J Atheroscler Thromb, 2018; 25: 430-438.
http://doi.org/10.5551/jat.42226

Original Article

Usefulness of a Short Dietary Propensity Questionnaire in Japan

Nagako Okuda[1], Kazuyoshi Itai[2] and Akira Okayama[3]

[1]Department of Health and Nutrition, University of Human Arts and Sciences, Saitama, Japan
[2]Department of Nutritional Science, Morioka University, Morioka, Japan
[3]Research Institute of Strategy for Prevention, Tokyo, Japan

***Aim*: There is a growing need for nutritional education for prevention and non-pharmacological treatment of risk factors for cardiovascular diseases (CVD). We compared the results of a short dietary propensity questionnaire (SDPQ) with those from the food frequency and quantity survey (FF Quantity), which had been previously quantitatively assessed by comparison with the 24-hr dietary recall (24hr-DR), to examine the usefulness of the SDPQ. The SDPQ was designed to assess dietary propensities of 12 food/nutrients relevant to CVD risk factors.**

***Methods*: We conducted a dietary survey using the SDPQ on Japanese men and women. After 2−3 weeks, we conducted the FF Quantity survey with the same participants. For each of the 12 food/nutrient categories, the relationships between quintiles of results from the SDPQ and FF Quantity were examined. Results from 79 participants who completed both surveys were used.**

***Results*: Spearman's correlation coefficients (r) were significant for all food/nutrient categories. Good correlations were found with alcohol ($r=0.792$), starchy foods ($r=0.566$), and milk and dairy products ($r=0.687$), for which good correlations between the FF Quantity and 24hr-DR had been observed previously. Moderate correlations were found for vegetables ($r=0.386$) and high-salt foods ($r=0.505$), although the FF Quantity survey poorly correlated with the 24hr-DR.**

***Conclusion*: The SDPQ may be useful for assessment of dietary propensities for alcohol, starchy foods, and milk and dairy products in Japan.**

Key words: Cardiovascular disease risk factors, Dietary survey, Nutritional education, Japan

Introduction

Lifestyle modification has been found to be effective for both prevention and treatment of risk factors for cardiovascular diseases (CVD), which include elevated blood pressure, lipid disorders, impaired glucose tolerance (IGT), and obesity[1-4]. Assessment of habitual intake of relevant foods in individual patients is important to provide effective dietary advice on improving these risk factors[5], and dietary questionnaires are required for medical settings.

For this purpose, we developed the food frequency and quantity (FF Quantity) method questionnaire, which included 134 questions asking usual frequencies and usual portion sizes of foods generally consumed in the Japanese diet[6, 7]. Using this method, trained interviewers used portion-sized food models and utensils to estimate portion sizes. The interview lasted approximately 60 min, and data entry into the computer system required approximately 20 min. It was confirmed to be efficient for quantitative assessment of nutrient/food group intake[6]. However, its usage has been limited to specialized departments like diabetes outpatient centers where a registered dietitian imparts nutritional education, which is covered by health insurance because of the time and food models required.

A simplified dietary assessment method that can be easily employed in many health education settings, including internal medicine departments treating patients with hypertension or lipid disorders where a registered dietitian is unavailable or municipal governments giving health education programs, where time and space available for nutritional education is lim-

Address for correspondence: Nagako Okuda, Department of Health and Nutrition, University of Human Arts and Sciences, 1288 Magome, Iwatsuki-ku, Saitama, 339-8539 Japan
E-mail: okuda.nagako@gmail.com
Received: August 3, 2017
Accepted for publication: October 10, 2017

Table 1. Cardiovascular disease risk factors and nutritional advice to improve each risk factor

Risk factor	Nutritional advice
Hypertension	Excess intake should be avoided.
	High-sodium foods[9-13]
	Alcohol[10, 13-15]
	Inadequate intake should be avoided.
	Vegetables (potassium)[9, 10, 13, 16-18]
	Fruits (potassium)[9, 10, 13, 16, 17]
Lipid disorders	
Hyper LDL cholesterolemia	Excess intake should be avoided.
	Meat and eggs (SFA, cholesterol)[19-23]
	Milk and dairy (SFA)[19, 21, 22, 23]
	High fat sweets/snacks (SFA)[21, 23]
	Inadequate intake should be avoided.
	Fish and soy products (PUFA)[19-23]
	Vegetables (dietary fiber)[19, 21, 22, 23]
Low HDL cholesterolemia	Inadequate intake should be avoided.
	Fish and soy products (PUFA)[21, 23-25]
Hypertriglyceridemia	Excess intake should be avoided.
	Alcohol[21, 23]
	Inadequate intake should be avoided.
	Fish and soy products (PUFA)[21, 23, 24]
Impaired glucose tolerance	Excess intake should be avoided.
	High-calorie foods[28-30]
	Inadequate intake should be avoided.
	Vegetables (dietary fiber)[26, 30]
Obesity	Excess intake should be avoided.
	High-calorie foods[28, 29]
	Inadequate intake should be avoided.
	Vegetables (dietary fiber)[26]

