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Primary Prevention of Type 2 Diabetes

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Abstract

Following Saint Vincent Declaration in 1989 and International Ministerial Conference in Viena in 2013, Type 2 Diabetes has been included into the preventive noncommuncable diseases. Prevalence of Type 2 Diabetes reched endemic level over the world,and may reached 300 milion people in 2020. The main risk factors of this disease are simple obesity and low physical activity. Consequences of obesity: insulin resistance, Type 2 Diabetes, hyperlipidemia and arteriosclerosis, create very serious health burden on the population level and need the proper preventive program. Primary preventive program for Type 2 Diabetes is based on the reduction of body weight, physical activity and education.

Results reached in preventive program in Poland lead to the conclusion that after reduction of body weight Type 2 Diabetes may be reversible under one condition that program is applied in the early phase of development disease before application of the insulin therapy.

Introduction

In 1989 Saint Vincent Declaration elaborated by the International Diabetes Federation (IDF) called all the European countries to take action aimed at reducing the prevalence of Type 2 Diabetes and its complications on the population level [1].

On 2013 International Ministerial Conference in Viena took place in the context of the "Global Plan WHO Action in Prevention and Control of Noncommunicable Diseases 2013-2020". It was approved by the 66th World Health Assambly and the 8th Global WHO Conference on Health Promotion in Helsinki. The International Ministerial Conference in Viena referred to the issue on healthy food, physical activity and preventing food-related noncommunicable diseases-among them Type 2 Diabetes [2]. The goal of the conference with participation of the group of expert and representatives of various international organization was to show how health service officers and decision-makers can support the action for food-related non-communicable diseases control and prevention. The conference also resulted in issuing the Viena Declaration,whitch points at continuing the Ministerial Conference on Conteraction Obesity, that took place in Istambul in 2006. The document raised the problems of healthy food and preventing food-related non-communicable diseases,as well as lead the way to reniew the WHO Action Plan for Food and Nutrition Policy" program whitch expired in 2012 [3].

Representatives of 46 member countries of the region took part in the conference, the group of Type 2 Diabetes of experts-observers and representatives of various international organizations constituted of 139 people.

Epidemiology of Type 2 Diabetes

Complications of Type 2 Diabetes and arteriosclerosis are the main cause of death in the developed countries. The prevalence of Type 2 Diabetes has exceeded 22 milion people in Europe and according to WHO it will increase over the world from 135 milion in 1935 to 300 milion in 2025. WHO included Type 2 Diabetes into the group of social diseases, as a disease exerting significant influence upon the general level of health in the population [4,5].

Following the Saint Vincent Declaration - signed also by Poland- Polish Multicenter Study on Diabetes Epidemiology financed by he Ministry of Health were carried out in the period of time from 1998 to 2000. The prevalence of Type 2 Diabetes-standardized to Polish population - accounted for 5.37 % and reflected a true endemic state [6]. It allowed to calculate an actual number of patients with Type 2 Diabetes- over 2 million people and around

50% of them represented so called Unknown Diabetes - diagnosed in the course of the investigation [6]. The prevalence of Type 2 Diabetes increased 2-3 times with comparison to a similar survey carried out in Poland in 1986. The most serious complication of Type 2 Diabetes is so called Metabolic Syndrome (insulin resistance, hypertension, dyslipidemia, obesity and microalbuminuria). The study conducted in 2004 -2005 in Krakow's primary health care units in 40 989 people aged 25-97 years diagnosed metabolic syndrome in 20.9 % women and 16.2% men [7]. The study results confirmed the necessity of implementation of screening based on determination of prevalence of obesity and glucose intolerance based on the 2 hours glucose tolerance test in obesity - and introducing effective preventive program on the population level.

Pathogenesis of Type 2 Diabetes

The effective preventive program for Type 2 Diabetes must bebased on a knowledge of real risk factors of the disease. The group of risk factors of Type 2 Diabetes is presented in the Table 1.

Genetic	Primary	Secondary
Biologic	age	Hyperinsulinemia
	Obesity	Hyperlipidaemia
	Low physical activity	Tobacco smoking
	Gravidity	Alcohol overconsumption
	Menopause	

Table 1: Risk Factors of Type 2 Diabetes.

The leading risk factor of Type 2 Diabetes is obesity connected to the style of life and low physical activity. Genetic in this type of diabetes plays a very small role however together with low physical activity and overweight may accelerate developnment of the Type 2 Diabetes. The main ethiologic factors of simple obesity are increase calories intake especially coming from fats and simple carbohydrates and low every day physical activity. These factors are especially important in meno and andropause, and in the course of pregnancy without a controlled diet. Majority of obese patients are adult, however we observe very frequent overweght in schoolchildren [8]. Additional risk factors are alcohol consumption and tabacco smoking Alcohol increases appetite and tabacco smoking is a leding risk factor for hypertension, cardiovascular diseases,and arteriosclerosis.

