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Lifestyle-related Determinants and Serum Adiponectin Concentrations in a General Population of Japanese Females

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Background. Serum adiponectin concentration plays a role in the development of metabolic and atherosclerotic diseases. Although elucidating the determinants that affect circulating adiponectin concentrations including lifestyle factors are important, little is known about the relationships between lifestyle and adiponectin in the general Japanese female population.

Methods. A total of 311 Japanese females (mean age 54 years) with normal lifestyles and taking no medications were enrolled in a community-based cross-sectional study to investigate which lifestyle factors were associated with serum adiponectin concentrations. Adiponectin was measured with an enzyme-linked immunosorbent assay. The modified Breslow's index (a well-known comprehensive index) was used in assessing lifestyle factors.

Results. The group of moderate drinkers (consuming 1–3 go/day on average) had significantly higher serum adiponectin concentrations than that of nondrinkers (consuming <1 go/day) (15.0 ± 7.2 vs. 12.0 ± 6.5 μg/mL). Using a partial correlation analysis on serum adiponectin concentrations adjusted for age and all lifestyle factors, there were significant positive correlations with age ($r = 0.197$) and alcohol intake ($r = 0.130$) and a significant inverse correlation with body mass index (BMI) ($r = -0.178$).

Conclusions. Among many lifestyle factors, in addition to maintaining decreased BMI levels, moderate alcohol intake habits may have a significant, independent, and positive effect on adiponectin concentrations in the general population of Japanese females, similar to that of Caucasian populations.

Key Words: Alcohol, Body mass index, Aging, Breslow, Lifestyle, Biosocial factors.

Introduction

Adiponectin is secreted by adipocytes, and serum adiponectin concentrations play a role in the development of metabolic and atherosclerotic diseases such as obesity, hypertension, type 2 diabetes, dyslipidemia, and cardiovascular disease (1–3). Elucidating the determinants affecting circulating adiponectin concentrations is crucial for the prevention of metabolic and atherosclerotic diseases. Serum adiponectin concentrations are under the control of environmental factors, lifestyle-related factors, and genetic factors, which possibly lead to ethnic differences in adiponectin concentrations (4). A consideration of ethnic differences is important in research on the relationships of adiponectin to some pathophysiology: studies on Asian as well as Caucasian populations are needed because of the differences in the prevalence of metabolic and atherosclerotic diseases (5).

Because lifestyle-related factors are able to be modified, they may become one of the significant targets for the control of adiponectin. Recently, some lifestyle factors such as nutritional variables, habitual exercise, smoking, and alcohol intake (6–9) have been reported to affect serum

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adiponectin concentrations. Most of these previous studies were performed in male populations or in combined populations of both genders. Although gender differences should be considered in serum adiponectin concentrations (2,10) or in lifestyle factors such as alcohol habits and their metabolism (8), little is known about the relationships between adiponectin and lifestyle in only the female population. Although there has been one report on the adiponectin and alcohol habits in females (8), no lifestyle factors other than alcohol habits were included in the study. Lifestyle-related factors could link together and even though lifestyles are not easy to be all-inclusively assessed, studies with a simultaneous evaluation of some lifestyles should be promoted. With these principles in mind, the current study was aimed to determine which lifestyle factors were associated with serum adiponectin concentrations in the general Japanese female population.

Subjects and Methods

A total of 311 asymptomatic community-dwelling Japanese females between the ages of 21 and 80 years (mean age 53.8 ± 13.4 years) were recruited during a health check-up. Eligible subjects were taking no medications and had no known history of diabetes, renal disease, hepatic disease, coronary artery disease, and other vascular diseases. All subjects had consistent lifestyle habits. None reported that they had recently experienced a significant body weight change (±5% when subjects were asked if their current body weight had been maintained during the last year). This information was obtained with the assistance of trained medical interviewers. The study was approved by the Ethics Committee of Kyoto Medical Center.

Lifestyle factors were assessed with a self-reported questionnaire (followed by careful confirmation by trained medical interviewers), the Breslow's index (a well-known comprehensive index) comprised of seven habits: eating breakfast, eating between meals, smoking, alcohol intake, physical activity, sleep status, and weight maintenance (11) (to achieve more detailed data we modified the acceptable responses). The categories for each habit are described in Table 1. Regarding ''alcohol intake'', the amount is often expressed using the go (unit) in Japan. One go (180 mL or one traditional container) of Japanese sake (Japanese rice wine) contains 23 g of ethanol. One go corresponds to ~633 mL of beer (one large bottle), 240 mL of wine (two glasses), 70 mL of whisky (a double), or 120 mL of shochu (a distilled spirit made in Japan) (one unit). A nondrinker was defined as a subject who had never or had rarely drunk (<1 go/day on average). Overnight fasting serum adiponectin concentrations were measured by the ELISA kit (Otsuka Pharmaceutical Co Ltd., Tokyo, Japan).

The measured variables were compared between groups by Mann-Whitney U test or ANOVA followed by the Tukey post-hoc test. The simple correlation between variables was analyzed using Spearman's rank correlation test. Furthermore, a partial correlation analysis was performed to assess the adjusted influences of each lifestyle factor (as independent variables) on adiponectin (as a dependent variable); $p < 0.05$ was considered significant.

Table 1. Subjects' characteristics of lifestyle factors

Parameters	Subject numbers in each category
Eating breakfast	
Never	16
Occasionally	17
Always	278
Eating between meals	
Never	44
Occasionally	143
Always	24
Smoking status	
Current smoker	5
Ex-smoker	9
Nonsmoker	297
Alcohol intake (regardless of alcohol type)	
Nondrinker	284
1–3 go/day	27
≥3 go/day	0
Physical activity (defined as ≥30 min per session or equivalent)	
No activity	215
Several times monthly	16
Once a week	15
2–5 times a week	28
Everyday	37
Sleep status (h)	
≤5	18
6	70
7	110
8	97
≥9	16
Maintenance levels of body mass index	
<25 kg/m^2	233
25–30 kg/m^2	66
≥30 kg/m^2	12

Results

Table 1 listed data on the subjects' lifestyle factors. There were no abstainers, subjects who were alcohol-abusers, or heavy drinkers (consuming ≥3 go/day) in all of the studied females. In the population as a whole, mean serum adiponectin concentrations were 12.3 ± 6.6 μg/mL. The group of subjects drinking 1–3 go/day (n = 27, 15.0 ± 7.2 μg/mL) had significantly higher mean serum adiponectin concentrations than the nondrinking group (n = 284, 12.0 ± 6.5 μg/mL) (p = 0.026, Figure 1). According to body mass index (BMI) categories (<25, 25–30, ≥30 kg/m^2), the mean adiponectin concentrations were 12.7 ± 6.8 (n = 233), 11.6 ± 6.2 (n = 66) and 7.3 ± 3.4 (n = 12) μg/mL, respectively. The group in the <25 BMI category