LDL, low density lipoprotein; HDL, high density lipoprotein; SFA, saturated fatty acids; PUFA, polyunsaturated fatty acids

ited. For this purpose, we developed a short dietary propensity questionnaire (SDPQ) that included 40 questions regarding the intake frequency of 29 foods relevant to CVD risk factors.

Aim

In this study, we compared the results of the SDPQ survey with those of the FF Quantity survey, both performed with the same participants, to examine the usefulness of the SDPQ in assessing the propensity for habitual consumption of food/nutrients relevant to CVD risk factors for health education in Japan.

Methods

Study Procedure

A dietary survey using the SDPQ[8] was first performed for each participant. Participants filled in the questionnaire by themselves, and interviewers further checked the answers with the participant. The FF Quantity survey[6] was scheduled 2-3 weeks after the SDPQ survey. Participants were given the FF Quantity questionnaire at the end of the SDPQ survey. Trained interviewers confirmed the frequencies written for the FF Quantity and asked usual portion sizes. Answers to the two surveys were processed using the methods described in the method section.

The interviewers were registered dietitians, public health nurses, or nurses, and all received training for the two methods before the survey.

Table 2. Foods listed in the SDPQ

Foods	Number of questions	Example of portion size	High-calorie foods	High-sodium foods
Starchy foods				
Rice (breakfast, lunch, dinner)	3	A small bowl, a medium bowl, or a large bowl	x	
Bread	1	A slice (60 g)	x	
Noodles (Japanese/Chinese served with soup)	1	One serving	x	
Noodles (fried noodle, pasta)	2	One serving	x	
Potatoes and pumpkin	1	A small potato (100 g)	x	
Fish and soy products				
Fish without added salt	1	A piece (80 g)		
Salted fish	1	A piece (80 g)		x
Fish cake	1	Four slices		x
Soy products (tofu, fried tofu, boiled soy bean, etc.)	1	One-quarter loaf of tofu (100 g)		
Meat and eggs				
Meat (boiled, broiled)	2	One serving (80 g)		
Meat (stir-fried, deep-fried)	2	One serving (80 g)	x	
Ham, sausages	1	Two slices of ham (30 g)	x	x
Hen eggs	1	One egg		
Milk and dairy products				
Milk and yogurt	1	One cup		
Cheese, ice cream	1	A slice of cheese/half cup of ice cream	x	
Vegetables (excluding pickles)				
Vegetable dish (small sized)	1	Served in a small dish		
Vegetable dish (medium sized)	1	Served in a medium/large dish		
Between-meal eating				
Fruits	1	One banana, half an apple		
High fat sweets/snacks	1	One-quarter bag of chips, one piece of cake	x	
Low fat sweets/snacks	1	Three rice crackers	x	
Sugary beverages	1	A can	x	
Fats and oils				
Dishes with cooking fats/oils (deep-fried/pan-fried)	4	Single serving	x	
Mayonnaise/dressing	1	One tablespoon	x	
High-sodium condiments and dishes				
Soups (miso soup and other soup)	1	A bowl		x
Soup for noodles (Japanese/Chinese)	1	One serving		x
Flavored rice (sushi, rice bowl dish)	1	One serving		x
Japanese pickles	1	One small plate		x
Discretionary soy sauce	1	One tea spoon		x
Total	40			

SDPQ, brief dietary propensity questionnaire
The "x" in columns for "high-calorie foods" and "high-sodium foods" was added to note consumption points for high-calorie foods and high-sodium foods, respectively.

Participants

We invited men and women aged 40−74 years to participate in the survey in 2013 at two locations: Iwate prefecture and Tokyo. In Iwate prefecture, a local area in northeastern Japan, residents who attended a community health class were invited. In Tokyo, recipients of complete medical checkups at a medical institution located in a business district and employees of the institution were invited. We selected two areas with different characteristics; a local area where relatively older and retired persons could be recruited, and a business district where working persons could be recruited, assuming that the questionnaire would be used at different settings for nutritional education.

