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Research Article

Factors Related to Change Staple Foods in "GENKI Study 2" Population

Sayuri Kodama[1], Shaw Watanabe[2]*, Tanji Hoshi[3] and Shoichi Mizuno[4]

[1]*Department of Food and Nutrition Science, Sagami Women's Junior College, Japan*

[2]*Lifescience Promoting Association, Asia Pacific Clinical Nutrition Society*

[3]*Tokyo Metropolitan University, Japan*

[4]*National Cancer Medical Research Center, East*

***Corresponding Author:** Shaw Watanabe, Life Science Promoting Association, Asia Pacific Clinical Nutrition Society, Japan.

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Abstract

Background/Aims: Brown rice has health benefits for health, but people who eat polished white rice are almost addicted to it, and it is difficult to substitute or add unpolished brown rice or other types of nutrient enriched rice to it. The purpose of this study was to clarify the factors of staple "rice change" for making evidence for implementation of dietary education.

Subjects and Method: The subjects were 5,329 ordinary Japanese residents who participated in the "*GENKI* Study 2" to clarify the association between rice intake and health in 2016. After six months, a second survey was conducted for asking the changes of dietary habit and health status. A copy of health check-up data were also asked to send to us. The number of correspondences 6 months later were 4,929 (90.3%) for survey and 1,076 provided laboratory data. We focused on the factors related to change staple foods, and analyzed by a logistic regression analysis.

Result: The number of rice "changed" group was 48 (8.7%) in males, and 52 (9.9%) in females. Significantly related factors to "rice change" in the second survey by the regression model were "blood triglyceride level≧150 mg/dl" (OR=2.03, 95% CI: 1.15-3.58), "fasting blood glucose level" (OR=1.02, 95% CI: 1.01-1.03), "women" (OR=1.99, 95% CI: 1.12-3.55), and "annual income" (OR=1.37, 95% CI: 1.03-1.82) with positive association, and "levels of physical exercise" were with negative association.

Conclusion: A part of the longitudinal study showed that people who changed polished rice to healthier rice were women, having preclinical laboratory data of hyperlipidemia and/or diabetes, and high annual income.

Keywords: Brown Rice; Health Check-Up; Socioeconomic Status; Longitudinal Study; Epidemiology; Nutrition

Introduction

Observational epidemiology studies suggest that higher whole grain intake is associated with lower risk of all-cause, cardiovascular, and cancer mortality [1,2], type 2 diabetes [3], and inversely associated with BMI [4], independent of other dietary and lifestyle factors. Moreover, a systematic analysis of dietary risks from studies of 195 countries also reported that 11 million deaths and 255 million in disability-adjusted life-years (DALYs) were attributable to the low intake of whole grain, fruits, and high intake of sodium [5]. The definition of whole grain has been shown that "the starchy endosperm, germ, and bran are present in the same relative proportions" [6]. It contains rich nutrients especially thiamin (vitamin B1), minerals, polyphenols and dietary fiber.

In the studies conducted in western countries, "whole grain" intake has been evaluated by mainly "whole wheat" of bread or pasta, according to their dietary customs. In our Asian countries, "rice" is a staple food. Japanese prefer to consume polished white rice and have very low prevalence of brown rice of whole gain, unpolished rice. Our previous study strongly suggested that brown rice intake could improve health condition and prevent obesity compared with a polished white rice intake [7]. Our study also reported that brown rice eaters of Japanese showed ideal body weight with good bowel movement, suggesting good intestinal environment, probably due to good composition of microbiota [8].

Reducing the risk for diabetes by replacing white rice with brown rice has been reported in interventional studies from various countries, where white rice is their main source of carbohydrate [9-11]. Pre-germinated brown rice in Japanese healthy adults [9], overweight Asian Indians [10], Nigerian Adults served four different types of brown rice's rate [11] were shown above relationships. However, people who eat a polished white rice are almost addicted to it, and it is difficult to substitute an unpolished brown rice for it.

Concerning the current public health strategy, notwithstanding, many countries revised their Food-based Dietary Guidelines [12] with the recommendation of whole grain in everyday meals, our Japanese one has not addressed it yet. It is recommended that "Eating enough grains such as rice and other cereals", not to mention about whole grain such as brown rice is very moderate.

