Chapter

Food Intakes and Correlations between Food Intakes and Body Mass Index (BMI) in Japanese Old Men, Women, and Male Medical Doctors

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Abstract

Objective; Obesity is an important health problem, leading to many metabolic diseases such as type2 diabetes mellitus, cardiovascular diseases, cancer. The are many diet proposals to combat obesity. Since obesity is relatively rare in Japan, we wante to know what kind of foods influence body mass index (BMI) in old Japanese people. METHODS; Healthy participants, old men and women and male medical doctors (MD) were given self-administered diet history questionnaires and described answers on each item by recollection of diets they took (7 days dietary recall). We used a brief-type self-administered diet history questionnaire (BDHQ) by using which the Japanese Ministry of Health, Labour and Welfare reports national Nutrition Surveys. From these questionnaires, we calculated the intakes of energy, carbohydrate, fat, protein or other foods. RESULTS; Me take more alcohol, salt fruit, beans than women. Intakes of major foods such as carbohydrate, lipid, and protein did not influence BMI in men and women. MD with higher BMI tend to take vegetables and fruits. MD may be more health concerned than lay people. CONCLUSION; within the range of foods intakes in Japan, no restriction of any food such as carbohydrate is not necessary for staying lean. Medical doctors seem to be very health concerned compared to lay people.

Keywords: carbohydrate, protein, lipid, cholesterol, DHA (docosahexaenoic acid), EPA (eicosapentaenoic acid), fish, glucose, insulin, BMI (body mass index),obesity

1. Introduction

A world wide obesity epidemic together with an increasing aging population threaten the health and functional independence of old adults [1]. Increase in obesity is reported in US or developing countries [2, 3].

In order to prevent an obesity epidemic, many weight-loss diets are proposed [4–6]. Low-carbohydrate, high-protein or high fat diets were compared with low-fat diets [7–11]. In fact, 4 weight-loss diets of low to high carbohydrate intake were compared [5]. Women assigned to follow the Atkins diet (high protein, low carbohydrate) showed a greater weight loss [5].

A Mediterranean diet (a moderate amount of fat and a high protein portion of monounsaturated fat) shows cardiovascular protective effects [12]. A recent review suggested that the Mediterranean diet was beneficial for weight loss [13, 14].

As stated later, the rate oof obese people is very low, in fact one of OECD countries with lowest obesity rate [15]. We have previously reported correlations between various foods intakes, plasma levels of amino acids or fatty acids in Japanese young and old men and women [16–19]. So it may be interesting to know what kinds of foods old Japanese men and women are taking and whether any kind of foods intake influence body mass index.

In the present article, we report about various foods intakes and their relationships to BMI in old Japanese men and women.

We also obtained data from od male medical doctors to know if there are changes in eating habits between lay people and men of a medical profession.

2. Ethics

This work has been approved by the Ethical committees of Showa Women's University and NPO (non-profit organization) "International projects on food and health" and has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for experiments.

3. Method

We asked male and female acquaintances older than 50 years old. Acquaintances mean that these participants are personal friends of our group member. We asked 1961 alumni of Keio University School of Medicine, who are class mates of one of the authors, A.Takada. The sample sizes and ages of participants are as follows. Acquaintances are older than 50 years old; men (n = 22, age; 61.8 ± 9.5) and women(n = 39, age; 67.4 ± 7.5) and medical doctors (MD) (n = 22, 79.6 ± 0.4). We did not ask premenopausal women to participate since data may be variable due to their hormonal influences so that sample sizes must be big to get statistically significant results. Dr. K. Matsuoka and K. Kato, who are internists, checked their health carefully and examined their blood samples then recruited them if there were no health problems such as diabetes, hypertension or not serious diseases experienced in the past. They did not smoke in the past. We also excluded people who took drugs for dyslipidemia, hyperglycemia, or hypertension. We collected blood samples early morning. Healthy participants were given self-administered diet history questionnaires and described answers on each item by recollection of diets they took (7 days dietary recall). We used a brief-type self-administered diet history questionnaire (BDHQ) by using which the Japanese Ministry of Health, Labour and Welfare reports national Nutrition Surveys. From these questionnaires, we calculated the intakes of energy, carbohydrate, fat, protein or other foods.

