

Comparison of dietary habits and folic acid intake between registered dietitian course students and nursing course students

Takuya MATSUO¹⁾ and Kumiko TAKEMORI²⁾

¹⁾*Department of Art and Sciences, Kindai University Faculty of Medicine**

²⁾*Department of Food Science and Nutrition, Kindai University Faculty of Agriculture*

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Summary

We provide lectures and questionnaire surveys on folic acid for registered dietitian course students and nursing course students. They may have the opportunity to be involved in future patient health care and provide important advice on the involvement of folic acid in neural tube obstruction (mainly spina bifida and anencephaly). The food intake frequency survey and the dietary habit questionnaire were administered to 980 female students aged 18 to 22 (registered dietitian course students: 730, nursing course students: 250). Among registered dietitian course students (N = 258), the intake of folic acid by students who did not omit meals was significantly ($p < 0.05$) higher than that by those who answered that they omit meals. Moreover, it was significantly ($p < 0.05$) higher for students who responded that their dietary status was “Good” than for those who answered “Problematic”. Among nursing course students (N = 52), there was no difference in the presence of the omission of meals or the intake of folic acid. In addition, it was significantly ($p < 0.05$) lower for students who answered “Problematic” for their dietary status than for those who answered “Neither good nor problematic”. Registered nutrition course students promoted the intake of folic acid as their dietary habits and dietary consciousness improved. However, there was no relationship among dietary habits, consciousness, and folic acid intake in nursing course students.

Introduction

Many studies on the etiology and prevention of neural tube defects (NTDs), including spina bifida, have been performed¹⁾. As genetic factors, polymorphisms of methylene tetra hydro reductase (MTHFR) are involved due to ethnic and racial differences²⁾. Among environmental factors, it is well known that mothers taking antiepileptic drugs during pregnancy have a high frequency of offspring with NTDs³⁾. Regarding nutritional factors, it was reported in the United Kingdom in 1991 that folate deficiency had the greatest effect on the development of NTDs⁴⁾. In 2000, the Ministry of Health and Welfare recommended that women planning to get pregnant take 400 µg of folic acid per day⁵⁾. Furthermore, since 2003, the important role of folic acid has been described in the Maternal and Child Health Handbook⁶⁾. However, although the Ministry of Health and Welfare has recommended the use of folic acid supplements⁷⁾, the incidence of spina bifida over the past two decades ranged from 4.7 to 6.2 per 10,000 births¹⁾ and has

hardly declined. The recognition and dissemination of folic acid intake are essential.

Health providers may provide pregnant women with important information about folic acid⁷⁾. The rates of awareness of folic acid for the prevention of neural tube defects among health providers were reported by Kondo et al. in 2002 and 2007: (general practitioners: 18.4% and 29.8%, urologists: 26.1% and 36.0%, obstetricians/gynecologists: 76.4% and 87.0%), midwives: 42.2% and 78.5%, nurses: 12.1% and 22.5%, pharmacists: 40.4% and 36.4%, dietitians: 53.6% and 50.6%, respectively.⁸⁾ Although the recognition rate of folic acid is gradually increasing among all occupations except dietitians and pharmacists, it differs depending on the occupation¹⁾. On the other hand, in their 2017 survey, Okai and Kondo⁹⁾ reported that 75.7% of registered dietitians recognize the usefulness of folic acid supplements, which was 1.5-times higher than the rate in the 2007 survey (50.6%), and the majority of registered dietitians share this knowledge.

Folic acid is abundant in green-yellow vegetables (60 g

* Address: 377-2, Ohno-Higashi, Osaka-Sayama, Osaka, 589-8511 Japan
Tel: +81-72-366-0221; E-mail: tkmatsuo@med.kindai.ac.jp

of spinach contains 126 µg of folic acid), seaweed (grilled seaweed 2 g, 38 µg), and fruits (orange 130 g, 44 µg)⁵. Folic acid intake in the current diet was 237 ± 99 µg/day for 134 females aged 15–19 and 236 ± 105 µg/day for 217 females aged 20–29. This meets the required amount (200 µg/day), but the recommended amount (240 µg/day) was not reached¹⁰.