Besides, grain consumption's ratio in carbohydrates has been reduced during the past 40 years in Japan (Figure 1) [13]. Especially when dealing with the percentage of rice consumption, "rice and rice products" has become under 50%. Much more intervention studies are needed to accumulate enough evidence to recommend consumption of brown rice of whole grain or other types of white rice, which have more health benefits than white rice, resulting in an increase of consumption of rice.

Figure 1: Trend of grain ration in carbohydrates consumption and its food component in Japanese.

Furthermore, it has become common knowledge that socioeconomic status (SES), i.e., income, educational levels, employment status, is a determinant of our health [14]. It has been also reported that diet quality has been determined by SES. From the results of 4-year follow up study for about 1.9 million subjects, high adherence to Mediterranean diet associated with 15% reduced cardiovascular disease risk was evident in highly educated subjects, but not in those of less educated. Similar relationships for household income [15]. Greater consumption of whole grain was associated with a healthier lifestyle and higher educational levels in adults [16]. Effective dietary education for substituting or adding an unpolished brown rice or other types of rich nutrient rice for it ("rice change") are implemented with consideration for many factors effect on "rice change".

Therefore, the purpose of this study was to find related factors, including SES factors, of the "rice change" behavior, gathering evidence for the implementation of an effective dietary education with appropriate stages to support people's sustainable well-being by healthy type of rice intake.

Methods

GENKI study 2

We have conducted a longitudinal study on dietary information and health status from December in 2016 to May in 2017 for residents in various part of Japan. Recruiting participants for the study was announced in a local magazine or pamphlets at their workplace. A total 5,459 people have participated in the survey from more than 30 workplaces concerning food or agriculture. The subjects were staff members and their family members from rice companies (19%), Agricultural Cooperative Associations (46%), restaurants, nutrition schools, etc., who lived in different areas of Japan.

As the longitudinal study's name "*GENKI* Study", in which abbreviation is "Genmai (brown rice) Evidence of Nutrition for Kenko (health) Innovation", this study was conducted to clarify the association of whole grain of brown rice intake and health-related factors [7].

The second survey was conducted six months later in 2017. The information from the health check-ups, which were carried out during the spring of 2015 to 2017 was sent from the participants. A total of 2,038 excluding missing data have been collected.

Analysis sample

In the baseline study, we had a total of 5,271 respondents excluding missing data of sex (n=3), age (n=4), dietary information (n=1), under 18 years old (n=117), and over 80 years old (n=63) from 5,329. In the second survey, a total of 4,929 participants responded (respondent's rate: 90.3%).

In the current study, we aimed to clarify the factors related to the dietary behavior of rice change. A total of 1,076 (550 men, woman 526, 18-79 years old), who ate white rice and did not mix other rice at baseline were analyzed, including the participants who had health check-ups information.

Types of rice intake and definition of "rice change"

In the baseline of the study, we asked two questions related to rice types as a staple food. The one was "What type of rice do you usually eat? (multiple answers were allowed)". The answers were 8 types of rice, i.e. "white rice", "semi-brown rice", "rice with the germ", "brown rice", "rice with mixed 16 grains", "low energy and rich nutrient white rice", "Wax-free brown rice" [17], and "the others". In addition, we asked "Do you usually mix another type of rice together?" The answers were "Yes" or "No". We have not provided special dietary advice to the participants for recommending their rice change.

In the second survey, we asked whether their type of rice that they usually ate had changed 6 months later, i.e. "Rice change". The answers were "Yes" or "No". If they chose "Yes", they selected from the 8 types of rice (multiple answers were allowed). We defined the group that changed or added other types of white rice six months later as "changed" group, and the other was defined "unchanged" group.

SES, health related factors

At the baseline study, we collected participants' sex, age, family structure (single), SES (employment, annual income), health-related factors (medical history, taking medicine, subjective health

(both baseline and second survey), subjective well-being comparing from last year, levels of physical exercise, sleeping hours, wake-up easily, supplement use, smoking, and alcohol consumption. etc.). Body mass index (BMI) was calculated by using the participants' declaration of height and weight. We made 4 categories of BMI, referring to BMI classification by WHO.

