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Preventive Measures Against: Type 2 Diabetes and Iodine Deficiency

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Abstract

The type 2 diabetes and Iodine deficiency, according to WHO definition belong to the group of non communicable diseases. Characterized by high frequency on the population level. The main risk factors of the type 2 diabetes are overweight and obesity. The Polish Multicenter Study in Diabetes Epidemiology revealed over 2 millions diabetics in Poland, half of which represented unknown diabetes diagnosed in the course of investigation.

Primary prevention in this type of diabetes is based on reduction of body weight and education. The type 2 diabetes is curable when the treatment starts in the early phase of development of the disease, and before treatment with insulin.

Iodine deficiency belongs also to the group of non communicable diseases, particular in the mountain regions. Poland is an iodine deficient area. In 1991, the Polish Council for Control of Iodine Deficiency Disorders was created as a multi-center group of experts in the field. In the years 1992-1993, it carried out research that detected endemic goiter in schoolchildren and pregnant women. Following that, the Ministry of Health introduced mandatory iodization of household salt (20-40 mg KI/1kg) , iodization of formulas for neonates (0,10-0,15 mg KI/100 ml) and defined recommendation concerning additional dose of iodine (100-150 ug/day) for pregnant and breast-feeding women. The model proved very effective.

Endemic goiter in schoolchildren disappeared, and prevalence of goiter in pregnant women decreased from 80% to 10, 53%. The conference of WHO expert in 2002 classified Poland as country with proper iodine daily intake on the population level.

Keywords: Type 2 diabetes; Iodine deficiency; Obesity; Endemic goiter; Primary prevention

Introduction

Non communicable diseases fulfilled epidemic criteria: a frequency on the population level > 5,0% [1] and type 2 diabetes and iodine deficiency belong to this group of diseases. According to WHO data in 2008, in general, mortality 58 million 63% is caused by "noninfectious" diseases, and leading risk factors are overweight, obesity and type 2 diabetes [2]. In 1989, International Diabetic Federation and WHO published the document "Saint Vincent Declaration" [3], where type 2 diabetes has been defined as endemic disease. WHO formulated also preventive measures against obesity as the main risk factor of type 2 diabetes [4].

Iodine deficiency belongs also to the non communicable diseases. In 2004, WHO data indicated 2 milliards people over the world with iodine deficiency 20% in Europe and recommended the main model of iodine prophylaxis consisting in salt iodization [5]. However, salt (NaCl) is a risk factor for hypertension and its secondary complications are the main cause of death in people over 60 years of age [6]. In 2006, the WHO Technical Consultation in Paris [7] and in 2007 in Luxembourg [8] recommended reducing salt consumption to the daily level of 5,0g. Therefor national strategy for iodine prophylaxis should take into account above recommendation.

Primary Prevention of Type 2 Diabetes Mellitus

Epidemiology

The prevalence of type 2 diabetes has exceeded 22 million people in Europe and according to WHO, it will increase over the world from 135 million in 1935 to 300 million in 2025 [1,2]. Poland has signed Saint Vincent Declaration within the "Polish Multicenter Study in Diabetes Epidemiogy" financed by the Ministry of Health and developed within the years of 1998-2000. It revealed over 2 million diabetics in Poland, half of which represented the so called unknown diabetes, diagnosed

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for the first time in the course of investigation [9]. The prevalence of the main risk factor of type 2 diabetes obesity is also endemic over the world. Investigation in the United States registered 55% frequency of overweight and obesity in the persons over 20 years aged [10].

In Poland overweight and obesity estimated in the group of age 20-74 revealed frequency in men 61,6% and in women 50,3% [11]. These alarming data explain increasing frequency of the type 2 diabetes over the world.

Pathogenesis

The most significant risk factors in the type 2 diabetes are life-style related environmental determinants: obesity and low exercise level [12]. However, they are influenced by the genetic factors like isoform of peroxisome proliferator activated receptor gamma (PPAR g) Pro12 YAlal12 Pro 12 Ala .Mutation in this gene results in inherited insulin resistance and increases diabetes risk by 25% [13]. The variant (Glu 23 Lys) in the gene encoding potassium channel KIR 6.2, increases also risk of diabetes by about 25% [14].

