

OBESITY AND CARDIOVASCULAR DISEASE IN CHILDREN

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Abstract

Obesity is performed by genetic, environmental, and complex interaction between genetic and environmental factors. Fatness levels in obese children are indicative of increased risk for elevated blood pressure, cholesterol, and lipoprotein ratios children and adolescents. Serum cholesterol and blood pressure are related to raise atherosclerotic lesion. Certain cardiovascular disease risk factors in obese children are related to the earliest stages of atherosclerosis disease. Obese children have the high risk factors of certain cardiovascular disease. Genetic factors affecting metabolic rate can be successfully managed by the introduction of environmental factors such as decrease caloric intake and increase physical activity. The treatment of obesity and of atherosclerotic patients should include dietary restriction (protein sparing modified fast and hypocaloric balanced diet), nutrition education, increased physical activity, behavior modification, and familial support. Successful management of obesity can improve the quality of life and reduce the risk of morbidity and mortality associated with obesity.

Keywords: Obesity, cardiovascular disease, energy balance, cholesterol, and lipoprotein.

Introduction

Obesity is defined as an excessive accumulation of fat when a body weight exceeds the normal by at least 20 percent, which becomes a psychosomatic, social economic and aesthetic problem. Obesity is one of the most prevalent and serious nutritional problems facing children in the USA. Today, 15%-25% of children and adolescents in this country being affected [1]. For children, 6-11 years of age, there has been a 54% increase in the prevalence of obesity and a 98% increase in the prevalence of super obesity from 1966 to 1980 [2].

Obesity relates to increases of blood pressure, serum total cholesterol, serum triglycerides, β -lipoprotein cholesterol (LDL-C), pre β -lipoprotein cholesterol (VLDL-C), fasting glucose, fasting insulin, peak insulin and glucose responses after glucose load, and free fatty acids, and decrease α -Lipoprotein cholesterol (HDL-C).

Coronary heart disease is the leading cause of death in the US and an elevated blood cholesterol level is a major risk factor. There is substantially evidence that the atherosclerotic process leading to coronary heart disease (CHD) begins in childhood and adolescence [2]. Obesity during childhood associated with an increase in cardiovascular disease mortality in adult life [2].

The aims of this paper are to review the obesity in childhood and correlation of obesity to cardiovascular disease. In the following sections will be discussed the causes and effects of obesity in children, correlation of the obesity to cardiovascular disease, and prevention and treatment of childhood obesity.

Causes and Effects of Obesity in Children

According to Bouchard [3] the expression of multifactor phenotype can be summarized as follows: $P = G + E + (G \times E) + e$, where P is the phenotype, G the genotype, E the environmental factors, $G \times E$ the interaction between G and E, e the source of error. Hence, obesity is performed by genetic, environmental, and complex interaction between genetic and environmental factors.

Diet composition, independent of total energy intake, resting energy expenditure, and physical activity may contribute to childhood obesity [4].

Stunkard et al. [5] compared the weight of 540 Danish adoptees to the body mass index (BMI) of their biological or adoptive parents. They found a significant correlation between the weight class of the adoptees and the BMI of their biological parents, not of the adoptive parents. Price et al. [6] found that obesity of very early onset has a high familial risk.

First	degree	relative	of
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patients whose onset of obesity occurred before the age of 10 years have a risk of becoming obese of 1.84 vs. 1 for adult onset. Therefore, precocious obesity from early childhood is more heritable than adult onset type obesity.

Besides genetic factors, it is believed in human and animal that obesity results from positive energy balance, when the body assimilates more calories than it needs. Environmental factors influencing this effect are physical and social environment.

The study of the relationship of obesity to environmental factors such as season, geographic region and population density, was conducted by Dietz and Gortmaker [7] in children. They found that the prevalence of obesity was lowest in the summer or spring and highest in the winter or fall season. The highest prevalence occurred in the Northeast United States, followed by the Midwest, South and West. There was greater prevalence in large metropolitan areas than in areas of lower population. They stated that the effect of season, geographic region and population density seemed independent of race and socioeconomic status.