Written informed consent was obtained from all the participants. The ethical committee of the First

Table 3. Median (IQR) for intakes of the 12 foods/nutrient categories obtained from the SDPQ and FF Quantity method (n=79)

Food/nutrient category	SDPQ			Food/nutrient category	FF Quantity method		
	(unit)	Median	(IQR)		(unit)	Median	(IQR)
Starchy foods	(Pts/wk)	46	(38−53)	Starchy foods	(g/day)	412	(327−524)
Fish and soy products	(Pts/wk)	13	(9−20)	Fish and soy products	(g/day)	170	(137−254)
Meat and eggs	(Pts/wk)	18	(13−23)	Meat and eggs	(g/day)	92	(68−133)
Milk and dairy products	(Pts/wk)	6	(3−10)	Milk and dairy products	(g/day)	196	(87−258)
Vegetables	(Pts/wk)	10	(6−16)	Vegetables	(g/day)	309	(186−398)
Fruit	(Pts/wk)	4	(2−6)	Fruit	(g/day)	127	(69−221)
Fatty sweets and snacks	(Pts/wk)	1	(1−2)	Fatty sweets and snacks	(g/day)	8	(5−19)
Low fat sweets and snacks	(Pts/wk)	1	(1−2)	Low fat sweets and snacks	(g/day)	49	(18−128)
Sugary beverages	(Drinks/wk)	0	(0−2)	Sugary beverages	(g/day)	12	(7−21)
High-calorie foods	(Pts/wk)	31	(21−39)	Total energy	(kcal/day)	1972	(1677−2353)
High salt foods	(Pts/wk)	19	(14−25)	Salt	(g/day)	10.8	(8.7−13.1)
Alcohol	(go/wk)	0	(0−3)	Alcohol	(go/day)	0.0	(0.0−1.0)

IQR, interquartile range; SDPQ, brief dietary propensity questionnaire; FF Quantity, food frequency and quantity

Institute for Health Promotion and Health Care, Japan Anti-Tuberculosis Association approved the study protocol.

SDPQ

For the SDPQ, we defined five CVD risk factors that should be improved by nutritional education using this method: hypertension, lipid disorders, IGT, and obesity. The five risk factors with their corresponding dietary advice are listed in **Table 1**. We included dietary advice stating that increasing/decreasing food/nutrient intake would improve the risk factor level, for which evidence was provided in both cross-sectional and intervention studies, and included in guidelines[9-30]. We categorized foods that were to be enquired about in the SDPQ, such that healthcare providers may provide dietary advice using the results of the SDPQ. The basic structure of food categorization used in the FF Quantity[6] was used for the SDPQ, but some of the food categories in the FF Quantity were consolidated in the SDPQ.

Food items to assess food/nutrients in **Table 1** are listed in **Table 2**. Some foods were included to assess the consumption of high-calorie foods and high-sodium foods. For high-calorie foods, we included foods associated with a higher proportion of fat intake (%kcal) and elevated body mass index in epidemiological studies[28, 29]. For high-sodium foods, we included foods with a higher contribution to sodium intake in the Japanese diet[31, 32]. Examples of portion sizes shown in the SDPQ were determined by referring to the common portion sizes from our previous study using the FF Quantity method[6].

In the survey, participants were asked to answer their usual frequencies of consuming specific foods over the past month by selecting one of the options provided. The options were “do not eat,” “less than once a week,” “two to three times a week,” “four to five times a week,” “six or more times a week,” and “two or more times a day.” Foods were presented in general portion sizes (i.e., “one bowl” for rice, “one cup” for beverages, “a piece” for fish, “one tablespoon” for mayonnaise and dressings, etc.). Several utensils (rice bowls, bento boxes, plates and cups of different sizes) were used to recall their usual portion size with interviewers. If the general portion size posed in the questionnaire was larger or smaller than the usual portion size for the participant, the interviewer reselected the frequency accordingly, i.e., lower frequency was reselected if the participant’s portion size was smaller, and higher frequency was reselected if the portion size was larger.

A calculation table was prepared for interviewers to organize the answers to the SDPQ. Using the table, frequencies per week were assigned to the chosen frequency options; i.e., 0 for “do not eat,” 1 for “less than once a week,” 2 for “ two to three times a week, 4 for “four to five times a week,” 6 for “six or more times a week,” and 14 for “two or more times a day.” Decimals for the frequency were avoided to avoid complex calculations that would require a calculator. Then, the frequencies were multiplied by coefficients prepared for each food question in the calculation table; i.e., 1 for vegetable dish (small size), and 2 for vegetable dish (medium size), and for other foods 1 corresponded to approximately 160 kcal, and for high salt foods 1 corresponded to approximately 1 gram to calculate consumption points per week (pts/wk). For alcoholic beverages, alcohol intake per day was estimated with the

Table 4. Spearman's correlation coefficients between quintiles by the SDPQ and FF Quantity method ($n=79$)

