Original Article

Epidemiology of obesity and public health strategies for its control in Japan

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Obesity has become a public health problem in Japan. The National Nutrition Survey (2000) showed prevalence of preobese (body mass index: 25–29.9 kg/m^2) and obesity (≥ 30 kg/m^2) was 24.5% and 2.3%, respectively, in males, and 17.8% and 3.4%, respectively, in females aged 20 years and over. Trends in prevalence of overweight in the last 25 years differed among age-sex groups and across residential areas. The most significant increase in overweight was observed in men in small towns, whilst there was a remarkable decrease in women in metropolitan areas. In the 10 year national plan for health promotion named 'Health Japan 21', maintaining appropriate body weight (obesity control and prevention of thinness brought about by dieting in young women) is a core component of the prioritized issues. Increasing the number of people who know their healthy body weight and practice weight control is also listed as an important objective. The proportion of people engaged in regular exercise for health and following the recommended average number of steps in daily life is a major indicator for evaluation of the program. We conclude that when formulating effective public health strategies for obesity control, it is important to consider each country's own situation related to obesity issues including the proper BMI cutoff point, which might be much different from that in western societies.

Key words: body mass index, epidemiology, Japan, national nutrition survey, obesity, public health policy.

Introduction

Obesity has been documented as a 'global epidemic' in recent years, leading to a large burden of diseases both in developed and developing countries.[1] With increasing prevalence of diabetes mellitus[2] and hyperlipidemia[3] not only medical professionals but also the general public in Japan have well recognized excess body weight as an important risk factor for these disorders.[4] The social concern about obesity or sense of values for one's body shape, on the other hand, might be very much influenced by some trends in 'fashion' in the community, apart from medical reasons. To understand both medical and social factors related to obesity would be very important for more effective and sustainable approaches to control the obesity epidemic in the community. In this paper, we review the epidemiology of obesity in Japan, its relevant lifestyle factors, and public health strategies for its control based on updated national data.

Epidemiological aspects of obesity in Japan

Cross-sectional data and criteria of obesity in Japan

Results from the National Nutrition Survey in Japan (NNS-J) in 2000[5] showed that the prevalence of preobese (body mass index [BMI]: 25–29.9 kg/m^2) and obesity (≥ 30 kg/m^2) was 24.5% and 2.3%, respectively, in males, and 17.8% and 3.4%, respectively, in females aged 20 years and over. Although the fraction of the population of obese adults is quite low compared with western societies and some other Asian countries, the prevalence of overweight (preobese and obesity) reached one-fifth or one-fourth of Japanese adults.[6] Cross-sectional studies of Japanese adults indicated the significantly increased risks for comorbidities such as hypertension, dyslipidemia, and diabetes mellitus even at a relatively low level of BMI 24–25 kg/m^2 when compared with a reference value of 22, as reported in other Asian populations.[7–11] On the basis of epidemiological and clinical data, the Japan Society for the Study of Obesity established new clinical criteria for obesity that needs medical care.[12] According to this guideline, the 'disease of obesity' is defined as high BMI ≥ 25 kg/m^2 when accompanied with related diseases such as diabetes mellitus, dyslipidemia, hypertension, hyperuricemia, coronary heart disease, cerebral infarction, sleep apnea syndrome, fatty liver, orthopedic diseases, and menstrual disorders, or as visceral fat obesity (visceral fat area ≥ 100 cm^2) diagnosed by abdominal CT.[12] There has been a lot of discussion in recent years on lowering cutoff points of BMI in Asian populations to diagnose excess body fat in a more appropriate way.[13–15] However, when using mortality data instead of comorbidity as endpoints of epidemiological observations, a recently published cohort study showed that the lowest risk for all causes of mortality in Japanese middle-aged men is at a BMI level of 23–24.9 kg/m^2.[16] Further research and extended analyses on epidemiological data are necessary to formulate more appropriate and evidence-based cutoff points of BMI in Japan.

