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ORIGINAL ARTICLE

Metabolically healthy obesity also has risk for hyperuricemia among Chinese general population: A cross-sectional study

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KEYWORDS
Metabolically healthy obesity;
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Summary
Introduction: The metabolically healthy obese (MHO) refers to obese individuals with a favorable metabolic profile. It is unknown whether metabolically healthy status in persons with obesity or overweight decreases the risk of hyperuricemia. This study aims to explore the association of MHO with risk of hyperuricemia.
Methods: We performed a cross-sectional study including 11,435 (5300 men and 6135 women) general population aged ≥35 years in Liaoning Province. Anthropometric measurements, laboratory examinations and self-reported information on lifestyle factors were collected by trained personnel. Metabolically healthy overweight/obesity was defined according to body mass index and ATP-III criterion of metabolically healthy status. Hyperuricemia was defined as SUA ≥7 mg/dl (420 mmol/L) in men or ≥6 mg/dl (360 mmol/L) in women. Logistic regression analyses were performed to explore the association between overweight/obesity with different metabolic status and risk of hyperuricemia.
Results: Among total subjects, 470 (4.2%) were metabolically healthy obese (MHO) and 1567 (14.0%) were metabolically unhealthy obese (MUO). For metabolically healthy female participants, the prevalence of hyperuricemia with overweight was

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similar to with a normal BMI (2.5% vs. 3.1%, $P = 0.314$). Multivariate logistic regression analyses showed that MHO (OR = 2.48, 95% CI: 1.81—3.41) and MUO (OR = 4.81, 95% CI: 3.97—5.83) were significantly associated with hyperuricemia. However, the odds ratio in females with metabolically healthy overweight was 0.85 (95% CI: 0.53—1.37).
Conclusions: Metabolically healthy might decline the risk of hyperuricemia, but overweight and obesity with metabolically healthy had also strong associations with hyperuricemia, except in females with metabolically healthy overweight.

Introduction

In recent decades, obesity has become a major public health and social problem worldwide [1]. Obesity is acknowledged to be one of the independent risk factors for both cardiovascular disease (CVD) and type 2 diabetes mellitus (DM) [2,3], and is often accompanied by hyperuricemia [4]. Meanwhile, hyperuricemia is commonly detected in subjects with abnormal purine metabolism, including overproduction of uric acid (UA) and insufficient UA excretion from the kidneys [5]. Prolonged hyperuricemia is a causal factor in the development of damage to joints, connective tissues, and the kidneys. Hyperuricemia is related not only to an increased risk of developing gout, but also cardiovascular diseases, such as stroke and ischemic heart disease. Obesity is a known determinant of serum uric acid (SUA) levels, and obesity and SUA levels correlate positively regardless of age or sex [6]. Furthermore, SUA levels also decrease with weight loss [7].

Recently, researchers have proposed a novel concept that within populations with obesity a subgroup exists which presents no metabolic disturbances, termed metabolically healthy obese (MHO). A current debate has arisen from the multiple studies which suggest that MHO individuals might be at lower risk of suffering cardiovascular events and all-cause mortality [8]. Some researchers consider that obesity is no longer a risk factor for CVD and all-cause mortality if accompanied by a healthy metabolism [8—10]. Thus, not all individuals with obesity should be included into treatment programs, which could help to reduce the medical and socioeconomic burdens associated with obesity treatment [8]. However, other prospective cohort studies and systematic reviews [11,12] conclude that MHO individuals are not at a lower risk of CVD incidence and all-cause mortality [12], and argue that MHO is not a relatively healthy status.

At present, no consistent conclusion has been reached regarding the benefits of MHO status. It has been shown that both obesity and metabolism have a close relationship with hyperuricemia [13,14]. However, it is yet to be established whether the new subgroup within obese/overweight, populations of metabolically healthy obese/overweight individuals could have a decreased the risk level of hyperuricemia. This study aims to explore the association of MHO phenotype with risk of hyperuricemia in a representative general sample of adults living in the rural areas of the Liaoning Province, China.

Subjects, materials and methods

Study population

From July 2012 to August 2013, we selected a representative general sample aged ≥35 years to describe the prevalence, incidence and natural history of cardiovascular risk factors in rural areas of Liaoning Province that is located in Northeast China. The study adopted a multi-stage, stratified randomly cluster-sampling scheme. In the first stage, 3 counties (Dawa, Zhangwu, and Liaoyang County) were selected from the eastern, southern, and northern region of Liaoning Province. In the second stage, one town was randomly selected from each county (a total of 3 towns). In the third stage, 8—10 rural villages from each town were randomly selected (a total of 26 rural villages). All the eligible permanent residents aged ≥35 years from each village were invited to attend the study (a total of 14,016 participants). Of those, 11,956 participants agreed and completed the present study and the response rate was 85.3%. The study was approved by the Ethics Committee of China Medical University (Shenyang, China). All procedures were performed in accordance with the ethical standards. Written consent was obtained in all participants after they had been informed of the objectives, benefits, medical items and confidentiality agreement of personal information. If the participants were illiterate, we obtained the

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