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[原著]

Subjective health status and lifestyle habits of Chinese international students in Japan.

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Summary

The number of international students enrolled in Japan is increasing. The majority of these students are from China. International students face various challenges, such as the language barrier and culture shock, when faced with a new intercultural society. In this study, we investigated the lifestyle, Japanese ability, subjective health status, nutritional intake, and body composition of Chinese international students attending a university in Osaka. As a result, 44% of the students did not have good subjective health and there was an association between poor subjective health status and lower frequency of exercise. The skipping breakfast habit was found in 41% of the students, and there was a positive correlation between a late bedtime and skipping breakfast. The fat-energy ratio was higher than the Dietary Reference Intakes (DRIs) for Chinese people. On the other hand, 43% of females were underweight. These findings are similar to previous reports on Japanese university students. Therefore, it was suggested that the contents of health promotional and nutritional education could be the same as those used for Japanese students. Language ability and cross-cultural adaptation are important factors for living in a foreign country. Although 71% of the students in this study had acquired the N1 grade of the Japanese Language Proficiency Test and possessed Japanese ability at a level where they did not experience difficulties in everyday life, some students had difficulties using their language skills. Consequently, when providing health promotion and nutritional instruction to Chinese students, it is important to consider that there are cultural and language barriers.

Keywords: Chinese international students, Lifestyle habits, Subjective health status, and Nutrient intakes

Introduction

In 2008, the Japanese government announced the "300,000 Foreign Students Plan," which aimed to increase the number of foreign students in Japan from 140,000 to 300,000 students by 2020 (1). The number of international students coming to Japan has increased sharply over the past two decades (2), and 92.7% of these students came from other Asian countries (2). Students from China account for 45.2% of the total number of international students (2). Along with an increase in the number of international students, the cross-cultural adjustment issues associated with these students have increased. There are many reports on the stress and mental health issues of international students (3-6). International students' health problems can be serious barriers to their acquisition of knowledge and skills.

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Therefore, it is important that their health problems be understood so that they can be dealt with effectively and efficiently (7). Diet is one of the factors supporting good health. In prior research about Japanese international students in the United States, it was food that had the greatest impact on international adjustment (8), and studies have reported changes in dietary patterns after immigration (9,10). Pan et al. reported that Asian international students in the United States changed their dietary pattern. These students skipped breakfast, increased the frequency of consumption of salty and sweet snack items, and decreased the frequency of consumption of vegetables, which could have undesirable long-term health effects (9). Lee et al. reported that Chinese international students in South Korea showed an increase in skipping meals and eating speed, but a decrease in the frequency of fruit and vegetable consumption in South Korea compared to when they lived in China (10). In Japan, reports on diet, food and nutritional environment of international students have been published (11,12), but so far no study of the dietary conditions, health status, lifestyles, and the relationship between these factors has been conducted to the author's knowledge.

Dietary conditions are closely related to health. Therefore, it is an important consideration in the development of nutritional education programs for international students. Since international students differ in their religion, culture and social background, their ability to adapt to living in Japan is not the same (13). In this study, we focused on Chinese students, who account for more than 45% of all of the international students, and investigated their lifestyle habits, Japanese ability, subjective health status, nutrient intake, and body composition.

Materials and Method

1.Participants

The participants were 86 Chinese students (38 males and 48 females) attending a university in Osaka, Japan. Their age was 24.1 ± 3.0 years old for the males, 23.8 ± 2.7 years old for the females. This study was a cross-sectional study that utilized survey methodology. Data were collected between 2014 and 2015. Consent for participation was obtained prior to beginning the present study. We conducted this study with the approval of the Ethical Review Board of Osaka Prefecture University's Graduate School of Comprehensive Rehabilitation (approval number: 2013-303).

2. Basic attributes, lifestyle habits and subjective health status

As basic attributes, questions were asked about age, sex, the number of years lived in Japan, lifestyle, whether they received scholarship or not, and Japanese language ability. Japanese language ability was surveyed based on the results of the Japanese Language Proficiency Test organized by Japan Educational Exchanges and Services and The Japan Foundation. This Japanese language proficiency test has five levels: N1, N2, N3, N4, and N5. The easiest level is N5 and the most difficult level is N1. N4 and N5 measure the understanding of basic Japanese mainly learned in class. N1 and N2 measure the understanding of Japanese used in a broad range of scenarios based on everyday life. N3 is a bridging level between N1/N2 and N4/N5. Self-assessment of Japanese ability was evaluated in 4 grades (Low: can talk in simple Japanese, Middle: able to speak Japanese of level that does not encounter difficulties in everyday life, Middle to high: can understand the contents of a

newspaper, High: Conference presentations can be made using technical terms).
To understand the participants' lifestyles, questions were asked about exercise habits, sleeping duration and bedtime. The participants' health condition was assessed by self-assessment. Subjective health status was divided into 4 health statuses (healthy, mostly healthy, somewhat unhealthy, and unhealthy).