Many studies were conducted about the relationship of obesity and social environment [8-11]. The prevalence of obesity rise with income except among women: upper-income women are leaner than women in lower income groups [8-9]. Goltblatt and Moore [8] found that in the midtown of New York City, obesity was six times more prevalence among women of lower income levels than among women of higher income levels.

Children from high-income level families are systematically fatter than those from lower income families. The study [9] found that a decrease in fatness with increasing educational level in the female and slightly increase in fatness with increasing educational level of males. Hence there was a consistent relationship between socioeconomic status and fatness in a total population with the effect being opposite for males and females.

Family behavior patterns also influence the obesity. Dietz and Gortmaker [10] demonstrated that children, age 6-11 years who watch more television experienced a greater prevalence of obesity than children watching less television. Television viewing by children may affect both energy intake and expenditure. Energy expenditure may be reduced because less energy is required to watch television than is required for more energy intensive activities (e.g., walking, cycling, and exercises). Television viewing tends to promote increased energy intake by the consumption of calorically dense foods advertised on television and increasing between meal snacks [10].

Family size also influences the level of obesity. The highest prevalence of obesity occurs in single child families. The prevalence decrease with increasing family size, with younger children from large families tending to have the higher rates of obesity [11]. The study [12] found that obese was influenced by ethnicity. The prevalence of obesity is greater among Whites than Blacks.

Childhood lipid and lipoprotein levels from a single cross-sectional survey can identify families at increase risk for cardiovascular heart disease [13]. Williams et al. [14] have studied to determine the level of body fatness, independent of patterning, associated with significant risk for elevated blood pressure (BP), total cholesterol and serum lipoprotein ratios. The data were collected in 1983-1985. The relationship between percent body fat and risk for elevated blood pressure, serum total cholesterol, and serum lipoprotein ratios was examined. The study was conducted in Ward 4, Washington Parish, La. Total body and regional fatness were estimated from triceps and subscapular skin-fold thickness. Blood pressure, serum total cholesterol and lipoproteins were measured. Fatness levels at or above 25% in males and 30% in females are indicative of increased risk for elevated blood pressure and lipoprotein ratios in White and Black children and adolescents. Body fatness standards in White and Black children and adolescents are significant predictors of CVD risk factors [14].

Obesity or over weight is associated with hypertension, hypercholesterolemia, increased triglyceride levels, increased fasting glucose and insulin levels, reduced carbohydrate tolerance, and reduced high density protein levels [14].

Along with other risk factors in coronary heart and cerebrovascular disease, obesity is frequently associated with the development of atherosclerosis, a disease in which the rheological characteristics of blood are important [15]. There is a need for physicians to measure blood pressures in order to identify not only those with fixed high levels of pressure, but also those with labile elevation which may prove to be predictive for future coronary heart disease [16]. Levels of high-density lipoprotein cholesterol, apolipoprotein A-I and B, and systolic blood pressure in heavy group probands are consistent with increases coronary risk [17]. Prospective epidemiologic studies with autopsy follow-up indicate that serum cholesterol and blood pressure are significantly related to raise atherosclerotic lesion [18]. Otherwise triglycerides are not significantly associated with raised lesion [18]. It is believed that certain cardiovascular disease risk factors in obese children are related to the earliest stages of atherosclerosis disease.

Burns et al. [19] have determined whether obesity during childhood is associated with an increase in cardiovascular mortality in adult life. They found that persistent obesity in children, particularly when accompanied by persistent blood pressure elevation, identifies families whose members are at increase risk of dying of cardiovascular disease. Excess ponderosity observed in childhood is predictive of future ponderosity through adolescence and into adult life, and increase cardiovascular mortality at and above 30 years of the age [19].