However we have to remember that taking off a tabacco smoking results in increase a body weight [9]. Hyperlipidemia and especially hyperinsulinemia lead to increase a insuline resistance that promote again hyperinsulinemia-a typical Vicious Circle [10]. Insulin resistance represents a very complicated mechanism [Table 2]. The collection of specific components has been called "Metabolic Syndrome". A very specific role in this syndrom plays fatty tissue taking part in general metabolism due to large spectrum of adipocyte receptors for hormones: insuline, TSH, GH, T-3, T-4, steroids hormones, catecholamines, Growth Factors (IGF-1,EGF), adiponectine and beta adrenergic receptors. Adipocyte is also endocrine organ secreting leptine and rezistine. Leptine,can stimulate secretion of insulin, neuropeptide Y, center of appetite in hypothalamus and some cytokines.

Components of the Insulin Resistance Syndrome
Type of feeding
BMI >30
Type 2 diabetes
Carbohydrate intolerance
Hypertension
Hyperinsulinemia
Dyslipidaemia
Creatinuria
Hyperuricuria
Disturbance of insulin secretion
Disturbance of homeostasis
Microalbuminuria

Table 2: Components of the Insulin Resistance Syndrome.

A very important component of the insulin resistance syndrome is hypertension with very complicated pathogenesis (Table 3).

Pathogenesis of Hypertension
Hyperinsulinemia
Angiotensinogen
Aldosterone
Renin
Adrenocorticosteroid
Asymmetric Dimethylarginine (ADMA)
Endothelin

Table 3: Pathogenesis of Hypertension.

The leading role in this mechanism play angiotensine and endoteline resulting in vascular cramp. Additional role play the hormones: aldosterone, renin and adrenocorticosteroids.

Program for Prevention of Type 2 Diabetes

Primary prevention of Type 2 Diabetes must be based on elimination or- at least-on reduction of the leading risk factors. Obesity is a main target of this program and should start in early chilhood. This is very important issue concerning style of life in the family home with the respect to every day diet and role of the physical exercise. The diet should be properly balanced in terms of profile and amount of the calories. An example of this kind of diet is presented in the Table 4.

Fats	15-30%
Saturated fatty acids	< 10 %
Unsaturated fatty acids	10-20 %
Carbohydrates	55-75 %
Sugar	< 10 %
Proteins	10-15 %
Cholesterol	< 300 mg /day
NaCl	<5 g /day
Fruits and vegetables	>400 g/day

Table 4: Physiologic Profile of the Diet.

The crucial point in this diet is reduction of the fats and sugar. The diet must be balanced with physical activity. It is important to reduce in every day transportation by means of car, or other means of transport. The supporting factors are elimination of the tabacco smoking, reducing an alkohol consumption and any kind of narcotics. A very important factor is a regular control of the body wieght. When we are facing overwieght or obesity (>30 BMI). 2 h. oral glucose tolerance test must be undertaken-when fasting glucose level determination is not efficient to discover the first signal of carbohydrate intolerance.

Reduction of body weight it is difficult program and should by realized step by step. Starvation in short time it is typical error. Within the program of the reduction of body weight realized in Kraków,we introduced an optimal reduction of body weight 3-4 kg /months in patients with new diagnosed type 2 diabetes. The program was based on the diet 1000-1400 calories /day with 15% of proteins, 55-60% of carbohydrate,below 30 % of fat and every day physical activity and education. After 12 weeks of the program reduction of body wieght reached 4-5 kg,reduction of glikemia and insulinemia and in 45 % of the patients with new diagnosed type 2 diabetes markedly improved carbohydrate metabolism and eliminated diabetes [5]. Similar results were observed in program realized in the Polish SPA [11]. It means that type 2 diabetes is reversible under conditione,that intervention will be introduce in the early phase of development of the diseases and before introducing an insulin therapy.

Conclusion

- The Type 2 Diabetes has been included by WHO into the group of preventive noncommunicable diseases.
- Prevalence of type 2 diabetes reached ednemic level over the world.
- Within the group of the leading risk factors of Type 2 Diabetes is obesity,that may by reduced or eliminated by diet, physical activity and education. In this way Type 2 Diabetes may be reversible.
- The reduction diet contains 1000-1400 cal/person/day reduced fat level to 30-40 % and sugar below 10 %.

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