Health check-ups

Data was derived from health check-ups information, which participants have carried out by themselves. The main items were "fasting blood glucose levels", "blood triglyceride levels", and "systolic and diastolic blood pressure". We classified "blood triglyceride levels" into two groups, "≧ 150mg/dl" and under 150 mg/dl", categorizing "1" for "≧ 150mg/dl", and "0" for "under 150mg/dl", respectively".

Statistical analysis

We conducted logistic regression analysis to examine the association of "rice change" six months later and indicators which showed a single and significant relationship with the diet behavior of " rice change". Chi-squared Test (categorical variables), Kruskal-Wallis Rank Test (ordinal variables), and T-test (continuous variables) were used for examining its single relationship. The software for analysis was SPSS Statistics 24.0 (IBM) for Windows, and the level of statistical significance was set at P value < 0.05.

Ethical issue

The current study protocol has been reviewed and approved by Ethics Review Board of the Life Science Promoting Association (#002-2016). Signed agreement to participate in the study was collected at the first questionnaire survey. Each participant's data were given an ID number, and it was made anonymous to protect private data.

Results

Basic information of the participants

The properties of the surveyed items at baseline are shown by sex and group of "rice change" 6 months later in table 1. Subjects doe analysis were restricted to the participants who ate only white rice and did not mix other rice at baseline. The number of the groups was as follows: men (n=550) of "changed" group was 48 (8.7%), "unchanged" group was 502 (91.3%), whereas women (n=526) was 52 (9.9%) and 474 (90.1%), respectively. In men of the fifty years old group, the ratio of changing rice was 16.2%, which was the most frequent group than others. In both men and women, the highest composition ratio of rice types was about 20% for "mixed rice", i.e. adding other types of rice.

In men of the "annual income" categories, the ration of "changed" group, more than 4 million yen groups (4,000,000~8,000,000: 10.5%, more than 8,000,000: 13.2%) were significantly higher rate of changing rice types than the others, While, there were no significant differences among women's groups.

Health related factors

We examined the relationship between health-related factors and "rice change" six months later and showed the results in table 2. Despite insignificant relationship, the ratio of "changed" group's subjective health, "fairly poor" (12.1%) in men, and "poor" (33.3%) in women were most frequent of rice change six month later than the others. After six month later, their subjective health tended to become better. The ratio of "fairly good" (10.3%) in men, and "fairly poor" (16.7%) in women were highest, and the ratio of "fairly poor" (6.2%) in men and "poor" (0.0%) in women tended to decrease, albeit not significantly.

In men of the low exercising level of "sedentary work, moving by car" group, ratio of changing rice was 12.4%, which was the most frequent than others, significantly. While, in women of the high exercising level, "physical strength and vigorous exercise" group, ratio of changing rice was highest; 17.4%.

Health check-ups

In the men's "changed" group, fasting blood sugar levels (102.4, SD15.9) was significantly higher than those of the "unchanged" group (96.9, SD15.8) (Table 3). In the women's "changed" group, it had also a significantly higher level (93.7, SD10.9) than those of the "unchanged" group (89.6, SD10.3), In the men's "changed" group, the ratio of "≧ 150mg/dl" of the blood triglyceride level (13.6%) was significantly higher than "under 150mg/dl" group (7.4%), The same can be seen in the women's group; 20.6% and 9.1%, respectively.

Factors having an influence on "rice change"

We conducted the logistic regression analysis to examine whether "blood triglyceride levels ≧ 150mg/dl" and "fasting blood glucose levels", which were shown in single and significant relationship with the indicator of "rice change", were still significant after adjusting sex, age, BMI (Model 3), and those of health-related factors of smoking, alcohol, exercising level, and annual income (Model 4). Categories of reference of which odds ratio (OR) is 1 were shown in table 4.