We conducted lectures and surveyed female students in the registered dietitian course and nursing course who have an opportunity to convey the importance of folic acid in order to raise awareness and promote the intake of folic acid to reduce the risk of NTDs^{11–13}. Prior to 2018, a research group examined the intake and recognition of folic acid of students of the registered dietitian and nursing courses without separating them^{11–13}. The previous studies clarified the following: 1) The awareness of folic acid increases after the lecture¹¹. 2) The intake of folic acid is affected by dietary habits¹². 3) The intake of folic acid is affected by dietary consciousness^{12, 13}. 4) The intake of folic acid is not affected by the knowledge of folic acid¹³. 5) Improving dietary consciousness promotes the intake of folic acid¹⁴. In addition, in a 2019 report, a survey of registered dietitian course students revealed that students with high dietary literacy based on health literacy had a large folic acid intake by preparing staple foods, main dishes, and side dishes¹⁵.

Based on these studies, we hypothesized that dietary consciousness and dietary habits differ between registered dietitian course students and nursing course students. The registered dietitian course is a curriculum that specializes in nutrition related to health and disease¹⁶. The nursing course is a curriculum for learning nursing related to diseases¹⁷. Within each curriculum, there may be significant differences in knowledge related to the cognition and nutritional benefits of folic acid.

The purpose of the present study was to investigate the differences in dietary habits and folic acid intake between registered dietitian and nursing course students.

Method

1. Participants

The food frequency questionnaire based on the food groups version 3.5 (FFQg)¹⁸ survey and the dietary habit questionnaire accompanying the FFQg were administered to 980 female students. They enrolled in the registered dietitian course and nursing course between 2011 and 2015 (Seven hundred and thirty students in the registered dietitian course and 250 female students in the nursing course at universities or vocational schools in Osaka and

Nara prefectures).

2. Dietary habits and food intake

Folic acid and food group intakes for each food category were classified based on the results of the dietary habit questionnaire accompanying the FFQg¹⁸. The dietary habit questionnaire consisted of four question groups. The question groups comprised sections I to IV: Section I consisted of 14 exercise and health questions (No. 1 to 14). Exercise and health questions included those about exercising to maintain one's health, maintaining proper weight, drinking alcohol, smoking, sleeping, and stress. Section II consisted of 15 questions on dietary behavior. Questions about dietary behavior included those about menus, foods intake, where to get health information, and how to check the expiration date of foods (No. 15 to 29). Section III consisted of 19 questions on dietary habits. Questions about dietary habits included those about the number of meals, meal times, number of omitted meals, number of snacks, frequency of eating out, and impressions of the current dietary situation (No. 30 to 48). Section IV consisted of 14 questions on dietary consciousness. Questions about dietary consciousness included those about the intake of specific food types and intake of health-conscious foods (No. 49 to 62). Question 1 (Q1): No. 35; Do you omit meals? (Never omit meals, omit meals approximately 1 to 2 times per week, omit meals approximately 3 to 4 times per week, and usually omit meals). Question 2 (Q2): No. 36; When do you omit meals? (Omit breakfast, omit lunch, omit dinner, and omit 2 or more meals). Question 3 (Q3): No. 48; Do you think that your current dietary status is good? (Good, neither good nor problematic, and problematic).

3. Energy correction

The folic acid intake and intake of each food group were converted to intakes per 1,000 kcal by correcting the energy using the residual method to eliminate the effects of energy intake due to physique and physical activity. The residual method can theoretically eliminate the effects of total energy intake¹⁹.

4. Statistical analysis

One-way analysis of variance (ANOVA) using the Excel add-in statistical software Statcel Version 4 was performed²⁰. If a significant difference was found between the respective groups, a multiple comparison test (Tukey method) was carried out and the difference between the groups was calculated. The level of significance was set to 5%.

5. Privacy policy

The FFQg survey was approved by the ethics committee of Kindai Himeji University School of Nursing (No. 2011615) and Kindai University Faculty of Medicine (No. 20140227). Response to the survey was voluntarily anonymous, the responses were filled out on the survey form, and submitting the survey form was considered consent to cooperate. The use of personal information (gender, date of birth, height, and weight) obtained from the survey and the storage of survey forms conformed to the Kindai University Basic Policy on the Protection of Personal Information (2013)²¹⁾.

Results

1. Participants

1) Distribution of the food frequency questionnaire survey and questionnaire, and the effective response rate

Effective answers were received from 310 female university students (registered dietitian course: N = 258, nursing course: N = 52). They responded to all FFQg questions and dietary questionnaire questions corresponding to Sections I through IV.

2) The physical characteristics

The physical characteristics of the female students and the folic acid intake with total energy correction are shown in Table 1.