In 1988, G.M. Reaven introduced the term "metabolic syndrome" for disturbances: insulin resistance, hyperinsulinemia, and carbohydrate intolerance, increase level of the VLDL and LDL lipids [15]. WHO recommends classification of obesity by body mass index (BMI) where normal weight is 18-25, overweight 25,1-30,0, obesity 31-40 and giant obesity >40,0. Additional marker is circumference of the waist and hip ratio WHR where normal value for women is 0, 85 and for men 0,9 [16]. WHR reflexes abdomen obesity leading to the metabolic syndrome.

The main risk factor of the type 2 diabetes is abdomen obesity and its composition presents Table 1. The adipose tissue presents also endocrinologic activity illustrated in the Table 2.

The compounds in Table 2 are especially active in the abdomen obesity and explain the clinical picture of the Reaven's metabolic syndrome confirmed by the WHO in 1999 (Table 3).

Primary prevention

Primary prevention of the type 2 diabetes must be based on the knowledge on the all pathogenesis element .The type 2 diabetes is a part of social diseases and exerts significant influence upon the general level of health in the population. Complications of the type 2 diabetes and arteriosclerosis are the major cause of death in the developed countries. In Poland investigation in 1993 [9] and within the Polish Multicenter Study in Diabetes Epidemiology (PMSDE) financed by the Ministry of Health [10] performed in the time 1998-2000 revealed over 2 million diabetics and half of them represented unknown diabetes diagnosed for the first time in the course of investigation.

Primary prevention of type 2 diabetes is based on unpharmacologic intervention and depends upon reduction of body weight, increase physical activity and education program. Reduction of body weight is available by low caloric dieted with limitation of sugar and fats with saturated fatty acids. Within the PMSDE program, we developed preventive action in the group of 16 men and 21 women with newly diagnosed type 2 diabetes based on oral glucose tolerance test (OGTT). The diet contained 1000-1400 calories, 10% of vegetal fats, 20% of proteins 60-70% of carbohydrates, and education and increase of physical activity have been included into the program. After 3 months of this program continuation, reduction of body weight in women was 4,7kg, in men 5,9kg, in 31% OGTT normalized , and insulin level in 120min of OGTT diminished in women from 148,8 +/- 86,2 to 58,4 +/- 41,0 in men from 81,5+/-52,7 to 41,6+/- 21,0 ulU/ml [10].

Table 1: Biologic Character of the Abdomen Obesity.

1. Adipocytes hypertrophy.
2. Diminishing of the number of insulin receptors.
3. Insulin resistance and hyperinsulinemia.
4. Disturbances of carbohydrate tolerance.
5. Increase of the number of beta 1 and 2 adrenergic receptors.
6. Mutation of the beta 3 adrenergic receptor.
7. Increase of the number of Glico corticosteroid receptors.
8. Increase of the concentration of Tumor Necrosis Factor alfa.
9. Increase of the lypolysis.
10.Increase of the concentration of VLDL and LDL lipids.

Table 2: The Endocrine Activity of the Adipose Tissue.

1. Insuline.
2. Prostaglandines.
3. Resistine.
4. Leptine.
5. Adipsine
6. Angiotensinogen.
7. Agouti protein.
8. Cytokines: TNF, Il 2,6,8.

Table 3: Metabolic Syndrome According to Who [16].

1. Obesity
2. Insuline resistance.
3. Glucose intolerance, type 2 diabetes.
4. Hypertension > 140/90mmHg.
5. Microalbuminuria >20ug
6. Creatinuria > 30mg/g
7. Dyslipidemia: TG > 1,7 mmol/l.

A very important impact took placed by WHO in 1999 where classification of the diabetes and its complications were presented as a report of WHO in Geneva [17]. In Europe prevention of type 2 diabetes makes real by establishment in 2005 for 3 years the DE-PLAN project [18]. Following that, many European countries developed program for prevention of type 2 diabetes with similar positive results. Among them were Finland [19] and Poland [20].

In addition, in 2007 a set of quality and scientific outcome evaluation indicators for diabetes prevention programs were developed within IMAGE project [21]. It was a very important impact introducing evidence-based guideline for the programs undertaking prevention of type 2 diabetes [22].

It reflects a real perspective for reduction the prevalence of the type 2 diabetes mellitus on the population level.

Conclusions

The prevalence of type 2 diabetes represents endemic level: 2 million people in Poland and half of them it is unknown diabetes diagnosed in the course of investigation.

The main risk factors of type 2 diabetes are overweight and obesity.

The most effective model of therapy is non-pharmacological intervention based on low caloric diet, body weight reduction, physical therapy and education.

Type 2 diabetes is curable when non-pharmacological intervention starts in early phase of development of the disease, and before insulin treatment.

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