

How to Achieve

1. Choose or prepare kuih, cookies and cakes with less sugar.
2. Replace desserts such as sweet puddings, cookies and cakes with fresh fruits.
3. Reduce the frequency of consuming food containing sugar.
4. Avoid adding sugar while cooking or to your meal.
5. Limit intake of ultra-processed foods such as sweet, candies, breads and buns, cookies, biscuits, pastries and cakes.
6. Avoid consuming sugary foods during morning and afternoon snacks and close to bedtime
7. Read food labels to choose low in sugar - food.
8. Limit intake of foods that sugar is listed as the first ingredient in the ingredient list on the food label.

Key Recommendation 2

Limit intake of sugar in beverages.

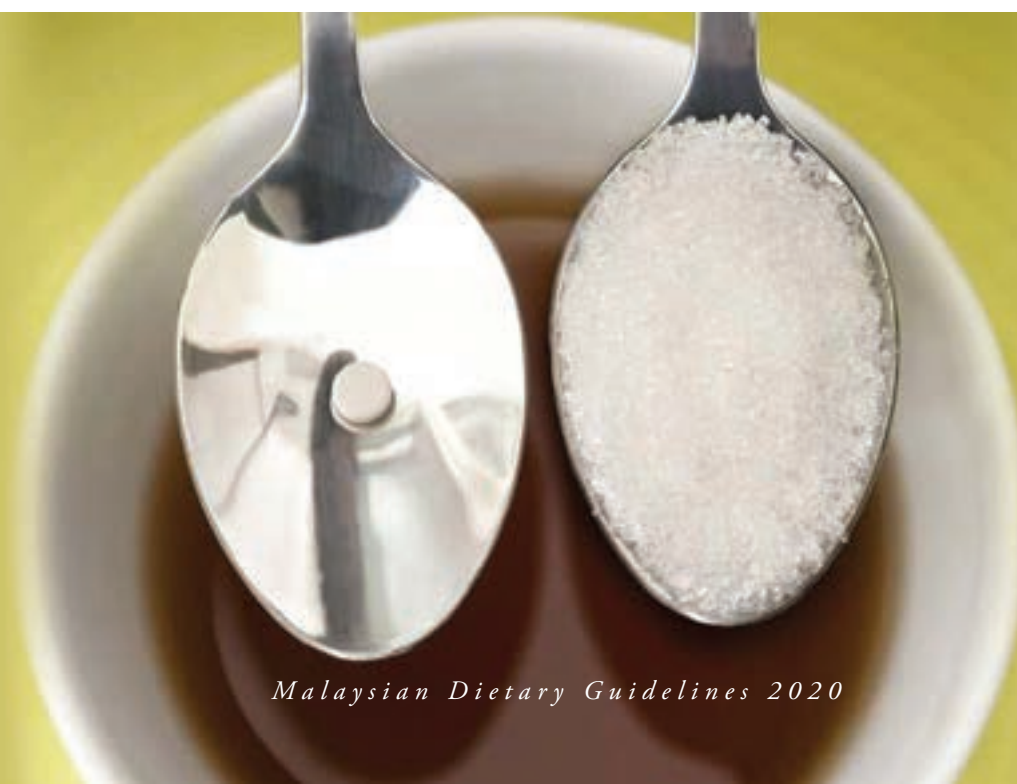
How to Achieve

1. Always choose plain water.
2. Limit intake of ultra-processed beverages such as carbonated and non-carbonated sugar-sweetened beverages (soft drink, syrup and cordial).
3. Limit intake of beverages with added sugar and sweetened condensed milk (*teh tarik*, coffee, *air batu campur*, *cendol*, bubble tea) and premix beverages.
4. Avoid consuming sugary beverages during morning and afternoon snack and close to bedtime.
5. Read food labels to choose low in sugar - beverages.
6. Limit intake of beverages that sugar is listed as the first ingredient in the ingredient list on the food label.

Additional recommendation: Artificial sweetener

Special consideration when consuming artificial sweeteners:

1. Use artificial sweeteners in moderation and those approved by the Food Regulation of Malaysia 1985.
2. Intake of artificial sweeteners should not become the sole and primary approach in obesity and diabetes management.