3) The energy intake

For registered dietitian course students, the average energy intake of 258 students was $1,712.5 \pm 367.9$ kcal/day (Table 1). The energy intake of students by physical activity level was as follows: physical activity level I (low), 78 students; $1,690.3 \pm 398.5$ kcal/day, physical activity level II (normal), 75 students; $1,753.5 \pm 346.4$ kcal/day, and physical activity level III (high), 105 students; $1,699.8 \pm 360.1$ kcal/day. There was no difference in the energy intake of registered dietitian course students among level I, level II, and level III. For nursing course students, the

average energy intake of 52 students was $1,749.3 \pm 465.6$ kcal/day (Table 1). The energy intake of students by physical activity level was as follows: physical activity level I (low), 20 students; $1,782.5 \pm 519.0$ kcal/day, physical activity level II (normal), 15 students; $1,718.7 \pm 380.0$ kcal/day, and physical activity level III (high), 17 students; $1,737.1 \pm 492.4$ kcal/day. There was no difference in the energy intake of registered dietitian course students or nursing course students among level I, level II, and level III.

2. Folic acid intake with energy correction

For registered dietitian course students, the folic acid intake with energy correction of 258 students was 212.5 ± 57.3 $\mu\text{g}/\text{day}$.

For nursing course students, the folic acid intake with energy correction of 52 students was 196.8 ± 63.0 $\mu\text{g}/\text{day}$ (Table 1).

There was no difference in folic acid intake with energy correction between registered dietitian course students and nursing course students (Table 1).

3. Dietary habits and folic acid

1) The presence of the omission of meals and folic acid intake

Question 1: No. 35; Do you omit meals?

a) Folic acid

Of the registered dietitian course students, the folic acid intake of 117 students who answered "Omit meals" (N = 117, 196.7 ± 48.5 $\mu\text{g}/\text{day}$) was significantly ($p < 0.05$) lower than that of 141 students who responded "Never omit meals" (N = 141, 225.6 ± 60.8 $\mu\text{g}/\text{day}$). In addition, that of students who answered "1-2 times per week" (N = 77, 203.2 ± 48.5 $\mu\text{g}/\text{day}$) or "3-4 times per week" (N = 26, 179.2 ± 48.5 $\mu\text{g}/\text{day}$) was significantly ($p < 0.05$) lower than that of the 141 students who responded "Never omit meals" (Table 2).

Of the nursing course students, 29 (55.8%) answered "Never omit meals" (N = 29, 203.2 ± 67.0 $\mu\text{g}/\text{day}$). However, 23 (44.2%) responded that they "Omit meals" (N = 23,

Table 1 Physical characteristics of female students

Number of students	Registered dietitian course students		Nursing course students	
	258		52	
Age	18.9	$\pm 0.7^*$	18.8	± 0.8
Height (cm)	158.6	± 5.9	158.6	± 4.9
Body weight (kg)	51.7	± 6.7	50.8	± 5.9
Body mass index (kg/m^2)	20.6	± 2.4	20.2	± 2.1
Total energy intake (kcal)	1,712.5	± 367.9	1,749.3	± 465.6
Folic acid intake with energy correction ($\mu\text{g}/\text{day}$)	212.5	± 57.3	196.8	± 63.0

*: Mean \pm SD

188.7 ± 58.0 µg/day). There was no significant difference between those who “Never omit meals” (N = 141, 54.7%, 225.6 ± 60.8 µg/day) and those who “Omit meals” (N = 117, 45.3%, 196.7 ± 48.5 µg/day) in folic acid intake (Table 2).

There was no difference in folic acid intake between registered dietitian course students and nursing course students (Table 2).

b) Cereals (Rice, noodles, etc.)

Of the registered dietitian course students, the intake of cereals of 117 students who answered “Omit meals” (316.8 ± 68.3 g/day) was significantly ($p < 0.05$) lower than that of 141 students who responded “Never omit meals” (347.3 ± 59.4 g/day) (Table 2).

Of nursing course students, there was no difference (Table 2).

There was no difference in cereal intake between registered dietitian course students and nursing course students (Table 2).

c) Green and yellow vegetables

Of the registered dietitian course students, the intake of green and yellow vegetables of 117 students who answered “Omit meals” (56.0 ± 26.8 g/day) was significantly ($p < 0.05$) lower than that of 141 students who responded “Never omit meals” (69.3 ± 37.1 g/day). In addition, that of those who answered “3-4 times per week” (N = 26, 51.0 ± 30.2 g/day) was significantly ($p < 0.05$) lower than that of 141 students who responded “Never omit meals” (Table 2).