Prevention and Treatment of Childhood Obesity

The prevention of the onset of obesity in early life may be important to reducing the risk of coronary heart disease in later life [20]. The prevention of obesity can be distinguished with two main ways [21]. The first is a pre-primary prevention through than mass media (television, news papers, etc.) to modifying certain cultural stereotypes, such as the identification of eating as a biological and social pleasure, and the promotion of an aesthetic model of fatness, especially for infant and children. The second concern the pediatrician more closely identify and manage patients who are at risk for developing obesity. The school children should be convinced that the maintenance of ideal weight, together with an adequate diet, regular physical activity, avoidance of excess salt and cigarette smoking are the main steps to a long and active life.

Intensive treatment resulted in decreased fat intake and also led to a reduction in relative weight, whereas a conventional approach appeared to be ineffective with regard to nutrient intake and weight loss [22]. Nuutinen and Knip [23] found that weight reduction increased HDL-C levels, ratio of HDL-C to total cholesterol, and reduced triglyceride concentration in two group treatments (individual and group treatments). Both treatment strategies were similar in weight loss [23]. If resources are limited, group treatment is suggested.

Weight loss associates with a decrease in risk factors for cardiovascular disease [23]. If sustained, these changes may improve the long term prognosis for successfully treated obese children [23]. Williams et al. [24] suggested that treatment of obesity is most successful if realistic goals are set; if a safe rate of weight loss of one to two pounds per week can be achieved through a reduction of caloric intake that amounts to 500 calories less per day; if increased physical activity is stressed as much as diet; if parental support is strong; and if behavior therapy is provided during the course of treatment to help both child and parent achieve the diet, exercise, and behavior goals.

The treatment of obesity should include dietary restriction (protein sparing modified fast and hypocaloric balanced diet), nutrition education, increased physical activity, behavior modification, and familial support [21, 25]. Dietary restriction remains the most importance of weight loss therapy for patients of any age [26].

Obese children weigh loss might be an effective method for reducing their blood pressure [25]. Ten obese adolescents, who elevated cardiovascular disease risk, were treated by an increase in exercise tolerance and aerobic capacity and a decrease in the percentage of fat in the diet [27]. On average, triceps skin-fold thickness declined 25 percent. Total cholesterol declined 14%, triglycerides declined 33%, LDL cholesterol declined 13%, and HDL cholesterol did not change with this form of treatment. As for systolic and diastolic blood pressure, four of the ten patients who had elevated blood pressures at the initiation of treatment were able to decrease their blood pressure, in absolute terms and on the basis of their percentiles for age and sex. They concluded that, in obese adolescents, improved diet and body composition, a slowed rate of weight gain, and a reduction of cardiovascular risk shown through lipid profiles and blood pressures can be achieved from a multi disciplinary treatment program focused on achievable goals, which were an

increased habitual exercise and increased aerobic exercise, and a decrease in the percentage of energy intake from fat and saturated fat.

The ideal weight loss program for children and adolescents which has rapid weight loss, is metabolically safe, involves no hunger, preserves lean body mass, has no psychiatric reaction, and allows normal growth and activity.

Conclusion

Obesity is performed by genetic, environmental, and complex interaction between genetic and environmental factors. Fatness levels in obese children are indicative of increased risk for elevated blood pressure, cholesterol, and lipoprotein ratios children and adolescents. Serum cholesterol and blood pressure are related to raise atherosclerotic lesion.

Certain cardiovascular disease risk factors in obese children are related to the earliest stages of atherosclerosis disease. Obese children have the high risk factors of certain cardiovascular disease. Genetic factors affecting metabolic rate can be successfully managed by the introduction of environmental factors such as decrease caloric intake and increase physical activity.

The treatment of obesity and of atherosclerotic patients should include dietary restriction (protein sparing modified fast and hypocaloric balanced diet), nutrition education, increased physical activity, behavior modification, and familial support. Successfully management of obesity can improve the quality of life and reduce the risk of morbidity and mortality associated with obesity.

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