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ORIGINAL ARTICLE

Obesity-related changes in clinical parameters and conditions in a longitudinal population-based epidemiological study

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KEYWORDS
Body mass index;
Obesity;
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Summary
Objectives: The purpose of the present study was to examine the association of body mass index (BMI) or obesity with various clinical parameters and conditions in a longitudinal population-based epidemiological study in Japan.
Methods: Study subjects comprised 6027 community-dwelling individuals who were recruited to the Inabe Health and Longevity Study, a longitudinal genetic

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epidemiological study of atherosclerotic, cardiovascular, and metabolic diseases. Obesity was defined as BMI $\geq$25 kg/m^2.
Results: Longitudinal analysis with the generalised linear mixed-effect model after adjustment for age showed that for men, BMI was significantly ($P < 0.0008$) related to systolic, diastolic, and mean blood pressure and serum concentrations of high-density lipoprotein (HDL)-cholesterol and low-density lipoprotein (LDL)-cholesterol. For women, BMI was also significantly related to serum concentrations of triglycerides, HDL-cholesterol, and LDL-cholesterol. Longitudinal analysis with the generalised estimating equation with adjustment for age showed that in men, BMI was significantly ($P < 0.0012$) associated with the prevalence of hypertension, type 2 diabetes mellitus, hypertriglyceridemia, hypo-HDL-cholesterolemia, decreased estimated glomerular filtration rate, and hyperuricemia. In women, BMI was also significantly associated with the prevalence of hypertension, type 2 diabetes mellitus, hypertriglyceridemia, and hyperuricemia.
Conclusion: Obesity has detrimental effects on various clinical parameters and conditions, resulting in increased risk of hypertension, dyslipidemia, type 2 diabetes mellitus, hyperuricemia, and chronic kidney disease.

Introduction

Obesity is a growing epidemic in both adults and children, and has become a serious health problem worldwide [1—3]. Obesity has numerous deleterious effects on blood pressure (BP), lipid and glucose metabolism, and renal and cardiac function [4—7]. Furthermore, obesity is strongly associated with the prevalence of most cardiovascular diseases and is associated with increased mortality due to these conditions [8,9]. Although environmental and genetic factors as well as socioeconomic conditions differ between European and Asian populations, several prospective studies have identified similar associations between body mass index (BMI) and cardiovascular disease mortality [10—13].

Currently in Japan, westernised diet and progressive decline in physical activity have resulted in an increase in the rate of obesity in the general population. Interestingly, a recent report from Japan [14] showed differences in the prevalence of obesity between men and women; the prevalence of obesity among men has increased about 1.5 times in the last 30 years, reaching 33% in 2011. In contrast, the prevalence of obesity among women is decreasing gradually across many generations [14]. Nevertheless, obesity is associated with the prevalence of hypertension, dyslipidemia, and diabetes mellitus (DM) in both men and women with above-normal waist circumference [14]. Given that obesity may increase the medical costs for the diagnosis and treatment of related cardiovascular diseases and reduce productivity due to subsequent restriction of social activities [15,16], early treatment is important for potential intervention to avert future cardiovascular events. However, the relation between obesity and various conditions has not been fully evaluated in a longitudinal study in Japan. We report here the results of a large 5-year follow-up study that was designed to define the association of BMI or obesity with clinical parameters and conditions, and to investigate age-related changes of these parameters and conditions in community-dwelling Japanese individuals.

Methods

Study population

The study subjects comprised 6027 community-dwelling individuals who were recruited to a population-based cohort study (Inabe Health and Longevity Study) in Inabe City, Mie Prefecture, Japan. The Inabe Health and Longevity Study is a longitudinal genetic epidemiological study of atherosclerotic, cardiovascular, and metabolic diseases [17—20]. The subjects were recruited from individuals who visited the health care centre of Inabe General Hospital for an annual health checkup, and they are followed up every year. A total of 6027 individuals was registered between March 2010 and September 2012, and genomic DNA was extracted from venous blood cells of these subjects and stored in the genomic DNA bank of the Research Center for Genomic Medicine at Mie University. For all participants, medical examination

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