

Lifestyles Matter in the Prevention of Type 2 Diabetes

The incidence of type 2 diabetes is rapidly increasing worldwide due to the increasing occurrence of obesity and sedentary lifestyle. Type 2 diabetes is no longer confined to middle-aged and elderly people but is increasingly common among young people and even children (1,2). Type 2 diabetes constitutes a major health problem in both developed and developing countries, and with obesity it is becoming one of the largest challenges to health care systems. Therefore, any measures to prevent or delay the development of diabetes are urgently needed.

There is a great deal of evidence that both genetic and environmental factors are of importance in the pathogenesis of type 2 diabetes. While the genetic factors are still poorly understood, numerous studies have shown that obesity (central obesity in particular), physical inactivity (3), high-fat diet, and diet rich in saturated fatty acids increase the risk of diabetes (4,5). Furthermore, based mainly on epidemiological studies, low intakes of dietary fiber, low-glycemic carbohydrates, and whole grain cereals have been shown to increase the risk of type 2 diabetes (5).

Type 2 diabetes is preceded by a long period of impaired glucose tolerance (IGT) or milder disturbances in glucose metabolism. These disturbances in glucose metabolism and insulin resistance syndrome or metabolic syndrome, characterized by a clustering of risk factors, are much more common than type 2 diabetes and carry an increased risk not only for type 2 diabetes but also for cardiovascular morbidity and mortality, even in early phases of impaired glucose metabolism (6,7). Therefore, the goals of the prevention of type 2 diabetes and metabolic syndrome are also to prevent cardiovascular diseases and long-term diabetic complications. It is important to notice that changing lifestyle is our primary target in the prevention of type 2 diabetes, since it is unrealistic to believe that any single drug we have today could become,

in the large-scale, the first line means for the prevention of type 2 diabetes.

Of all the former intervention studies (8–11), programs for the prevention of type 2 diabetes were built on the current knowledge of the pathogenesis of this disease. To summarize, if people are overweight, they should lose weight; if they are sedentary, they must increase physical activity. In addition, a healthy diet is also important, i.e., reducing the intake of total fat (saturated fatty acids in particular) and increasing intake of dietary fiber by consuming more vegetables and fruits and whole grain cereal products. In a Swedish uncontrolled study (8), it was shown that an increase in physical activity and moderate weight loss reduced the incidence of type 2 diabetes by 50% in middle-aged men with IGT. In a Chinese study (9) of IGT patients, 6-year interventions with diet, physical activity, and diet plus physical activity resulted in an approximate 30–40% reduction in diabetes risk in both normal weight and overweight persons. In the Finnish Diabetes Prevention Study, 522 subjects with IGT were randomized to either the intervention or control group. The intervention group was able to lose weight and increase physical activity, and they also reduced the intake of total and saturated fats and increased fiber intake more than the control group. These lifestyle changes resulted in a 58% reduction of diabetes risk. More interestingly, none in either group developed diabetes if they achieved four or five of the key targets of intervention (10). In the massive Diabetes Prevention Program Trial (11) there was also a 58% reduction in the risk of diabetes in the intervention group, while the metformin-treated group showed only a 31% reduction. These results from lifestyle intervention trials not only emphasize the importance of lifestyle in the prevention of type 2 diabetes, but they also strengthen the crucial importance of overweight and physical inactivity in the pathogenesis of this disease. Furthermore, they convincingly show that even

moderate change in lifestyle matters. What is also of importance is the fact that changes in lifestyle can reduce the level of cardiovascular risk factors (10).

In this issue, Liao et al. (12) report that modification of lifestyle could influence BMI and fat distribution in Japanese Americans with IGT. In their study, the intervention group had a diet particularly low in total fat and saturated fatty acids. Furthermore, the endurance exercise program was offered for the first 6 months to persons in the intervention group. After the first 6 months, exercise in both groups was not supervised. After 2 years there was a 2.5-kg decrease in body weight in the intervention versus control group, and most measurements of fat content showed favorable changes in the intervention group. There were more cases with normal glucose tolerance at least once during the 24 months of follow-up in the intervention group (67 vs. 30%). Unfortunately, any change in the main cardiovascular risk factors was not reported. The authors speculated that the beneficial changes could be due to the changes in visceral fat content, but the actual results do not firmly support this idea because it was subcutaneous fat that was reduced significantly at 24 months in the intervention group. It has been suggested that visceral fat could be of particular importance in the pathogenesis of metabolic syndrome and type 2 diabetes, and there might be racial and sex differences in this respect (13,14). However, this issue is still open for debate (15). Both genetic and environmental factors contribute to the accumulation of visceral fat, but the exact genetic background has remained unresolved. There is some evidence that physical activity is particularly effective in the prevention of visceral fat accumulation. It should be noticed, however, that the effects of physical activity are not limited to visceral fat but can have effects on muscle and lipid metabolism (16), independent of visceral fat. Nevertheless, it is very important to further examine the role of visceral fat in the

pathogenesis of metabolic disturbances, including type 2 diabetes. In this context, it is also crucial to take into account the impact of fetal and early childhood nutrition (17) and the complex interaction between the genes and lifestyles (18).

As for clinical practice, health care professionals must emphasize the key role of weight loss, increased physical activity, and healthy diet in the prevention of metabolic syndrome and type 2 diabetes and inform their patients that this therapy is targeted to the mechanisms lying behind these disorders. Physicians working in primary care should pay close attention to the recommendations to measure not only body weight but also waist of their patients and encourage them to change their lifestyle as a first-line treatment modality when appropriate. This is also according to evidence-based medicine and nutrition; in well-controlled clinical trials, lifestyle changes have been shown more effective than drugs in the prevention of type 2 diabetes in high-risk groups (10,11,19). As for future studies on the prevention of type 2 diabetes by drugs, one may ask, "Is it still ethical to have a placebo group, or should an effective lifestyle intervention serve as a more appropriate control?" Finally, what we really need are nationwide programs for the prevention of obesity and type 2 diabetes (20). This is because in many countries up to 30% of people are at increased risk, and it has been predicted that the prevalence of diabetes could double within the next 20 years. In Finland, we are planning that type of program, but financing these programs is a political issue, which should be of interest to politicians and health administrators responsible for the health of a nation.

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