SDPQ (consumption points)	FF Quantity method (daily intakes)	Correlation coefficient	*P*
Starchy foods	Starchy foods	0.566	<0.001
Fish and soy products	Fish and soy products	0.413	<0.001
Meat and eggs	Meat and eggs	0.485	<0.001
Milk and dairy products	Milk and dairy products	0.687	<0.001
Vegetables	Vegetables	0.386	<0.001
Fruit	Fruit	0.578	<0.001
Fatty sweets and snacks	Fatty sweets and snacks	0.304	0.007
Low fat sweets and snacks	Low fat sweets and snacks	0.259	0.021
Sugary beverages	Sugary beverages	0.401	<0.001
High-calorie foods	Total energy	0.364	0.001
High salt foods	Salt	0.505	<0.001
Alcohol	Alcohol	0.792	<0.001

SDPQ, brief dietary propensity questionnaire; FF Quantity, food frequency and quantity

unit of "go" (180 ml of Japanese sake). Consumption point totals were calculated for the 12 food/nutrient categories (**Table 3**).

FF Quantity Method

The FF Quantity method was reported previously[6]. Briefly, the questionnaire included 134 questions. Participants were asked to fill in the frequency of each food over the previous month or two by themselves before the interview. The participant filled in the frequency, including times per day, week, or month, freely at his/her convenience. At the interview, trained interviewers confirmed the frequencies and enquired about usual portion sizes using food models (49 items) and standard utensils (11 items). Participants told their usual portion sizes, and the interviewer estimated the amount in a continuous manner in grams. Habitual intake of food groups were calculated by multiplying the portion size by frequency. Nutrient intakes were calculated using the nutrient composition table on food groups based on results from the INTERMAP Japan Study[33, 34].

Statistical Analysis

Participants who completed both SDPQ and FF Quantity surveys were included in the analysis. From the SDPQ survey, consumption points per week (pts/wk) for the 12 food/nutrient categories were calculated for each participant. Intake of the corresponding 12 food/nutrients per day was calculated using the FF Quantity method. Total energy (kcal/day) and salt (NaCl, g/day) intakes obtained using the FF Quantity method were used to compare with the consumption points for high-calorie foods and high-sodium foods in the SDPQ, respectively. Participants were grouped into quintiles according to the 12 SDPQ consumption points and 12 food/nutrient intakes obtained using the FF Quantity survey. For each food/nutrient category, the relationship between quintiles of SDPQ consumption points and food/nutrient intake by FF Quantity was examined using Spearman's correlation coefficients. Percentages of agreement within the same or adjacent quintile from the two surveys were also examined.

Statistical testing was two-tailed, with 0.05 indicating significance. SPSS v.21.0 for Windows (IBM Corporation, Chicago, IL, USA) was used throughout the analyses.

Results

Ninety-four persons; 69 persons in Iwate prefecture (28 men and 41 women, average age was 64.0 years for men and 64.6 years for women) and 25 persons in Tokyo (22 men and 3 women, average age was 56.0 years for men and 52.7 years for women) agreed to participate in the survey. Results from 79 participants; 57 participants in Iwate prefecture (21 men and 36 women, average age was 62.0 years for men and 64.8 years for women) and 22 participants in Tokyo (20 men and 2 women, average age was 50.7 years for men and 45.5 years for women) who completed the two surveys were included in the analysis. It took approximately 10 min to confirm the SDPQ for the participant and the interviewer. **Table 2** shows the median and interquartile range (IQR) for the 12 food/nutrient categories in the two methods. For starchy foods, the median (IQR) was 412 g/day (327−524) by the FF Quantity survey, and 46 pts/wk. (38−53) by the SDPQ; for meat and eggs, it was 92 g/day

Table 5. Percentage agreement within quintiles of 12 food/nutrient categories obtained from SDPQ and FF Quantity ($n=79$)

SDPQ (consumption points)	FF Quantity method (daily intakes)	Same quintile	Same or adjacent quintile	Opposite quintile
Starchy foods	Starchy foods	32%	73%	0%
Fish and soy products	Fish and soy products	29%	63%	3%
Meat and eggs	Meat and eggs	35%	68%	0%
Milk and dairy products	Milk and dairy products	42%	87%	0%
Vegetables	Vegetables	29%	75%	4%
Fruit	Fruit	39%	79%	0%
Fatty sweets and snacks	Fatty sweets and snacks	30%	63%	4%
Low fat sweets and snacks	Low fat sweets and snacks	22%	68%	4%
Sugary beverages	Sugary beverages	27%	71%	0%
High-calorie foods	Total energy	28%	57%	1%
High salt foods	Salt	39%	72%	1%
Alcohol	Alcohol	70%	90%	0%

SDPQ, brief dietary propensity questionnaire; FF Quantity, food frequency and quantity

(68−133) by the FF Quantity method, and 18 pts/wk (13−23) by the SDPQ survey.