Among nursing course students, there was no difference in green and yellow vegetable intake (Table 2).

There was no difference between registered dietitian course students and nursing course students (Table 2).

2) The omission of meals and the folic acid intake

Question 2: No. 36; When do you omit meals?

a) Folic acid

Of registered dietitian course students, the folic acid intake of students who answered “Omit breakfast” (N = 83, 195.4 ± 48.2 µg/day) was significantly lower ($p < 0.05$) than that of those who answered “Never omit meals” (N = 141, 225.6 ± 60.8 µg/day). Of nursing course students, there was no difference in folic acid intake corresponding to the omission of breakfast, lunch, or dinner (Table 3).

b) Cereals (Rice, noodles, etc.)

Of registered dietitian course students, the intake of cereals of 83 students who answered “Omit breakfast” (321.1 ± 61.0 g/day) was significantly ($p < 0.05$) lower than

that of 141 students who responded “Never omit meals” (347.3 ± 59.4 g/day) (Table 3).

There was no difference among nursing course students (Table 3).

There was no difference in cereal intake between registered dietitian course students and nursing course students (Table 3).

c) Green and yellow vegetables

Of registered dietitian course students, the green and yellow vegetable intake of 83 students who answered “Omit breakfast” (55.6 ± 26.9 g/day) was significantly ($p < 0.05$) lower than that of 141 students who responded “Never omit meals” (69.3 ± 37.1 g/day) (Table 3).

There was no difference among nursing course students (Table 3).

There was no difference in green and yellow vegetable intake between registered dietitian course students and nursing course students (Table 3).

d) Fruit

Nursing course students who answered that they “Omit dinner” (N = 5, 144.9 ± 86.9 g/day) had a significant difference ($p < 0.05$) in fruit intake from registered dietitian course students (N = 22, 41.4 ± 49.8 g/day) (Table 3).

3) Dietary status and folic acid intake

Question 3: No. 48; Do you think that your current dietary status is good?

a) Folic acid

Of registered dietitian course students, the folic acid intake of students who answered “Problematic” (N = 122, 196.9 ± 53.8 µg/day) was significantly ($p < 0.05$) lower than that of those who answered “Good” (N = 43, 242.6 ± 54.2 µg/day) or “Neither good nor problematic” (N = 93, 219.1 ± 56.8 µg/day) (Table 4).

Of nursing course students, the folic acid intake of students who answered “Problematic” (N = 29, 173.8 ± 44.2 µg/day) was significantly ($p < 0.05$) lower than that of those who answered “Neither good nor problematic” (N = 13, 239.3 ± 86.4 µg/day) (Table 4).

Of students who answered “Problematic” (N = 29, 173.8 ± 44.2 µg/day), the folic acid intake of nursing course students was significantly lower ($p < 0.05$) than that of registered dietitian course students (N = 122, 196.9 ± 53.8 g/day) (Table 4).

b) Green and yellow vegetables

Of registered dietitian course students, the green and yellow vegetable intake of students who answered

Table 2 Relationship between responses to the questionnaire and food intake categories related to the frequency of omitting meals

