



Association of Consumption Frequency of Meals Consisting of Grain Dishes, Fish and Meat Dishes, and Vegetables Dishes with Satisfaction with Diet and Health Status Among Japanese People

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Abstract

Objective: To examine the association of the consumption frequency of well-balanced meals (comprising grain dishes, fish and meat dishes, and vegetable dishes) with satisfaction with the diet and health status.

Methods: In December 2019, a self-administered questionnaire survey on lifestyle was conducted for 295 local civil servants in a town of Aomori, Japan. Multivariate-adjusted logistic regressions were performed to compare satisfaction with the diet and health status among three groups (every day [daily], four to five days a week [frequently], three days or less in a week [occasionally]) based on the frequency of intake of well-balanced meals.

Results: Compared with participants who consumed well-balanced meals daily, participants who consumed well-balanced meals occasionally were less satisfied with the diet after adjustment for sex, age, smoking and drinking habits (odds ratio 0.28, 95% confidence interval: 0.09, 0.85). The association persisted after adjustment for BMI, hypertension, diabetes, and dyslipidemia. Compared with participants who consumed well-balanced meals daily, participants who consumed well-balanced meal occasionally had a higher risk of subjective health and dyslipidemia adjustment for sex, age, current smoking and drinking habits. These significant associations disappeared after adjustment for BMI.

Conclusion: The frequency of intake of well-balanced meals was associated with the degree of satisfaction of the diet.

Keywords: Grain Dish; Fish and Meat Dish; Vegetable Dish; Satisfaction with Diet; Health Status

Introduction

A Japanese-style diet consists of meals that include grain dishes, fish and meat dishes, and vegetable dishes. In Japan, Healthy Japan 21 (the second term) started in 2013. One of the goals of the nutrition and dietary habits included in Healthy Japan 21 is to increase the percentage of individuals who eat a balanced meal that includes these three types of dishes (designated as Japanese-style well-balanced meals, hereafter) more than twice a day every day [1]. The third basic plan for the promotion of shokuiku (food and nutrition education/promotion) also set a goal to increase the percentage of individuals who eat Japanese-style well-balanced meals more than twice a day every day [2].

According to a systematic review, consumption of Japanese-style well-balanced meals was related to adequate nutrient in-

take [3]. Studies using a scoring system to measure adherence the Japanese Food Guide Spinning Top showed that higher adherence scores, i.e., better meal balance, were associated with lower total mortality and lower mortality from cardiovascular disease [4,5]. In a cross-sectional study of Japanese elderly people, the frequency of consuming Japanese-style well-balanced meals were associated with the presence of ≥ 20 teeth [6]. A recent cross-sectional study also showed the inverse association between the Japanese-style well-balanced meal consumption and the risk of frailty in Japanese elderly people [7]. In another cross-sectional study of Japanese pregnant women, higher frequency of consuming the Japanese-style well-balanced meals were positively associated with subjective health, and satisfaction of the diet [8]. However, little is known about the association between the consumption of Japanese-style well-balanced meals and health status and dietary satisfaction among Japanese workers.

Approximately 60% of deaths among Japanese people are caused by lifestyle related disease such as hypertension, diabetes, and dyslipidemia [1]. Appropriate diet plays an important role in preventing lifestyle-related disease among Japanese workers. In this study, we clarify the specific dietary pattern for preventing lifestyle related disease.

Therefore, this study examined the association between the frequency of consuming Japanese-style well-balanced meals, health status, and the degree of satisfaction with the diet among local civil servants aged 20-65 years in a town of Aomori Prefecture.

Materials and Methods

In December 2019, a lifestyle survey using a self-administered questionnaire about frequency of Japanese-style well-balanced meals, lifestyle, satisfaction with diet, and health status was conducted on 295 local civil servants in a town of Aomori Prefecture. The participants were all civil servants 20-65 years of age working at the town. The participants consisted primarily of administrative works, clerical workers, and professional and technical workers.

A postal questionnaire with a cover letter explaining the research aim, a request for voluntary participation and the anonymity of the data and publication was sent to the participants through the personnel section of the local government department. The participants completed their questionnaires and returned them to the personnel section in sealed envelopes. Then, the researchers opened the envelopes, and the datasets were built.

This study was conducted under the control of the Safety and Health Committee of the local government, as a part of the annual health checkups regulated by the Industrial Safety and Health Law. All subjects participated voluntarily.

