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Lipoprotein (a) in a Sample of Children From the Province of Biscay

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Atherosclerosis is a process that is initiated in the earlier stages of life. Moreover, Lipoprotein (a) [Lp(a)] has taken the form of an independent risk factor. All this justifies the study of Lp(a) in children.

The Lp(a) plasma levels were determined in 115 children (51 girls and 64 boys) with ages ranging from 6 to 7 years. These children came from an epidemiological study on the prevalence of hypercholesterolaemia in children in the province of Biscay. ELISA was used to determine the Lp(a) concentration in each of the children and, at the same time, a lipid study was also carried out on them (total cholesterol, HDL cholesterol, triglycerides, LDL cholesterol, Apolipoprotein B and Apolipoprotein A1).

The average Lp(a) concentrations were 11.51 ± 16.97 mg/dl for the boys and 13.87 ± 14.72 mg/dl for the girls. In the case of the boys, 10.9 % were shown to have Lp(a) concentrations of more than 30 mg/dl. In the case of the girls, 11.4 % were shown to have Lp(a) concentrations of more than 30 mg/dl. The boys had lower Lp(a) average values and prevalences that were > 30 mg/dl than the girls ones, although they were not statistically significant. We did not find any relationship between the high Lp(a) concentrations and the various lipid parameters studied. *J Clin Basic Cardiol 2003; 6: 53–4.*

Key words: lipoprotein (a), children

Lipoprotein (a) [Lp(a)] is a low density lipoprotein identified by Berg at the beginning of the sixties [1]. This lipoprotein is a cholesterol rich particle, with pre-beta electrophoretic mobility, and contains Apolipoproteins B and A. Structurally, the ApoA shows a great similarity to plasminogen.

Amongst the physiopathological mechanisms described it is noted for being easily deposited on the arterial wall; moreover, it favours the proliferation of the smooth muscle cells, increases the LDL oxidation process, reduces the endothelium-dependent dilatation, it is procoagulative and reduces fibrinolysis [2].

Various clinical studies have demonstrated that high Lp(a) levels are associated with a greater cardiovascular disease and that they represent an independent risk factor for this disease, even in the presence of normal cholesterol and triglyceride concentrations [2–6].

It has been demonstrated that newborn babies may suffer endothelial cell damage, as may be detected by electron microscopy. The children may exhibit continuous accumulation of cholesterol esters in the intima of coronary arteries. Newborn babies have obstructive myo-intimal thickenings in their coronary arteries. A thickened intima is susceptible to lipid deposition and atherosclerosis [7].

If we consider that atherosclerosis is a process that is initiated in the earlier stages of life, and that Lp(a) takes the form of an independent risk factor, the objective of our study is to determine the Lp(a) plasma concentrations in a group of boys and girls aged between 6–7 years in the province of Biscay, as well as the percentage of children showing Lp(a) values of more than 30 mg/dl.

Material and Methods

A study was made of the Lp(a) concentration in a group of 115 boys and girls, aged between 6–7 years and coming from a study on the prevalence of hypercholesterolaemia in children in the province of Biscay.

They had a peripheral blood extraction with the blood being drawn using the Vacutainer disposable method after 12 hours fasting. The following parameters were analysed:

- Total cholesterol and triglycerides: by the normal enzymatic methods
- HDL-cholesterol: this was determined after the precipitation of LDL and VLDL by phosphotungstic acid and magnesium chloride and the subsequent determination of the cholesterol level by the normal enzymatic methods
- LDL-c: Calculated according to the Friedewald-Fredrickson equation for individuals whose serum triglycerides were ≤ 4.51 mmol/l:

  LDL-c = Total Cholesterol – HDL-c – Triglycerides/5
- Apolipoprotein A1 and Apolipoprotein B100: using inmunoturbidimetric methods
- Lp(a): determined by an enzymo-immune test

The data obtained were gathered together into a data base program and were statistically treated using the EXCEL program. The results of the qualitative variables were expressed as percentages, and, for the quantitative variables the average was used as a measurement of a central position, and the standard deviation as a measurement of dispersion. In the measurement study, the Student parametric t-test was used, after comparison that it was following a normal law and the variance homogeneity.

