

# Metabolic Syndrome is the Problem in a Population of Children and Adolescents

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## INTRODUCTION

Metabolic syndrome is an important problem in a population of children and adolescents. Genetic predisposition and environmental factors such as physical inactivity and increased caloric intake are responsible for the predisposition to metabolic syndrome. Insulin resistance is proposed to have a pivotal role in the development of the metabolic syndrome.

Metabolic syndrome, which is composed of such factors as insulin resistance, glucose intolerance or diabetes, dyslipidaemia and arterial hypertension, contributes to accelerated development of cardiovascular diseases, orthopaedic disorders, and other medical consequences. Early conservative intervention with diet, exercise, and behavioural therapy may prevent the complications of insulin resistance.

The metabolic syndrome is also referred to as Insulin Resistance Syndrome (IRS) because of its essential feature - insulin resistance. Insulin resistance may be the result of insulin receptors abnormalities (receptor insulin resistance) as well as be related to irregularities within the post-receptor signal system (post-receptor insulin resistance). The reduction of peripheral tissues sensitivity to insulin refers mainly to those ones being directly insulin sensitive. Currently, much attention is being paid to the lipotropic theory of the development of insulin resistance which assumes that the abnormalities of fatty acids metabolism result in excessive accumulation of lipids in muscle, liver and pancreatic  $\beta$  cells. This phenomenon known as "lip toxicity", leads to the development of insulin resistance in muscle and liver, as well as to the impairment of  $\beta$ -cell function. Increased influx of FFA (free fatty acids) contributes to the deterioration of insulin sensitivity by stimulating gluconeogenesis and the weakening of the suppressive effect of insulin on hepatic glucose production. Fatty acids have a direct effect on the activity of insulin-sensitive glucose transporter 4 (GLUT4), as well as on its movement [1].

In clinical research, the relationship between insulin resistance and cardiac hypertrophy has been studied. Increased fat accumulation in the perivascular space is also very important. It is believed that the insulin resistance occurs in genetically predisposed individuals, experiencing certain environmental factors - which show its epigenetic base. Epidemiological research documenting the differentiated prevalence of insulin resistance in different ethnic

populations and noting family predisposition to the development of diseases associated with impaired insulin sensitivity suggest a genetic base of insulin resistance. Currently, it is believed that the development of insulin resistance may depend largely on genetic factors. The main environmental factors associated with the development of insulin resistance include reduction in physical activity and access to the diet rich in calories, rich in foods with high glycaemic index. Reduced physical activity is an important factor in intensifying insulin resistance. Among the environmental factors, the disorders of fetal development have been also mentioned. In children [2], born with too low weight in relation to gestational age (small for gestational age - SGA), insulin resistance and other features of the metabolic syndrome have been more frequently observed than in children with normal birth weight [3]. On the other hand, children born with very high birth weight are also prone to obesity and insulin resistance. The consequence of insulin resistance is an excessive stimulation of  $\beta$  cells and the increase of endogenous insulin secretion for the maintenance of glucose homeostasis. This leads to a gradual reduction in the number of these cells resulting in impairment of glucose tolerance. The International Obesity Task Force report from 2005 indicates that nowadays one out of every five children is overweight or obese. Investigators from the Bogalusa Heart Study reported a prevalence of 3.6% in youth 8-17 years of age. The persistence of obesity from childhood and adolescence into young adulthood has been shown in a number of studies. It is known that obesity is a cause of early development of arteriosclerosis and its cardiovascular complications in adult life [4].

Selection of the criteria for the diagnosis of metabolic syndrome in adolescents has been still discussed. However, generally accepted model combines the presence of increased waist circumference, triglycerides and cholesterol HDL, insulin secretion and behaviour of blood pressure [5].

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Received: July 10, 2021; Accepted: August 12, 2021; Published: August 19, 2021

Citation: Al-Ahmad M (2021) Metabolic Syndrome is the Problem in a Population of Children and Adolescents. *Fam Med Med Sci Res* 10:294. doi: 10.35248/2327-4972.21.10.294.

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