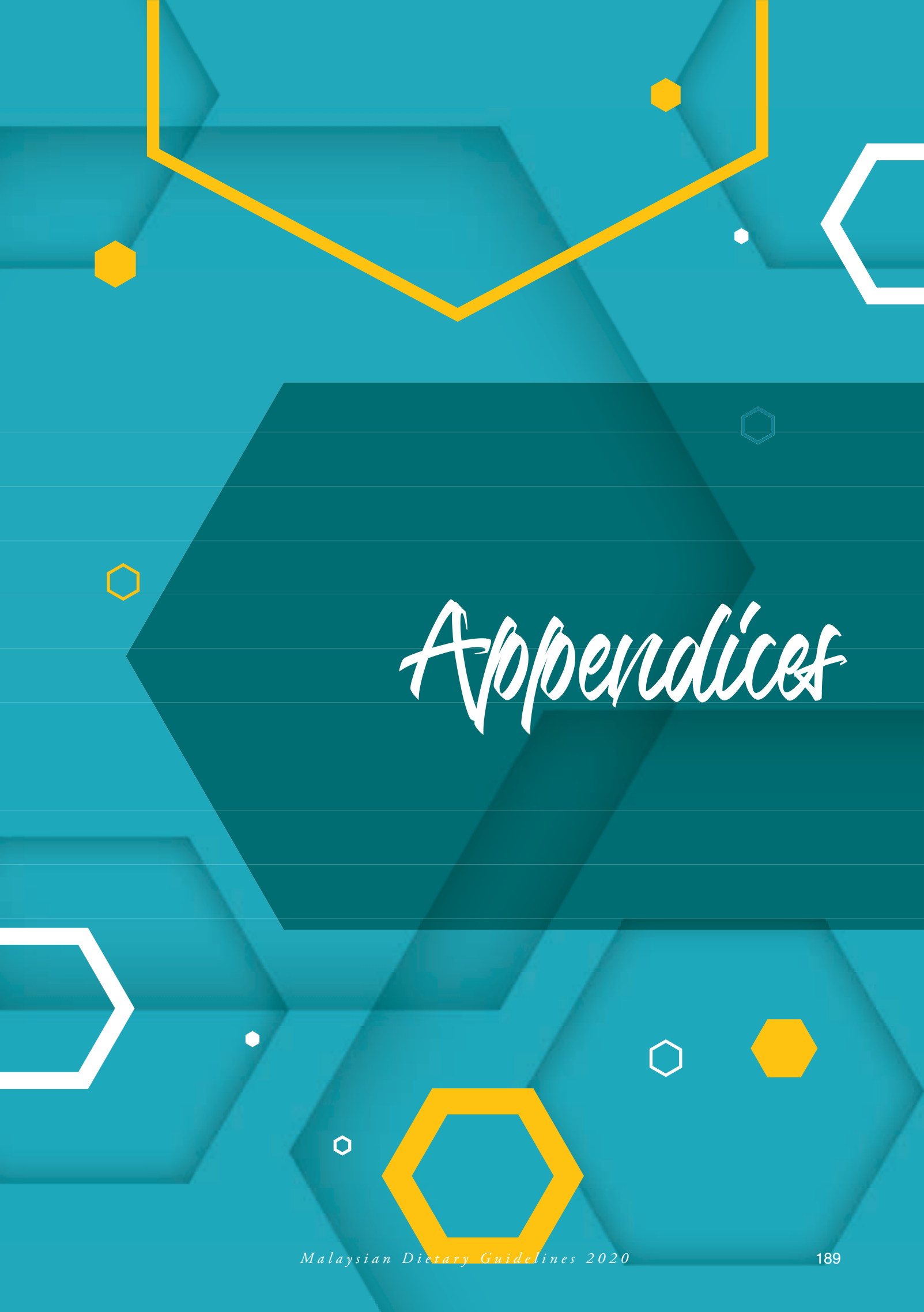


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Appendices

Appendices

Table 11.2: Total sugar contents in selected local *kuih*

Type of food	Total sugar (g/100g)	Household measurement equivalent (teaspoon)	Type of food	Total sugar (g/100g)	Household measurement equivalent (teaspoon)
<i>Kuih keria</i>	24.80	4.96	<i>Putu piring</i>	12.70	2.54
<i>Bingka ubi</i>	21.50	4.30	<i>Kuih koci</i>	12.10	2.42
<i>Cekodok pisang</i>	21.10	4.22	<i>Cucur badak</i>	11.90	2.38
<i>Pau kaya</i>	19.20	3.84	<i>Kuih tepung pelita</i>	11.40	2.28
<i>Kuih peneram</i>	18.60	3.72	<i>Pengat pisang</i>	11.30	2.26
<i>Cek Mek Molek</i>	17.50	3.50	<i>Kuih akok</i>	10.10	2.02
<i>Kuih apam</i>	17.20	3.44	<i>Putu mayam</i>	9.90	1.98
<i>Kuih kasturi</i>	16.90	3.38	<i>Pengat ubi keledak</i>	9.50	1.90
<i>Kuih bakar</i>	16.20	3.24	<i>Buah melaka</i>	8.90	1.78
<i>Kuih apam balik</i>	16.00	3.20	<i>Kuih ketayap</i>	8.70	1.74
<i>Lepat ubi</i>	15.80	3.16	<i>Kuih talam</i>	8.30	1.66
<i>Kuih sagu</i>	15.80	3.16	<i>Pau ayam</i>	7.00	1.40
<i>Kuih kasui</i>	14.80	2.96	<i>Kuih lopes</i>	5.50	1.10
<i>Pau kacang merah</i>	14.80	2.96	<i>Cucur bilis</i>	4.70	0.94
<i>Pau kelapa</i>	14.30	2.86	<i>Cucur bawang</i>	3.80	0.76
<i>Pau goreng</i>	14.20	2.84	<i>Pulut panggang</i>	2.20	0.44
<i>Kuih lapis</i>	13.70	2.74	<i>Cakoi</i>	1.20	0.24
<i>Lepat pisang</i>	13.50	2.70	<i>Ketupat</i>	0.50	0.10
<i>Kuih sri muka</i>	13.30	2.66			

Source: Chong *et al.* (2019)

Table 11.3: Total sugar contents in selected local cooked dishes

Type of food	Total sugar (g/100g)	Household measurement equivalent (teaspoon)	Type of food	Total sugar (g/100g)	Household measurement equivalent (teaspoon)