Question and choices	Number (%)	Folic acid ($\mu\text{g}/\text{day}$)	Cereals (Rice, noodles, etc.) (g/day)	Potatoes (g/day)	Green and yellow vegetables (g/day)	Seaweed (g/day)	Meat (g/day)	Fruit (g/day)
Q1. Do you omit meals?								
Registered dietitian course students								
Never omit meals	141 (54.7)	225.6 \pm 60.8 ^{#,a}	347.3 \pm 59.4 ^a	31.2 \pm 24.6	69.3 \pm 37.1 ^a	2.9 \pm 2.5	77.0 \pm 36.2	55.1 \pm 63.3
Omit meals	117 (45.3)	196.7 \pm 48.5 ^b	316.8 \pm 68.3 ^b	27.1 \pm 24.4	56.0 \pm 26.8 ^b	2.4 \pm 2.1	80.7 \pm 38.4	44.3 \pm 46.2
Omit meals approximately								
1-2 times per week	77 (29.8)	203.2 \pm 48.5 ^b	328.1 \pm 61.0	27.2 \pm 27.7	58.8 \pm 26.4 ^{a,b}	2.6 \pm 2.3	81.1 \pm 35.3	46.6 \pm 48.4
3-4 times per week	26 (10.1)	179.2 \pm 48.5 ^b	305.7 \pm 58.9	24.7 \pm 14.8	51.0 \pm 30.2 ^b	1.7 \pm 1.9	91.1 \pm 41.7	41.9 \pm 44.9
Usually omit meals	14 (5.4)	193.9 \pm 42.9 ^{a,b}	275.9 \pm 102.0	31.2 \pm 19.7	50.1 \pm 21.7 ^{a,b}	2.4 \pm 1.8	59.5 \pm 42.7	36.6 \pm 37.4
Nursing course students								
Never omit meals	29 (55.8)	203.2 \pm 67.0	322.5 \pm 113.0	27.9 \pm 28.6	58.5 \pm 40.7	2.3 \pm 1.9	89.1 \pm 38.4	57.9 \pm 59.4
Omit meals	23 (44.2)	188.7 \pm 58.0	315.9 \pm 81.5	22.7 \pm 20.8	44.6 \pm 30.6	2.6 \pm 2.3	71.4 \pm 34.5	57.2 \pm 65.0
Omit meals approximately								
1-2 times per week	17 (32.7)	193.7 \pm 63.3	341.1 \pm 56.4	16.7 \pm 16.8	46.4 \pm 31.9	2.8 \pm 2.6	72.0 \pm 37.0	58.8 \pm 55.2
3-4 times per week	4 (7.7)	168.7 \pm 43.5	264.8 \pm 122.9	41.6 \pm 26.8	33.1 \pm 28.2	2.4 \pm 1.6	69.2 \pm 35.5	74.8 \pm 112.7
Usually omit meals	2 (3.4)	186.7	203.2	36.1	52.3	1.5	70.9	8.0

#: Mean \pm SD

Values with different superscripts "a" and "b" are significantly different ($p < 0.05$) from each other.

Values with the superscript "a, b" are not significantly different from those with a superscript "a" or "b".

Table 3 Relationship between responses to the questionnaire and food intake categories related to omitting meals

Question and choices	Number (%)	Folic acid ($\mu\text{g/day}$)	Cereals (Rice, noodles, etc.) (g/day)	Potatoes (g/day)	Green and yellow vegetables (g/day)	Seaweed (g/day)	Meat (g/day)	Fruit (g/day)
Q2. When do you omit meals?								
Registered dietitian course students								
Never omit meals	141 (54.7)	225.6 \pm 60.8 ^a	347.3 \pm 59.4 ^a	31.2 \pm 24.6	69.3 \pm 37.1 ^a	2.9 \pm 2.5	77.0 \pm 36.2	55.1 \pm 63.3
Omit meals	117 (45.3)	196.7 \pm 48.5 ^b	316.8 \pm 68.3 ^b	27.1 \pm 24.4	56.0 \pm 26.8 ^b	2.4 \pm 2.1	80.7 \pm 38.4	44.3 \pm 46.2
Omit meals approximately								
Omit breakfast	83 (32.1)	195.4 \pm 48.2 ^b	321.1 \pm 61.0 ^b	25.7 \pm 16.7	55.6 \pm 26.9 ^b	2.4 \pm 1.9	82.7 \pm 38.9	45.0 \pm 46.1
Omit lunch	8 (3.1)	196.5 \pm 40.0 ^{a,b}	321.7 \pm 63.7 ^{a,b}	28.2 \pm 13.2	48.8 \pm 24.5 ^{a,b}	2.1 \pm 2.0	71.4 \pm 25.4	42.7 \pm 45.2
Omit dinner	22 (8.5)	206.3 \pm 53.8 ^{a,b}	307.5 \pm 95.2 ^{a,b}	33.4 \pm 45.5	63.8 \pm 27.5 ^{a,b}	2.9 \pm 3.1	79.7 \pm 43.0	41.4 \pm 49.8 ^A
Omit 2 or more meals	4 (1.6)	172.1 \pm 43.0 ^{a,b}	269.9 \pm 42.6 ^{a,b}	19.4 \pm 8.3	36.9 \pm 14.5 ^{a,b}	0.9 \pm 0.5	63.3 \pm 16.6	50.2 \pm 46.9
Nursing course students								
Never omit meals	29 (55.8)	203.2 \pm 67.0	322.5 \pm 113.0	27.9 \pm 28.6	58.5 \pm 40.7	2.3 \pm 1.9	89.1 \pm 38.4	57.9 \pm 59.4
Omit meals	23 (44.2)	188.7 \pm 58.0	315.9 \pm 81.5	22.7 \pm 20.8	44.6 \pm 30.6	2.6 \pm 2.3	71.4 \pm 34.5	57.2 \pm 65.0
Omit meals approximately								
Omit breakfast	15 (28.8)	183.1 \pm 33.7	288.1 \pm 81.3	21.2 \pm 18.2	42.5 \pm 16.8	2.3 \pm 1.6	73.3 \pm 37.9	35.8 \pm 29.9
Omit lunch	2 (3.8)	193.8	387.4	43.6	33.5	1.5	85.2	11.5
Omit dinner	5 (9.6)	208.9 \pm 115.9	258.5 \pm 67.7	21.8 \pm 30.6	56.6 \pm 62.1	4.1 \pm 4.1	60.6 \pm 33.8	144.9 \pm 86.9 ^B
Omit 2 or more meals	1 (1.9)	162.2	376.6	8.6	38.5	1.6	69.1	30.6