In this study, grain dishes were considered as those dishes that had rice, bread, or noodles as the main ingredients; fish and meat dishes were those that had meat, fish, eggs, or soybean products as the main ingredients; and vegetable dishes were those that had vegetables, potatoes, mushrooms, or seaweed as the main ingredients. Japanese people, including the participants in this study, mainly consumed milled rice as grain dish [9]. After explaining the definition of these three dishes, the frequency of consuming a Japanese-style well-balanced meal was self-reported in response to

the question "On how many days per week do you eat at least two meals with grain, fish and meat, and vegetable dishes?" using four semi-quantitative categories: "every day", "4-5 days/week", "2-3 days/week" and "< 1 day/week (almost none)". The question was similar to that used in Survey of Attitude toward shokuiku [10]. The above-mentioned frequency categories were created to allowed for logical cut points with enough participants (every day [daily], 4-5 days/week [frequently], ≤ 3 days/week [occasionally]).

A self-administered questionnaire was used to collect information on smoking status (current smoking, former smoking, no smoking), and frequency of alcohol intake (5-7 times/week, 3-4 times/week, 1-2 times/week, <1 time/day, and no drinking). Participants who responded drink alcohol at least 3 times/week were considered as habitual drinkers.

To assess the degree of satisfaction with the diet, a survey was conducted with the following question: "Are you satisfied with the daily diet?" and four categories of answers: "very satisfied", "fairly satisfied", "not very satisfied", and "not satisfied" [11]. In the analysis, "very satisfied" and "fairly satisfied" are summarized as "satisfied", and the other responses are grouped as "not satisfied".

Subjective health status was assessed through a survey by asking each participant the following question: "What do you think about your health condition?" They were instructed to select an answer from four categories: "very healthy", "well healthy", "not very healthy", and "unhealthy" [12]. In the analysis, "very healthy" and "well healthy" are summarized as "healthy", and the other responses are grouped as "unhealthy".

The question of medical history (hypertension, diabetes, and dyslipidemia) was posed in the following manner: "Have you been told your blood pressure is high in health checkups?", "Have you been told your blood sugar is high in health checkups?", and "Have you been told your cholesterol is high in health checkups?", respectively. Participants who answered "yes" to the question of medical history were considered as having with the disease. The body mass index (BMI) was calculated from the self-reported height and weight. Obesity was defined as BMI ≥ 25 kg/m² and thin as BMI < 18.5 kg/m², but only a few people in this study were thin (n = 8, 3.0%).

Of the 295 employees in the office, 268 (155 men, 113 women) responded, and the response rate was 90.8%. Among the 268 participants, we excluded those with missing data (n = 16). Finally, 252 participants (153 men, 99 women) were analyzed in this study.

Differences in mean age, BMI, lifestyle characteristics, satisfaction with the diet, and health status across the Japanese-style well-balanced meals frequency categories were evaluated using analysis of variance or chi-squared test. Logistic regression analysis was used to examine the association, with obesity, degree of satisfaction with diet, subjective health, and medical history of hypertension, diabetes, and dyslipidemia as objective variables and frequency of a Japanese-style well-balanced meals as the explanatory variable. The objective variable was 1 with obese, satisfied with the daily diet, health, and the medical history and 0 with the no medical history, no obese, no satisfied with the daily diet and unhealthy, respectively. The covariates in this study were known to be factors associated with satisfaction with the diet or health status in the existing literatures. The first model (model 1) was adjusted for sex and age. The second model (model 2) was adjusted for sex, age, current smoking and drinking habits. In subjective health and

degree of satisfaction, BMI, hypertension, diabetes, and dyslipidemia were further added in model 3. In hypertension, diabetes, and dyslipidemia, BMI was further adjusted in model 3. Models 1 to 3 estimated adjusted odds ratios and 95% confidence intervals (OR and 95% CI). IBM SPSS software version 26 (Japan IBM Ltd., Tokyo, Japan) was used for the analysis, and the significance level (P value) was set to 5% (two-sided test).

Results and Discussion

The 92 (36.5%) participants reported eating Japanese-style well-balanced meals daily, 73 (29.0%) participants reported eating a well-balanced meal frequently (4 - 5 days/week), and 87 (34.5%) participants reported occasional intake of well-balanced meals (0 - 3 days/week) (Table 1). Participants who reported a higher level of Japanese-style well-balanced meal intake were older. Participants who reported a higher level of Japanese-style well-balanced meal intake had lower proportions of current smoker, were satisfied with the diet, and participants who responded healthy. The frequency of Japanese-style well-balanced meal was not significantly associated with prevalence of obesity.

