We are IntechOpen, the world's leading publisher of Open Access books Built by scientists, for scientists

6,300

Open access books available

172,000

International authors and editors

190M

Downloads

Our authors are among the

154

Countries delivered to

TOP 1%

most cited scientists

12.2%

Contributors from top 500 universities

WEB OF SCIENCE™

Selection of our books indexed in the Book Citation Index
in Web of Science™ Core Collection (BKCI)

Interested in publishing with us?
Contact book.department@intechopen.com

Numbers displayed above are based on latest data collected.
For more information visit www.intechopen.com

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

Akikazu Takada, Fumiko Shimizu, Yukie Ishii, Mutsumi Ogawa and Tetsuya Takao

Abstract

Objective; Obesity is an important health problem, leading to many metabolic diseases such as type2 diabetes mellitus, cardiovascular diseases, cancer. There are many diet proposals to combat obesity. Since obesity is relatively rare in Japan, we want 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;** Men 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 of obese people is very low, in fact one of OECD countries with lowest obesity rate [15]. We have previously reported correlations between various food 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 food intake influence body mass index.

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

We also obtained data from old 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 $\pm$ SEM. Statistical significance of the differences between groups was calculated according to 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
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/m² 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 shifts 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 Nepal 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.

Acknowledgements

Experiments were designed and performed by all of the authors. AT wrote a manuscript. Statistical analyses were done by FS. All authors read the manuscript and approved the final version. All the authors had responsibilities for the final content. AT is a chairman of NPO “International Projects on Food and Health”. The NPO is financially supported by people who agreed with the purpose of the organization and voluntarily donated for the project. Since no profit is obtained by the present research, there are no conflicts of interest, thus no conflicts of interest for any author. We are really grateful for 1961 alumni of Keio University School of Medicine for the contribution of the present works.

Financial support

This study was supported by grants by NPO “International Projects on Food and Health.

Author details

Akikazu Takada^{1*}, Fumiko Shimizu², Yukie Ishii², Mutsumi Ogawa² and Tetsuya Takao²

1 International Projects on Food and Health (NPO), Tokyo, Japan

2 Faculty of Human and Environmental Sciences, Showa Women's University, Tokyo, Japan

*Address all correspondence to: takada-1a@kmd.biglobe.ne.jp

IntechOpen

© 2021 The Author(s). Licensee IntechOpen. This chapter is distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/3.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

References

- [1] Flegal KM, Kruszon-Moran D, Carroll MD, Fryar CD, Ogden CL. Trends in obesity among adults in the United States, 2005 to 2014. *JAMA* 2016;315:2284-2291.
- [2] Ng M, Fleming T, Robinson M, Thomson B, Graetz N, Margono C, Mullany EC, Biryukov S, Abbafati C, Abera SF, et al. Global, regional, and national prevalence of overweight and obesity in children and adults during 1980-2013: a systematic analysis for the Global Burden of Disease Study 2013. *Lancet* 2014;384:766-781.
- [3] Amarya S, Singh K, Sabharwal M. Health consequences of obesity in the elderly. *J Clin Gerontol Geriatr* 2014;5: 63-67
- [4] Obesity: preventing and managing the global epidemic: report of a WHO consultation. *World Health Organ Tech Rep Ser* 2000;894:1-253. 2. Kuczmarski RJ, Flegal KM, Campbell SM, Johnson CL. Increasing prevalence of overweight among US adults: the National Health and Nutrition Examination Surveys, 1960 to 1991. *JAMA* 1994;272:205-211.
- [5] Poirier P, Giles TD, Bray GA, et al. Obesity and cardiovascular disease: pathophysiology, evaluation, and effect of weight loss: an update of the 1997 American Heart Association Scientific Statement on Obesity and Heart Disease from the Obesity Committee of the Council on Nutrition, Physical Activity, and Metabolism. *Circulation* 2006;113 :898-918
- [6] Gardner CD, Kiazand A, Alhassan S, et al. Comparison of the Atkins, Zone, Ornish, and LEARN diets for change in weight and related risk factors among overweight premenopausal women: the A TO Z Weight Loss Study: a randomized trial. *JAMA* 2007;297: 969-977. [Erratum, *JAMA* 2007;298:178.]
- [7] Brehm BJ, Seeley RJ, Daniels SR, D'Alessio DA. A randomized trial comparing a very low carbohydrate diet and a calorie-restricted low fat diet on body weight and cardiovascular risk factors in healthy women. *J Clin Endocrinol Metab* 2003;88:1617-1623.
- [8] Foster GD, Wyatt HR, Hill JO, et al. A randomized trial of a low-carbohydrate diet for obesity. *N Engl J Med* 2003;348: 2082-2090.
- [9] Stern L, Iqbal N, Seshadri P, et al. The effects of low-carbohydrate versus conventional weight loss diets in severely obese adults: one-year follow-up of a randomized trial. *Ann Intern Med* 2004;140: 778-785.
- [10] Yancy WS Jr, Olsen MK, Guyton JR, Bakst RP, Westman EC. A low-carbohydrate, ketogenic diet versus a low-fat diet to treat obesity and hyperlipidemia: a randomized, controlled trial. *Ann Intern Med* 2004;140:769-777.
- [11] Dansinger ML, Gleason JA, Griffith JL, Selker HP, Schaefer EJ. Comparison of the Atkins, Ornish, Weight Watchers, and Zone diets for weight loss and heart disease risk reduction: a randomized trial. *JAMA* 2005;293:43-53
- [12] Covas MI, Nyyssönen K, Poulsen HE, et al. The effect of polyphenols in olive oil on heart disease risk factors: a randomized trial. *Ann Intern Med* 2006;145: 333-341.
- [13] McManus K, Antinoro L, Sacks F. A randomized controlled trial of a moderate-fat, low-energy diet compared with a low fat, low-energy diet for weight loss in overweight adults.

