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# Normal lipid values (cholesterol, triglycerides and HDL-cholesterol) for children in a rural area of Hungary. A screening program

Aranka László, Márta Németh, L Salgó, L Zlatarov, S Mecseki
Ildikó Adorján

Paediatric Department, Department of Clinical Chemistry,
Medical University Szeged, Hungary

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Screening for serum total cholesterol (Ch), triglyceride (Tg) and HDL-Ch levels was performed in 3 Hungarian rural areas among 3—14-year-old children, divided into three groups: 3—6, 6—10 and 10—14-year-old, respectively. The mean levels as well as the 85, 90 and 95 percentile values of the investigated lipids are given.

The serum HDL-Ch levels were very low in all three groups: 0.96 mmol/l in group I. (3—6 years), 0.99 mmol/l in group II. (6—10 years) and 1.04 mmol/l in the group III. (10—14 years). We did not found any correlation between the age and lipid parameters of the children.

Significant positive correlation was detected between the serum Ch and HDL-Ch levels, and a significant negative correlation was observed between the serum Tg and HDL-Ch concentrations. Our data represent the normal lipid values (Ch, Tg, HDL-cholesterol) for 3—14-year-old children, living in rural area.

There are many data concerning the normal levels of serum lipids and lipoproteins in children from different countries [1, 2, 19]. For the analysis of the atherosclerosis precursors, a multicenter study in Finnish children and adolescents was carried out by Viikari et al. in 1980—81 and published in 1985 [18] In the age groups of 3 to 18 years the mean cholesterol (Ch), LDL-Ch and HDL-Ch concentrations were 4.83 mmol/l, 3.09 mmol/l and 1.38 mmol/l, respectively. The HDL-Ch/Ch ratio was similar in all age groups (0.29); mean Ch and LDL-Ch values were lower in urban than in rural areas. As hyperlipemias and hyperlipoproteinemias are the most frequent genetically determined metabolic diseases a screening program for serum cholesterol (Ch), triglyceride (Tg) and HDL-Ch levels in 3 rural areas (Szatymaz, Derekegyháza, Nagytőke (has been performed investigating the correlation between the age and the serum lipids, as well as between the serum lipids and the HDL-Ch levels with antiatherogenic significance.

## Materials and Methods

During Sept—Oct 1982 healthy children from the nurseries of Szatymaz and Derekegyháza (n = 142: 3—6 years, and from three elementary schools of Szatymaz, Derekegyháza and Nagytőke (301 children girls and boys, from I.—IV. classes, age: 6—10 years and 243 children from V.—VIII. classes, age: 10—14 years) have been investigated.

Total Ch, Tg and the HDL-Ch levels were measured from venous blood in fasting state. Serum Ch was determined by the method of Huang et al. [11], serum Tg was determined according to Varsányi [17], HDL-Ch was measured after precipitation by Na-phosphowolframat and $MgCl_2$.

## Results

The mean levels and the standard deviations as well as the 85, 90 and 95 percentile values, of the serum Ch, Tg and HDL-Ch concentrations of the investigated three groups of children are given in the Tables I—III.

We did not find any correlation between the age of the children and the lipid parameters. The mean level of serum Ch in the I. group was 4.7 mmol/l, in the II. group was 5.0 mmol/l and in the III. group was 5.0 mmol/l respectively. In the three groups the mean values of serum Tg

Table I

Percentile values of serum lipids

| Cholesterol mmol/l | n | 85 | 90 | 95 | $\bar{x}$ | SD± |
|---|---|---|---|---|---|---|
| | | percentile | | | | |
| I. group 3—6 years | 142 | 5.73 | 5.96 | 6.09 | 4.7 | 0.91 |
| II. group 6—10 years | 301 | 5.89 | 6.23 | 6.52 | 5.03 | 1.06 |
| III. group 10—14 years | 243 | 5.89 | 6.21 | 6.59 | 5.00 | 0.96 |

Table II

| Triglyceride mmol/l | | | | | | |
|---|---|---|---|---|---|---|
| I. group | 142 | 1.08 | 1.3 | 1.55 | 0.76 | 0.4 |
| II. group | 301 | 1.13 | 1.19 | 1.39 | 0.76 | 0.34 |
| III. group | 243 | 1.09 | 1.25 | 1.52 | 0.75 | 0.41 |

Table III

| HDL-Ch mmol/l | | | | | | |
|---|---|---|---|---|---|---|
| I. group | 142 | 1.14 | 1.17 | 1.28 | 0.96 | 0.17 |
| II. group | 301 | 1.16 | 1.21 | 1.29 | 0.99 | 0.17 |
| III. group | 243 | 1.22 | 1.3 | 1.35 | 1.04 | 0.22 |