We found out that the two indicators of health check-ups were shown to have significant positive relationships between rice change behavior 6 months later, after adjusting by sex, age, and BMI. In Model 3, OR (95%CL) of "blood triglyceride levels≧150 mg/dl" was 1.97 (1.13-3.41), and "fasting blood glucose levels" was 1.02 (1.00-1.03). Moreover, the final model (Model 4) showed significant OR for "blood triglyceride levels≧150 mg/dl"; 2.03 (1.15-3.58), "Fasting blood glucose level" 1.02 (1.01-1.03), "women"; 1.99 (1.12-3.55), and "annual income"; 1.37(1.03-1.82). On the other hand, there were some negative relationships of which OR were under 1, i.e. related to unchanged rice. Referencing for the exercising level of "sedentary work, moving by car", "working inside, household affairs, going outside"; 0.44 (0.26-0.75), "walking for

		Men (n=550)				P	Women (n=526)				P
		"Rice change" 6 months later					"Rice change" 6 months later				
		Changed (n=48)		Unchanged (n=502)			Changed (n=52)		Unchanged (n=474)		
		n	%	n	%		n	%	n	%	
Age group[a)]	18～19 years	1	12.5	7	87.5		0	0.0	0	0.0	
	20～29 years	0	0.0	33	100.0		4	8.0	46	92.0	
	30～39 years	3	3.1	95	96.9		10	10.3	87	89.7	
	40～49 years	12	8.1	136	91.9	**	13	9.5	124	90.5	n.s.
	50～59 years	27	16.2	140	83.8		13	9.9	118	90.1	
	60～69 years	5	7.5	62	92.5		8	9.5	76	90.5	
	70～79 years	0	0.0	29	100.0		4	14.8	23	85.2	
Family structure	Single	1	3.4	28	96.6	n.s.	5	13.2	33	86.8	n.s.
	Others	47	9.0	474	91.0		47	9.6	441	90.4	
Employment	Yes	47	9.6	443	90.4	n.s.	40	9.9	366	90.1	n.s.
	No	0	0.0	24	100.0		7	9.1	70	90.9	
Annual income[a)]	Under 2,000	0	0.0	21	100.0		2	5.0	38	95.0	
(thousand yen)	2,000～under 4,000	4	3.8	102	96.2	**	15	9.8	138	90.2	n.s.
	4,000～under 8,000	27	10.5	230	89.5		25	12.8	170	87.2	
	More than 8,000	16	13.2	105	86.8		8	8.7	84	91.3	
Medical history	Yes	30	10.3	261	89.7	n.s.	29	11.2	230	88.8	n.s.
	No	18	6.9	241	93.1		23	8.6	244	91.4	
Taking medicine	Yes	23	11.3	181	88.7	n.s.	20	12.1	145	87.9	n.s.
	No	25	7.3	319	92.7		32	8.9	327	91.1	
BMI	Under 18.5	0	0.0	13	100.0		3	6.3	45	93.8	
	18.5～under 25	39	10.1	348	89.9	n.s.	40	9.7	372	90.3	n.s.
	25～under 30	9	6.7	125	93.3		6	11.5	46	88.5	
	More than 30	0	0.0	13	100.0		3	25.0	9	75.0	

"Rice change" was defined as changing or adding other types of white rice six months later.
[a)]Kruskal-Wallis Rank Test was used, and Chi-squared Test was used for the others.
** P<0.01, n.s. P≧0.05

Table 1: Characteristics of the analysis participants according to the categories of "rice change".

7,000~8,000 steps everyday"; 0.27 (0.09-0.77) showed negative relationships.

Discussion

Factors having an influence on "rice change"

The current study aimed to explore the determinants of rice change in adult aged 18 and over, and elucidated that high blood triglyceride levels and fasting blood glucose levels, women, annual income, and low levels of physical exercise were related to "rice change" behavior. To the best of our knowledge, this would be the first study which was clarified the factors having an influence on "rice change". The novel points of our results were that the factors of changing type of rice were associated with unhealthy laboratory tests, i.e. unhealthy results of health check-ups or unhealthy life-style such as low levels of physical exercise. The results suggested that people who are likely in the preclinical stage of sickness would be able to change their dietary behavior more easily than those of the healthy people. It might become a target for an effective dietary education for intervention support. The observational studies reported that higher whole grain intake, including brown rice, has been associated with a lower risk of cardiovascular [1,2], Type 2 diabetes [3], and obesity [4-7], and some interventional studies for Type 2 diabetes [9-11]. It has been reported that brown rice-derived γ-oryzanol can act on the brain reward system [18]. The system is related to satisfaction of the meals, and it is attenuated in obese humans.