Changes in prevalence of obesity in Japanese adults

In spite of the controversy on the BMI cutoff points both within and outside the country, many of the recently published articles on epidemiology of obesity in Japan use the BMI cutoff point of 25 to describe the prevalence of 'obesity' or 'overweight', including the annual reports of NNS-J.[4,5] Our latest publication on trend of obesity in Japanese adults using the NNS-J data showed the 20 year changes in mean BMI and the prevalence of overweight and obesity from 1976 to 1995.[17] In this paper we present the updated figures covering the recent 25 years up to 2000 from the same survey data. Details in the survey subjects and methods for data analyses were shown in the previous papers.[6,17] Briefly, mean values of BMI and prevalence of overweight were calculated for five periods (1976–80, 1981–85, 1986–90, 1991–95, and 1996–2000) by age groups and by residential areas (metropolitan areas, cities, and small towns) to diminish the fluctuation of the figures from single-year data. To evaluate magnitude of increasing (or decreasing) trends in mean BMI and the rate of overweight, a general linear model and a multiple logistic model were used to obtain an increment of BMI (kg/m^2 per 10 years) and an odds ratio for the prevalence of overweight for + 10 years, respectively.

Figs 1 and 2 illustrate the changes in prevalence of overweight (BMI ≥ 25 kg/m^2) by age groups and by residential areas in both sexes, respectively. Table 1 is a summary of changes in BMI and the prevalence of overweight in each group. As already discussed in the previous paper the most significant and interesting point is the difference in trends across residential areas; that is, the very prominent increasing trend in overweight among males in the rural populations and the significant decrease in overweight among females in the metropolitan areas.[17] These urban-rural differences could be partly explained by lifestyle and social factors, which will be discussed below.

Lifestyles and social factors that may influence the changes of overweight and obesity

Dietary factors

The total energy intake in Japan has not increased; rather it has gradually decreased in the last 2–3 decades.[5,17,18] Higher proportion of fat intake is thought to be a risk factor for development of obesity although the hypothesis is still controversial.[19,20] The nutrition survey data showed the urban–rural differences in fat intake: a transition toward higher fat intake had emerged earlier in urban areas than in rural areas.[17] A catch-up increase in fat intake in rural areas was observed after the high economic growth period (1960–75), which might have caused the rapid increase in overweight in the rural areas.

Energy expenditures

The increase in overweight especially in men in rural areas could be explained by transitions of labour patterns and by the increasing use of automobiles. Although no data at a national level are available to describe the changes in physical activity, mechanization of agricultural and other manual labour, especially in men residing in rural areas, are thought as important factors for overweight.[17] One of the objective indicators that can be easily collected in field settings is the number of steps measured by a pedometer. The NNS-J has adapted a small step counter (DIGI-WALKER® Yamasa Co.) since 1992 to monitor the number of steps in a selected day of dietary records in the participants aged 15 years and over. Figure 3 shows the average number of steps by age and sex groups in the latest survey.[5]