<i>Mee rebus</i>	6.20	1.24	<i>Mee-hoon goreng</i>	2.40	0.48
<i>Roti canai</i>	4.60	0.92	<i>Kuey teow goreng</i>	2.10	0.42
<i>Mee bandung</i>	4.00	0.80	<i>Nasi ayam</i>	1.90	0.38
<i>Capati</i>	3.30	0.66	<i>Nasi lemak</i>	1.50	0.30
<i>Roti telur</i>	3.10	0.62	<i>Lontong</i>	1.20	0.24
<i>Murtabak</i>	30.00	0.60	<i>Idli</i>	1.10	0.22
<i>Mee goreng</i>	2.70	0.54	<i>Tosai</i>	1.10	0.22
<i>Mee Kari</i>	2.60	0.52	<i>Kuey teow sup</i>	1.10	0.22
<i>Lempeng</i>	2.60	0.52	<i>Mee sup</i>	0.90	0.18

Source: Chong *et al.* (2019)**Table 11.4:** Total sugar contents in selected cereal, starchy & tuber, legume, nut & seed and other processed products

Type of food	Total sugar (g/100g)	Household measurement equivalent (teaspoon)	Type of food	Total sugar (g/100g)	Household measurement equivalent (teaspoon)
Cereal products					
Wafer, chocolate, full coated	39.13	7.83	#Bun, red bean filling	14.4	2.88
Biscuit, cream filled	25.65	5.13	Biscuit, corn	14.02	2.80
Biscuit, raisin	24.56	4.91	Bun, potato	13.55	2.71
Biscuit, chocolate chip	24.17	4.83	#Bun, corn cream filling	12.5	2.50
#Cake, banana	24.00	4.8	Biscuit, crackers, vegetable flavour	9.72	1.94
Bun, kaya	22.82	4.56	Corn flakes	8.58	1.72
Cookies, butter	21.62	4.32	*Bun, plain	6.80	1.36
Biscuit, milk	19.06	3.81	*Bread, white	4.40	0.88
Muesli	18.75	3.75	*Bread, wholemeal	3.70	0.74
Biscuit, shortbread	17.80	3.56	*Instant noodles, curry	2.30	0.46
Biscuit, oatmeal	16.43	3.29	*Biscuit, cream cracker	2.10	0.42
Biscuit, cracker with sugar	14.92	2.98	Oatmeal cereal, dry	1.20	0.24
#Bun, coconut filling	14.9	2.98			
#Bun, chocolate filling	14.6	2.92			

Table 11.4: Total sugar contents in selected cereal, starchy & tuber, legume, nut & seed and other processed products (cont...)