Spearman's correlation coefficients between quintiles obtained by the two methods are shown in **Table 4**. Correlation coefficients were significant for all the food/nutrient categories. The correlation coefficients (r) were high for starchy foods ($r=0.566$), milk and dairy products ($r=0.687$), and alcohol ($r=0.792$).

Table 5 shows percentage agreement in the same quintile, same or adjacent quintile, and opposite quintile (Q1 from the SDPQ and Q5 from FF Quantity, and vice versa) of the 12 food/nutrient categories obtained with the two methods. For all the categories, more than half of the participants were classified in the same or adjacent quintiles. Few participants were grouped into the opposite quintile.

Discussion

The consumption points obtained from the SDPQ correlated with the food/nutrient intakes obtained using the semi-quantitative dietary questionnaire, the FF Quantity method.

In this study, we compared the results of the SDPQ survey with those from the FF Quantity survey but did not compare with those from detailed dietary surveys. **Table 6** shows the degree of correlation between results from 24-hr dietary records and the FF Quantity survey that we previously reported[6], and the results of the present study on the FF Quantity and SDPQ (**Table 4**). The correlation was considered good if the correlation coefficient (r) was ≥0.6, moderate if r was ≥0.3 but <0.6, and poor if r was <0.3. Differences in the degree of correlation among foods have also been reported in other previous studies in Japan, comparing the results of food frequency questionnaires (FFQs) and detailed dietary surveys[35].

In the current analysis, we found significant correlations between the results from the SDPQ and FF Quantity surveys for all foods/nutrients (**Table 4**), and few participants were categorized into the opposite quintile (**Table 5**). Most participants were categorized into a similar consumption rank for all foods/nutrients by both the SDPQ and FF Quantity surveys. However, this did not apply to all food/nutrients in the comparison of FF Quantity and 24-hr dietary recalls (**Table 6**). We found good/moderate correlations between the FF Quantity and 24-hr dietary recalls and between the FF Quantity and SDPQ for some foods such as starchy foods, milk and dairy products, and alcohol. For these foods, results from the SDPQ may be useful as a quantitative assessment. For foods with a poor correlation between 24-hr recalls and the FF Quantity, such as vegetables and salt, results from the SDPQ should be used only as a reference. Detailed questions on consumption of these foods must be asked to provide advice on nutritional education.

For use in nutritional education, we prepared a table indicating ranges of consumption points from the SDPQ corresponding to "excessive," "ordinary," "lower," and "insufficient" intake levels by each food/nutrient category for adult/elderly men and women[8]. In making the table, we referenced the median and IQR values of food intakes reported in the National Health and Nutrition Survey in Japan 2012[36] and nutritional guidelines[13, 37]. By applying the ranges to the results of the SDPQ for a patient, healthcare providers may view the propensity of his/her dietary habits (eg. higher meat and egg consumption, but lower fish and soy product consumption), and provide dietary

Table 6. Degree of correlation between results from four 24-hr dietary recalls and the FF Quantity, and between the FF Quantity and SDPQ

Four 24-hr dietary recalls and FF Quantity[6]		FF Quantity and SDPQ	
Cereals	Good	Starchy foods	Moderate
Fish and shellfish	Moderate	Fish and soy products	Moderate
Soy bean and soybean products	Poor		
Eggs	Moderate	Meat and eggs	Moderate
Meat	Poor		
Milk and yogurt	Good	Milk and dairy products	Good
Other dairy products	Moderate		
Vegetables	Poor	Vegetables	Moderate (Results should be used only as a reference)
Fruit	Moderate	Fruits	Moderate
Sweets and snacks	Moderate	Fatty sweets and snacks	Moderate
		Low fat sweets and snacks	Poor
		Sugary beverages	Moderate
Total energy	Moderate	Total energy vs. high-calorie foods	Moderate
Salt	Poor	Salt vs. high salt foods	Moderate (Results should be used only as a reference)
Alcohol	Good	Alcohol	Good

FF Quantity, food frequency and quantity
Poor, Spearman's correlation coefficient (r) < 0.3; moderate $0.3 \leq r < 0.6$; good, $r \geq 0.6$

advice to improve risk factor levels. Detailed questions are necessary and helpful in the educational interview for effective behavior modification, especially for foods with limited correlations on survey comparison, such as vegetables and salt.