4. Statistics

The results are presented as means ± SEM. Statistical significance of the differences between groups was calculated according by one-way ANOVA. When ANOVA indicated a significant difference ($p < 0.05$) the mean values were compared using Tukey's least significant difference test at $p < 0.05$. Spearman's correlation tests were used to examine statistical significance.

5. Results

Table 1 shows that height, weight and BMI are smaller in old women than old men and MD. There was no difference in weight, height and BMI between lay men and MD.

Basic characteristics of participants and amounts of food intakes					
0		**①old men)**	**②male MD**	**③old women**	**significance**
		n = 22	n = 22	n = 39	p < 0.05
age		61.8 ± 9.5	79.6 ± 0.9	67.4 ± 7.5	①vs.②, ①vs.③, ②vs.③
height	cm	167.7 ± 6.7	165.3 ± 6.7	157.1 ± 5.8	①vs.③, ②vs.③
weight	kg	69.5 ± 12.8	65.4 ± 9.1	50.6 ± 6.8	①vs.③, ②vs.③
BMI	kg/m2	24.6 ± 3.7	23.9 ± 2.9	20.5 ± 2.5	①vs.③, ②vs.③
energy(kcal)	kcal/日	2247 ± 575	2282 ± 676	1941 ± 535	
protein	g/d	83.2 ± 29.1	89.2 ± 26.6	80.0 ± 27.3	
animal protein	g/d	48.8 ± 21.3	54.8 ± 22.8	47.4 ± 19.8	
vegetable protein	g/d	34.4 ± 10.2	34.4 ± 9.3	32.6 ± 10.9	
lipid	g/d	64.6 ± 20.7	68.2 ± 20.8	60.9 ± 20.9	
animal protein	g/d	31.0 ± 13.5	33.3 ± 13.5	29.0 ± 10.7	
vegetable lipid	g/d	33.6 ± 10.1	34.9 ± 9.9	31.9 ± 11.9	
carbohydrate	g/d	270.2 ± 70.6	281.7 ± 106.4	248.2 ± 76.9	
saturated fatty acid	g/d	16.8 ± 6.7	18.5 ± 6.3	16.3 ± 5.6	
monounsaturated fatty acid	g/d	23.4 ± 7.3	24.9 ± 8.0	21.6 ± 7.7	
poly unsaturated fatty acid	g/d	15.8 ± 4.8	15.5 ± 4.7	14.6 ± 5.3	
cholesterol	mg/d	459.3 ± 191.7	480.5 ± 178.2	440.4 ± 187.9	
soluble food fiber	g/d	3.5 ± 1.4	4.1 ± 1.4	4.0 ± 1.5	
insoluble food fiber	g/d	10.4 ± 4.1	11.9 ± 4.3	11.0 ± 4.1	
total food fiber	g/d	14.4 ± 5.6	16.6 ± 5.8	15.3 ± 5.7	
salt	g/d	13.1 ± 3.8	14.6 ± 4.4	11.5 ± 3.2	②vs.③
sucrose	g/d	17.0 ± 9.0	18.6 ± 12.7	15.1 ± 8.5	
alcohol	g/d	31.5 ± 27.5	24.5 ± 29.9	9.7 ± 16.5	①vs.③
n-3 fatty cid	g/d	3.3 ± 1.3	3.4 ± 1.3	3.1 ± 1.4	
n-6 fatty acid	g/d	12.4 ± 3.5	11.9 ± 3.6	11.4 ± 4.0	
grain	g/d	456.2 ± 161.8	368.0 ± 161.3	338.6 ± 171.6	①vs.③
potatoes	g/d	53.1 ± 44.0	73.7 ± 46.9	53.2 ± 41.3	
sucrose	g/d	7.6 ± 5.6	7.3 ± 6.1	5.1 ± 2.9	
beans	g/d	68.0 ± 51.0	50.1 ± 32.4	82.5 ± 59.3	
green, yellow vegetables	g/d	120.1 ± 91.0	175.8 ± 84.1	145.4 ± 75.7	
other vegetables	g/d	203.9 ± 105.6	241.9 ± 106.8	220.1 ± 117.5	
fruits	g/d	96.5 ± 73.2	221.6 ± 190.7	212.8 ± 115.9	①vs.②, ①vs.③
fish	g/d	97.1 ± 60.8	115.7 ± 66.4	94.0 ± 61.7	

