The Profile of Serum Cholesterol and Triglyceride of Indonesian School Age Children

Lily I. Rilantono, dr, FACC*; Rachmad Soegih, dr.**

Abstrak

Peninggian kadar lipid sebagai petanda proses aterosklerosis, merupakan tanda dini kalau ditemui pada usia kanak-kanak. Oleh karena itu penelitian gambaran lipid serum pada anak-anak, dihubungkan dengan pola makannya, akan merupakan penelitian yang penting. Diperiksa sebanyak 394 anak sekolah usia 9-12 tahun yang dibagi menjadi dua kelompok, 199 berasal dari sekolah golongan sosial ekonomi menengah ke atas (A), dan 195 dari golongan sosial ekonomi rendah (B). Pada kedua golongan diperiksa kolesterol dan trigliserid serum puasa, serta pola makan mereka. Nilai kolesterol yang sama didapat dari kedua golongan, tetapi didapat perbedaan nilai trigliserid antara kedua golongan. Masukan kalori dari golongan B sangat rendah, masukan protein pada kedua golongan ternyata cukup, pada golongan A malah lebih tinggi dari yang dibutuhkan, bila diambil pedoman kebutuhan sehari-hari di Indonesia yang dianjurkan. Makanan lemak pada golongan A kebanyakan berasal dari sayuran, sedang pada golongan B berasal dari santan/kelapa. Rasio P/S pada golongan A adalah lebih besar dari 1.5, agaknya tidak mempengaruhi penurunan kadar kolesterol. Dapat disimpulkan bahwa pola makanan dan komposisi makan anak sekolah umur 9-12 tahun tidak mempunyai pengaruh yang berarti pada kadar kolesterol dan trigliserid darah.

Abstract

Elevated lipid levels can be one of the early markers of artherosclerosis when found in the growing child. It is therefore worthwhile to explore the profile of lipids in children, also in correlation with food habits. A total of 394 serum cholesterol and triglyceride levels has been determined on fasting school children age 9-12 years, 199 children of group A were from a high socio economic class, 195 children of group B from a low socio economic class. A dietary survey of the daily intake was done using the 48 hours dietary recall method adopted for children, to look for eventual dietary influence. Same levels of cholesterol were obtained from group A and B and a significant difference of triglyceride levels were found between the two groups. The calory intake of group B was very low, the protein intake in both groups were sufficient, in group A even higher than required, according to the recommended daily allowance used in Indonesia. The fat intake in group A mostly derived from legumes, while in group B it derived mostly from coconut oil. The PS ratio in group A which was greater than 1.5, likely did not count for lowering the serum cholesterol level. It can be concluded that the Indonesian food composition and food pattern of school children, age 9-12 years is of no significant influence for the serum levels of cholesterol and triglycerides.

Keywords : *Serum Cholesterol Serum triglyceride, School age children.*

INTRODUCTION

The evidence of coronary artery lesions in the young[1] and the incidence of myocardial infarction in the younger age group[2] are sufficient reasons to begin focussing on the risk factors for cardiovascular disease in children. Although multiple factors are involved, the association of elevated lipids with the probability of premature coronary artery disease has now been rather well established. Efforts on prevention of atherosclerosis should be based on information of serum cholesterol and triglyceride levels.

* *Department of Cardiology, Faculty of Medicine, University of Indonesia, Jakarta, Indonesia*
** *Department of Nutrition, Faculty of Medicine, University of Indonesia, Jakarta, Indonesia*

Therefore it is most important to search for the possibility of a dietary influence in the growing child, in correlation with food habits of different populations. This study is to obtain such data in correlation with the Indonesia food intake pattern.

MATERIALS AND METHOD

A total of 394 serum cholesterol and triglyceride levels have been determined on fasting school children ranging from the age of 9 to 12 years from 2 different schools in the area of South Jakarta. Group A consisted of 199 children from a high socio economic class and group B 195 children from a low socio-economic class. The dietary survey of the daily food intake were done using the 48 hours dietary recall method adopted for children as described by Rose G.A., Blackburn H.[3] The 48 hours dietary recall consists of 3 meals and the intersnacks. For this purpose interviewers have been trained periodically according to the method used. Bowman's method was used for the cholesterol determination and the triglyceride studies were based on the Wahlefeld's method. Student T-test formula was used to search for significant differences of the result. Anthropometric measurements of body weight, height and skin fold thickness were done and will be reported in a separate paper.

RESULTS

The overall mean and standard deviation of the cholesterol and triglyceride levels are shown in Table 1.

