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Dietary acculturation and changes of Central Asian immigrant workers in South Korea by health perception

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Conflict of Interest
There are no financial or other issues that might lead to conflict of interest.

ABSTRACT

Purpose: This study analyzed the dietary patterns of Central Asian immigrant workers (Mongolia, Kazakhstan, Uzbekistan, and Kyrgyzstan) living in South Korea to determine the food acculturation and how their dietary practices have changed after immigration.
Methods: Self-administered questionnaires were completed by 186 Central Asian immigrant workers living in South Korea. A food frequency questionnaire (FFQ) was used to obtain information on the consumption frequency of 22 food items before and after their immigration to Korea.
Results: Central Asians switched to Korean meat consumption patterns, which consume mainly pork, chicken, and beef, showing a decrease in the intake of beef and lamb and an increase in that of pork. Their consumption of Namul (cooked vegetable), Kimchi, rice, and marine products increased while that of potatoes decreased during acculturation to Korean food culture. Positive changes were observed in Mongolians' eating habits. Their meat-based diet turned into a healthy one in which nutritional balance was achieved by consuming the various food groups. Negative dietary changes were also observed; intake of instant foods and coffee increased while black and green tea consumption decreased. Intake of Namul ($p < 0.01$), Kimchi ($p < 0.01$), rice ($p < 0.001$), ramen ($p < 0.001$), pork, chicken ($p < 0.01$), fish ($p < 0.01$), seafood ($p < 0.001$), and coffee ($p < 0.001$) increased significantly in the group that responded and their health improved after moving to Korea. This result suggests that health improved among those who were well settled in Korea and ate the various food groups.
Conclusion: These findings can help understand the acculturation process to Korean food culture and provide a basis for developing policies to help them adjust to Korean food culture.

Keywords: diet acculturation, South Korea, immigrants, vegetables, pork

INTRODUCTION

As Korea is getting into a rapidly aging society with a low birth rate, resulting in a decrease in economically active population, Korea has accepted foreign workers to maintain its growth potential. As of 2019, including Philippines, Thailand, Indonesia, Sri Lanka, Vietnam, Mongolia, Uzbekistan, Cambodia, China, Bangladesh, Kyrgyzstan, Nepal, Myanmar, East Timor, Laos, workers from 16 countries are granted E-9 Visa, a work permit to work in Korea for up to 4 years and 10 months and visa extension is allowed once [1]. Kazakhstan works in

Korea as an H2 visa or F4 visa (Korean resident abroad visa). As of the end of 2019, foreign population rose 6.60% from a year earlier to reach 2.524 million, and 567,261 of them are in employment. Of the 567,261, Uzbekistanis account for 34,482 (6.1%), followed by Kazakhstan for 7,870 (1.4%), followed by Mongolians for 6,263 (1.1%), and followed by Kyrgyzstan for 2,672 (0.5%) [2]. Foreign workers who move to Korea under the E-9 Visa program are called 'immigrant workers' in Korea. Immigration stress refers to a negative feeling of psychological strain and emotional distress stemming from cultural differences and the process of acculturation to life in a new country, and a research reported that less immigration stress brings a higher level of acculturation [3]. Dietary acculturation is multidimensional, dynamic, and complex notion, and varies considerably depending on a variety of personal, cultural, and environmental characteristics [4]. It can be said that food culture is the priority for acculturation when living abroad, away from home [5]. For immigrants, getting adjusted to a different culture in a new country is closely associated with acculturation to food culture, which in turn has effects on dietary changes and health [6,7].