meats	g/d	94.6 ± 45.7	96.8 ± 46.3	82.7 ± 34.1	
eggs	g/d	48.8 ± 35.8	41.7 ± 27.9	41.9 ± 27.1	
milk	g/d	123.1 ± 115.6	41.7 ± 27.9	169.7 ± 105.1	
oil	g/d	14.2 ± 5.3	11.4 ± 5.6	11.1 ± 5.8	
cakes	g/d	48.4 ± 31.6	67.1 ± 54.7	62.1 ± 43.1	
beverage	g/d	1005.4 ± 387.6	1082.5 ± 452.5	779.7 ± 429.9	②vs.③
spices	mg/d	313.4 ± 173.0	279.5 ± 156.5	222.0 ± 140.7	

Table 1.
Basic characteristics of participants and amounts of foods intakes.

Table 2 Correlations between foods intakes and BMI.

Men (lay or MD) take more salty foods than women. Also men drink more alcohol than women.

Table 2 shows that there was no correlation between energy, protein, carbohydrate, and lipid intakes and BMI.

Most interestingly, obese MD (high BMI) tend take vegetable protein, dietary fibers and green and yellow vegetables and fruits. Probably obese MD are more concerned about their health, So they intend to take more vegetables or fruits.

6. Discussion

The prevalence of overweight defined as body mass index (BMI) larger than 25 g/m^2 in adults increased from 21.5% in 1975 to 38.9% in 2016 [20]. Generally, people in the poor countries may be lacking nutritional foods, thus being less obese than people in the wealthier countries. However,,as national economic growth increases the prevalence of overweight and obesity shifted to people with lower personal wealth [21–23]. These shits result in increases in people suffering from cardiometabolic diseases and related conditions in poorer population.

Increase in the population of overweight or obesity in affluent countries such as USA have been suggested to be due to decreased physical activity and intakes of highly processed foods.

As stated above, many diet plans were proposed and examined. Among these, low carbohydrate-high protein diets and so called Mediterranean diet have been recommended [4–6].

Figure 1 shows comparisons of male and female BMI in various countries. As shown, People in wealthier countries do not necessarily have higher BMI. People in Tonga or Samoa in the pacific have unusually high BMI in men and women. Eating habits and genetics may count for this phenomenon. On the other hand people in North Korea or Nepar have very low BMI, possibly due to low intakes of nutritional foods.

Japan is one of the wealthiest countries, her GDP being third in the world. Never the less, Japanese men and women are very lean. BMI of men of Korea and China are in the same level with that of Japanese men, Chinese or Korean women have larger BMI compared with Japanese women.

Comparison of BMI among people in OECD countries, people in USA show one of the largest BMI. Countries of EU such as Germany, France, Checs show that BMI of people in these countries are between USA and most of Asian countries.

Our data indicate that changes in intakes of protein, carbohydrate or fata do not influence BMI. Thus within the range of eating habits no particular foods intakes being about obesity or slimness.

Correlation			
BMI vs. foods	**①old men (lay)**	**②old men(MD)**	**③old women**
	n = 22	n = 22	n = 39
energy	−0.097	0.268	0.125
protein	−0.070	0.251	0.158
animal protein	−0.040	0.081	0.125
vegetable protein	−0.116	0.517*	0.168
lipid	0.164	0.324	0.157
animal lipid	−0.001	0.235	0.066
vegetable lipid	0.338	0.361	0.216
carbohydrate	−0.141	0.243	0.073
saturated fatty acids	0.042	0.239	0.145
monounsaturated fatty acid	0.266	0.332	0.152
polyunsaturated fatty acids	0.172	0.361	0.190
cholesterol	0.230	0.247	−0.009
soluble dietary fiber	−0.066	0.621**	0.080
insoluble dietary fiber	−0.049	0.620**	0.161
total dietary fiber	−0.034	0.644**	0.136
salt	−0.088	0.366	0.203
sucrose	0.215	−0.121	0.022
alcohol	−0.179	−0.005	−0.024
n-3 fatty acids	0.038	0.197	0.196
n-6 fatty acids	0.218	0.379	0.181
grains	−0.205	0.073	−0.009
potatoes	−0.311	0.363	−0.047
sucrose	−0.258	−0.228	−0.037
beans	−0.261	0.272	0.289
green yellow vegetables	0.012	0.511*	0.095
other vegetables	0.082	0.481*	0.248
fruits	0.298	0.508*	−0.047
fish	−0.194	0.051	0.105
meats	0.119	0.183	0.125
eggs	0.356	0.365	−0.260
milk	−0.216	−0.270	0.082
oil	0.270	0.208	0.258
cakes	0.381	0.153	0.068
beverages	−0.111	0.124	0.130
seasonings, spices	−0.154	0.224	0.023