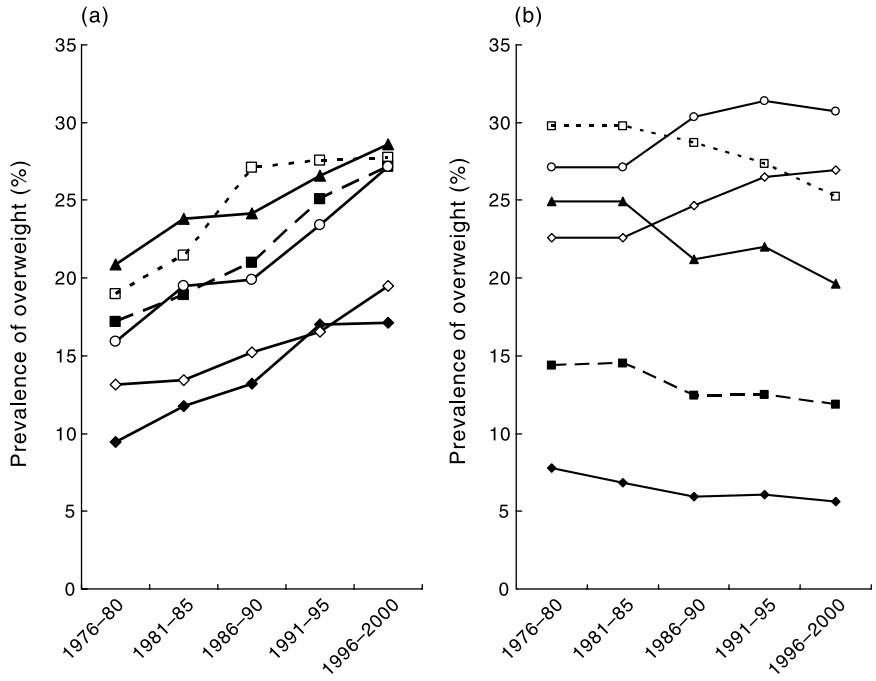

Figure 1. Changes in prevalence of overweight (BMI ≥ 25) by age and (a) male, (b) female. Modified and up-dated from National Nutrition Survey, Japan 1976–2000.[17] (◆) 20–29; (■) 30–39; (▲) 40–49; (□) 50–59; (○) 60–69; (◇) ≥ 70 years.

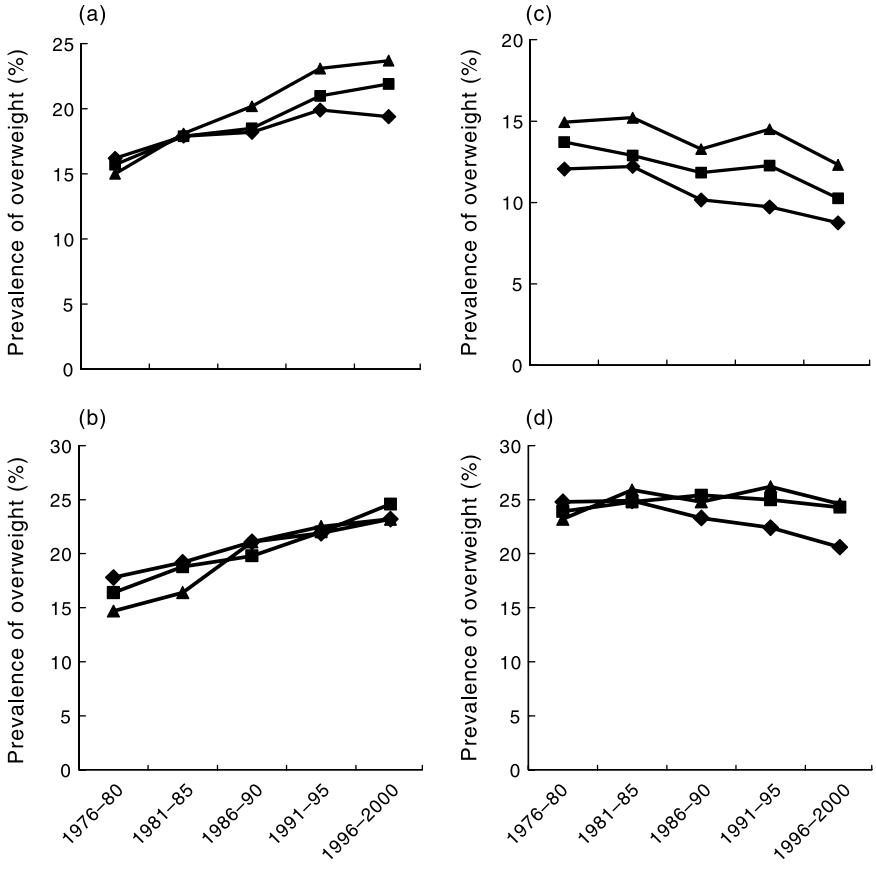

Figure 2. Changes in prevalence of overweight (BMI ≥ 25) by residential areas: (a) male 20–49 years; (b) male ≥ 50 years; (c) female 20–49 years; (d) female ≥ 50 years. National Nutrition Survey, Japan 1976–2000.[17] (*Updated on the published data)* (◆) Metropolitan; (■) cities; (▲) small towns.