When developing a FFQ, the foods that are frequently consumed by the general population are listed[38]. In Japan, the most existing FFQs were developed to assess baseline dietary characteristics of participants in cohort studies, and some were developed to assess certain nutrient/food intakes relevant to certain diseases[35], i.e., habitual calcium intake in a study on osteoporosis[39], for patients with diabetes mellitus[40], but few were developed for use in the education of CVD risk factors[6]. According to the review of 21 FFQs in Japan[35], the number of food items questioned in the FFQs ranged from 9 to 169, and six of them included more than one hundred questions. Many food items have to be assessed for cohort studies because beneficial or harmful foods may be discovered during follow-up. For nutritional education on CVD, assessment of food/nutrients with sufficient evidence for risk factors is adequate. Large numbers of questions may require more time to answer and confirm the answers, which may be significantly difficult for busy healthcare departments and elderly participants.

In 2008, Specific Health Checkups and Specific Health Guidance were enacted in Japan as stipulated by the Act on Elderly Health Care[41-43]. Under this system, health insurance providers across the country, municipal governments, and corporate health insurance societies are required to hold six month long health education programs to improve metabolic syndrome of the insured person based on the results of health checkups. In 2013, 759,982 untreated insured persons finished the Specific Health Guidance program provided by their municipal government or healthcare provider[44]. Hospitals and clinics also provide health education for their outpatients. Knowledge, techniques, and tools for effective health education among healthcare providers are needed.

Participants in the current analysis were elderly local residents in Iwate prefecture and middle-aged persons in Tokyo. Both participants and interviewers did not encounter any major difficulties in using the SDPQ, and comparisons of the SDPQ and FF Quantity surveys in the two settings yielded similar results (data not shown). The SDPQ has utility in both healthcare centers of municipal governments and internal medicine outpatient departments.

There are several limitations to this study. Although Japanese people consume a wide variety of foods, we consolidated the questions. This may have caused misclassification of foods, as well as underestimation of food/nutrient intakes. Participants were asked to answer their frequencies from a limited number of options, which may have caused misclassification during assessment. The SDPQ was not compared with

detailed dietary surveys, and the dietary propensities obtained using the questionnaire should be used as a guide for dietary modification for people who need improvement in CVD risk factors. The possibility of selection bias cannot be excluded because the participants were either at a community health class or a medical facility providing complete medical checkups. They may have been interested in diet, and the present findings may not fit with the general population in Japan.

Conclusion

The SDPQ may be useful for assessment of dietary propensities for alcohol, starchy foods, and milk and dairy products in Japan. Healthcare providers should make additional detailed questions to give advice regarding vegetables and salt to people who need improvement in CVD risk factors.

Acknowledgements

This study was supported by a Grant-in-Aid for Scientific Research (C) Grant Number 26460759 from the Ministry of Education, Culture, Sports, Science and Technology, Japan.

Conflicts of Interest

None.

