

## Nutrition for Prevention and Management of Type-2 Diabetes

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About 8.3% of people (382 million adults) in the world suffer from diabetes, and over 592 million by 2035 is predicted [1]. Overwhelming majority of diabetes is type 2 diabetes mellitus, which is associated with insufficient release of insulin (caused by damage of pancreas) and insulin resistance (i.e. low sensitivity). The cause of type-2 diabetes is long term malnutrition and therefore it is possible to prevent or even treat this disease by proper long term nutrition.

Prevention and treatment of overweight/obesity for preventing or managing diabetes Obesity or overweight caused by over-nutrition (excessive intake of energy-containing nutrients) is the major cause of diabetes or hyper blood glucose level (a precondition of diabetes). About 13% and 39% of world populations are obese and overweight, respectively [2].

For some people (especially those older than 30 years), the energy intake/expenditure could not be balanced by the physiological mechanism described above. Hence, overweight and obesity occur widely. Many reports have suggested methods of controlling body weight [3,4]. Here, a new approach (perseverance combining with proper dietary model, which is based on the physiological mechanism described above and its modification by will) to tackle obesity is suggested. The proposed procedures are as the following:

1. Setting up standard BMI [5] ( $\text{kg}/\text{m}^2$ ; 18.5 - 24.9 for healthy weight) or BAI [6];
2. Setting up the daily requirement of vitamins, essential amino acids, fatty acid and minerals (such as according to recommended daily intake), and determining the quantitative way of supplying these essential nutrients to avoid essential nutrients deficiency during dietary energy intake control [such as taking pills or capsules that quantitatively contain a sufficient amount of these essential nutrients mixture or a sufficient amount of fruits or vegetables (especially, those freshly edible being preferred)];
3. Determining the right amount of staple foods (ordinary or formulated foods) that mainly contain energy components (which may include saccharides, proteins and fats) by the following procedures: firstly, monitoring whether the BMI or BAI increases or decreases by taking a fixed amount (which could be determined according to recommended daily energy intake) of the staple food; then, reducing or increasing the amount of the staple food intake until the BMI or BAI (by self-weighing and calculation) is right.

The success of the procedures described above would largely rely on perseverance. Especially, dieter should be able to bear the unpleasant feeling of hunger during the initial period of diet. After some time depending on the individual's body condition, the dieter should certainly find and become used to the diet that can keep his/her body weight right.

The advantage of this anti-obesity method includes its safety in operation, economy and efficiency of keeping body weight right. Therefore, this anti-obesity method could be widely applied.

For obese people with diabetes, 1100 kcal energy intake may be helpful to decrease body weight and blood glucose level rapidly. This method should significantly reduce blood glucose level by about 4 days and further decrease blood glucose level by 28 days.

Food components when total energy intake is proper, no scientific evidence indicates that high fat diet can increase or low fat diet can decrease the risk of diabetes. Replace of saturated fat by  $\omega$ -6 polyunsaturated fat can decrease the risk of diabetes. The energy from satu-

rated fat < 10% of total energy intake should be beneficial. The cholesterol intake should be less than 300 mg per day. With the condition of proper total energy intake, no scientific evidence indicates that high or low saccharide diet can increase or decrease the risk of diabetes. However, proper increase in intake of foods rich in diet fibers such as whole cereals can be beneficial. The intake of sugars should be restricted with the energy from them being less than 10% of total energy intake. It is not necessary to restrict protein intake, but 0.8 g/body weight/day should be proper. Proper increase in intake of fruits or vegetables should be beneficial for adequate intake of vitamins and minerals while their supplements in daily diet may be helpful. Sodium intake should be less than 2.3g per day.

Drinks It would be beneficial if intake of sugar-containing beverages can be avoided or reduced. Beverages with low or no calorie sweeteners such as sorbitol or stevia glycosides can be beneficial. Moderate alcohol intake (i.e. 10 - 30g per day) is encouraged.

Type of foods with the condition of proper total energy intake, increase in consumption of nuts or beans should be beneficial to control blood glucose level. It must be noted that the amount of intake should within the limit level that over intake of total energy is avoided.

Bioactive food components proper intake of some compounds which are beneficial to pancreas health or improve insulin sensitivity is encouraged. For example, stevia glycosides which are currently used as sweeteners in the food industry and tabletop and have the function of repairing damaged pancreas and improving insulin sensitivity. The acceptable daily intake of 4 mg (steviol equivalent or ca. 10 mg stevia glycosides)/kg.bw/day was recommended by FAO/WHO Expert Committee on Food Additives [7].

It is concluded that the cause of type-2 diabetes is long term daily diet. This kind of chronic disease can be prevented or even treated by proper long term nutrient intake.

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