Satia et al. [8] investigated the dietary acculturation and health of Chinese immigrants living in the U.S., and those surveyed commented that they got into a high intake of western food after immigration to America. Another study on the changes in dietary patterns and acculturation among Chinese Americans [9] reported that their intake of all food groups increased, and a high intake of western food in combination with a reduced intake of Chinese food resulted in health deterioration. Therefore, the author of the study argued that first-generation immigrants need to reduce the intake of sugar, fat, soft drinks, and newcomers need to adhere to the dietary patterns they followed in China and increase fruit and vegetable intake. Ayala et al. [10] studied how acculturation of Latin American immigrants to American diet affected their health and found that their intake of fruits, rice, and beans increased whereas that of sugar decreased. A study on the dietary acculturation of Greek students in Glasgow, the U.K. [11] showed that they frequently consumed fresh fruits, meat, and cheese in Greece but consumed snacks more and underwent rapid dietary acculturation after moving to the U.K. Thus, previous studies indicate that dietary differences between the 2 cultures, i.e., their own culture and other cultures in a new country, raise a health issue that dietary practice changes in a positive or negative way during acculturation to food culture of the country people migrate to. However, the rapid industrialization of Korea has brought the country under the influence of westernized dietary lifestyle, consequently bringing up dietary issues of the increased intake of instant foods such as Ramen (instant noodles), pizza and hamburger among young people. In their research on the comparison of correlation between intake of traditional Korean food and health from 1998 through 2009, Lee and Cho [12] reported that a higher intake level of traditional Korean food lowered the risk of metabolic syndrome including obesity, hypertension, and hypertriglyceridemia. Traditional Korean food is well-known as a healthy food with the following characteristics: healthy ingredient composition by well-balanced use of vegetables, meats, and grains; cooking methods using a small amount of cooking oil, such as steaming, roasting or grilling; use of lots of fermented foods such as Kimchi and Jang (fermented soybean paste and sauce) [13]. Also, they added that basic seasonings for Korean food such as soy sauce, red pepper paste, soybean paste contribute to health. Studies on dietary changes among immigrants to Korea are put into 3 categories by a surveyed group: marriage immigrants, employment immigrants, and international students. An in-depth interview conducted in a study on the dietary attitudes and behaviors of female immigrants married to Korean male showed that Chinese female immigrants acculturated to Korean food culture with decreased intake frequency of their native land food at the same time. The longer they resided in Korea, the more their interest in

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healthy eating grew [14]. A study on the dietary practices among Arabic-speaking immigrants and refugees (ASIR) in Western societies showed that acculturation into Western lifestyles produced both positive and negative changes of ASIR's diet, i.e., increased fruit/vegetable intake for the positive, and significantly increased consumption of low nutrient, energy-dense foods for the negative [15]. Although the number of Central Asian students and workers is increasing in Korea, very few studies have been conducted on the dietary practices of Central Asians. So far, there has been only one relevant study carried out, therefore, we took the subject for our thesis.

This study adopts the modern definition of Central Asia and intends to work on the former Soviet Union Republics and border sharing countries, Kazakhstan, Uzbekistan, Kyrgyzstan, and Mongolia. Although Mongolia and the former Soviet Union Republics, Kazakhstan, Uzbekistan, and Kyrgyzstan, are geographically close and share a nomadic culture, these 2 regions have cultural and climate differences. Mongolia is a landlocked country in East Asia and Mongolians have lived a nomadic life in the barren steppes and deserts, doing limited vegetable farming due to cold and dry climates. This makes their diet based on the 5 species of livestock (sheep, goats, cattle, horses, and camels) [16]. The former Soviet Union Republics, Kazakhstan, Uzbekistan, Kyrgyzstan, are located in areas with high and rugged mountain ranges, vast steppes and deserts allowing semi-nomadic and semi-agricultural life. Lately, with the establishment of agricultural culture, grains, vegetables, fruits are relatively in abundance in the region. Kazakhstan grows wheat, fruits, vegetables, and rice whereas Uzbekistan grows cotton, grains, fruits and vegetables as the main crops of the country. Central Asia has dry climates in common, thus making soup and tea is an indispensable feature of daily diets in the regions [16]. These republics were separated and independent from Soviet Union in 1991, however, they are in a politically and socially close relationship, sharing a history of employing Russian alphabets as an official language [17]. Russian is still the official language of Kazakhstan, Kyrgyzstan and spoken for communication in Uzbekistan [18]. The former Soviet Union Republics had been ruled by imperial Russia in the 19th C before they became a republic of the Soviet Union in the 1920s [19]. Consequently, there is still the Russian influence left in their diet. In addition, as Mongolia belongs to Tibetan Buddhism culture while the former Soviet Union Republics, Kazakhstan, Uzbekistan, and Kyrgyzstan, belong to Islamic culture, there are differences in religious characteristics between the 2 cultures [20].