3. Nutrient intake and body composition

The food frequency questionnaire (FFQ) developed by Willett et al. (14) is a semi-quantitative dietary survey that is the most widely used method to assess food or nutrient intake in dietary studies. In Japan, some simple nutritional questionnaires have been developed and their reproducibility and validity have been evaluated (15). In this study, we used a Food Frequency Questionnaire that is based on 29 food groups and 10 types of cooking (FFQg version 3.0, Kenpaku Co., Ltd., Tokyo, Japan). This was used to estimate the energy and nutrient intake of each participant during the previous 1-2 months. The questionnaire used in this study was translated into Chinese by a translator. In addition, a questionnaire was conducted on the frequency of breakfast intake (every day, almost every day, sometimes eat, skip). Body composition was measured using a body composition analyzer (DC-320, TANITA), body weight, body fat percentage, and Body Mass Index (BMI) were calculated as weight (kg) / height (m^2).

4.Statistical analysis

Statistical analyses were performed using statistical analysis software (SPSS Ver. 22.0, IBM Japan, Tokyo, Japan). The numerical data were expressed as the mean ± SD. The intake of most nutrients were correlated and calculated by the residual method using a regression model. The density method was used for energy-containing nutrients. The association between each survey item was tested using Spearman's rank correlation. The presence or absence of scholarship was compared with nutrient intake using Student's t-test. All reported p values are two-sided with a significance level of 5%.

Results

1. Characteristics of participants

Table 1 shows the characteristics of the Chinese international students. The mean of number of years living Japan was 2.8 years. 69.8% of the students were living alone and 23.3% of the students were living with friends.

Table 1 Participant characteristics

Characteristic		Total n=86 (%)	Male n=38 (%)	Female n=48 (%)
Student type	Reserch student	10 (11.6)	4 (10.5)	6(12.5)
	Undergrade	29(33.7)	18(47.4)	11(22.9)
	Master's	45(52.3)	14(36.8)	31(64.6)
	Doctoral	2(2.3)	2(5.3)	0
Number of years living Japan	Less than 1 year	17(19.8)	5(13.2)	12(25.0)
	1 year or more and less than 2 years	29(33.7)	14(36.8)	15(31.3)
	2 years or more and less than 3 years	16(18.6)	4(10.5)	12(25.0)
	3 years or more and less than 4 years	10(11.6)	6(15.8)	4(8.3)
	4 years or more and less than 5 years	4(4.7)	3(7..9)	1(2.1)
	5 years or more	10(11.6)	615.8)	4(8.3)
Self assessment of Japanese ability	Low	2(2.3)	2(5.3)	0
	Middle	25(29.1)	14(36.8)	11(22.9)
	Midlle to high	27(31.4)	10(26.3)	17(35.4)
	High	32(37.2)	12(31.6)	20(41.7)
Japanese Language Proficiency Test*	N1	61(70.9)	23(60.5)	38(79.2)
	N2	18(20.9)	11(28.9)	7(14.6)
	Not taken	7(8.1)	4(10.5)	3(6.3)
Residential arrangement	Living alone	60(69.8)	21(55.3)	39(81.3)
	Living with friends	20(23.3)	14(36.8)	6(12.5)
	Living with family	6(7.0)	3(7.9)	3(6.3)
Scholarships	With scholarships	49(57.0)	16(42.1)	21(43.8)
	Without scholarships	37(43.0)	22(57.9)	27(56.3)

*The JLPT has five levels: N1, N2, N3, N4 and N5. The easiest level is N5 and the most difficult level is N1.