,$p < 0.05$,;$p < 0.01$.*

Table 2.
Correlation between BMI vs. various foods intakes in men and women.

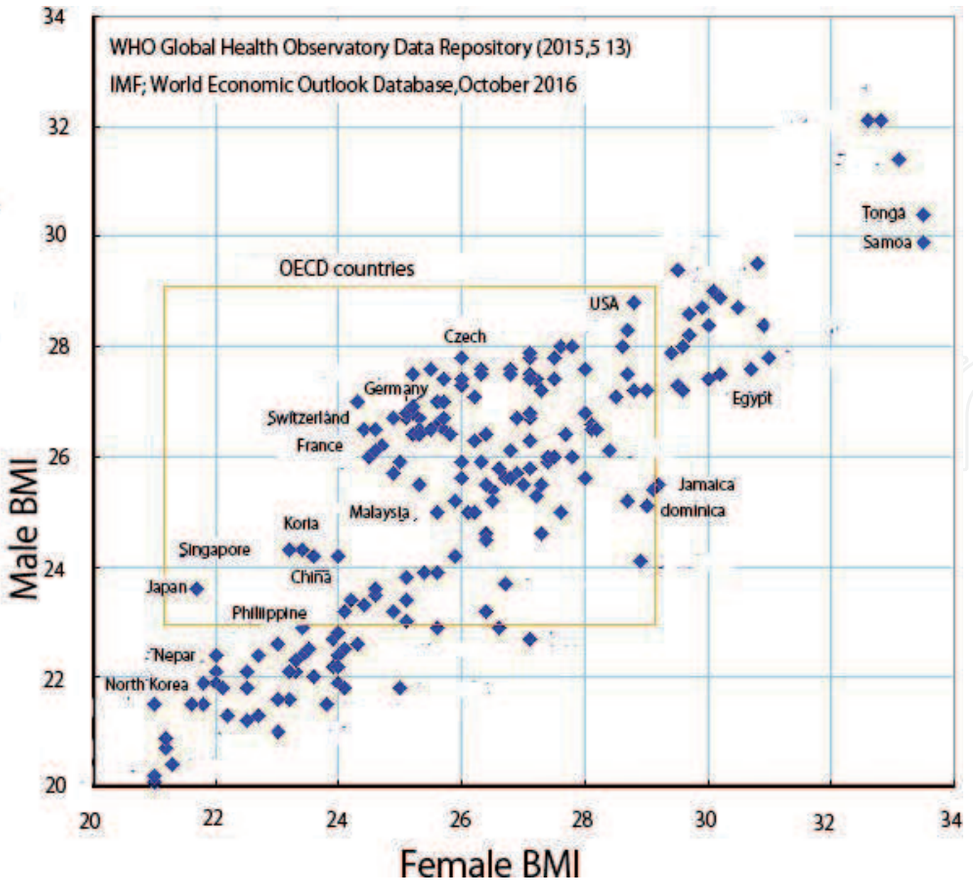

Figure 1.
BMI of male and female populations in various countries.

Japanese are very health concerned and are informed about various diet plans and their nutritional meanings by the media. So the amounts of foods taken by Japanese are in the range that a little change do not affect body weights.

There is a so-called Grant studies in which graduates of Harvard University were examined about their health, social status, or psychological or mental health for a long time [24]. We wanted to know whether medical doctors try to be healthier. As **Table 2** indicates there is no difference in weight, height or BMI between lay men and MD. In both groups, the amounts of energy, protein, lipid or carbohydrate taken did not affect BMI. However, MD, with higher BMI tend to take vegetables such as green-yellow vegetables or fruits. They may be quite concerned about keeping healthy.

We want to continue the study to know such differences are shown at the later age.

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