

# The place of low-grade inflammatory markers among traditional metabolic risk factors in adolescents

## The HELENA study

by

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**Objectives:** Metabolic risk factors traditionally include obesity, dyslipidemia, insulin resistance and high blood pressure, but also new inflammatory risk markers that have been associated with the development of chronic diseases such as type 2 diabetes and cardiovascular disease. By factor analysis, a multivariate correlation technique, data from the HELENA study enables us to provide insight into the underlying structure of the metabolic syndrome in European adolescents.

**Methods:** We performed a factor analysis of the individual continuous components of the metabolic syndrome, *i.e.* BMI, waist, fasting serum values of insulin, glucose, triacylglycerol and HDL-cholesterol, and systolic and diastolic blood pressure (BP), and selected inflammatory markers *i.e.* C-reactive protein (CRP), complement factor C3, white blood cell counts (WBC) in 744 adolescents from 10 European cities from 8 different countries (included in the HELENA study).

**Results:** Factor analysis reduces a set of directly measured variables into a smaller set of underlying factors representing unique statistically independent domains termed factors. Our analyses yield four factors which together explained 60% of the total variance. Factor 1, “the metabolic factor with C3” (27.5%) included waist, BMI, HDL, Systolic BP, C3 and insulin. Factor 2, “the metainflammatory factor” (12.5%) included WBC, CRP, C3, triglycerides and glucose, while factor 3, “the blood pressure factor” (10.5%) grouped only the diastolic and systolic BP and the last factor 4, “the metabolic factor” (9.5%) included glucose, insulin, triglycerides and HDL.

**Conclusion:** The presented results indicate that “metainflammation”, the metabolically triggered low-grade inflammation, is part of the underlying structure in the traditional metabolic risk pattern in adolescents.

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