Associations of Metabolic Factors and Cigarette Smoking with Colorectal Adenoma Risk in Taiwanese Men

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Purpose: The purpose of this study was to determine the associations of metabolic risk factors and cigarette smoking with colorectal adenoma risk among Taiwanese men.

Methods: A retrospective case-control study was conducted on Taiwanese men who visited our institution for health examination. From January 2005 to April 2006, 1,542 male subjects who underwent complete colonoscopy during health examinations were enrolled. Metabolic syndrome was defined according to the modified National Cholesterol Education Program adult treatment panel III definition for South Asian and Chinese populations. Metabolic risk factors, body mass index, cigarette smoking habit, and the frequency of metabolic syndrome were compared between individuals with and without colorectal adenoma. Multivariate logistic regression was used to analyze the association between independent risk factors and colorectal adenoma. The effects of metabolic syndrome and cigarette smoking on pathological features and size of colorectal adenoma were also examined.

Results: There were 279 (18.1%) subjects with pathologically proven colorectal adenoma. The prevalence rate of metabolic syndrome in men was 36.2% in the adenoma group and 21.6% in the control group. In multivariate analysis, old age (>50 years), central obesity, current smoking habit, and metabolic syndrome were associated with an increased risk of colorectal adenoma in men. Male subjects with metabolic syndrome who were current smokers were more likely to develop colorectal adenoma than nonsmokers (OR = 1.69, 95% CI: 1.01-2.84). Furthermore, current smokers with metabolic syndrome had a significantly increased risk of colorectal adenoma compared to the risk of current smokers.
without metabolic syndrome \( (p=0.049) \). Metabolic syndrome was also associated with an increased risk of colorectal adenoma larger than 1 cm in diameter in the adenoma group \( (p=0.01) \).

**Conclusion:** Male subjects with central obesity, metabolic syndrome, or a current smoking habit have an increased risk of developing colorectal adenoma, and the risk is significantly increased in current smokers with metabolic syndrome. We recommend that an increased emphasis on smoking prevention and reducing the prevalence of central obesity and metabolic syndrome will reduce the risk of colorectal adenoma among Taiwanese men.

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**Key Words:** central obesity, cigarette smoking, colorectal adenoma, male subjects, metabolic syndrome

### INTRODUCTION

Colorectal adenoma is a well-established premalignant lesion of colorectal cancer. Colorectal cancer, which resulted in 2,875 male deaths in Taiwan in 2011\(^1\), is more common in developed countries than in developing countries. In Taiwanese men, colorectal cancer was the third leading cause of cancer-related mortality in 2011\(^1\) and the second most common cancer in 2009\(^2\). The age-adjusted incidence of this cancer was 48.7 per 100,000 men, and the median age at diagnosis for colorectal cancer among men in Taiwan was 68 years in 2009\(^2\).

Both obesity and metabolic syndrome (MetS) have become major public health issues worldwide because central obesity contributes to the development of MetS by promoting insulin resistance, and MetS development has been associated with an increased risk of cardiovascular disease\(^3,4\). The prevalence of MetS defined by National Cholesterol Education Program (NCEP) adult treatment panel (ATP) III was relatively high in Taiwanese adults compared to that in China, South Korea, and Japan\(^5\). The prevalence of MetS and obesity in men dramatically increased from 13.6% to 25.5% and from 10.1% to 18.9%, respectively, over the last 12 years in Taiwan\(^5\), which might be due to an increase in the prevalence of obesity, increasingly sedentary lifestyle, and increased consumption of Westernized diets\(^5,6\). Metabolic risk factors include central obesity, high blood pressure, high serum fasting glucose levels, low high-density lipoprotein cholesterol (HDL-C) levels, and hypertriglyceridemia. MetS is known to contribute to morbidity and mortality via its metabolic risk factors, all of which are manifestations of insulin resistance\(^3\). MetS reflects increased insulin resistance, and insulin resistance due to obesity or an inherited genetic defect has been hypothesized as the mechanism underlying MetS\(^3,7\).