		Man (n=550)				P	Women (n=526)				P
		"Rice change" 6 months later					"Rice change" 6 months later				
		Changed (n=48)		Unchanged (n=502)			Changed (n=52)		Unchanged (n=474)		
		n	%	n	%		n	%	n	%	
Health related factors											
Subjective health[a)]	Good	7	6.5	100	93.5	n.s.	12	8.5	130	91.5	n.s.
	Fairly good	30	9.0	303	91.0		34	10.6	288	89.4	
	Fairly poor	11	12.1	80	87.9		3	5.7	50	94.3	
	Poor	0	0.0	18	100.0		3	33.3	6	66.7	
Subjective health[a)]	Good	4	4.6	83	95.4	n.s.	9	9.2	89	90.8	n.s.
(6 months later)	Fairly good	36	10.3	315	89.7		33	9.2	327	90.8	
	Fairly poor	6	6.2	91	93.8		10	16.7	50	83.3	
	Poor	1	7.7	12	92.3		0	0.0	7	100.0	
Subjective well-being	Fine	2	11.1	16	88.9	n.s.	1	4.0	24	96.0	n.s.
compearing from last year[a)]	Unchange	39	8.7	411	91.3		43	9.8	398	90.2	
	Poor	7	9.0	71	91.0		8	13.6	51	86.4	
Levels of physical exercise	Sedentary work, moving by car	38	12.4	269	87.6	**	24	13.6	152	86.4	n.s.
	Working inside, household affairs, going outside	6	5.0	115	95.0		22	7.7	262	92.3	
	Walking for 7,000〜8,000 steps everyday	2	2.4	80	97.6		2	5.1	37	94.9	
	Physical strength and vigorous exercise	2	6.1	31	93.9		4	17.4	19	82.6	
Sleeping hours[a)]	Under 6 hours	10	7.1	130	92.9	n.s.	23	12.7	158	87.3	n.s.
	6〜under 7 hours	26	9.2	256	90.8		22	8.1	250	91.9	
	7〜under 8 hours	10	9.2	99	90.8		5	8.3	55	91.7	
	More than 8 hours	1	6.3	15	93.8		2	15.4	11	84.6	
Wake-up easily[a)]	Yes	21	7.5	258	92.5	n.s.	25	10.9	204	89.1	n.s.
	Still feel fatigue	24	12.1	175	87.9		17	9.3	165	90.7	
	Hard to wake up	3	4.3	66	95.7		10	8.8	103	91.2	
Supplement use	Yes	6	6.2	91	93.8	n.s.	16	11.3	126	88.7	n.s.
	No	42	9.5	401	90.5		34	9.0	343	91.0	
Smoking	Never	16	8.7	168	91.3	n.s.	39	9.1	390	90.9	n.s.
	Used to smoke	21	11.6	160	88.4		8	13.1	53	86.9	
	Smorker	11	6.0	172	94.0		4	11.4	31	88.6	
Have an alcohol consumption	Yes	39	8.6	416	91.4	n.s.	35	10.8	288	89.2	n.s.
	No	8	8.5	86	91.5		17	8.4	185	91.6	

a)Kruskal-Wallis Rank and test was used chi-squared test was used for the others.

** $P<0.01$, n.s. $P \geqq 0.05$

Table 2: Relationship between health related factors in baseline study and categories of "rice change" six months later.

	Men (n=550)					Women (n=526)				
	"Rice change" 6 months later				P	"Rice change" 6 months later				P
	Changed (n=48)		Unchanged (n=502)			Changed (n=52)		Unchanged (n=474)		
	average	SD	average	SD		average	SD	average	SD	
Fasting blood sugar levels	102.4	15.9	96.9	15.8	*	93.7	10.9	89.6	10.3	*
Blood triglyceride levels	130.5	84.2	113.0	70.7	n.s.	79.5	56.2	79.0	53.1	n.s.
[a)] Under 150mg/dl (n, %)	32	7.4	400	92.6	*	45	9.1	447	90.9	*
[a)] More than 150mg/dl (n, %)	16	13.6	102	86.4		7	20.6	27	79.4	
Systolic blood pressure	122.6	17.3	122.1	15.2	n.s.	116.4	14.8	113.6	15.4	n.s

[a)] Chi-squared Test was used, and t-test was used for the others.
*P<0.05, n.s. P≧0.05

Table 3: Relationship between health check-ups and categories of "rice change" six months later.