Int J Obes Relat Metab Disord
 2001;25:1503-1511.

[14] Esposito K, Marfella R, Ciotola M, et al. Effect of a Mediterranean-style diet on endothelial dysfunction and markers of vascular inflammation in the metabolic syndrome: a randomized trial. *JAMA* 2004;292:1440-446.

[15] WHO global Health Observatory Data Repository (2015,5.15), IMFWorld Economic Outlook Database, October, 2016.

[16] Shimizu F, Ogawa M, Takao T, Ishii Y, Takada A. Correlations among Various Foods Uptakes and Body Mass Index (BMI) or Plasma Parameters. *Obes Open Access*. 2016, 2(3): doi <http://dx.doi.org/10.16966/2380-5528.123>

[17] Ishii Y, Shimizu F, Ogawa M., Takao T., Takada A. (2016) Gender differences in foods uptakes, glycemic index, BMI, and various plasma parameters between young men and women in Japan. *Integrated Foods, Nutrition and Metabolism* 2016, 3: 427-430. doi: 10.15761/IFNM.1000163

[18] Shimizu F, Ishii Y, Ogawa M, Takao T, Matsuoka K., Kato K., Takada A., Relationship between Various Food Uptakes and Body Mass Index (BMI) in Japanese Young and Old Men and Women. *J Clin Nutr Diet*. 2017, 3:2. DOI: 10.4172/2472-1921.100046

[19] Shimizu F, Ishii Y, Ogawa M, Takao T, Matsuoka K., Kato K., Takada A. Age and Gender Influence Differently on Various Foods Intakes, Body Mass Index (BMI), and Levels of Various Plasma Parameters in Young and Old Men and Women in Japan. 2017;*Obes Open Access* 3(3): doi <http://dx.doi.org/10.16966/2380-5528.134>

[20] NCD Risk Factor Collaboration (NCD-RisC) Worldwide trends in body-mass index, underweight,

overweight, and obesity from 1975 to 2016: a pooled analysis of 2416 population-based measurement studies in 128.9 million children, adolescents, and adults. *Lancet*. 2017; 390):2627-2642. [https://doi.org/10.1016/S0140-6736\(17\)32129-3](https://doi.org/10.1016/S0140-6736(17)32129-3) PMID: 29029897

[21] Dinsa GD, Goryakin Y, Fumagalli E, Suhrcke M. Obesity and socioeconomic status in developing countries: a systematic review. *Obesity reviews*. 2012; 13:1067-1079. doi:10.1111/j.1467-789X.2012.01017.x PMID: 22764734

[22] Deuchert E, Cabus S, Tafreschi D. A short note on economic development and socioeconomic inequality in female body weight. *Health economics*. 2014; 23:861-869. <https://doi.org/10.1002/hec.2968> PMID: 23873750

[23] Goryakin Y, Lobstein T, James WP, Suhrcke M. The impact of economic, political and social globalization on overweight and obesity in the 56 low and middle income countries. *Social Science & Medicine*. 2015; 133:67-76.

[24] Vaillant GE *Triumphs of experiences. The men on the Harvard Grant study.* The Belknap Press of Harvard University Press. Cambridge, Massachusetts, USA, 2012.