	Frequency of consuming Japanese-style well-balanced meals						P [†]
	daily (n = 92)		frequently (n = 73)		occasionally (n = 87)		
	Mean	SD	Mean	SD	Mean	SD	P [‡]
Age (years)	47.0	(12.0)	44.0	(12.9)	40.9	(11.9)	0.004
BMI (kg/m ²)	23.5	(3.5)	23.5	(3.8)	24.6	(3.6)	0.082
	n	%	n	%	n	%	
Men	52	(57%)	45	(62%)	56	(64%)	0.551
Current smoking	21	(23%)	23	(32%)	31	(36%)	
Former smoking	29	(32%)	8	(11%)	12	(14%)	0.005
No smoking	42	(46%)	42	(58%)	44	(51%)	
Habitual drinker	37	(40%)	27	(37%)	30	(34%)	0.729
Obesity (BMI ≥ 25.0 kg/m ²)	29	(32%)	21	(29%)	38	(44%)	0.099
Satisfaction with diet, satisfied	87	(95%)	64	(88%)	72	(83%)	0.045
Subjective health, health	71	(77%)	53	(73%)	51	(59%)	0.021
Hypertension	31	(34%)	23	(32%)	31	(36%)	0.860
Diabetes	16	(17%)	16	(22%)	19	(22%)	0.695
Dyslipidemia	38	(41%)	30	(41%)	44	(51%)	0.364
†Analysis of variance, ‡ chi-square test							
"Daily" indicated "every day", "frequently" indicated "4-5 days/week", and "occasionally" indicated "less than 3 days/week".							

Table 1: Participants characteristics according to frequency of consuming meals including grain, fish and meat, and vegetable dishes (frequency of consuming Japanese-style well-balanced meals).

Participants who occasionally consumed a Japanese-style well-balanced meal were less satisfied with their diet than who consumed a Japanese-style well-balanced meal daily, after adjustment for demographics, lifestyle covariances, and BMI (model 3, OR: 0.29; 95% CI: 0.09, 0.91) (Table 2). Compared with participants who consumed well-balanced meals daily, participants who occasionally consumed well-balanced meals had a higher risk of subjective health and dyslipidemia after adjustment for demographics, lifestyle covariances (subjective health in model 2, OR: 0.41; 95% CI: 0.21, 0.82; dyslipidemia in model 2, OR: 2.04; 95% CI: 1.04, 4.00). After further adjustment for BMI, the associations were attenuated and disappeared significant associations of frequency of consuming Japanese-style well-balanced meal with subjective health and

dyslipidemia (model 3).

In this study, we examined the association between the frequency of consumption of Japanese-style well-balanced meals, health status, and degree of satisfaction with the diet. After adjusting for sex, age, and smoking and drinking habits, participants who had a lower frequency of consuming Japanese-style well-balanced meals (less than three days/week) had lower diet satisfaction, lower subjective health, and higher prevalence of dyslipidemia than participants with a higher frequency of consuming Japanese-style well-balanced meals (every day). Similar results were obtained in terms of satisfaction with the diet after adjusting for BMI, hypertension, diabetes, and dyslipidemia.

	Frequency of consuming Japanese-style well-balanced meals							
	Daily			Frequently		Occasionally		Trend P
Obesity	Model 1	1	(reference)	0.88	(0.44,1.75)	1.78	(0.94,3.39)	0.077
	Model 2	1	(reference)	0.80	(0.39,1.64)	1.62	(0.84,3.14)	0.138
	Model 3	1	(reference)	0.83	(0.38,1.79)	0.52	(0.25,1.06)	0.067
Satisfaction with diet	Model 1	1	(reference)	0.39	(0.12,1.22)	0.25	(0.08,0.74)	0.011
	Model 2	1	(reference)	0.48	(0.15,1.53)	0.28	(0.09,0.85)	0.022
	Model 3	1	(reference)	0.47	(0.14,1.59)	0.29	(0.09,0.91)	0.031
Subjective health	Model 1	1	(reference)	0.79	(0.39,1.61)	0.42	(0.22,0.81)	0.010
	Model 2	1	(reference)	0.81	(0.39,1.68)	0.41	(0.21,0.82)	0.010
	Model 3	1	(reference)	0.83	(0.38,1.79)	0.52	(0.25,1.06)	0.067
Hypertension	Model 1	1	(reference)	1.02	(0.51,2.04)	1.48	(0.76,2.90)	0.252
	Model 2	1	(reference)	1.06	(0.52,2.15)	1.55	(0.78,3.07)	0.211
	Model 3	1	(reference)	1.05	(0.51,2.18)	1.41	(0.70,2.85)	0.334
Diabetes	Model 1	1	(reference)	1.50	(0.68,3.35)	1.73	(0.79,3.78)	0.172
	Model 2	1	(reference)	1.66	(0.72,3.85)	1.94	(0.85,4.42)	0.115
	Model 3	1	(reference)	1.67	(0.72,3.89)	1.80	(0.78,4.13)	0.167
Dyslipidemia	Model 1	1	(reference)	1.11	(0.56,2.18)	2.01	(1.04,3.87)	0.039
	Model 2	1	(reference)	1.11	(0.55,2.23)	2.04	(1.04,4.00)	0.036
	Model 3	1	(reference)	1.12	(0.56,2.27)	1.92	(0.97,3.79)	0.059
Model 1 includes sex and age.								
Model 2 includes model 1 + smoking, habitual drinking.								
Model 3 includes model 2 + BMI, hypertension, diabetes, and dyslipidemia (satisfaction with diet and subjective health); model 2 + BMI (hypertension, diabetes, dyslipidemia).								
"Daily" indicated "every day", "frequently" indicated "4-5 days/week", and "occasionally" indicated "less than 3 days/week".								