#: Mean \pm SD

Values with different superscripts "a" and "b" are significantly different ($p < 0.05$) from each other.

Values with the superscript "a, b" are not significantly different from those with a superscript "a" or "b".

Values with different superscripts "A" and "B" are significantly different ($p < 0.05$) from those of registered dietitian course students and nursing course students who "Omit dinner".

Table 4 Relationship between responses to the questionnaire and folic acid and food intake categories related to dietary status and dietary habits

Question and choices	Number (%)	Folic acid ($\mu\text{g/day}$)	Cereals (Rice, noodles, etc.) (g/day)	Potatoes (g/day)	Green and yellow vegetables (g/day)	Seaweed (g/day)	Meat (g/day)	Fruit (g/day)
Q3. Do you think your current meal status is good?								
Registered dietitian course students								
Good	43 (22.5)	242.6 \pm 54.2 ^{#,a}	339.1 \pm 51.1	31.9 \pm 22.8	81.6 \pm 36.6 ^{a,A}	3.3 \pm 3.1 ^a	80.0 \pm 31.0	77.5 \pm 82.1 ^a
Neither good nor problematic	93 (36.0)	219.1 \pm 56.8 ^a	343.7 \pm 58.1	32.4 \pm 29.8	66.8 \pm 32.9 ^b	2.9 \pm 2.6 ^{ab}	79.6 \pm 35.3	47.7 \pm 56.1 ^{b,C}
Problematic	122 (47.2)	196.9 \pm 53.8 ^{b,E}	323.8 \pm 73.4	26.1 \pm 20.0	54.3 \pm 29.6 ^{b,E}	2.2 \pm 1.8 ^b	77.5 \pm 40.6	42.6 \pm 41.1 ^b
Nursing course students								
Good	10 (19.2)	208.3 \pm 44.8 ^{ab}	329.3 \pm 109.6	30.4 \pm 26.8	57.1 \pm 23.6 ^{ab,B}	3.0 \pm 2.5	96.4 \pm 38.2	25.6 \pm 34.8 ^a
Neither good nor problematic	13 (25.0)	239.3 \pm 86.4 ^a	324.9 \pm 120.0	28.7 \pm 31.3	76.9 \pm 46.5 ^a	2.9 \pm 2.9	75.2 \pm 34.5	92.5 \pm 67.2 ^{b,D}
Problematic	29 (55.8)	173.8 \pm 44.2 ^{b,F}	313.8 \pm 88.8	22.6 \pm 22.4	39.7 \pm 30.4 ^{b,F}	2.0 \pm 1.4	78.9 \pm 39.5	52.6 \pm 55.2 ^{ab}

#: Mean \pm SD

Values with different superscripts "a" and "b" are significantly different ($p < 0.05$) from each other within registered dietitian course student or nursing course students.

Values with the superscript "a, b" are not significantly different from those with a superscript "a" or "b".

Values with different superscripts "A" and "B" are significantly different ($p < 0.05$) from those of registered dietitian course students and nursing course students who answered "Good".

Values with different superscripts "C" and "D" are significantly different ($p < 0.05$) from those of registered dietitian course students and nursing course students who answered "Neither good nor problematic".