Being a part of Central Asia and sharing borders, Mongolia and the 3 former Soviet Union Republics have a common dietary culture, however, also have environmental and cultural differences. These differences are expected to bring differences by country during their acculturation to Korean food culture after immigration to Korea. In Korea, a majority of the previous studies on dietary acculturation focus on marriage immigrants from Asia including China and Vietnam, etc., or international students because they have a relatively large population and marriage immigrants are to settle down in Korean society for a long term [5,21,22]. In contrast, studies on dietary acculturation among foreign workers, with a relatively small population and a limited length of residence, are very limited [23], and the study conducted by Lee and Lee [24] has been the sole research on dietary practices among Central Asian immigrant workers in Korea until now. For immigrants, less immigration stress brings higher levels of acculturation during immigration process [3].

The current study aims at investigating the following research questions; 1) What dietary changes have occurred after Central Asian workers moved to Korea? 2) What are positive or negative changes in Central Asian workers' diets after immigration to Korea by health perception?

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This study will provide a basis for developing policies to help Central Asian immigrant workers living in Korea well adjust to Korean food culture and decrease immigration stress by investigating how their food intake, dietary practices have changed since they moved to Korea, then identifying dietary issues facing them, and examining the expected effects during their dietary acculturation observed in the previous studies

METHODS

Data collection

This study was performed with immigrant workers from the 4 Central Asian countries (Mongolia, Kazakhstan, Uzbekistan, Kyrgyzstan) living in the northern Gyeonggi area of Korea. We obtained the ethical approval by Institutional Review Board of Ansan University (AN01-201906-HR-003-01). Using 2 languages (Mongolian and Russian), the survey was conducted from May 1 through May 31, 2019. A total of 190 participants completed and returned the questionnaires and except for incomplete responses, a total of 186 questionnaires (97%) were used for final analysis. Foreign workers participating in this survey were recruited mainly from those who visit Uijeongbu Support Center for Foreign Workers.

Variables for demographic information on subjects

The questionnaire was composed of 3 sections: demographics of study participants, intake frequency by food group, and health perception. Questions in the demographic section included age, sex, marital status, religions, length of residence in Korea. In the food intake section, a food frequency questionnaire (FFQ) was used to obtain information on consumption frequency of 22 food items before and after immigration in South Korea. FFQ is a tool used in existing studies [9,11,25]. Lv and Cason [9] examined 7 food groups and 55 food items, Kremmyda et al. [11] examined 22 food items, and Lee et al. [25] examined 34 food items. FFQ questions were tailored to the circumstances of each country in the previous studies, and also tailored to the situation in Korea for this study. FFQ was validated after amendments. There is an explanation that Korean food is a healthy food. The hypothesis of this study is to find positive and negative changes in eating behavior (diets) in Korea. The 22 food items include basic foods consumed mainly in Korea and health-related foods. The FFQ was based on a 7-point scale: 7 for 2–3 times a day, 6 for once a day, 5 for 5–6 times a week, 4 for 2–4 times a week, 3 for once a week, 2 for 1–3 times a month and 1 for less than once a month. For this survey, participants were asked to provide information on consumption frequency for fruits & vegetables, carbohydrates, meat, marine products, fast food, and beverages before and after immigration. Questions in the health perception section, health perception towards Korean food and perception of their own health since their immigration to Korea were measured on a 5-point Likert scale.

The first version of the questionnaire went through reviews under the editorship of the team manager and interpreters of the Uijeongbu Support Center for Foreign Workers and some of the questions were revised to improve. The second review of the questionnaire was done by Mongolian and Russian language experts to verify the translational accuracy. Then, the questionnaires were distributed with an explanation to the participants, the Mongolian version to Mongolians, the Russian version to Kazakhstanis, Uzbekistanis, and Kyrgyzstanis. A self-completion method was employed to answer the questionnaire.

