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Original Article

The effect of dietary intervention and physical activities on the lipid profile of obese children

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Abstract

Background Obesity is defined as body weight increase due to excessive fat accumulation. Obesity during childhood and teenage years is related to cardiovascular risks including hyperinsulinism, hypercholesterolemia, decreased high density lipoprotein (HDl), and hypertension. The principles of managing obesity are reducing energy intake and increasing energy use, e.g., by increasing physical activities, changing life habits and, most importantly by involving family in the therapeutic process.

Objective To evaluate the effect of dietary intervention and physical activity on obese children.

Methods Seventy-six obese primary school children were randomly allocated to either receive intervention (diet and physical activities) or no intervention. At the beginning of the study, lipid profile was measured in all subjects. Subjects in the intervention group were asked to reduce calorie intake by 200 – 500 kCal per day, and participating in a walk of 20-30 minutes for five days per week over a period of one month. After one month, the lipid profile of both groups was remeasured and compared.

Results After one month, 73 children had successfully completed the study and had complete data for analysis. There was a significant change in the mean HDL level before intervention (47.3 [SD 36.2] mg/dl) compared with after intervention (100.5 [SD 35.7] mg/dl, $P<0.05$) in the group where intervention was implemented.

Conclusion There are no significant differences in serum lipid values after intervention in both groups. **[Paediatr Indones. 2009;49:108-11]**.

Keywords: *febrile convulsion, recurrent febrile convulsion*

Obesity is a serious health problem in both children and adults because it may lead to endocrine disturbances, cardiovascular and gastrointestinal problems; in addition, in children it also complicates the bone growth.[1-4] Obesity during childhood tends to continue to early adulthood, leading to a continuation of health problems. For the last 25 years, obesity prevalence has increased both in industrial countries and in developing countries including Indonesia.[5-7] Obesity results from imbalance between energy intake and output, with the energy surplus is stored in the form of fat tissue. Adipose tissue is the main storage location of fatty acid in the form of triglyceride, one of the main lipids in the human body. After it is released from the adipose tissue, the fat is freely transported to the blood, bonded by albumin, and immediately released to circulation. Adipocyte obtains fatty acid from chylomicron particles and very low density lipoprotein (VLDL) in the circulation. The release of free fatty acid from adipose tissue occurs with the help of a lipase enzyme whose action results in

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the hydrolysis of triglyceride to produce three free fatty acid molecules and one glycerol molecule. The glycerol molecule is used as substrate in the process of in the liver and kidney, and also in the resynthesis of triglyceride in the liver and body tissue. This lipolysis process is halted by insulin and stimulated by cathecolamine. The concentration of free fatty acid in the blood plasma is higher in obese children and free fatty acid concentration is very closely related to complications occurring in obesity cases.[6-7]

One of complications of obesity is dyslipidemia, which is characterized by high triglyceride, low HDL, and high LDL. One study indicates that 17% of children with obesity have increased total cholesterol including LDL, VLDL (very low density lipoprotein) and HDL) and 24% have increased triglyceride level.[7] To determine the risk factor of coronary cardiovascular, testing the serum for total cholesterol and determining increased LDL level is effective in adults but not in children. In order to test for increased LDL level in children, it is required to check Apo B and ratio of LDL / Apo B; a ratio of less than 1.2 indicates poor prognosis for cardiovascular events.[8] The principle of obesity management is to reduce energy intake and increase energy output. Medium physical activities in which approximately 150 Calories per day or 1000 Calories per week utilization is preferred for maintaining health.[7] The target is to reduce body weight up to 10% above the ideal weight. We aimed to evaluate the effects of dietary intervention and physical activities on blood lipid profile in obese children.

Methods

This study was conducted for three months from January to March 2005 in 6-12 year old students in three primary schools in Medan (SD Harapan, SD Annizam and SD Kartika). The protocol of the study was approved by the Ethics Committee of the Medical School, North Sumatra University, and parental informed consent was obtained from all subjects.

Seven days prior to data collection we distributed forms to record information about food intake to families, one form for the subject and one for the parents. The parents and the subjects were asked to record the subject's food intake over a period of three days. On the day of data collection, the parents were invited for interview to confirm the record of food intake. We made a home visit when the parents were unable to come for direct interview.

We measured body weight and height in all students, and calculated the body mass index (BMI). We used a Camry scale (with sensitivity of 0.1 kg) for measuring body weight and a stature with two meter-capacity (sensitivity 0.5 cm) for body height. All measurements were done by paramedics. Students with a BMI of more than P95 were considered as obese. Among 1080 children, 192 children were found to be obese (17.8%). Seventy-six children were then randomly selected to be included in the study, and each subject was randomized to either receive intervention or no intervention.