Type of food	Total sugar (g/100g)	Household measurement equivalent (teaspoon)	Type of food	Total sugar (g/100g)	Household measurement equivalent (teaspoon)
Starchy root & tuber products			Other processed products		
Tapioca chips, spicy	12.64	2.53	¹ Palm sugar	86.70	17.34
Tapioca chips, plain, unsalted	7.61	1.52	¹ Seri kaya	47.30	9.46
Sweet potato, red, chips	5.09	1.02	² Sweetened creamer	45.90	9.18
Tapioca chips, black pepper	4.92	0.98	² Chili, sauce	27.90	5.58
Potato chips, spicy	2.75	0.55	² Tomato, sauce	20.50	4.10
Legume, nut & seed products			Thousand island, sauce	15.47	3.09
Soya sauce, sweet	42.23	8.45	¹ Peanut butter	12.20	2.44
Peanut, crush	40.97	8.19	Mayonnaise	8.59	1.72
Peanut/ groundnut, flour coated	8.06	1.61			
Pistachio nut	6.41	1.28			
Soya flour	6.33	1.27			
Macadamia nut	4.28	0.86			
Sunflower seed	2.38	0.48			
Hazelnut	1.72	0.34			
Flaxseed	1.69	0.34			
Pumpkin seed	1.10	0.22			

Source: Norhayati *et al.* (2018); ¹Rosmawati *et al.* (2018); ²Chong *et al.* (2019)

Table 11.5: Total sugar contents in selected sugar & syrup products and beverages

Type of food	Total sugar (g/100g)	Household measurement equivalent (teaspoon)	Type of food	Total sugar (g/100g)	Household measurement equivalent (teaspoon)
Sugar & syrup products			Ready-to-drink Beverages		
Cordial, pineapple	65.52	13.10	¹ Cocoa flavoured drink with sweetened creamer	10.70	2.14
Cordial, guava	64.63	12.93			
Jam, blueberry	54.78	10.96			
Jam, apricot	53.65	10.73	¹ Coffee with sweetened creamer	9.00	1.8
Jam, strawberry	52.67	10.53	¹ Tea with sweetened creamer	8.80	1.76
Jam, grape	52.43	10.49			
Cordial, roselle	51.03	10.20	¹ Orange flavoured cordial drink	7.70	1.54
Cordial, soursop	45.39	9.08			
Cordial, mango	43.46	8.69	¹ Orange juice, fresh	7.60	1.52
Cordial, orange	41.41	8.28			
Cordial, grape	34.90	6.98	¹ Soymilk, fresh	7.00	1.4
Cordial, sarsi	32.91	6.58	¹ Coffee with sugar	6.90	1.38
Cordial, lime	31.22	6.24	¹ Barley drink, fresh	6.60	1.32
Cordial root beer	15.00	3.00	¹ Chrysanthemum tea, fresh	5.70	1.14
Powdered Beverages					
¹ Pre-mix coffee, powder	48.6	9.72	Total Sugar (g/500ml)		
¹ Pre-mixed cocoa, powder	46.40	9.28	² Bubble milk tea	102.5	20.5
¹ Malted milk, powder	44.80	8.96	² Brown sugar	92.5	18.5
¹ Full cream milk, powder	40.70	8.14	Boba milk tea		
¹ Low fat milk, powder	39.90	7.98			

Source: Norhayati *et al.* (2018); ¹Chong *et al.* (2019); ²Channel News Asia (n.d.)

Table 11.6: Total sugar contents in selected fruits

Type of food	Total sugar (g/100g)	Household measurement equivalent (teaspoon)	Type of food	Total sugar (g/100g)	Household measurement equivalent (teaspoon)
³ Pisang berangan	20.40	4.08	Green pear	10.10	2.02
Rambutan	17.90	3.58	³ Soursop	9.20	1.84
³ Ciku	17.10	3.42	³ Pineapple	8.60	1.72
Longan	16.70	3.34	² Dragon fruit, white	8.50	1.70
Mangosteen	15.10	3.02	² Dragon fruit, red	8.40	1.68
Langsat	14.10	2.82	³ Papaya	7.80	1.56
³ Durian	13.90	2.78	Yellow pear	7.70	1.54
¹ Watermelon, red, seeded	11.40	2.28	Tangerine	7.10	1.42
			³ Mandarin orange	7.00	1.40
² Pomegranate	10.70	2.14	³ Guava	6.70	1.34
¹ Watermelon, Yellow	10.10	2.01			

Source: ¹Sabeetha *et al.* (2017), ²Norhayati *et al.* (2018), Rosmawati *et al.* (2018); ³Chong *et al.* (2019).