Values with different superscripts "E" and "F" are significantly different ($p < 0.05$) from those of registered dietitian course students and nursing course students who answered "Problematic".

“Problematic” (N = 122, 54.3 ± 29.6 g/day) was significantly ($p < 0.05$) lower than that of those who answered “Good” (N = 43, 81.6 ± 36.6 g/day) or “Neither good nor problematic” (N = 93, 66.8 ± 32.9 g/day) (Table 4). In addition, that of those who responded “Neither good nor problematic” was significantly ($p < 0.05$) lower than that of those who answered “Good” (Table 4).

Of nursing course students, the green and yellow vegetable intake of students who answered “Problematic” (N = 29, 39.7 ± 30.4 g/day) was significantly ($p < 0.05$) lower than that of those who answered “Neither good nor problematic” (N = 13, 76.9 ± 46.5 g/day) (Table 4).

Of those who answered “Good”, the folic acid intake of nursing course students (N = 10, 57.1 ± 23.6 g/day) was significantly lower ($p < 0.05$) than that of registered dietitian course students (N = 43, 81.6 ± 36.6 g/day). In addition, of those who answered “Problematic”, the green and yellow vegetable intake of nursing course students (N = 29, 39.7 ± 30.4 g/day) was significantly lower ($p < 0.05$) than that of registered dietitian course students (N = 122, 54.3 ± 29.6 g/day) (Table 4).

c) Seaweed

Of registered dietitian course students, the seaweed intake of students who answered “Problematic” (N = 122, 2.2 ± 1.8 g/day) was significantly ($p < 0.05$) lower than that of those who answered “Good” (N = 43, 3.3 ± 3.1 g/day) (Table 4).

Among nursing course students, there was no difference in cereal intake corresponding to “Good”, “Neither good nor problematic”, or “Problematic” (Table 4).

d) Fruit

Of registered dietitian course students, the fruit intake of students who answered “Problematic” (N = 122, 42.6 ± 41.1 g/day) or “Neither good nor problematic” (N = 93, 47.7 ± 56.1 g/day) was significantly ($p < 0.05$) lower than that of those who answered “Good” (N = 43, 77.5 ± 82.1 g/day) (Table 4).

Of nursing course students, the fruit intake of students who answered “Good” (N = 10, 25.6 ± 34.8 g/day) was significantly ($p < 0.05$) lower than that of those who answered “Neither good nor problematic” (N = 13, 92.5 ± 67.2 g/day) (Table 4).

Among those who answered “Neither good nor problematic”, the fruit intake of registered dietitian course students (N = 93, 47.7 ± 56.1 g/day) was significantly lower ($p < 0.05$) than that of nursing course students (N = 13, 92.5 ± 67.2 g/day) (Table 4).

Discussion

1. Participants

1) The physical characteristics

The height, weight, and BMI of the 310 female students (registered dietitian course students: N = 258, nursing course students: N = 52) surveyed were similar to those reported by the National Health and Nutrition Survey in Japan, 2018²¹⁾ (Females, Age: 19 years old, N = 15, height: 156.6 cm, Age: 19 years old, N = 15, weight: 51.2 kg, BMI, 15–19 years old, N = 103, 20.1 kg/m²).

2) Energy intake

The energy intake of the 310 female students (registered dietitian course students: N = 258, nursing course students: N = 52) surveyed was lower than that reported by the National Health and Nutrition Survey in Japan, 2018¹⁰⁾ (15–19 years old females, N = 134, 1,820 ± 418 kcal). According to the Japanese Dietary Intake Standard 2020²²⁾, the estimated energy requirement for females aged 18 to 29 is 1,650 kcal/day for physical activity level I (low), 1,950 kcal/day for physical activity level II (normal), and 2,200 kcal/day for physical activity level III (high). The energy intake of 258 registered dietitian course students by physical activity level was lower than the estimated energy requirement set by the Japanese Dietary Intake Standard 2020²²⁾ at physical activity levels II and III.

2. Dietary habits for omitting meals

1) Omitting meals

Of the registered the dietitian course students¹⁴⁾, 44% omitted meals and 48.2% of the nursing course students omitted meals²³⁾, similar to the percentages in the present study. Among the registered dietitian course students who answered that they omit meals, 70% answered that they omit meals 1–2 times per week (N = 107)¹⁴⁾. This value was similar to the number of students who answered that they omit 1 or 2 meals in the present study. In addition, of nursing course students who answered that they omit meals, 53% answered that they omit meals 1–2 times per week (N = 66)²³⁾. This value was lower than that in the present study. In the present study, the rate of the omission of breakfast among the registered dietitian course students (32.1%) and the nursing course students (28.8%) was higher than that reported by the National Health and Nutrition Survey in Japan, 2017 (20–29 years old females, N = 199, 23.6%)²⁴⁾.