Table 2 Body composition of participants

	Male (n=38)	Female (n=48)
Height (cm)	176.2±6.0	164.0±5.3
Weight (kg)	68.8±10.3	52.6±9.4
Fat (%)	13.8±5.2	25.2±6.9
BMI (kg/m^2)	22.2±3.1	19.5±3.0

Values are mean±SD

70.9% of the students had acquired the N1 grade of the Japanese Language Proficiency Test. In self-assessment of their Japanese ability, 98% of students responded 'My Japanese ability is able to deal with common challenges in everyday life' or reported an even higher level; however, 30% of them had language difficulties (data not shown), and 57% of the students were receiving scholarship.

2. Body composition

Table 2 shows the measurement results of body composition. BMI values were divided into four categorical levels based on the World Health Organization's definition: underweight, BMI <18.5kg/m^2; normal weight, BMI 18.5-24.9 kg/m^2; pre-obesity, BMI 25.0-29.9 kg/m^2; and obesity, BMI 30 kg/m^2. The mean value of BMI was 22.2 for males and 19.8 for females, according to the WHO BMI classification (16). In our experiment, 7.9% (n=3) of males and 43.8% (n=21) of females were underweight, 18.4% (n=7) of males and 8.3% (n=4) of females were pre-obese. There were no students with BMI 30 kg/m^2.

3. Lifestyle and subjective health status

Table 3 shows the participants' lifestyle habits and subjective health status. Sleep duration was more than 7 hours and less than 8 hours in 40.7% of students. As for bedtime, 51.2% slept after 1 a.m., and when bedtime was later, the duration of sleep was shorter ($r=0.264$, $p<0.05$). 41.9% of students ate breakfast sometimes or skipped it every day. The skipping breakfast habit started after coming to Japan. There was a positive correlation between a late bedtime and skipping breakfast ($r=0.307$, $p<0.01$). The longer the number of years of residence in Japan, the more frequently the students skipped breakfast ($r=0.279$, $p<0.01$). Frequency of alcohol consumption was less than once per week in 89.5% of students. 24.4% of students partook in exercise twice a week or more, but 41.9% of students did not do any exercise at all. In response to the subjective health status questionnaire, 55.8% of students answered 'healthy' and 43.0% answered 'somewhat unhealthy' or

Table 3 Participants' lifestyle habits

		Total n=86 (%)	Male n=38 (%)	Female n=48 (%)
Sleep duration (hours/day)	~4.9	3 (3.5)	3(7.9)	0
	5.0~5.9	9(10.5)	5(13.2)	4(8.3)
	6.0~6.9	22(25.6)	7(18.4)	15(31.3)
	7.0~7.9	35(40.7)	16(42.1)	19(39.6)
	8.0~	17(19.8)	7(18.4)	10(20.8)
Bedtime	22:00~22:59	4(4.7)	0	4(8.3)
	23:00~23:59	11(12.8)	6(15.8)	5(10.4)
	0:00~0:59	27(31.4)	10(26.3)	17(35.4)
	1:00~	44(51.2)	22(57.9)	22(45.8)
Frequency of breakfast	Eating everyday	24(27.9)	13(34.2)	11(22.9)
	Eating almost everyday	26(30.2)	11(28.9)	15(31.3)
	Sometimes eat	30(34.9)	11(28.9)	19(39.6)
	Skipping everyday	6(7.0)	3(7.9)	3(6.3)
Frequency of alcohol consumption	Abstention	26(30.2)	7(18.4)	19(39.6)
	Less than once per week	51(59.3)	25(65.8)	26(54.2)
	2-3 times per week	7(8.1)	4(10.5)	3(6.3)
	More than 4 times per week	2(2.3)	2(5.3)	0
Exercise (times/week)	No exercise	36(41.9)	11(28.9)	25(52.1)
	<2 times	29(33.7)	14(36.8)	15(31.3)
	2 or more times	21(24.4)	13(34.2)	8(16.7)
Subjective health status	Healthy	31(36.0)	17(44.7)	14(29.2)
	Mostly healthy	17(19.8)	8(21.1)	9(18.8)
	Somewhat unhealthy	34(39.5)	11(28.9)	23(47.9)
	Unhealthy	3(3.5)	2(5.3)	1(2.1)