	Model 1		Model 2		Model 3		Model 4	
	OR	(95%CI)	OR	(95%CI)	OR	(95%CI)	OR	(95%CI)
Blood triglyceride levels ≧ 150 mg/dl	1.96	(1.19 - 3.24)**			1.97	(1.13 - 3.41)*	2.03	(1.15 - 3.58)*
Fasting blood sugar levels			1.02	(1.01 - 1.03)**	1.02	(1.00 - 1.03)**	1.02	(1.01 - 1.03)**
Sex (ref: Men)					1.48	(0.94 - 2.33)	1.99	(1.12 - 3.55)*
Age					1.00	(0.99 - 2.33)	1.01	(0.99 - 1.03)
BMI					0.99	(0.93 - 1.06)	0.99	(0.92 - 1.06)
Smoking (ref: Never)								
Have smoked							1.15	(0.65 - 2.01)
Have been smoking							0.79	(0.40 - 1.56)
Have an alcohol consumption							1.05	(0.62 - 1.78)
Levels of physical exercise (ref: sedentary work, moving by car)								
Working inside, household affairs, going outside							0.44	(0.26 - 0.75)**
Walking for 7,000〜8,000 steps everyday							0.27	(0.09 - 0.77)*
Physical strength and vigorous exercise							0.93	(0.37 - 2.37)
Annual income							1.37	(1.03 - 1.82)*
Logistic regression analysis was used. OR: Odds ratio, CI: Confidence interval, ref: category of reference of which OR is 1, *P<0.05, ** P<0.01								
Annual income was categoried for 4 ordinal variable (thousand yen) : 1."under 2,000", 2."2,000〜under 4,000", 3."4,000〜under 8,000", 4."More than 8,000"								

Table 4: Odds ratio of "rice change" six months later.

On the other hand, the intervention studies do not consistently support the results from observational studies. There were no significant differences in any markers of cardiovascular risk between the groups by increasing whole-grain intake [19], and also brown rice consumption for 16 weeks does not substantially affect metabolic risk factors [20]. It was suggested that the study's design, which are constructed by grain's intake in quantity, intervention period, whole grains' type, and other factors, has not been established yet.

Moreover, our results showed that the participants' annual income of SES was related to "rice change" behavior. It is consistent with previous studies [16], which reported the relationship between greater consumption of whole grain and higher educational levels. Our previous study [21] showed that SES due to five years prior income indirectly determined the dietary quality and a five-year subjective health via emotional well-being. Therefore, to establish the programs for supporting healthier "rice change" behavior modification in public health strategy, a lot of factors not only its taste, but also their SES, physical health, psychological, and many more factors should be considered.

Recommendations strategy of unpolished brown rice or other types of nutrient rich rice

Asian countries, especially Japan, display an excellent technique of plant breeding to produce a good taste white rice after polishing. Even if people know its health benefits, it is difficult to substitute unpolished brown rice to polished white rice, which has been consumed traditionally. In our study's participants, the number of "rice change" was under 10% in both male and female.

It is suggested that we need a two-dimensional type of strategy; "dietary education" and "supportive environment". A Basic Direction for Comprehensive Implementation of Japanese National Health Promotion from 2013 to 2022 (the second term Health Japan [21,22] has set targets for those two approaches; one is "improvement of individual lifestyle", and the other is "supportive social environment". As the focus-group study in Chinese has reported, it was suggested that "large-scale promotion was needed to change social attitudes toward brown rice" [23].