References

1) Li J, Zheng H, Du HB, Tian XP, Jiang YJ, Zhang SL, Kang Y, Li X, Chen J, Lu C, Lai ZH and Liang FR: The multiple lifestyle modification for patients with prehypertension and hypertension patients: a systematic review protocol. BMJ Open, 2014; 4: e004920
2) Mannu GS, Zaman MJ, Gupta A, Rehman HU and Myint PK: Evidence of lifestyle modification in the management of hypercholesterolemia. Curr Cardiol Rev, 2013; 9: 2-14
3) Aguiar EJ, Morgan PJ, Collins CE, Plotnikoff RC and Callister R: Efficacy of interventions that include diet, aerobic and resistance training components for type 2 diabetes prevention: a systematic review with meta-analysis. Int J Behav Nutr Phys Act, 2014; 11: 2
4) Bassi N, Karagodin I, Wang S, Vassallo P, Priyanath A, Massaro E and Stone NJ: Lifestyle modification for metabolic syndrome: a systematic review. Am J Med, 2014; 127: 1242 e1241-1210
5) Kushner RF and Ryan DH: Assessment and lifestyle management of patients with obesity: clinical recommendations from systematic reviews. JAMA, 2014; 312: 943-952
6) Chiba N, Okuda N, Okayama A, Kadowaki T and Ueshima H: Development of a food frequency and quantity method for assessing dietary habits of Japanese individuals--comparison with results from 24hr recall dietary survey. J Atheroscler Thromb, 2008; 15: 324-333
7) Research Institute of Strategy for Prevention: Health Education Tools (in Japanese), Chishoku Standard version (Food Frequency Quantity method). http: //www.jrisp.com/service.html Accessed July 6th, 2017
8) Research Institute of Strategy for Prevention: Health Education Tools (in Japanese), Chishoku Smart version (Short Dietary Propensity Questionnaire). http://www.jrisp.com/service.html Accessed July 6th, 2017
9) Intersalt Cooperative Research Group: Intersalt: an international study of electrolyte excretion and blood pressure. Results for 24 hour urinary sodium and potassium excretion. Intersalt Cooperative Research Group. BMJ, 1988; 297: 319-328
10) Hermansen K: Diet, blood pressure and hypertension. Br J Nutr, 2000; 83 Suppl 1: S113-119
11) Miura K, Okuda N, Turin TC, Takashima N, Nakagawa H, Nakamura K, Yoshita K, Okayama A and Ueshima H: Dietary salt intake and blood pressure in a representative Japanese population: baseline analyses of NIPPON DATA80. J Epidemiol, 2010; 20 Suppl 3: S524-530
12) Aburto NJ, Ziolkovska A, Hooper L, Elliott P, Cappuccio FP and Meerpohl JJ: Effect of lower sodium intake on health: systematic review and meta-analyses. BMJ, 2013; 346: f1326
13) Japan Society of Hypertension: Guidelines for the Management of Hypertension 2014, Life Science Publishing, Tokyo, 2014
14) Marmot MG, Elliott P, Shipley MJ, Dyer AR, Ueshima H, Beevers DG, Stamler R, Kesteloot H, Rose G and Stamler J: Alcohol and blood pressure: the INTERSALT study. BMJ, 1994; 308: 1263-1267
15) Ueshima H, Ogihara T, Baba S, Tabuchi Y, Mikawa K, Hashizume K, Mandai T, Ozawa H, Kumahara Y, Asakura S and et al.: The effect of reduced alcohol consumption on blood pressure: a randomised, controlled, single blind study. J Hum Hypertens, 1987; 1: 113-119
16) Appel LJ, Moore TJ, Obarzanek E, Vollmer WM, Svetkey LP, Sacks FM, Bray GA, Vogt TM, Cutler JA, Windhauser MM, Lin PH and Karanja N: A clinical trial of the effects of dietary patterns on blood pressure. DASH Collaborative Research Group. N Engl J Med, 1997; 336: 1117-1124
17) Aburto NJ, Hanson S, Gutierrez H, Hooper L, Elliott P and Cappuccio FP: Effect of increased potassium intake on cardiovascular risk factors and disease: systematic review and meta-analyses. BMJ, 2013; 346: f1378
18) Hartley L, Igbinedion E, Holmes J, Flowers N, Thorogood M, Clarke A, Stranges S, Hooper L and Rees K: Increased consumption of fruit and vegetables for the primary prevention of cardiovascular diseases. Cochrane Database Syst Rev, 2013; 6: CD009874
19) Hu FB, Stampfer MJ, Manson JE, Ascherio A, Colditz GA, Speizer FE, Hennekens CH and Willett WC: Dietary saturated fats and their food sources in relation to the risk of coronary heart disease in women. Am J Clin Nutr, 1999; 70: 1001-1008
20) Weggemans RM, Zock PL and Katan MB: Dietary cholesterol from eggs increases the ratio of total cholesterol to