Blood specimen was taken after 8 hour-fasting; an aliquot of 3 ml of venous blood was obtained for lipid profile measurement using the spectrophotometer at Prodia Laboratory, Medan. Normal levels of triglyceride, total cholesterol, HDL, and LDL were based on the National Cholesterol Education Panel**.** Dietary intervention was carried out by reducing intake by 200 – 500 kCal per day, while exercise was given by 20-30 minute walk daily. The target was to reduce body weight by 0.5 kg per week; the body weight reduction continued until it reached 10% above the ideal body weight. The intervention was carried out for a month.

Table 1. Baseline characteristics in intervention and control groups

Characteristic	Intervention	Control
Age (year)		
< 9	8 (21.6%)	13 (36.1%)
≥ 9	29 (78.4%)	23 (63.9%)
Sex: boy / girl	25 / 12	25 / 11
Body Mass Index, mean (SD) kg/m2		
Mean (SD)	26.6 (3.24)	25.79 (5.1)
History of DM in family: No / Yes	23 / 14	22 / 14
History of obesity in family: No / Yes	15 / 22	15 / 21
Total cholesterol, mean (SD) mg/dl	184.5 (34.9)	192.4 (30.2)
LDL cholesterol, mean (SD) mg/dl	121.7 (33.2)	124.8 (25.5)
HDL cholesterol, mean (SD) mg/dl	47.2 (6.6)	48.0 (6.4)
Tryglyceride mg/dl	101.2 (36.1)	105.7 (39.8)
Apo B mg/dl	83.4 (26.4)	82.2 (21.2)
LDL /ApoB	1.6 (0.3)	1.6 (0.3

We used SPSS for Window v. 10.0 for data processing and analysis. We used Chi squared test and the independent t-test for statistical analysis. P value of <0.05 was considered significant.

Results

Seventy-six obese children were included in the study; 38 in the intervention and 38 in control group. One of subjects in intervention group and 2 in control group did not complete the study. **Table 1** shows that there were no differences in the characteristics of subjects between both groups.

There were not any significant differences in serum lipid values after intervention on both groups (**Table 2**).

Discussion

Studies on obesity in adults and children have been numerous, the emphasis is usually on its effect on hypertension, lipid profiles, and blod glucose, which are risks of cardiovascular disease.[9] One of the risks of obesity is dyslipidemia, i.e., high levels of total cholesterol, triglyceride, and LDL cholesterol, and low level of HDL cholesterol. In this study, we see that in the intervention (dietary plus physical exercise) group there were increase of HDL cholesterol and decrease of tryglyceride following the intervention. Srinivasan *et al*[8] discovered that Apo B screening is better than just the increase of LDL cholesterol. In this study, the concentration of Apo B increased in the intervention group but the increment was not statistically significant.

Sung *et al*[13] also discovered that the decrease of total up to 6%. HDL and LDL cholesterol also slightly decreased in training and non-training groups. The ratio of LDL to HDL cholesterol also significantly decreased on the training group.[13] Chen *et al*[14] reported that serum lipid profile improved significantly for all measures with exception of HDL, which did not change with two week-diet intervention and physical activities. Kraus *et al*[15] found that exercise training had no significant effect on the total cholesterol concentration or LDL cholesterol, however it had important effects on the concentration of LDL subfractions. The effect of the amount of exercise was also seen for HDL variables.[15] Other study showed that combination of dietary-behavioral-physical activity intervention would give significant differences in body weight, BMI, serum total cholesterol level, LDL cholesterol in intervention group.[16]

Our study shows that the improvements of certain levels of lipids in intervention group did not show statistical difference when compared with the values in control group. We believe that these results were associated with the small number of subjects and the limited time for the intervention. The other limitations of this study include the results of food recall that may not represent the actual situation. When interview regarding the food recall as reported was conducted, the results were partly different compared to those made by the children. Physical activities performed by children at home were very difficult to control, so that the control was mostly done in school during sports session. The limited time for the children to perform the extra-physical activities at home was also one of the obstacles in providing the accurate result of the study. Another serious problem in this study was the lack of parents' cooperation in controlling the children's diet at home or outside the school.

In some children in the intervention group we observe an increase of body weight. This may also associated with the lack of control of children's obedience on the food intake during and after school hours. This showed that children had no motivation

Table 2. Comparison of serum lipid values after intervention in both groups

Laboratory	Intervention	Control	P value
Total cholesterol, mean (SD) mg/dl	181.0 (33.4)	191.3 (30.0)	0.173
LDL cholesterol, mean (SD) mg/dl	125.6 (34.1)	129.1 (29.9)	0.642
HDL cholesterol, mean (SD) /dl	48.0 (6.8)	48.9 (6.6)	0.599
Tryglyceride, mean (SD) mg/dl	100.5 (35.7)	105.2 (39.6)	0.599
Apo B mg/dl	86.8 (26.3)	83.1 (22.6)	0.528
LDL /ApoB	1.5 (0.6)	1.6 (0.5)	0.431

for a diet in order to decrease their body weight. This kind of study should be conducted in a school with a boarding house so that the diet program can be strictly controlled.

In conclusion, dietary intervention plus physical activity in obese 6-12 years old children for one month did not give significant improvement in serum lipid values when compared with those without intervention.

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