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Prediction of pre-hypertension and metabolic syndrome using combined obesity indices based on machine learning

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Hypertension and metabolic syndrome (MetS) are a common health problem. Many previous studies reported that MetS and hypertension were strongly associated with obesity. However, no studies on the prediction of pre-hypertension and MetS using combined anthropometric indices related to obesity have been reported. The objectives of this study were to predict pre-hypertension and MetS using combined anthropometric indices based on machine learning and to evaluate the quality of various predictive models. **Methodology & Theoretical Orientation:** A total of 3,927 subjects aged 40-70 years participated in this study. To diagnose pre-hypertension and MetS, we considered the recommendations of the National Cholesterol Education Program Adult Treatment Panel III. For anthropometric indices, eight circumferences (forehead, neck, axilla, chest, rib, waist, pelvis, and hip) were measured. We calculated the ratios between the indices. Finally, we extracted a total of 41 variables including age, weight, height, waist-to-hip ratio, waist-to-height ratio, body mass index, neck-to-rib ratio, and so on. For model building, correlation-based feature selection and wrapper-based variable selection based on logistic regression (LR) and naïve Bayes (NB) were used to identify the optimal variable subsets. **Findings:** There were 1,605 men with pre-hypertension (41%) and 1,136 (29%) with MetS. We tested six models in each disease (Figure 1). The LR-wrapper model showed the highest predictive power. The ROC values for the pre-hypertension and MetS were 0.645 and 0.819, respectively. In MetS, the model using combined indices showed slight improvements in the ROC compared with the waist circumference (ROC = 0.809 by NB and LR), even though waist circumference is one of the five components used to diagnose MetS and is a strong predictor of MetS. **Conclusion & Significance:** Our results provide insight into a simple and inexpensive method that could be used to identify pre-hypertension and MetS in initial health screening.

Biography

Bum Ju Lee has his expertise in evaluation in association between anthropometric indices and metabolic abnormalities. He studied the relationship between anthropometric indices related to obesity and hypertension, hypotension, type 2 diabetes, hypertriglyceridemia, and serum high- and low-density lipoproteins, and have published many articles with these contents. He is currently a senior researcher in the Korea Institute of Oriental Medicine, Daejeon, Korea. His research interests include data mining and database, bioinformatics, public health, epidemiology, and oriental medicine.

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