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

*Anastasiya M. Kaneva, Natalya N. Potolitsyna, Evgeny R. Bojko

Institute of Physiology of Komi Science, Centre of the Ural, Branch of the Russian Academy of Sciences, FRC Komi SC UB RAS, Syktyvkar, Russia

*Corresponding Author: Email: amkaneva@mail.ru

(Received 07 Oct 2019; accepted 10 Nov 2019)

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. Hostmark 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. Hostmark 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).

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/m²; (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 were normally distributed, and the mean value was 2.07 with a standard deviation of 1.13. The ATH index was significantly lower in men with normal levels of apoA-I and apoB compared to men with high cardiovascular risk.

Available at: http://ijph.tums.ac.ir
The 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.

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:

\[
\text{ATH index = } \frac{(5.2 \text{ mmol/l} - 1.0 \text{ mmol/l} \times 120 \text{ mg/dl})}{(1.0 \text{ mmol/l} \times 120 \text{ mg/dl})} = 4.2
\]

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.

Acknowledgements

The study is supported by the Program for Fundamental Research of RAS (2018-2020), state registration number AAAA-A18-118012290366-9 (project № 18-7-8-7).

Conflict of interest

The authors declare that there is no conflict of interests.

References