2) Folic acid and food intake

Regarding the timing of meals and folic acid intake, there were no differences in folic acid intake related to the omission of meals at any time between the registered dietitian course students¹⁴⁾ and the nursing course students²³⁾. In a previous survey of registered dietitian course students¹⁴⁾, the frequency of meal omission and food intake was not investigated. However, the intake of green yellow vegetables of nursing course students who reported that they omit meals 3-4 times a week was significantly lower than that of those who never omit meals²³⁾.

Regarding the timing of meals and folic acid intake, there were no differences in folic acid intake related to the omission of meals at any time between registered dietitian course students¹⁴⁾ and nursing course students²³⁾. In the present study, there was no difference in folic acid intake due to differences in meal timing. However, registered dietitian course students who answered "Omit breakfast" had a lower folic acid intake, whereas there was no such differences in nursing course students.

Students who think their current diet is "Good" have a higher intake of folic acid than those who think it is "Problematic"^{14, 23)}. In the present study, among registered dietitian course students, the folic acid intake of those who answered "Good" was significantly higher than that of those who answered "Problematic". The green and yellow vegetable intake of the registered dietitian course students who answered "Never omit meals" was similar to that reported by the National Health and Nutrition Survey in Japan, 2018¹⁰⁾ (15-19 years old females, N = 134, 69.5 ± 56.3 g/day and 20-29 years old females, N = 217, 67.5 ± 68.5 g/day). However, all of the students with other responses had lower values than that by the National Health and Nutrition Survey in Japan, 2018 (15-19 years old females, N = 134, 69.5 ± 56.3 g/day and 20-29 years old females, N = 217, 67.5 ± 68.5 g/day).

3) Comparison of dietary habits and food intake between the registered dietitian course students and the nursing course students

In the registered dietitian course¹⁶⁾, there is a long period of learning about nutrition, but in the nursing course¹⁷⁾, this time may be short. In the present study, although the two curriculums^{16, 17)} likely affected the awareness and dietary habits regarding folic acid, there was no significant difference.

Registered dietitian course students had slight differences compared with nursing course students in some items. The following items were slightly higher among registered dietitian course students than nursing course students:

Folic acid intake ($p = 0.07$), folic acid intake of students who do not omit meals ($p = 0.08$), cereal intake of students who do not omit meals ($p = 0.09$), cereal intake of students who omit breakfast ($p = 0.08$), and green and yellow vegetable intake of students who omit breakfast ($p = 0.07$). Therefore, to clarify the difference between registered dietitian course students and nursing course students, the number of surveys should be increased. The differences in lifestyle between registered dietitian students and nursing students should be assessed.

It is important that students in the registered dietitian course and nursing course have knowledge of folic acid because while they are working as registered dietitians or nurses, they may have the opportunity to inform females of childbearing potential about the need for folic acid.

3. Limitations

In the present study, we investigated the perception and intake of folic acid between registered dietitians and nursing course students. Many students may not consciously take folic acid, even if they have knowledge of it, as they are not currently considering pregnancy. Moreover, it is unclear whether their student knowledge will be employed during their own pregnancy. In addition, we have not investigated females who are planning to become pregnant or who are pregnant. Therefore, the perception and intake of folic acid by females planning to become pregnant are unknown.

Conclusion

We investigated the effects of dietary habits and dietary consciousness on food and folic acid intakes of registered dietitian course and nursing course students. The registered dietitian students promoted the intake of folic acid and food as their dietary habits and dietary consciousness improved. However, no relationship among dietary habits, dietary consciousness, folic acid intake, and food intake was noted in nursing course students. Several factors may have led to the unclear results for nursing course students. 1) Nursing course students had fewer descriptive responses to the survey and fewer valid responses than registered nutrition courses students. 2) The impact of the small number of nursing students participating may be reflected in the results.

It is necessary to conduct a survey with a larger number of participants in order to investigate the difference in folic acid perception between registered dietitian course students and nursing course students in detail.

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Disclosure

None