Table 2: Odds ratio and 95% confidence interval of satisfaction with diet, and health status according to frequency of consuming meals including grain, fish and meat, and vegetable dishes (frequency of consuming Japanese-style well-balanced meals).

Adjusted for sex, age, current smoking and drinking habits, BMI, the frequency of consuming Japanese-style well-balanced meals was positively associated with the degree of satisfaction with the diet. A cross-sectional study has shown that frequency of Japanese-style well-balanced meals was positively associated food diversity [13,14]. Food diversity was positively related to satisfaction with diet. in elderly people [15] and community-dwelling individuals with spinal cord injuries [16,17]. The participants who had higher frequency of Japanese-style well-balanced meals had also higher food variety. This is why higher frequency of Japanese-style well-balanced meals led to satisfaction with the diet.

In addition, the degree of the satisfaction with the diet is a variable of the quality of life (QOL) related to food [18]. An accumulative number of studies have shown that overall diet quality is positively associated with QOL. Findings from a cross-sectional study suggested that connections between the Mediterranean diet score and health related QOL [19]. A cohort study has demonstrated the influence of the Mediterranean diet score on mental and physical health related QOL [20]. Japanese-style well-balanced meal consumption may also be associated with QOL. The possible mechanisms underlying the impact of diet quality on QOL are explained via oxidative stress and inflammation [21]. Frequency of Japanese-style well-balanced meals was positively associated with intakes of vegetable and antioxidant nutrients such as vitamin C [22-24].

After adjustment for demographic and lifestyle covariates, the frequency of consuming Japanese-style well-balanced meals was positively associated with subjective health and inversely associated with dyslipidemia. Previous studies indicated that Japanese-style well-balanced meal intake was associated with higher intake of vegetables and dietary fiber [22-24]. Intake of vegetable and dietary fiber was reportedly associated with a lowered risk of dyslipidemia [25]. These nutritional characteristics of Japanese-style well-balanced meals may help prevent dyslipidemia.

However, when the BMI was further adjusted, the significant associations of Japanese-style well-balanced meals consumption with subjective health and dyslipidemia disappeared. Although the association between the frequency of consuming Japanese-style well-balanced meals and BMI and prevalence of obesity was not significant, BMI and prevalence of obesity increased when the consumption frequency of Japanese-style well-balanced meals decreased. Obesity is associated with subjective health [26] and dyslipidemia [27]. Thus, it was suggested that the association of con-

sumption frequency of Japanese-style well-balanced meals with subjective health and dyslipidemia can be mediated by obesity.

There were no associations of frequency of Japanese-style well-balanced meal with hypertension or diabetes. A possible reason is that the participants of this study were 20-64 years, which may have influenced the prevalence of hypertension and diabetes. The results of the Japan National Health and Nutrition Survey showed that the prevalence of hypertension and diabetes increased with age and the prevalence clarify after middle age [9]. Thus, a study with older participants may clarify the risk of hypertension and diabetes. Furthermore, the lower prevalence of hypertension and diabetes compared to dyslipidemia may have affected the association between Japanese-style well-balanced meal and the health status identified in the results.

This study has some limitations. First, it was a cross-sectional survey, and it is not possible to infer a causal relationship. Second, there is a possibility that participants with disease may have received nutrition therapy before the survey and thus have changed their dietary habits. Third, participants were selected from one town in Japan, rather than the entire country. The participants were also all from a workplace. Further studies from other regions in Japan are needed to clarify the effects of consumption of Japanese-style well-balanced meals on health status in the Japanese population. Fourth, data on the frequency of Japanese-style well-balanced meal were obtained from a non-validated questionnaire. No validated questionnaire has been designed to assess adherence to this well-balanced diet. For mixed dishes, some participants might not correctly recognize the grain dishes, fish and meat dishes, and vegetable dishes [28]. However, the question used in this study was similar to that used in the Survey of Attitude toward shokuiku [10]. Fifth, the answer of subjective health might be a mixture of physical and mental health. Finally, since the data used in this study are self-reported, the prevalence of diseases in this study may not match that defined using laboratory data. Finally, in this study we did not collect information about marriage. Satisfaction with diet is related to marriage [29]. So, the association between frequency of Japanese-style well-balanced meals and satisfaction with the diet were confounded by marriage.

Conclusion

This study concludes that the frequency of consuming Japanese-style well-balanced meals can be associated with the degree

of satisfaction with the diet. Further studies with an objective assessment of health status will be needed to further research in this area.

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Conflict of Interest

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