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CORRESPONDENCE

Effect of metabolic syndrome components and their clustering on carotid atherosclerosis in a general Japanese population: methodological issues of model building

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We were interested to read the paper by Hirata *et al.*[1] that was published in *Hypertension Research* in May 2016. The authors aimed to evaluate the impact of age, current smoking habit, low density lipoprotein cholesterol (LDL-C), hemoglobin A1c (HbA1c)and the metabolic syndrome (MetS) components including systolic blood pressure (SBP), diastolic blood pressure (DBP), triglycerides, high density lipoprotein cholesterol, fasting blood glucose (FBG) and waist circumference as independent variables with respect to the intima-media thickness (IMT), the dependent variable. A stepwise multiple regression analysis was used to determine the effect measure of the associations. The result demonstrated that among males, age, SBP, LDL-C, current smoking habit and HbA1c were determinants of IMT. Among females, age, SBP and FBG were significantly associated with IMT.[1]

Although the statistical method was correct and the data were interesting, some methodological and statistical issues should be considered. It seems that the main limitation of the study by Hirata *et al.*[1] was that it overlooked clinical judgments in model building. Stepwise methods are criticized because the variables included in the final model are based on statistical logic rather than prior knowledge. Stepwise methods have some limitations, such as biased coefficient estimates, unstable variable selection and exaggerated *P*-values. It is suggested that the included variables in regression models should rely on knowledge from previous studies and from expert opinions.[2]

MetS components are strongly correlated with one another. For example, a strong correlation generally exists between SBP and DBP and/or among lipid profiles;[3,4] this phenomenon is called collinearity or singularity. Collinearity mainly leads to an unreliable estimation of regression coefficients.[2] It seems there was multicollinearity among the determinants of IMT that was missed in the analysis by Hirata *et al.*[1] This problem can be solved by a factor analysis, an advanced statistical method used to identify independent groups and clusters of variables.[5]

The authors should consider reanalyzing their data to clarify the true role of each determinant of IMT. To evaluate the determinants of IMT, we suggest that the regression models should be constructed in the four following scenarios: (a) covariates and all MetS components as continuous variables, (b) covariates and all MetS components in dichotomized form, (c) covariates and MetS (yes/no) and (d) covariates and factor analysis factors. One way to check the model specification of the four scenarios would be to present calibration and discrimination statistics for different models.

Moreover, the authors reported only *P*-values as an effect measure of the associations. The *P*-value only indicates the compatibility between data and a single hypothesis. Confidence intervals, however, provide the readers with information about the magnitude, direction of the association and even the random variability of the point estimate.[6]

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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