**Focus Group Discussion on
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Recommendations and How to
Achieve of the Malaysian Dietary
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(5 - 7 February 2020)**

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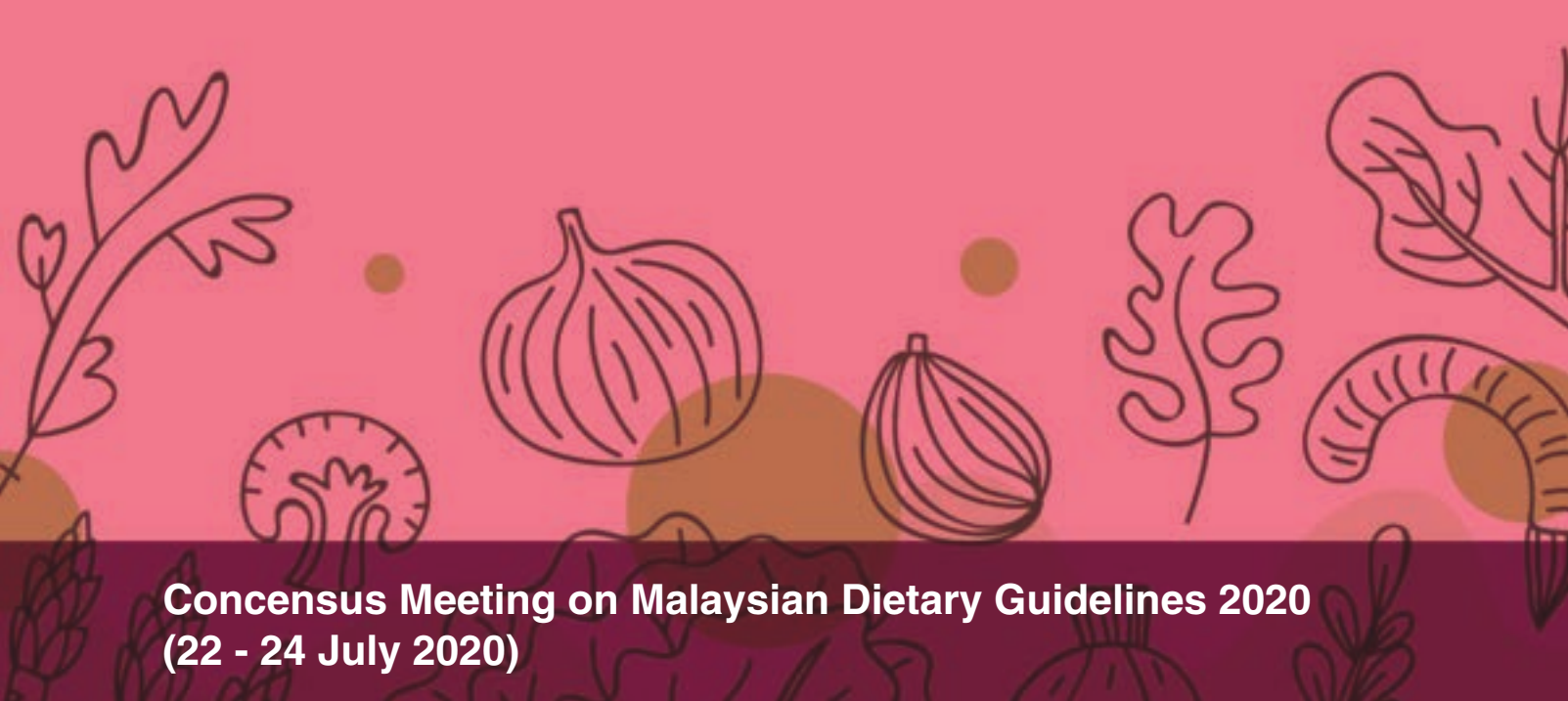
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