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Statistical analysis

Fifty Mongolians, 41 Kazakhstanis, 45 Uzbekistanis, and 40 Kyrgyzstanis gave their consent to the survey. Of the returned questionnaires, a total of 186 questionnaires were used for analysis. All statistical analyses were performed using IBM SPSS Statistics for windows (version 22.0; IBM Corp., Armonk, NY, USA). Frequency analysis was performed on the demographics of the participants and paired t-test was performed on food intake frequency by country before and after immigration.

RESULTS

Demographics of the participants

Table 1 shows the results of frequency analysis to identify the demographics of study participants, immigrant workers from the 4 Central Asian countries. Those aged 25 to 29 (24.7%) and 40 or over (24.7%) had the greatest number, followed by 30–34 (22.6%),

Table 1. Demographics of the participants

Characteristics	Mongolia (n = 50)	Kazakhstan (n = 51)	Uzbekistan (n = 45)	Kyrgyzstan (n = 40)	Total (n = 186)
Age (yrs)					
20–24	2 (4.0)	7 (13.7)	1 (2.2)	6 (15.0)	16 (8.6)
25–29	19 (38.0)	10 (19.6)	10 (22.2)	7 (17.5)	46 (24.7)
30–34	11 (22.0)	13 (25.5)	7 (15.6)	11 (27.5)	42 (22.6)
35–39	10 (20.0)	11 (21.6)	11 (24.4)	4 (10.0)	36 (19.4)
≥ 40	8 (16.0)	10 (19.6)	16 (35.6)	12 (30.0)	46 (24.7)
Sex					
Male	21 (42.0)	25 (49.0)	31 (68.9)	22 (55.0)	99 (53.2)
Female	29 (58.0)	26 (51.0)	14 (31.1)	18 (45.0)	87 (46.8)
Education					
Less than high school	13 (26.0)	9 (17.6)	0 (0.0)	2 (5.0)	24 (12.9)
High school	9 (18.0)	20 (39.2)	23 (51.1)	10 (25.0)	62 (33.3)
College & university	28 (56.0)	22 (43.2)	22 (48.9)	28 (70.0)	100 (53.8)
Religion					
Muslim	1 (2.0)	26 (51.0)	25 (55.6)	28 (70.0)	80 (43.0)
Christian	46 (92.0)	9 (17.6)	11 (24.4)	5 (12.5)	71 (38.1)
Buddhist	3 (6.0)	14 (27.5)	9 (20.0)	7 (17.5)	33 (17.7)
No religion	0 (0.0)	2 (3.9)	0 (0.0)	0 (0.0)	2 (1.1)
Family type (No. of families living together in Korea)					
Single	39 (78.0)	18 (35.3)	28 (62.2)	27 (67.5)	112 (60.2)
Couple	7 (14.0)	15 (29.4)	16 (35.6)	10 (25.0)	48 (25.8)
With sibling	4 (8.0)	18 (35.3)	1 (2.2)	3 (7.5)	26 (14.0)
Job					
Factory work	39 (78.0)	36 (70.6)	38 (84.4)	33 (82.5)	146 (78.5)
Farm work	1 (2.0)	4 (7.8)	0 (0.0)	2 (5.0)	7 (3.8)
Office	2 (4.0)	3 (5.9)	3 (6.7)	5 (12.5)	13 (7.0)
Others	8 (16.0)	8 (15.7)	4 (8.9)	0 (0.0)	20 (10.8)
Monthly income (10,000 won)[1)]					
< 100	3 (6.0)	3 (5.9)	3 (6.7)	5 (12.5)	14 (7.5)
100–199	34 (68.0)	27 (52.9)	27 (60.0)	19 (47.5)	107 (57.5)
200–299	13 (26.0)	20 (39.2)	14 (31.1)	15 (37.5)	62 (33.3)
≥ 300	0 (0.0)	1 (2.0)	1 (2.2)	1 (2.5)	3 (1.6)
Length of residence (yrs)					
< 1	7 (14.0)	13 (25.5)	10 (22.2)	3 (7.5)	33 (17.7)
1–2	12 (24.0)	8 (15.7)	13 (28.9)	12 (30.0)	45 (24.2)
3–4	15 (30.0)	12 (23.5)	9 (20.0)	7 (17.5)	43 (23.1)
5–6	6 (12.0)	12 (23.5)	5 (11.1)	7 (17.5)	30 (16.1)
≥ 7	10 (20.0)	6 (11.8)	8 (17.8)	11 (27.5)	35 (18.8)