To implement the strategy of "rice change" behavior as the "supportive social environment" approach, it might be more effective if diversified areas are taken into partnerships. There is a new concept of the rice for the functional effect for a disease prevention effect and treatment; "Medical Rice" [17,24]. Dr. Shaw Watanabe, co-author of the current study has constituted "Medical Rice Association" [25] in 2019. The association's members come from diversified areas and their backgrounds, such as medical specialists, nutritionists, agricultural chemists, farmers, rice breeders, housewives, etc.

Focusing Rice toward super-aged society

A nutrient taken by staple food of rice in Asian countries is more than 60% of their meal and a very large influence on health. Besides of its rich nutrient inclusion, brown rice intake makes good

effect on selection of side dish foods. Watanabe, et al. reported that brown rice eaters consumed more healthy foods such as soy products, vegetable and sea-weeds, which include rich fiber, than those of white rice eaters [26]. As the recommendation strategy of variety foods intake for aged people, changing staple food to brown rice of whole grain may associate with increasing healthy side dish food intake. From two large-scale epidemiologic studies conducted in Greece [27], higher intake of whole grains evaluated by mainly "whole wheat" of bread was associated with a higher level of "successful aging" index, which was evaluated by 10 attributes such as health-related social, lifestyle and clinical factors.

On the other hand, there were few longitudinal studies and benefits of rice eating, and they were limited at best. For the sake of happy and healthy sustainable lives within the super-aged society like Japan, we must establish scientific evidence for healthy rice functional effects on healthy longevity.

Limitations and future research topic

The current longitudinal study's participants were mostly staff members and their family members from workplace concerning rice or agriculture. Although there were no arbitrarily recommendations for their rice change, their consciousness of participating the study related to rice intake was possible to become bias, in part.

For a possible future research topic, we would like to investigate the association of diet pattern of individual rice types and health related factors. Because diet quality is determined by combination of staple food and side dish foods. Therefore, much more scientific evidence for healthy rice is needed for implementation of "dietary education" and "supportive environment" for healthy people and preliminary one.

Conclusion

A part of the longitudinal study showed that people who changed polished rice to healthier rice were less than 10% within 6 months, mostly women, having preclinical laboratory data of hyperlipidemia and/or diabetes, and high annual income.

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GENKI Study Research Group

Makoto Sugimoto, Kunihiro Aono, (Ohigawa Aglreculture Association), Hironori Maruyama, Tomoki Seki (Meal care Co. Ltd.), Keiji Sakika, Tetsuo Sakamoto, Yasunobu Heya, Haruhiko Ito, Hiroyuki Seki, Akihiro Yamamoto, Naoki Nishiyama, Masaharu Iwatsubo, Yusuke Mirura, Yasuhiro Tobari (Toyo rice Co. Ltd.)

Naoaki Nishimura, Kenichi Watanabe (Mitsui Sumitomo Bank Co. Ltd.), Takahiro Ishii, Yamashita (JA Shimane Group), Shaw Watanabe, Azusa Hirakawa, Shoichi Mizuno, Masahito Takahashi, Tanji Hoshi, Sayuri Kodama (Lifescience Promoting Association)

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Bibliography

1. Zhang B., *et al*. "Association of whole grain intake with, all-cause, cardiovascular, and cancer mortality: a systematic review and, dose-response meta-analysis from prospective cohort studies". *European Journal of Clinical Nutrition* 72 (2018): 57-65.

2. Aune D., *et al*. "Whole grain consumption and risk of cardiovascular disease, cancer, and all cause and cause specific mortality: systematic review and dose-response meta-analysis of prospective studies". *BMJ* 353 (2016): i2716.

3. Aune D., *et al*. "Whole grain and refined grain consumption and the risk of type 2 diabetes: a systematic review and dose-response meta-analysis of cohort studies". *European Journal of Epidemiology* 28 (2013): 845-858.

4. Maki KC., *et al*. "The Relationship between Whole Grain Intake and Body, Weight: Results of Meta-Analyses of Observational Studies and Randomized, Controlled Trials". *Nutrients* 11 (2019). pii: E1245.

5. GBD 2017 Diet Collaborators. "Health effects of dietary risks in 195 countries, 1990-2017: a systematic analysis for the Global Burden of Disease Study 2017". *Lancet* 393 (2019): 1958-1972.