TABLE IV

Correlation coefficients between the serum lipids and the HDL-Ch

| | n | Ch-HDL-Ch corr. coef. | p < | Tg-HDL-Ch corr. coef. | p < |
|---|---|---|---|---|---|
| I. group | 142 | 0.16 | 0.05 | —0.21 | 0.01 |
| II. group | 301 | 0.16 | 0.01 | — 0.12 | 0.05 |
| III. group | 243 | 0.17 | 0.01 | —0.25 | 0.001 |

were 0.76, 0.76 and 0.75 mmol/l, without any significant differences; the mean values of the serum HDL-Ch were very low: 0.96, 0.99, and 1.04mmol/l, respectively.

Significant positive correlation was observed between the serum Ch and HDL-Ch levels (Table IV.) and a significant negative correlation was detected between the serum Tg and HDL-Ch levels.

## DISCUSSION

Considerable variations have been published in the levels of serum lipids among the different populations [5, 9, 10, 14, 15]. Berenson et al [3] have proved that the serum Ch concentration in children aged 3—4 years reached the mean value of the 23—25-year-old adults.

Askevold et al. [1] have found significantly higher Ch values for girls (15—16 years) than for boys of the same age group, the Tg levels of 15—16-year-old boys were significantly higher than that of 13—14-year-old boys. As appropriate upper limits, the 85th percentile values have been suggested since plasma Ch was slightly below 6 mmol/l, the corresponding plasma Tg was below 2 mmol/l.

According to the data of Berenson et al. [3] the concentrations of the praebeta-lipoproteins of children were the half (47 mg/100 ml) of those in a group of medical students. Czinner [6] has calculated the pathological limit for Tg above 120 mg/dl (1.36 mmol/l) and for serum Ch above 200 mg/dl (5.17 mmol/l) in a population of Hungarian children aged 3—14 years In our material of the above-mentioned three groups of children, the mean values of the serum Tg were lower than those of adults.

Widhalm and Strobl [19] investigating the HDL and LDL-Ch concentrations in normally alimented 15 years old healthy children, have got some differences from the literary data/Ch 155 mg/dl (4.1 mmol/l), 150 mg% (3.88 mmol/l) LDL-Ch 98 (2.53 mmol/l) and 96 mg/dl (2.48 mmol/l). Kaas Ibsen et al [12] have found higher LDL-Ch and lower HDL-Ch levels in Danish school-children than in a same population from the USA. In the latter group the 95 percentile of the HDL-Ch was 1.86 mmol/l; the mean values for HDL-Ch were comparably low in a population of Hungar-

ian children to the Danish group which might indicate a risk-factor for cardiovascular diseases.

Earlier by Boulton a strong correlation was found [4] between the LDL-Ch values and the age, and a weak correlation was proven between the LDL-Ch concentrations and the HDL-Ch values. Somogyi et al [13] have performed a screening program for Ch, Tg and beta-lipoproteins among the 1—20-year-old girls and boys in Budapest dividing them into 5 groups; the 95 percentile values for Ch were in the I. group (1—3.9 years) 6.03 mmol/l, in the II. group (4—7.9 years) 5.95, in the III. group (8—12.9 years) 6.57, in the IV. group (13—16.9 years) 5.95 and in the V. group (16—20 years) 6.47 mmol/l determined by chemical methods. The corresponding values measured by enzymatic methods were: in the I. group 6.41, in the II. group 5.64, in the III. group 6.0, in the IV. group and in the V. group 6.47. The cholesterol levels measured chemically by the method of Huang were 11 per cent higher than those determined by the enzymatic colorimetric method (EnzaChol-F) Gödecke) (own unpublished data).

In the material of Somogyi et al [13] the 95 percentile values were: for Tg determined chemically by a non-enzymatic, colorimetric method, in the I. group 1.72, in the II. group 1.7, in the III. group 2.49, in the IV. group 1.7, in the V. group 1.81 respectively, IG values determined by an enzymatic test were: 1.72, 1.59 1.48, 1.4, 1.7, respectively.

The Ch and Tg values were similar to the published data [2, 3, 7, 8, 10, 16]. Differences in Ch and Tg levels between both sexes could be ascertained statistically only for adolescents soon after puberty [2]. Therefore we have not calculated the serum lipid and lipoprotein values separately according to the sexes in our children.

The data of Somogyi et al [13] and our results represent the Hungarian standards for lipids and lipoproteins in a population of children and young adults.

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A László, MD
P Box 471
H-6701 Szeged, Hungary