Values are expressed as number (%).
[1)]10,000 won = $ 1.25.

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35–39 (19.4%), 20–24 (8.6%). Male accounted for 53.2%, more than half of the participants and female for 46.8%. For education level, college & university graduates had the greatest number (53.8%), followed by 33.3% high school graduates, and 12.9% less than high-school graduates. As for religion, it was in the order of Muslim 43.0%, Christian 38.1%, Buddhist 17.7%, and no religion 1.1%. However, there were different demographic distribution on religion among Mongolia and the other 3 countries; For Mongolian, Christian population was the highest (92%), while Muslim population was the highest among the other 3 countries (51% for Kazakhstan, 55% for Uzbekistan, 70% for Kyrgyzstan). For family type, singles had the greatest number (60.2%), followed by 25.8% couple, and 14.0% with sibling. For length of residence, 1–3 years had the highest rate, 24.2%, followed by 3–5 years 23.1%, less than one year 17.7%. 5 years or more had relatively low rates: 5–7 years 16.1%, 7 years or more 18.8%.

Dietary practice of Central Asian immigrant workers

Table 2 shows the dietary practice of Central Asian immigrant workers. The most frequent eating out was 1–2 times/week (40.3%) and 1–3 times/month (34.2%). The most frequent eating at home was 1–2 times/week (40.3%) and 1–3 times/month (34.2%). The 33.3% were eating very little at home, 23.7% were eating at home 1–2 times/week and 19.9% were eating at home 1–3 times/month.

Food intake trends among Central Asian immigrant workers living in Korea

Table 3 shows the frequency changes in food intake of 22 food items consumed by Central Asian immigrant workers. Followings are the difference comparisons by food group.

Fruits and vegetables

After their immigration to Korea, Mongolian immigrant workers' intake of fresh fruits increased ($p < 0.001$) while that of Kazakhstan, Uzbekistan, and Kyrgyzstan immigrant workers decreased ($p < 0.05$, $p < 0.05$, $p < 0.01$). In a narrow sense, Namul indicates cooked vegetables, slightly blanched, rinsed in cold water, squeezed, and mixed with various spices and in our research, we used the latter definition. Intake of Namul increased among immigrant workers from all 4 countries surveyed in this study, and there was a significant increase particularly among Mongolians and Kyrgyzstanis ($p < 0.01$, $p < 0.01$). There were no differences in frequency of raw and stir-fried vegetable intake before and after immigration to

Table 2. The dietary practice of Central Asian immigrant workers

Characteristics	No. (%)
Frequency of eating out	
Everyday	14 (7.5)
5–3 times/week	28 (15.1)
1–2 times/week	75 (40.3)
1–3 times/month	45 (24.2)
No eating out	17 (9.1)
No answer	8 (4.3)
Total	186 (100.0)
Frequency of eating at home	
5–7 times/week	14 (17.5)
3–4 times/week	15 (8.1)
1–2 times/week	44 (23.7)
1–3 times/month	37 (19.9)
Hardly	62 (33.3)
No answer	14 (7.5)
Total	186 (100.0)

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Table 3. Consumption frequency of 22 food items among Central Asian immigrant workers before and after immigration to South Korea