high-density lipoprotein cholesterol in humans: a meta-analysis. Am J Clin Nutr, 2001; 73: 885-891
21) Houston MC, Fazio S, Chilton FH, Wise DE, Jones KB, Barringer TA and Bramlet DA: Nonpharmacologic treatment of dyslipidemia. Prog Cardiovasc Dis, 2009; 52: 61-94
22) Nakamura Y, Okuda N, Turin TC, Fujiyoshi A, Okamura T, Hayakawa T, Yoshita K, Miura K and Ueshima H: Fatty acids intakes and serum lipid profiles: NIPPON DATA90 and the national nutrition monitoring. J Epidemiol, 2010; 20 Suppl 3: S544-548
23) Japan Atherosclerosis Society: Japan Atherosclerosis Society (JAS) Guidelines for Prevention of Atherosclerotic Cardiovascular Diseases 2012 (in Japanese), Japan Atherosclerotic Society, Tokyo, 2012
24) Stone NJ: Fish consumption, fish oil, lipids, and coronary heart disease. Circulation, 1996; 94: 2337-2340
25) Ho SC, Woo JL, Leung SS, Sham AL, Lam T and Janus E: Intake of soy products is associated with better plasma lipid profiles in the Hong Kong Chinese population. The Journal of nutrition, 2000; 130: 2590-2593
26) Anderson JW, Baird P, Davis RH, Jr., Ferreri S, Knudtson M, Koraym A, Waters V and Williams CL: Health benefits of dietary fiber. Nutr Rev, 2009; 67: 188-205
27) Okuda N, Ueshima H, Okayama A, Saitoh S, Nakagawa H, Rodriguez BL, Sakata K, Choudhury SR, Curb JD and Stamler J: Relation of long chain n-3 polyunsaturated fatty acid intake to serum high density lipoprotein cholesterol among Japanese men in Japan and Japanese-American men in Hawaii: the INTERLIPID study. Atherosclerosis, 2005; 178: 371-379
28) Peters JC: Dietary fat and body weight control. Lipids, 2003; 38: 123-127
29) Ueda H, Higashiyama A, Okayama A, Okamura T, Okuda N, Yoshita K, Saitoh S, Sakata K, Choudhry SR, Kadowaki T, Kita Y, Miura K, Nakagawa H, Watanabe M, Ueshima H and group Ir: Association of obesity and energy intake from fat in middle aged men, INTERMAP Japan Study (in Japanese). 2008;
30) Japan Diabetes Society: Practice Guidelines for the Treatment of Diabetes in Japan 2013 (in Japanese), Nankodo, Tokyo, 2013
31) Anderson CA, Appel LJ, Okuda N, Brown IJ, Chan Q, Zhao L, Ueshima H, Kesteloot H, Miura K, Curb JD, Yoshita K, Elliott P, Yamamoto ME and Stamler J: Dietary sources of sodium in China, Japan, the United Kingdom, and the United States, women and men aged 40 to 59 years: the INTERMAP study. J Am Diet Assoc, 2010; 110: 736-745
32) Okuda N, Okayama A, Miura K, Yoshita K, Saito S, Nakagawa H, Sakata K, Miyagawa N, Chan Q, Elliott P, Ueshima H and Stamler J: Food sources of dietary sodium in the Japanese adult population: the international study of macro-/micronutrients and blood pressure (INTERMAP). Eur J Nutr, 2017; 56: 1269-1280
33) Okuda N, Okayama A, Choudhry SR and Ueshima H: Development of an integrated food database as Japanese standard food table for International Cooperative Study on the Relation of Diet to Blood Pressure (INTEMRAP) (in Japanese). Japan Journal of Cardiovasuculta Desiase Prevention, 1997; 32: 124-129
34) Okuda N, Miura K, Yoshita K, Matsumura Y, Okayama A, Nakamura Y, Okamura T, Saitoh S, Sakata K, Ojima T, Turin TC and Ueshima H: Integration of data from NIPPON DATA80/90 and National Nutrition Survey in Japan: for cohort studies of representative Japanese on nutrition. J Epidemiol, 2010; 20 Suppl 3: S506-514
35) Wakai K: A review of food frequency questionnaires developed and validated in Japan. J Epidemiol, 2009; 19: 1-11
36) National Institutes of Biomedical Innovation, Health and Nutrition: The National Health and Nutrition Survey Japan, 2012 (in Japanese), Daiichi Shuppan, Tokyo, 2016
37) Ministry of Health, Labour and Welfare: Dietary reference intakes for Japanese, 2010 (in Japanese), Daiichi Shuppan, Tokyo, 2010
38) Willet W: Nutritional Epidemiology, third edition, Oxford University Press, New York, 2012
39) Uenishi K, Ishida H and Nakamura K: Development of a simple food frequency questionnaire to estimate intakes of calcium and other nutrients for the prevention and management of osteoporosis. J Nutr Sci Vitaminol (Tokyo), 2008; 54: 25-29
40) Yamaoka K, Tango T, Watanabe M and Yokotsuka M: Validity and reproducibility of a semi-quantitative food frequency questionnaire for nutritional education of patients of diabetes mellitus (FFQW65) (in Japanese). Nihon Koshu Eisei Zasshi, 2000; 47: 230-244
41) Kohro T, Furui Y, Mitsutake N, Fujii R, Morita H, Oku S, Ohe K and Nagai R: The Japanese national health screening and intervention program aimed at preventing worsening of the metabolic syndrome. Int Heart J, 2008; 49: 193-203
42) Hirakawa Y and Uemura K: No Improvement in Metabolic Health Condition of 40-74-year-old Rural Residents One Year After Screening. J Rural Med, 2013; 8: 193-197
43) Ministry of Health, Labour and Welfare: Specific Health Checkups and Specific Health Guidance 2008 (in Japanse). http://www.mhlw.go.jp/english/wp/wp-hw3/dl/2-007.pdf Accessed July 6th, 2017
44) Ministry of Health, Labour and Welfare: Specific Health Chechups and Specific Health Guidance, 2013 (in Japanese). http://www.mhlw.go.jp/bunya/shakaihosho/iryouseido01/dl/info03_h25_00.pdf Accessed July 6th, 2017