6. Van der Kamp JW., *et al*. "The HEALTHGRAIN, definition of 'whole grain'". *Food and Nutrition Research* 58 (2014).

7. Watanabe S., *et al*. "Effects of brown rice on obesity: GENKI Study (cross sectional epidemiological study)". *Journal of Obesity and Chronic Diseases* 2.1 (2018): 12-19.

8. Hirakawa A., *et al*. "The nested study on the intestinal microbiota in Genki Study with special reference to the effect of brown rice eating". *Journal of Obesity and Chronic Diseases* 3 (2019): 1-13.

9. Ito Y., *et al*. "Postprandial blood glucose and insulin responses to pre-germinated brown rice in healthy subjects". *The Journal of Medical Investigation* 52 (2005): 159-164.

10. Mohan V., *et al*. "Effect of brown rice, white rice, and brown rice with legumes on blood glucose and insulin responses in overweight Asian Indians: a randomized controlled trial". *Diabetes Technology and Therapeutics* 16 (2014): 317-325.

11. Adebamowo SN., *et al*. "A mixed-methods study on acceptability, tolerability, and substitution of brown rice for white rice to lower blood glucose levels among Nigerian adults". *Frontier in Nutrition* 4 (2017): 33.

12. The Food and Agriculture Organization (FAO). Food-based dietary guidelines.

13. Ministry of Health, Labour and Welfare (Japan), National Health and Nutrition Survey (NHNS), 1975, 2018

14. World Health Organization, Health Impact Assessment (HIA), The determinants of health.

15. Bonaccio M., *et al*. "High adherence to the Mediterranean diet is associated with cardiovascular protection in higher but not in lower socioeconomic groups: prospective findings from the Moli-sani study". *International Journal of Epidemiology* 46 (2017): 1478-1487.

16. Ruggiero E., *et al*. "Consumption of whole grain food and its determinants in a general Italian population: Results from the INHES study". *Nutrition, Metabolism and Cardiovascular Diseases* 29 (2019): 611-620.

17. Takei N., *et al*. "Medical Rice: Brown rice for health and low protein rice for preventing CKD". *EC Nutrition* 14 (2019): 1-9.

18. Masuzaki H., *et al*. "Brown rice-specific γ-oryzanol as a promising prophylactic avenue to protect against diabetes mellitus and obesity in humans". *Journal of Diabetes Investigation* 10 (2019): 18-25.

19. Brownlee IA., *et al*. "Markers of cardiovascular risk are not changed by increased whole-grain intake: the WHOLE heart study, a randomized, controlled dietary intervention". *British Journal of Nutrition* 104 (2010): 125-134.

20. Zhang G., *et al*. "Substituting white rice with brown rice for 16 weeks does not substantially affect metabolic risk factors in middle-aged Chinese men and women with diabetes or a high risk for diabetes". *Journal of Nutrition* 141 (2011): 1685-1690.

21. Kodama S. Chapter 9 SES, dietary quality, emotional well-being, and a five-year subjective health in middle-age, Hoshi T, Kodama S, (Editors), The Structure of Healthy Life Determinants: Lessons from the Japanese Aging Cohort Studies. Singapore: Springer (2018): 143-160.

22. Minister of Health, Labour and Welfare (Japan), A Basic Direction for Comprehensive Implementation of National Health Promotion (2012).

23. Zhang G., *et al*. "Substituting brown rice for white rice to lower diabetes risk: a focus-group study in Chinese adults". *Journal of the American Dietetic Association* 110 (2010): 1216-1221.

24. Singh RB., *et al*. "Medical rice as a whole grain: A new technological advancement by Shaw Watanabe, for prevention of cardiometabolic diseases and dementia". *Biomedical Journal of Scientific and Technical Research* 14 (2019).

25. Medical Rice Association, http://medicalrice.com/

26. Watanabe S., *et al*. "Obesity and diabetes: Dietary and life habits of obese people and brown rice eaters among GENKI STUDY I and II". 10 (2018): 79-86.

27. Foscolou A., *et al*. "The Association between Whole Grain Products Consumption and Successful Aging: A Combined Analysis of MEDIS and ATTICA Epidemiological Studies". *Nutrients* 11 (2019): 1221.

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