Characteristics	Mongolia			Kazakhstan			Uzbekistan			Kyrgyzstan		
	Before	After	t-value	Before	After	t-value	Before	After	t-value	Before	After	t-value
Fruits and vegetables												
Fresh fruits	2.31 ± 1.31	3.41 ± 1.73	0.000***	5.28 ± 1.47	4.74 ± 1.58	0.042*	5.44 ± 1.11	5.03 ± 1.39	0.027*	5.47 ± 1.27	4.87 ± 1.46	0.008**
Cooked vegetables (fried)	3.40 ± 2.08	3.70 ± 1.84	0.129	4.40 ± 1.54	4.47 ± 1.59	0.821	4.86 ± 1.62	4.65 ± 1.49	0.264	4.38 ± 1.34	4.72 ± 1.39	0.200
Cooked vegetables (Namul)	3.20 ± 2.09	3.82 ± 1.81	0.006**	4.35 ± 1.84	4.83 ± 1.79	0.111	4.03 ± 2.04	4.73 ± 1.59	0.021*	4.34 ± 1.65	5.03 ± 1.38	0.007**
Raw vegetables	2.60 ± 1.80	2.87 ± 1.48	0.208	5.23 ± 1.64	4.87 ± 1.23	0.123	5.36 ± 1.18	5.26 ± 1.31	0.553	5.10 ± 1.27	5.38 ± 1.21	0.220
Kimchi	1.53 ± 0.52	3.27 ± 0.80	0.000***	1.60 ± 0.52	4.40 ± 1.27	0.000***	1.92 ± 0.999	4.61 ± 1.12	0.000**	1.78 ± 0.44	4.11 ± 0.93	0.000***
Carbohydrates												
Rice	3.40 ± 1.64	5.40 ± 1.34	0.000***	4.81 ± 1.90	6.40 ± 0.99	0.000***	4.89 ± 1.93	5.97 ± 1.28	0.000***	3.82 ± 1.99	6.41 ± 0.99	0.000***
Potatoes	4.35 ± 1.58	3.96 ± 1.41	0.079	5.16 ± 1.49	4.44 ± 1.78	0.001**	4.84 ± 1.50	4.19 ± 1.84	0.008**	5.46 ± 1.41	4.51 ± 1.71	0.000***
Ramen	2.18 ± 1.33	3.00 ± 1.26	0.000***	3.11 ± 2.07	3.98 ± 2.29	0.003**	2.49 ± 2.00	3.58 ± 1.82	0.001**	2.71 ± 2.12	4.34 ± 2.14	0.000***
Bread, cakes	3.22 ± 2.10	2.90 ± 1.49	0.159	5.33 ± 1.93	4.59 ± 2.12	0.001**	4.00 ± 2.06	3.59 ± 1.89	0.051	5.25 ± 1.77	4.83 ± 1.69	0.022*
Meat												
Beef	4.62 ± 1.54	4.46 ± 1.37	0.498	5.02 ± 1.79	4.74 ± 1.93	0.358	5.56 ± 1.40	3.11 ± 1.97	0.000***	5.39 ± 1.39	4.26 ± 1.96	0.001**
Pork	2.04 ± 1.47	3.89 ± 1.51	0.000***	4.84 ± 1.86	5.14 ± 1.96	0.257	3.38 ± 2.10	4.73 ± 1.87	0.012*	4.22 ± 2.28	4.30 ± 2.00	0.879
Fried chicken	1.98 ± 1.30	3.27 ± 1.35	0.000***	4.41 ± 1.96	4.52 ± 1.89	0.617	3.33 ± 1.80	3.25 ± 1.70	0.654	3.49 ± 1.96	3.90 ± 1.79	0.210
Boiled chicken	1.91 ± 1.30	2.98 ± 1.34	0.000***	4.36 ± 2.04	4.11 ± 2.05	0.109	3.37 ± 1.85	3.11 ± 1.84	0.106	4.24 ± 1.90	4.32 ± 2.09	0.760
Lamb	4.96 ± 1.69	3.63 ± 1.61	0.000***	4.67 ± 2.36	3.57 ± 2.37	0.001**	3.71 ± 1.72	2.42 ± 1.85	0.000***	4.69 ± 2.09	2.90 ± 2.22	0.000***
Processed meat products	2.54 ± 1.81	2.52 ± 1.53	0.946	5.04 ± 1.67	4.30 ± 2.03	0.004**	4.69 ± 1.66	4.09 ± 1.90	0.040*	5.05 ± 1.66	4.03 ± 1.88	0.003**
Marine products												
Fish	1.47 ± 0.97	2.32 ± 1.22	0.000***	3.76 ± 1.84	4.15 ± 2.06	0.141	2.50 ± 1.54	3.03 ± 1.53	0.004**	3.33 ± 1.83	4.28 ± 1.85	0.000***
Seafood	1.23 ± 0.83	2.08 ± 1.47	0.000***	2.90 ± 2.15	3.15 ± 1.97	0.243	1.53 ± 1.46	2.75 ± 1.92	0.000***	2.57 ± 2.21	3.33 ± 2.38	0.013*
Fast foods												
Hamburger	1.69 ± 1.16	2.20 ± 1.17	0.004	2.72 ± 1.76	2.82 ± 1.79	0.561	2.03 ± 1.42	2.14 ± 1.66	0.554	2.55 ± 1.33	2.58 ± 1.39	0.889
Pizza	1.61 ± 1.15	2.29 ± 1.26	0.001**	2.95 ± 1.67	3.21 ± 1.82	0.169	1.97 ± 1.44	2.19 ± 1.61	0.210	2.58 ± 1.69	3.00 ± 1.68	0.009**
Beverages												
Coffee	3.42 ± 2.04	5.10 ± 1.73	0.000***	4.73 ± 1.81	5.69 ± 1.72	0.001**	4.38 ± 2.06	5.15 ± 2.06	0.001**	4.05 ± 1.81	5.85 ± 1.48	0.000***
Black tea	4.48 ± 1.69	4.46 ± 1.78	0.926	5.94 ± 1.34	5.17 ± 1.70	0.001**	5.27 ± 2.24	4.68 ± 2.31	0.023*	6.10 ± 1.52	5.13 ± 1.84	0.003**
Green tea	4.04 ± 1.96	3.88 ± 1.97	0.467	4.98 ± 2.11	4.16 ± 1.93	0.001**	5.45 ± 2.17	4.90 ± 2.21	0.011*	5.22 ± 1.91	4.47 ± 2.20	0.019*

