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ORIGINAL ARTICLE

# Usefulness of combining serum uric acid and high-sensitivity C-reactive protein for risk stratification of patients with metabolic syndrome in community-dwelling women

**Ryuichi Kawamoto · Yasuharu Tabara · Katsuhiko Kohara · Tetsuro Miki · Tomo Kusunoki · Shuzo Takayama · Masanori Abe · Tateaki Katoh · Nobuyuki Ohtsuka**

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**Abstract** Metabolic syndrome (MetS) is associated with an increased risk of major cardiovascular events. In women, increased uric acid (UA) levels are associated with MetS and its components. High-sensitivity C-reactive protein (hsCRP) levels are also associated with MetS, and hsCRP levels could be modulated by UA. We investigated whether combining UA and hsCRP levels are independently associated with MetS and insulin resistance in Japanese community-dwelling women. From a single community, we recruited 1,097 women (63 ± 12 years) during their annual health examination, and examined the cross-sectional relationship between UA, hsCRP, and MetS and insulin resistance, which was evaluated by homeostasis of minimal assessment of insulin resistance. Of these subjects, 218 women (19.9 %) had MetS. Multiple linear regression analysis was performed to evaluate the contribution of each confounding factor for MetS and insulin resistance, both UA and hsCRP as well as age and alcohol consumption, were independently and significantly associated with MetS and insulin resistance. The adjusted-odds ratios (95 % confidence interval) for MetS across tertiles of UA and hsCRP were 1.00, 1.45 (0.95–2.22), and 2.61 (1.74–3.93), and 1.00, 1.80 (1.18–2.74), and 3.23 (2.15–4.85), respectively. In addition, the combination increased UA, and hsCRP was also a significant and independent determinant for MetS and insulin resistance. In direction associations, we also observed a synergistic effect between these two molecules ($F = 2.76, P = 0.027$). These results suggested that combined assessment of UA and hsCRP levels provides incremental information for risk stratification of patients with MetS, independent of other confounding factors in community-dwelling women.

**Keywords** Uric acid · C-reactive protein · Metabolic syndrome · Insulin resistance · Women

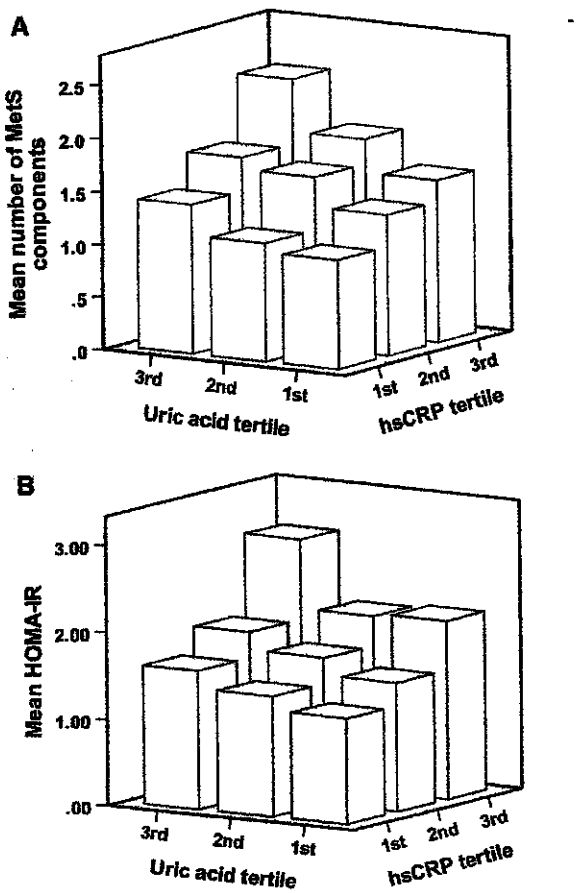


**Fig. 1** Combining effect of UA and hsCRP. **a** Mean accumulating number of metabolic syndrome (MetS) components: obesity, raised blood pressure, hypertriglyceridemia, low HDL cholesterolemia, and impaired fasting glucose. **b** HOMA-IR. Study subjects were divided into three groups (tertiles) according to the UA and hsCRP levels

## Introduction

Metabolic syndrome (MetS), a clustering of cardiovascular risk factors such as visceral obesity, insulin resistance, hypertension, glucose intolerance, hypertriglyceridemia, and low high-density lipoprotein cholesterol (HDL-C) levels, is a major worldwide public health problem. In Japan, it is 13.3 % in men and 11.5 % in women [1]. MetS increases the risk of