

HORSESHOE-SHAPED ASSOCIATION BETWEEN BODY MASS INDEX AND PROTEINURIA IN A LARGE JAPANESE GENERAL POPULATION SAMPLE

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Objectives:

The body mass index (BMI) is a heuristic proxy for human body fat calculated from an individual's weight and height. According to the WHO's criteria, BMI of between 18.5 and 25 kg/m² may be optimal; BMI lower than 18.5 kg/m² suggests the person is underweight; BMI above 25 kg/m² may indicate the person is overweight; and BMI above 30 kg/m² suggests the person is obese. It is not difficult to anticipate a high prevalence of cardiovascular disease, diabetes, hypertension, dyslipidemia, or proteinuria in higher-BMI subjects. However, there is little published data about the association of proteinuria with BMI. Chronic kidney disease is now recognized as a major global public health issue. Persistent proteinuria is one of the major criteria of chronic kidney disease. Determination of the association of proteinuria with BMI is considered of value for health guidance. Therefore, we report here new findings concerning the independent association of proteinuria with BMI in both genders using a large Japanese national cohort

Study design and population

Cross-sectional cohort study assessing the association of BMI with proteinuria in a large Japanese population
Part of the prospective ongoing "Research on the Positioning of Chronic Kidney Disease in Specific Health Check and Guidance in Japan" project

346,942 subjects

Exclusion criteria

- previous history of cardiovascular disease
- chronic kidney disease (CKD) stage 5
- insufficient blood sampling data
- no waist circumference data

Final subjects

212,251 subjects
85,183 Men (median age 66)
127,068 Women (median age 65)

Baseline measurement

Blood samples were collected after an overnight fast and were assayed within 24 hours with an automatic clinical chemical analyzer.

Urinalysis by the dipstick method was performed manually.

Proteinuria was defined as 1+ or more.

eGFR (mL/min/1.73 m²)=194 × age (years)^{-0.287} × serum creatinine (mg/dl)^{-1.094} (if female × 0.739)

Methods:



Results:

- (1) BMI of around 22 +/- 0.5 kg/m² was considered optimal for Japanese; therefore, this subgroup was set as a reference when logistic analysis was applied.
- (2) Age, waist circumference, height, weight, smoking and drinking habits, use of medications such as antihypertensive, antidiabetes, or antihyperlipidemic, proteinuria, eGFR, chemistry data, and blood pressure levels were significantly different between subgroups in both genders.
- (3) The odds ratio for proteinuria showed a horseshoe shape in men and women, even after adjustment for significant covariates such as age, waist circumference, systolic blood pressure, eGFR, fasting plasma glucose, triglyceride, low-density lipoprotein, antihypertensive use, antidiabetic use, antihyperlipidemic use, and lifestyle factors (smoking and drinking).
- (4) Gender differences were also prominent in that those with a BMI of less than 20.4 kg/m² were significantly associated with proteinuria in men, but a BMI of less than 18.4 kg/m² in women. On the other hand, BMI ≥ 25.5 kg/m² was also significantly associated with proteinuria in men, but BMI ≥ 22.5 kg/m² in women.

References:

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Conclusions:

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- (1) Criteria of obesity is different between Asians and Caucasian.
 - (2) Possible reasons for higher prevalence of proteinuria in the lowest BMI levels
Postural proteinuria
Young age
More glomerulonephritis? More postural proteinuria?
Smoking
Undetected kidney diseases
Low birth weight ⇒ smaller number of nephrons
Alcohol intake

CONCLUSION

- (1) We found that BMI levels were associated with proteinuria in a horseshoe-shaped manner and showed marked gender differences.
- (2) Health guidance should not only focus on higher-BMI subjects, but also the thinnest subjects, in terms of the prevention of chronic kidney disease.