Table 4 Nutrient intake of participants

	Male (n=38)	Female (n=48)	Reference (DRIs)#
Energy (kcal)	2238±647	1896±465	Male:2600/Female:2100
Protein-energy ratio (%energy)	13.7±2.2	13.6±2.0	10-15
Fat-energy ratio (%energy)	33.1±4.3	34.1±4.2	20-30
Carbohydrate-energy ratio (%energy)	53.1±4.3	52.3±5.1	50-65
Calcium (mg)	627±301	587±223	650 (EAR†)
Iron (mg)	8.0±2.8	6.8±2.1	9/15 (EAR†)
Retinol activity equivalents (μg)	606±234	587±192	560/480 (EAR†)
Vitamin D (μg)	5.2±3.7	4.1±2.5	8 (EAR†)
Thiamin (mg)	1.1±0.4	1.0±0.3	1.2/1.0 (EAR†)
Riboflavin (mg)	1.4±0.5	1.18±0.35	1.2/1.0 (EAR†)
Vitamin C (mg)	89±38	92±35	85 (EAR†)
Dietary fiber (g)	13±5	12±3	25-35
Salt equivalent (g)	10.1±3.7	7.8±3.3	< 6*

DRIs: Dietary Reference Intakes for Chinese people.
†EAR: Estimated Average Requirement.
* Data from dietary guidelines for Chinese residents.

'unhealthy'. The worse the subjective health status, the lower the frequency of exercise. There was no significant correlation between subjective health status and BMI.

4. Nutrient intake and food group intake

Table 4 shows the nutrient intake, and Table 5 shows the food group intakes of participants. The protein-energy ratio was 13.7% for males, 13.6% for females, and the fat-energy-ratio was 33.1% for males and 34.1% for females. The protein-energy ratio was within the range of 10-15%, but the fat-energy ratio was outside the range of 20-30% of energy intake advised by the Dietary Reference Intakes (DRIs) for Chinese people (17). Concerning food group intakes, intake of dietary fiber, vegetables and fruits were low compared with the dietary guidelines for Chinese residents (2016) (18). The higher the fat-energy ratio, the more frequently the skipping breakfast habit was observed ($r=0.214$, $p<0.05$). The protein-energy ratio of students with a scholarship was higher than those without scholarships. In males, there was a significant correlation between soft drinks and BMI ($r=0.640$, $p<0.05$). On the other hand, there was no significant correlation between nutrient intake and BMI in females. The intake of vegetables and fruits were significantly higher for the students who had a part-time job, but only in the males (Data not shown).

Table 5 Food group intake of participants

Food group	Male (n=38)	Female (n=48)	Reference*
Cereals (g)	384.6±105.6	325.7±85.5	250-400
Potatoes (g)	21.2±24.6	27.2±27.4	
Meats (g)	127.5±47.7	105.8±64.6	40-75
Fish and shellfish (g)	41.1±48.0	29.9±27.5	40-75
Eggs (g)	48.8±32.8	38.8±21.8	40-50
Dairy products (g)	195.3±156.5	203.6±131.3	300
Dark vegetables (g)	72.0±42.6	78.9±43.0	300-500
Other vegetables (g)	124.1±71.2	114.9±66.8	
Pulses (g)	33.9±28.5	39.1±38.2	25-30
Nuts (g)	2.1±4.1	1.5±2.5	
Fruits (g)	81.5±55.8	99.2±59.4	200-350
Soft drinks (g)	225.2±180.0	93.6±91.8	-

* Reference: Dietary guidelines for Chinese residents.

Discussion

In this study, we investigated the lifestyle habits, Japanese ability, subjective health status, nutrient intake, and body composition of Chinese international students attending a university in Osaka, Japan.

As a result, 44% of the students did not feel that their health status was good. Subjective health status was poorer when the frequency of exercise was lower. In a prior study of Japanese university students, 16.9-33.6% of students were a little unhealthy or unhealthy (11,19,20). Compared with these studies, Chinese international students in this study tended to be unhealthy. There are many reports on the

relationship between exercise and health (21), similar to our study, students who partook in exercise had a better subjective health status. These results suggest that it is necessary to educate the students about the importance of doing exercise.

There are many reports on the importance of eating breakfast (22-25). The skipping breakfast habit was found in 41% of the students. The skipping breakfast habit started after coming to Japan, and increased in frequency as the number of years of residence in Japan increased. In Japan, the skipping breakfast habit rate is highest in people in their 20s (male: 30.6%, female: 23.6%) (26), and is considered a problem among young people in Japan. In previous studies, the prevalence of skipping breakfast increased with increasing distance from the place of study, and 60% of students living alone developed this habit after becoming university students (27). A student who skipped breakfast typically had a late wake-up time (28) and a late bedtime has an influence on the state of wakefulness (29). The Chinese international students' situation was similar to that of the Japanese university students. Therefore, it is important that the students are advised not to delay their bedtime and eat breakfast.