Table 1. Overall mean and standard deviation (SD) of cholesterol and triglyceride levels of group A (high socio economic class) and group B (low socio economic class)

	Cholesterol mg %		Triglyceride mg %	
	mean	SD	mean	SD
Group A	161.88	132.71	110.73	36.58
Group B	160.94	33.55	94.23	37.55

It is obvious that same levels of serum cholesterol were obtained from groups A and B and that a significant difference of serum triglyceride levels was found between the two groups. Since possibilities for dietary influences were searched for, the lipid levels were further analyzed according to relevant age groups based on the recommended daily allowance in Indonesia[4] as seen in Table 2.

Table 2. Mean standard deviation (SD) and n (number of samples) of serum cholesterol and triglyceride of 2 age groups in group A and group B.

GROUP	Cholesterol mg %		Triglyceride mg %	
	9 years	10-12 years	9 years	10-12 years
A				
mean	162.47	165.40	89.50	95.51
SD	21.84	28.66	37.66	37.96
n	32.00	167.00	32.00	167.00
B				
mean	152.54	163.31	119.15	120.23
SD	27.92	33.22	26.68	23.60
n	26.00	169.00	26.00	169.00

Table 3. Comparison of dietary intake of group A (high socio economic class) and group B (low socio economic class)

A : High socio economic level

Age	Calori cal	Protein g	Fat g	Cholesterol mg	PS ratio	N	Serum level mg % Chol. (mean)	Trigl. (mean)
9	2013.24	67.80	56.52	170.40	0.92	27	152.54	119.15
10-12	2017.56	65.04	57.84	217.20	1.52	170	163.31	120.23

B : Low socio economic level

Age	Calori cal	Protein g	Fat g	Cholesterol mg	PS ratio	N	Serum level mg % Chol. (mean)	Trigl. (mean)
9	1331.76	38.88	33.24	62.80	0.26	26	162.47	89.50
10-12	1379.76	43.32	24.10	46.80	0.41	161	165.40	95.51

Except for the triglyceride value in the age group of 10-12 years, no significant difference was seen between the mean values of group A and group B of each age group. Also in each group A and group B itself there was no significant difference between the values in the 2 age groups.

It was shown intake no significant differences were seen between that mean values of calory, protein, fat and cholesterol intake of the 2 age groups, each in group A as well as in group B. The cholesterol intake of the high socio economic group consists mainly of eggs, cheese and sometimes liver, shrimps and butter, while in the low socio economic group even eggs were very little consumed.

In group A the animal protein intake is good, while in group B the protein source mostly consisted of plant proteins.

Fat intake in group A mostly derived from legumes, while in group B it mostly derived from coconut oil, although not in large quantities.

In reference to the recommended daily allowance (RDA) used in Indonesia, it is obvious that the calory intake of group B was very low. In the group of 9 years the calory intake was 75 % of the RDA and in the group of 10-12 years 65 % of the RDA. In group A there is no difference seen in the calory intake of both age groups. The protein intake in both groups A and B was sufficient, in group A it was even higher than required; the group of 9 years had a protein intake of 200 % of the RDA, while the group of 10- 12 years 110 % of the RDA.

The difference of the sample between Table 2 and Table 3 in gorup B due to absent of sample and some children moved to other city.

DISCUSSION

There are two pathways of triglyceride resynthesis in the epithelial cells of the small intestine, both require fatty acids activated to coenzyme A derivatives. In one pathway, called the monoglyceride pathway the monoglycerides serve as acceptors for fatty acids. In the second pathway alfa glycerophosphate is formed from free glycerol and then acts as a fatty acid acceptor. Glycerol is mainly a product of carbohydrate metabolism.[5] This explains the higher triglyceride levels in group A than in group B, since group A has much higher calory intake.

The major plasma lipid classes are triglycerides, phospholipids, cholesterol ester and cholesterol. Most dietary fat are stored in the fat cells in the form of triglycerides. About 70 % of the cholesterol in plasma is esterified in a process that takes place in the plasma within the HDL via the Lecithine cholesterol Acyl Transferase (LCAT) reaction.[6] LCAT is an enzyme synthesized in the liver, it transfers fatty acid (usually unsaturated fatty acid) from lecithin to free cholesterol.

