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Letter to the Editor

Variability of Values for the Atherogenic Index (ATH Index) in Healthy Men

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Dear Editor-in-Chief

The atherogenic index (ATH index) is a compound index reflecting the balance between atherogenic and antiatherogenic lipids. The formula for calculating the ATH index was proposed by A.T. Høstmark et al. (1). This formula requires the plasma levels of total cholesterol (TC), high-density lipoprotein cholesterol (HDL-C), apolipoprotein (apo) B and apoA-I and is calculated as: ATH index = ((TC – HDL-C)*apoB)/(HDL-C*apoA-I).

The importance of the ATH index as marker of cardiovascular diseases has been shown in a number of studies (1, 2). The ATH index predicts cardiovascular risk better than lipid parameters used separately. Høstmark et al. (1) showed that the ATH index has a high discriminating ability between subjects with and without stenosis. This index grew appreciably with increasing numbers of stenosed vessels. In addition, calculation of the ATH index may prove useful for identification of subjects with high cardiovascular risk (2).

A cut-off value for the ATH index was defined based on outdated clinical laboratory reference values for TC, HDL-C, apoB and apoA-I equal to 6.5 mmol/l, 0.9 mmol/l, 1.3 g/l and 1.8 g/l, respectively. The ATH index was given a cut-off value of 4.5 (2).

At present, the ATH index is rarely used, and there are no current reference values for it. The aim of this study was to determine the variation range for the ATH index in healthy men.

The variation range of the ATH index values was investigated in 157 apparently healthy men with normolipidaemia. Participants were included in the study if they met the following conditions: (i) a body mass index < 30 kg/m^2; (ii) a TC concentration < 5.2 mmol/l; (iii) a triglycerides (TG) concentration < 1.7 mmol/l; and (iv) a HDL-C concentration > 1.0 mmol/l. The plasma levels of TC, TG, HDL-C, apoB and apoA-I were measured on the automated spectrophotometer with commercially available kits (Chronolab).

The values of the ATH index in men with normolipidaemia varied from 0.27 to 5.39 (Fig. 1A). At the same time, the ATH index values in most of these subjects did not exceed 2.32.

Since at present there are no established normal reference values for the ATH index, we attempted to determine the reference range for this index. Subjects with normal levels of apoA-I and apoB were selected from a general group of men with normolipidaemia. Only 89 men in the study had normal values for all parameters used to calculate the ATH index. The values of the ATH

index in these 89 men varied from 0.27 to 2.56 (Fig. 1B). Thus, the upper limit value for the ATH index in the subjects with normal levels of lipids and apolipoproteins is 2.60.

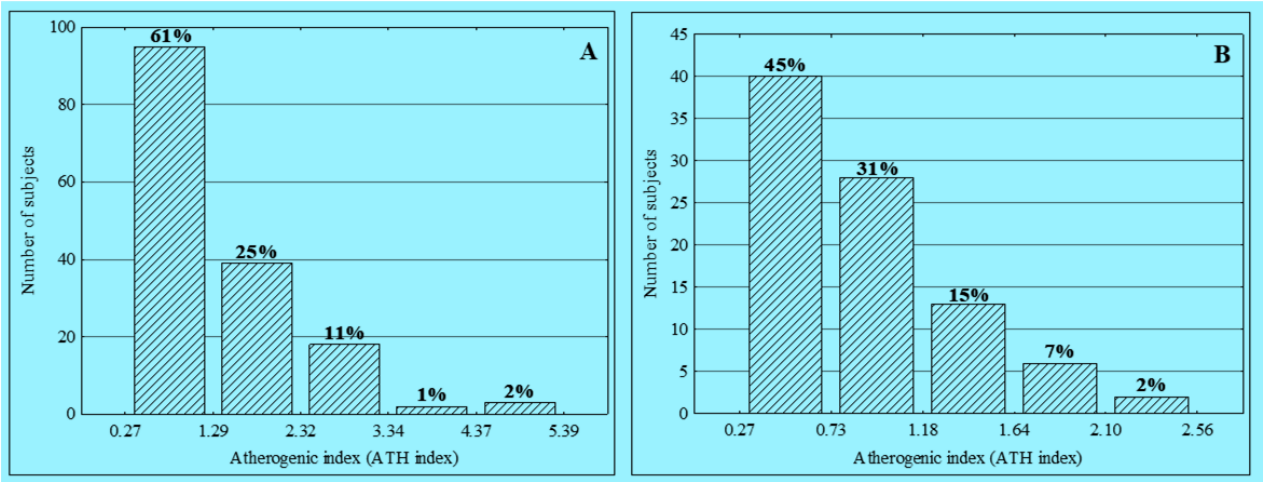

Fig. 1: Frequency distribution of the ATH index values in men with normolipidemia (n=157) (A) and in men with normolipidemia and normal levels of apoA-I and apoB (n=89) (B).

In addition to the above way of establishing a reference range, there is another approach for determining threshold values for integrated indices. This method consists in substituting threshold values of parameters in a required formula. In our case, the calculation of threshold value for the ATH index was as follows:

ATH index = ((TC–HDL-C)*apoB)/(HDL-C*apoA-I)=((5.2 mmol/l – 1.0 mmol/l)*120 mg/dl)/(1.0 mmol/l*120 mg/dl) = 4.2

Reference values for TC, HDL-C and apoA-I, apoB are taken from the National Cholesterol Education Program (NCEP) ATP III Classifications (3) and appropriate references (4, 5).

The threshold value for the ATH index is 4.2. This value is 61.5% higher than the maximum value of the ATH index in men with normal levels of lipids and apolipoproteins. Of the 157 men with normolipidaemia, only 12 subjects had values of the ATH index in the range of 2.6 to 4.2. The analysis of individual data showed that these 12 men had apoB/apoA-I ratios exceeding 0.9 (the accepted risk value of cardiovascular disease), which indicates an imbalance between transport apolipoproteins. Therefore, the calculation of upper reference value for indices by using the maximum threshold values of parameters in formulas is not always correct.

Thus, a value of 2.6 is more appropriate to use as the threshold value for the ATH index, at which optimal balance is maintained both between lipoproteins and between transport apolipoproteins.

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Conflict of interest

The authors declare that there is no conflict of interests.

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