Values are expressed as mean ± SD. Values are presented as 7-point Likert scale: 7 = 2–3 times/day, 6 = once/day, 5 = 5–6 times/week, 4 = 2–4 times/week, 3 = once/week, 2 = 1–3 times/month, 1 = less than once/month.
*p < 0.05; **p < 0.01; ***p < 0.001.

Korea. Intake of Kimchi increased among immigrant workers from all 4 countries surveyed in this study, and there was a significant increase ($p < 0.001$).

Carbohydrates: rice, potato, Ramen, bread and cake

There was a significant increase in rice intake among immigrant workers from the 4 Central Asian countries after immigration to Korea ($p < 0.001$). Potato intake decreased among all 4 countries after immigration to Korea, and there was a significant decrease particularly among Kazakhstanis, Uzbekistanis, and Kyrgyzstanis ($p < 0.01$, $p < 0.01$, $p < 0.001$). Ramen intake increased among all 4 countries ($p < 0.001$, $p < 0.01$, $p < 0.01$, $p < 0.001$), and it is likely that their increased Ramen intake was influenced by the fact there is a wide variety of Ramen in Korea, frequently consumed by Koreans for its simplicity and convenience. Frequency of bread and cake intake decreased among Kazakhstanis, Kyrgyzstanis after immigration to Korea ($p < 0.01$, $p < 0.05$), and the decrease can be attributed to the fact that their intake of rice and processed rice products rather than flour food increased after immigration to Korea.