Concerning nutrient intake, the fat-energy ratio was higher than the DRIs for Chinese (17), and the consumption of vegetables and fruits was lower than the dietary guidelines for Chinese residents (18). In a previous study of international students in Japan, 35.1% of the foods were categorized as staple foods, and 47.1% of staple foods were prepared with oil (11). The low consumption of vegetables and fruits is also reported in international students from other countries (9,10). In this study, it was not possible to clarify whether the high fat-energy ratio and low consumption of vegetables and fruits started after arrival in Japan, as the diet survey was not conducted before and after the visit to Japan. In China, lifestyle-related diseases are increasing (30), and there have been reports on eating disorders in young people (31). Therefore, high fat intake and the low consumption of vegetables and fruits may have started before arrival in Japan. In any case, since the fat-energy ratio was higher than that of the DRIs and the consumption of vegetables and fruits was lower than the dietary guidelines for Chinese residents, it is important to provide nutritional education to help students reduce intake from fat and increase intake from vegetables and fruits. Additionally, only in the male students, there was a significant correlation between soft drink consumption and BMI. The consumption of soft drinks is related to obesity (32), hence, dietary education is needed to advise students on how to consume soft drinks in moderation. On the other hand, almost half of the female respondents were underweight. Being underweight is a concern in both China and Japan, and young female students are more prone to being underweight than males (33,34). Although there was no significant correlation between BMI and nutritional intake or subjective health status in this study, dietary education based on tackling this issue is important.

Health status is influenced by socioeconomics, Ohashi et al. reported that students without scholarships showed more symptoms of depression compared with students who received scholarships, which suggests that financial conditions affect health-related quality of life (35). In this study, there was no significant difference in subjective health status between students who received a scholarship and

those who did not receive a scholarship, but the protein-energy ratio was higher for students who received a scholarship. From these results, we concluded that although receiving or not receiving a scholarship affects the students' dietary patterns, the possibility of it affecting subjective health is low. Most of today's Chinese students are an only child, and rely on their parents for tuition and living expenses (36,37). It is necessary to investigate household income and expenditure details in order to confirm this, but the economic situation of Chinese students is generally considered to be better. Since scholarships are part of household income, research on household income and expenses is necessary.

In conclusion, for information about diet and lifestyle disorders, since the Chinese students' situation is similar to that of Japanese university students, the basic recommendations should be similar to those given to Japanese university students. However, there are also reports that recent Chinese students contact family and Chinese friends more frequently using Chinese social network services, and have few Japanese friends. This situation affects their cross-cultural adaptation (38). Furthermore, some students were having difficulties with language. Therefore, in order to promote health and nutritional education, it is necessary to consider that some students may lack sufficient Japanese language ability and have an insufficient understanding of Japanese culture. In addition, it is considered important to consult with advisers who can speak Chinese and hold communication events with Japanese people.

There are several limitations to our study. Our study is limited strictly to Chinese international students at a university in Osaka, therefore our findings may not be generalized to Chinese students attending other universities or in other areas in Japan, nor to Chinese international students from other countries.

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Conflicts of interest

None.

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中国人留学生の主観的健康状態と生活習慣

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要旨

日本を訪れる留学生の数は増加しており，中でも中国人留学生は最も多い。留学生は言語の壁や文化の違いから様々な問題を抱えることが多い。本研究では，大阪のある大学に所属する中国人留学生を対象に，生活習慣や日本語能力，主観的健康状態，身体組成，栄養摂取状況について調査を行った。その結果，対象者の 44 %は主観的健康状態が芳しくなく，主観的健康状態が低い者では身体活動の頻度が低い状況であった。また，朝食欠食習慣は対象者の 41 %でみられ，朝食欠食習慣の頻度が高いほど就寝時刻は遅かった。さらに，脂質エネルギー比率は中国人の食事摂取基準の値に比較して高かった。その一方で，女性では 43 %の者において，痩せがみられた。これらの状況は日本人大学生を対象とした研究においても散見される事項であり，中国人留学生も類似の状況であることが明らかとなった。これらのことから，中国人留学生に対する栄養教育の方向性は日本人大学生と同様で良い可能性が高いが，中国人留学生の場合は言葉の壁があることを踏まえた上での対策が必要になると考えられた。

キーワード： 中国人留学生，生活習慣，主観的健康状態，栄養摂取状況

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