No Relationship Between Body Mass Index During Adolescence and All-Cause Mortality in Japanese Women – A 56.5-Year Observational Study

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INTRODUCTION

It is well known that the body mass index (BMI) in adulthood is closely associated with subsequent mortality regardless of ethnic group (1, 2), including Asians (1). However, the association between BMI during adolescence and subsequent mortality has not been completely established (3-5). Also, previous studies, including the above-referenced reports, (3-5) were done only in Western countries with a predominantly Caucasian population. That there are no such reports from Asian countries despite vast ethnic differences in physical size and degrees of obesity led us to examine this issue in our extremely long-term cohort of Japanese women.

METHODS

From 1947 to 56, the height and weight of all 513 students (mean age, 16.5 [standard deviation (SD) , 1.3] years) who were attending the Ochanomizu University Senior High School, a typical high school located in the Tokyo urban area, had been measured by school nurses; from this information we calculated the BMI (weight [in kilograms]/height [square meters]) of these students. Vital status of the subjects was determined through records of the school's alumni association, and the follow-up rate was 97%. All analyses were performed by using the Statistical Package for the Social Sciences, version 15.0, for Windows (Chicago, IL).

RESULTS

A total of 513 subjects whose mean age was 16.5 years (SD, 1.3) and mean BMI was 20.2 (SD, 2.1) (range, 15.0-26.3) were followed up for a mean duration of 56.5 years (range, 3.3-61.2), comprising 29,130 person-years. Forty-three deaths occurred during the observational period. We calculated the relative risk of all-cause mortality by the Cox proportional hazard model and found that it was not significantly increased by an elevated BMI (1.01 [95% confidence interval: 0.85, 1.19]). Also, Kaplan-Meier analysis with log-rank testing did not reveal significant differences in cumulative all-cause mortality between subjects in each tertile of BMI (p=0.689; Fig. 1). Additionally, there were no

significant differences between subjects in each half, quartile, and quintile of BMI (data not shown).

DISCUSSION

Our results demonstrated that an elevated BMI in Asian female adolescents was not associated with long-term all-cause mortality. This result differs from studies of Caucasians that concluded that a high BMI in adolescence is predictive of adult mortality, such as reported by Engeland et al. and Hoffmans et al. (3, 5, respectively). The reasons for this difference in results are currently unclear; however, Asians in general have a lower BMI (6) but a higher percentage of body fat. Differences in distribution of body fat (7) exist between Asians and Caucasians, which might influence the impact of BMI on morbidity and mortality.

In terms of historical background of our cohort, the year 1947, when our cohort was formed, was during the immediate post-war period in Japan so the influence of this historical background needs to be considered. Our subjects included those over a rather long period from 1947-1956; thus, not all were living under conditions of deprivation and hardship. Actually, the mean BMI of Japanese women aged 17 years has remained consistently constant, at around 21, during the approximately 60-year period of the follow-up (8). Therefore deprivation or hardship had little influence on BMI in our subjects.

In addition, although the survival rate of our cohort, which was 91.6%, appears very high, it is quite close to that of age-matched Japanese women in the general population, which was reported to be 85.5% (9). These high survival rates for Japanese elderly women are quite normal, since Japanese women have the longest life expectancy in the world.

Although the number of subjects in our cohort was relatively small and only women attended the Ochanomizu University Senior High School, our observational period was 56.5 years, which was longer than in previous studies (3-5). Moreover, the follow-up rate of 97% was extremely high, considering the long follow-up period. Further investigations with longer observational periods from many ethnic groups might be

necessary before we can conclude that a high BMI in adolescence is predictive of longevity. Such a conclusion could have a profound psychological effect, such as leading to a depressive status or high-risk behavior among adolescents (10). Our current results demonstrated that a higher BMI in adolescence was not associated with long-term all-cause mortality. Therefore, we think that we should not put too much pressure on young people who are at their most sensitive stage in life to achieve what is considered a healthful and ideal weight.

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FIGURE 1.

Kaplan-Meier cumulative mortality curve for all-cause mortality during a long follow-up period according to the BMI level in 513 women. (Intertertile thresholds of BMI were 19.3 and 21.1)
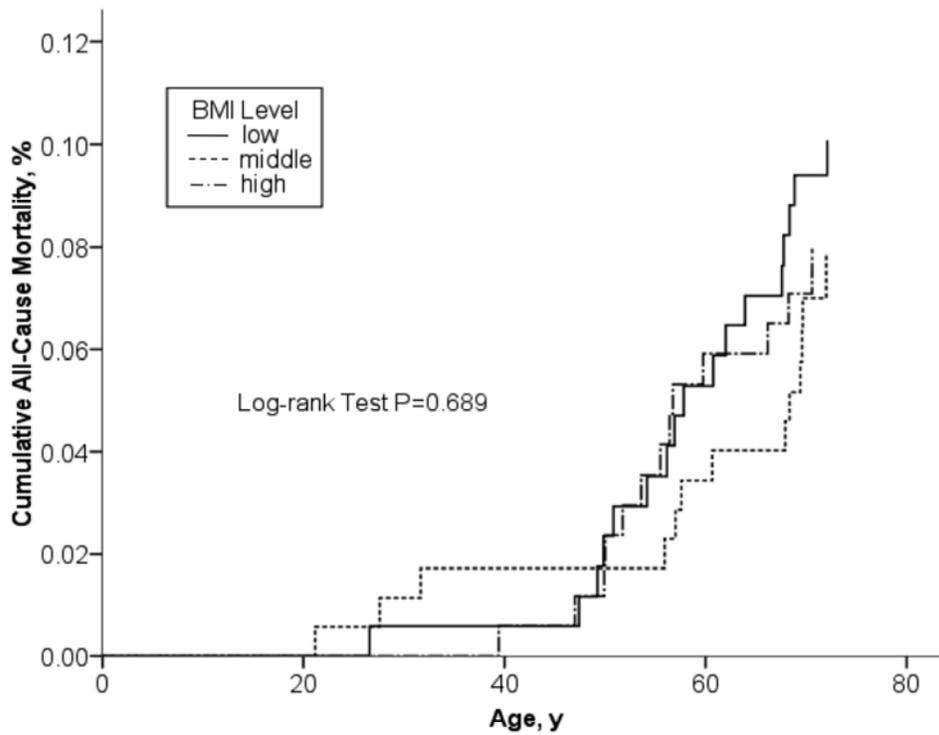
No. at Risk					
low	170	170	169	161	153
middle	174	174	171	168	161
high	169	169	168	159	156