

PREVENTION OF DIABETES MELLITUS TYPE - 2

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ABSTRACT

Diabetes is a major public health problem that is approaching epidemic proportions globally. There is an urgent need for strategies to curb the rising prevalence of this disease, and prevention appears a logical approach. Lifestyle modifications with weight loss and exercise can reduce the incidence of diabetes by >50% in patients with impaired glucose tolerance (IGT). The use of metformin has shown in randomized trials to prevent type - 2 diabetes in high-risk subjects with IGT. One or a combination of these approaches could make diabetes prevention a reality in the near future.

Keywords: Diabetes mellitus type 2, Weight loss, Exercise, Metformin

INTRODUCTION

Diabetes mellitus type 2 is a major health problem associated with excess mortality and morbidity. The condition is increasing in epidemic proportions in both developed and developing nations, with the global population predicted to rise from 61.3 million in 2011 to 101.2 million in 2030.¹⁻³

Subjects with DM type 2 are at a significantly higher risk for coronary heart disease, peripheral vascular disease, stroke and various complications. The economic impact of diabetes is substantial in developed countries, it accounts for 10% or more of the total health-care budget on its management or that of its associated complications.⁴ The epidemic is thought to be in part related to obesity and fat

accumulation as a result of a positive calorific balance.¹

Pathogenesis of diabetes mellitus type 2

Subjects who have develop DM type 2 are thought to proceed through a phase of impaired glucose tolerance (IGT)⁵ with defects in the action or secretion of insulin thought to be the two major abnormalities leading to the development of DM. As tissue resistance to insulin progressively increases, insulin secretion by pancreatic beta cells progressively rises as it attempts to compensate for this resistance. Glucose tolerance remains normal as long as the beta cells can compensate for insulin resistance. Eventually, beta cell failure tends to be

slowly progressive over time and leads to a progressively rising glucose levels. Initially, IGT develops, resulting in postprandial hyperglycaemia and subsequently DM type 2, when glucose levels reach a critical point at which the risk of various complications ensues. The risk of progressing from IGT to DM type 2 is variable, depending on the type of population studied, obesity and cardiovascular risk factors.⁶

The need for prevention of Diabetes

The high economic and social costs of DM type 2 and its rising prevalence makes a compelling case for its prevention.¹ In DM type 2 patients, intervention trials have demonstrated clear benefits of good glycaemic control in preventing or retarding the progression of various complications and also reductions in cardiovascular disease.⁷⁻⁹ Intervention prior to the onset of DM type 2 may be the only way of preventing the complications of DM. Thus in subjects with IGT, preventing or delaying the progression to DM type 2 are a potential mechanism to reduce the burden and complications of diabetes.

Aim and Objective

To study the role of lifestyle management, weight reduction and exercise in the prevention of diabetes mellitus type 2.

Materials and Methods

This study is based on lifestyle management, weight reduction and exercise. The material is collected from various modern books and websites.

Lifestyle, weight reduction and exercise

Weight loss has been an important measure in preventing DM type 2. In overweight subjects with IGT undergoing gastric bypass surgery, the rate of conversion to DM type 2 after an average weight loss of 22.5 kg over 4–6 years was 0.15% per year, compared to an average rate of 4.72% in a control group without the operation.¹⁰ A number of small early uncontrolled studies have shown benefits of health and lifestyle changes in preventing progression from IGT to DM type 2.¹¹⁻¹⁴

Two large well-designed randomized control studies have compared the impact of lifestyle measures in subjects with IGT and progression to DM.¹⁵⁻¹⁶

The Finnish Diabetes Prevention Study (FDPS) enrolled 522 middle-aged men with mean age of 55 years and a mean Body Mass Index (BMI) of 31 kg/m² (normal BMI 20–25 kg/m²).¹⁵ Subjects with IGT according to the WHO criteria were randomized to receive either brief diet and exercise counseling (control arm) or intensive individual instructions on weight reduction (>5%), reduction of food intake (<30% of calorific intake) and increased moderate physical exercise (>150 min/week), (intervention arm). Subjects in the intervention arm received sessions with a dietician seven times during the first year. The proportion of patients progressing to DM type 2 per year was 3.2% in the intervention group vs. 7.8% in the control group. Mean weight loss was 3.5 kg in the intervention vs. 0.8 kg in the control group. After 3.2 years, there was a 58% relative risk reduction in incidence of DM in the intervention compared to control group.¹⁵

Diabetes Prevention programme (DPP) in the

USA, consisting of Caucasian, African American, Hispanic, American Indian and Asian Americans, also confirmed the findings of the Finnish Diabetes Prevention Study.¹⁶ Compared with the FDPS, participants were slightly younger (mean age 51 years) and were more obese (mean BMI 34 kg/m²). Subjects with IGT were randomized to intensive nutrition and exercise counseling (lifestyle group) or either one of two masked groups: metformin or placebo.¹⁶ After a period of two years, a 58% reduction in the progression to DM type 2 was observed in the lifestyle group compared with controls. At least 50% of the lifestyle group had achieved the goal of >7% weight reduction. These two studies have clearly demonstrated the effects of lifestyle changes, with at least a 50% reduction in the progression from IGT to DM type 2.

- Pharmacological Agent

Drug interventions have shown potential benefit, economic studies to assess the cost effectiveness are lacking, and are urgently required to consider this approach in preventing DM type 2.

- Metformin

The American Diabetes Prevention Programme (DPP), in addition to lifestyle measures, also randomized patients to metformin. The study found that metformin reduced the risk of progression of IGT to DM type 2 by 31%, compared to patients in the placebo arm. The benefit was not seen in patients aged >60 years or those with a BMI < 30 kg/m².¹⁶

DISCUSSION AND CONCLUSION

The prevention of DM type 2 is an urgent priority in order to halt this rising epidemic. A >50% reduction in progression of IGT to DM type 2 can be achieved by lifestyle measures with moderate exercise and diet. The real challenge is to support such an intervention outside the framework of a clinical trial to large-scale populations with an increasing epidemic of obesity and to maintain these benefits long term. The use of pharmacological intervention with use of drugs such as metformin can prevent progression of IGT to DM type 2. However, their cost-effectiveness and long-term safety are largely unknown.

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