How significant is in fact the influence of large amounts of dietary cholesterol to the serum level ? Many mechanisms have been found to take place. Quintao et al[7] has found that excessive dietary cholesterol causes significant inhibition of cholesterol production in the body. But this reaction varies individually; it seems that this feedback regulatory mechanism has a great variation. It is also discovered that a large amount of dietary cholesterol increases the excretion of endogeneous neutral steroids, which are a derivatives of biliary cholesterol. The storage of cholesterol on body pools outside the plasma compartment is very important. By feeding cholesterol to animals, liver cholesterol concentration is increased without significant increase in plasma cholesterol. The liver seems to act as a buffer between dietary cholesterol and that in the plasma compartment. Excessive dietary cholesterol causes also accumulation outside the liver. If the arterial wall is one site of accumulation, concentration of tissue cholesterol could be even more important for determining rates of atherogenesis, than is plasma cholesterol accumulation[9].

The total amount of cholesterol absorbed from the intestine both endogenous and exogenous is an important factor regulating serum cholesterol concentration. The mechanism illustrated above could be an explanation of the equal serum cholesterol levels, on great differences of dietary cholesterol.

It has now been established that diets rich in polyunsaturated fats can lower plasma cholesterol independently of the steroid content of the diet[10]. The mechanism for this effect has not been clarified, it is theoretically assumed that it could be due to an alteration of metabolism of cholesterol or other constituents of lipoprotein. In patients with familial hypercholesterolemia, polyunsaturated fats seem to play a role in the redistribution of cholesterol between plasma and tissue pools, rather than to cause an increase of steroid excretion.[11] In normal subjects this influence has not been confirmed. Therefore, in group A of this sample, where the PS ratio is greater than 1.5, it likely does not count for lowering the serum cholesterol level.

Looking into food habits, the Indonesian food composition and food pattern according to the recommended daily allowance for Indonesian is : 60-70 % carbohydrate, 10-15 % protein, 13-20 % fat. Intersnacks of the children in this study consisted more of carbohydrate, and did not add very much calories. The

invasion of fast food and fat rich food, will apparently be of influence to the food pattern of school children, especially of the high socio-economic category. And ultimately this will influence the serum cholesterol and triglyceride levels.

CONCLUSION

From this study it can be concluded that the Indonesian food composition and food pattern in school age children (9 to 12 years) is of no significant influence for the serum levels of cholesterol and triglyceride.

Acknowledgement

We wish to thank the Indonesian Heart Foundation for their financial support and also the members of the Indonesian Heart Foundation for their active participation in this study.

We wish also to thank the Ministry of Health, Regional Office of DKI Jakarta for their cooperation in particular the School Health Section for making this study possible.

REFERENCES

1. EnosWF, Holmes RH, Beyer J. Coronary diseases among United States soldiers killed in action in Korea. JAMA 1953, 152 : 1090-3.
2. Hanafiah A. Myocardial infarction in young adults, risk factors and clinical features. Kardiologi Indonesia 1990; 12: 132-9.
3. Rose GA, Blackburn H. Cardiovascular survey method, WHO Monograph Series 1968; 56: 66-76.
4. Djumadias A, Muhilal, Karyadi D, Tarwotjo IG. Recommended daily allowance in Indonesia. Kecukupan kalori, protein dan zat gizi yang dianjurkan untuk Indonesia. Widya Karya Nasional Pangan dan Gizi. Buku II. Kumpulan Kertas Kerja Utama. Jakarta : Lembaga Ilmu Pengetahuan Indonesia, 1979; 79-98.
5. Dawson AM, Isselbacher KJ. Studies on lipid metabolism in the small investigation with observations on the role of bile salbs. J Clin Investigation 1960; 39: 730-40.
6. Glomset JA. The plasma Lecithine cholesterol acyl transferase reaction. J Lipid Res 1986; 9: 155-67.
7. Quintao E, Grundy SM, Ahrens EH Jr. The effects of dietary cholesterol on the regulation of total body cholesterol in man. J Lipid Research 1971; 12 : 233-47.
8. Grundy SM, Ahrens EH Jr. Measurements of cholesterol turnover, synthesis and absorbtion in man, carried out by isotope kinetic and sterol balance methods. J Lipid Research 1969; 10: 91-107.
9. Ho KJ, Taylor CG. Serum cholesterol levels in US males. Arch Pathol. 1974; 97: 307-15.
10. Spritz N, Ahrens EH Jr, Grundy SM. Steroid balance in man as plasma cholesterol concentrations are altered by exchange of dietary fats. J Clin Investigation 1965; 44: 1482-93.
11. Grundy SM, Ahrens EH Jr. The effects of unsaturated dietary fats on absorbtion, excretion, synthesis and distribution of cholesterol in man. J Clin Investigation 1970; 49: 1135-52.