Table 1. Changes in average body mass index (BMI) and prevalence of overweight of Japanese adults by age and sex groups and residential areas from 1976 to 2000.[17]*

	Changes in BMI (kg/m^2/10 years)†		Changes in prevalence of overweight (Odds ratio for +10 years)¶	
	Male	Female	Male	Female
Overall‡	+0.45 (+0.42 – +0.47)	−0.08 (−0.11 – −0.06)	1.32 (1.29 – 1.34)	0.95 (0.93 – 0.97)
Age (years)				
20–29	+0.38 (+0.32 – +0.44)	−0.31 (−0.36 – −0.25)	1.44 (1.36 – 1.54)	0.89 (0.83 – 0.97)
30–39	+ 0.44 (+0.39 – +0.50)	−0.27 (−0.32 – −0.22)	1.36 (1.30 – 1.24)	0.91 (0.86 – 0.95)
40–49	+0.35 (+0.29 – +0.40)	−0.25 (−0.30 – −0.20)	1.23 (1.18 – 1.28)	0.87 (0.83 – 0.90)
50–59	+0.50 (+0.44 – +0.55)	−0.05 (−0.10 – +0.01)	1.29 (1.24 – 1.35)	0.89 (0.86 – 0.93)
60–69	+0.55 (+0.49 – +0.62)	+0.28 (+0.21 – +0.34)	1.37 (1.30 – 1.45)	1.08 (1.04 – 1.12)
≥70	+0.52 (+0.45 – +0.60)	+0.30 (+0.22 – +0.37)	1.28 (1.19 – 1.38)	1.12 (1.07 – 1.18)
Residential area§				
20–49 years of age‡				
Metropolitans	+0.33 (+0.26 – +0.41)	−0.32 (−0.39 – −0.26)	1.21 (1.13 – 1.29)	0.82 (0.76 – 0.88)
Cities	+0.51 (+0.46 – +0.56)	−0.28 (−0.32 – −0.24)	1.32 (1.27 – 1.37)	0.89 (0.86 – 0.93)
Small towns	+0.46 (+0.40 – +0.53)	−0.18 (−0.25 – −0.12)	1.40 (1.32 – 1.48)	0.92 (0.87 – 0.97)
≥ 50 years of age‡				
Metropolitan	+0.39 (+0.30 – +0.48)	+0.02 (−0.07 – +0.11)	1.20 (1.11 – 1.29)	0.89 (0.84 – 0.95)
Cities	+0.38 (+0.34 – +0.43)	+0.15 (+0.09 – +0.20)	1.30 (1.25 – 1.36)	1.01 (0.98 – 1.05)
Small towns	+0.60 (+0.54 – +0.67)	+0.23 (+0.17 – +0.30)	1.41 (1.33 – 1.46)	1.06 (1.02 – 1.11)

* Updated on the published data; † Calculated by general linear models using the raw data from 25 points of observation (data are expressed as value (95% confidence interval)); ‡ Adjusted for age by multivariate model; § defined by the size of the municipality; ¶ calculated by logistic regression models (data expressed as value (95% confidence interval)).

Body image and 'desired' body weight

In the 1998 NNS-J several questions regarding perception of body weight and weight control were asked of the subjects aged 15 years and over.[21] Figure 4 illustrates the gaps between 'self-desired' and actual body weight, and 'self-desired' body weight expressed as BMI by age and sex groups. Women aged 15–39 years desired their body weight at a level of BMI below 20 kg/m^2, and the gaps between 'desired' and actual body weight were largest among the high teens and 40s. Around 20% of the women aged 15–39 years considered their body shape as 'obese' and 25–30% thought it to be 'slightly obese' [data not shown], even if the actual prevalence of overweight in these age groups was only around 10%. The desire to be thin especially in young women could be much influenced by social circumstances.[22] Such 'social pressure' can explain the particular phenomenon of decreasing BMI in young women observed in metropolitan areas, which should also be taken into consideration when considering public health strategies for obesity control at national levels.