Results

Of the 115 children studied, 51 (44.35 %) were girls and 64 (55.65 %) boys. The average Lp(a) concentration in the sample studied was 12.56 ± 15.97 mg/dl with 11.51 ± 16.97 mg/dl in the boys and 13.87 ± 14.72 mg/dl in girls. The lowest value encountered was 0.25 mg/dl and the highest 66 mg/dl.

Figure 1 shows the Lp(a) concentration frequency distribution in the overall sample. Table 1 shows the percentiles corresponding to the general sample and by sex.

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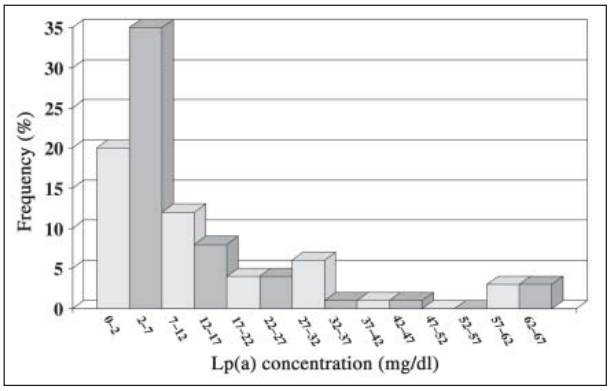

Figure 1. Lp(a) frequency distribution

Table 1. Lp(a) percentiles for the overall sample and by sexes

	P10	P25	P50	P75	P90
Boys	1.1	2.0	4.1	12.2	29.7
Girls	1.9	4.3	8.3	19.4	30.6
Overall	1.2	2.4	5.6	13.5	30.2

Table 2. Lipid parameters according to Lp(a) concentrations

	TC ($\bar{x}$ ± SD) µm/l	TG ($\bar{x}$ ± SD) µm/l	HDLc ($\bar{x}$ ± SD) µm/l	LDLc ($\bar{x}$ ± SD) µm/l	ApoB ($\bar{x}$ ± SD) mg/dl	ApoA ($\bar{x}$ ± SD) mg/dl
Lp(a) < 30 mg/dl	4.96±0.6	0.63±0.25	1.86±0.38	2.79±0.59	93±14	169±24
Lp(a) > 30 mg/dl	5.19±0.7	0.56±0.12	1.93±0.49	3.0±0.59	93±15	170±24

Analysing the frequency distribution by sex, we can observe that in case of the boys, 10.9 % were shown to have Lp(a) concentrations of > 30 mg/dl. In the girls, 11.4 % had concentrations > 30 mg/dl. In the overall sample, there was an 11.11 % prevalence of Lp(a) values of > 30 mg/dl.

If we distribute the sample into two groups, with respect to the values of Lp(a) > 30 mg/dl and Lp(a) < 30 mg/dl, and compare the average values for total cholesterol, HDL cholesterol, LDL cholesterol, apolipoprotein B and apolipoprotein A1, we can find no statistically significant differences for any of the parameters under study (Table 2).

Discussion

In our study, as in the Bogalusa Heart Study [8] (2438 boys and girls 8–17 years old) and in the study carried out by Lopez Montero [9] (1970, boys and girls 4–18 years old) we found higher Lp(a) values in girls than in boys, even though these differences were not statistically significant. This is perhaps due to the ages studied since the variability is more marked when puberty is reached.

With regard to the average concentrations of Lp(a), our values are slightly below those found in other studies [8–11], although the studies analysed actually contemplate the infant and youth population.

The Lp(a) variables appear to behave independently from the rest of the lipid and protein variables associated with cardiovascular risk, and show no association with any of these variables. Similar results have been described by other authors [12, 13].

If we bear in mind that Lp(a) is an independent factor and that more than 10 % of our infant population were shown to have high concentrations of Lp(a), we consider that it would be interesting to determine this parameter in those children with a high risk of experiencing cardiovascular disease.

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