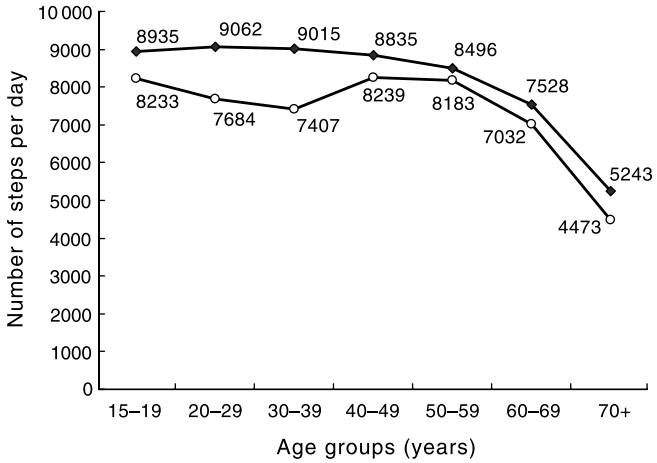

Figure 3. Average number of steps per day by age and sex groups: National Nutrition Survey, Japan 2000. (◆) Male; (○) female.

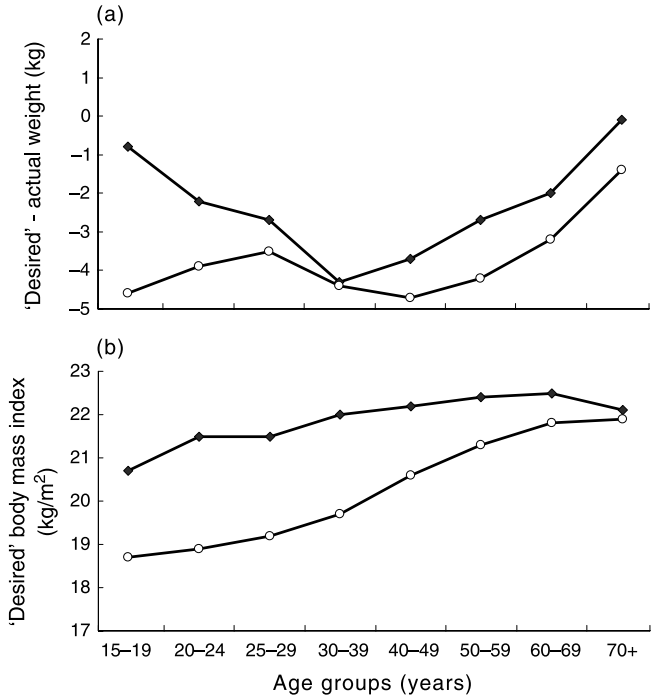

Figure 4. The gaps between 'self-desired' and actual body weight, and 'self-desired' body weight expressed as body mass index by age and sex groups: National Nutrition Survey, Japan 1998. (a) 'Desired' actual weight; (b) 'desired' BMI. (◆) Male; (○) female.

National plan for nutrition and physical activity

'Health Japan 21', a 10 year national plan for health promotion and disease prevention, was recently established by the Ministry of Health, Labour and Welfare.[23] This covers nine focus areas including nutrition and physical activity. In the area of nutrition, maintaining appropriate body weight, focusing not only on obesity control, but also on possible health hazard due to thinness by 'dieting' in young women, is a core component of the target issues to be achieved in the next 10 years. For example, the baseline figures on the prevalence of overweight of 24.3% in males aged 20–69 years and 25.2% in females aged 40–69 years are expected to reduce to < 15% and < 20%, respectively. To achieve these goals, increasing the number of people who know their healthy body weight and continue appropriate weight control was also listed as an important objective. Regarding promotion of physical activity, increasing the number of people engaged in regular exercise for health and increasing the average number of steps in daily life by 1000 steps per day, were selected as priority objectives. Following the establishment of plans at the national and prefecture levels, operational plans for action are in the process of preparation in cities, towns and villages, which have an essential role in providing health services directly to their residents.

Conclusion

When formulating effective public health strategies for obesity control, it is important to consider each country's own situation related to obesity issues, which might be significantly different from that in western societies. For example, the fact of increasing prevalence of thinness in young women would be a key issue in Japan when formulating reasonable and effective population approaches to combat the generally increasing trend of overweight. It is also important to establish, through research, the rationale and effectiveness of community (or school)-based approaches for obesity control in our own settings.

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