Meat: beef, pork, chicken, lamb, and processed meat products

Beef intake tended to decrease while that of pork was on a rising trend among those surveyed

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after immigration to Korea. Beef intake decreased particularly among Uzbekistanis and Kyrgyzstanis ($p < 0.001$, $p < 0.01$) while that of pork increased among Mongolians and Uzbekistanis ($p < 0.001$, $p < 0.05$).

Before their immigration to Korea, lamb (4.96) was found to be the most frequently consumed meat among Mongolians, followed by beef (4.62), pork (2.04), and frequency of chicken intake was low (fried chicken 1.98, boiled chicken 1.91). After immigration, there were no differences in frequency of beef intake, and that of lamb intake decreased (3.63) while that of chicken intake increased both in fried (3.27) and boiled chicken (2.98). Lamb intake decreased among all immigrant workers from the 4 countries after immigration to Korea ($p < 0.001$, $p < 0.01$, $p < 0.001$, $p < 0.001$). Consumption of processed meat products also decreased among those surveyed immigrant workers from the 4 Central Asian countries after immigration to Korea (Kazakhstanis [$p < 0.01$], Uzbekistanis [$p < 0.05$] and Kyrgyzstanis [$p < 0.01$]).

Marine products: fish and seafood

Intake of fish and seafood increased among the participants from the 4 Central Asian countries after immigration to Korea. Fish and seafood intake increased among Mongolians, Uzbekistanis, and Kyrgyzstanis (fish: $p < 0.001$, $p < 0.01$, $p < 0.001$; seafood: $p < 0.001$, $p < 0.001$, $p < 0.05$).

Fast foods: hamburger and pizza

Intake of fast foods such as hamburgers and pizza seemed to be on the rise, but there were no significant differences in hamburger intake. Pizza intake increased among Mongolians and Kyrgyzstanis ($p < 0.01$, $p < 0.01$).

Beverages: coffee, black tea and green tea

Coffee intake increased among the participants from the 4 countries after immigration to Korea ($p < 0.001$, $p < 0.01$, $p < 0.01$, $p < 0.001$). In contrast, black and green tea intake decreased among immigrant workers from the 3 countries except Mongolians (black tea: $p < 0.01$, $p < 0.05$, $p < 0.01$; green tea: $p < 0.01$, $p < 0.05$, $p < 0.05$).

The change of consumption frequency of 22 food items after immigration to South Korea by health perception

The consumption frequency of 22 food items after immigration to South Korea by health perception towards Korean food

Participants were divided into 2 groups based on their level of health awareness of Korean food and the difference in the frequency of their food intake was analyzed (**Table 4**). The average score on the response that Korean food is good for health was 3.52 (5-point Likert scale). The group above 3.52 was referred to as 'high health perception towards Korean food group (HHP)' and the group below 3.52 as 'low health perception towards Korean food group (LHP)'. **Table 4** shows differences in intake frequency of 22 food items between HHP (n = 102) and LHP (n = 80). HHP showed a more significant increase in intakes of cooked vegetable (Namul) and pork than LHP. Before immigration to Korea, HHP had lower intakes of cooked vegetable, pork, seafood than LHP, however, the intakes increased considerably after immigration to Korea. On the other hand, intakes of Ramen, pizza, and hamburger also increased in HHP but the increase tended to be less than that in LHP. This result can be interpreted that the HHP, recognizing Korean food as healthy food, frequently turned to healthy food such as seafood and cooked vegetable 'Namul', one of the representative traditional Korean side dishes.

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Table 4. Consumption frequency of 22 food items before and after immigration to South Korea by health perception towards Korean food

Characteristics	LHP (n = 80)			HHP (n = 102)		
	Before	After	t-value	Before	After	t-value
Fruits and vegetables						
Fresh fruits	4.89 ± 1.68	4.59 ± 1.62	0.139	4.19 ± 2.02	4.36 ± 1.74	0.251
Cooked vegetables (fried)	4.43 ± 1.66	4.48 ± 1.58	0.775	4.02 ± 1.90	4.27 ± 1.69	0.082*
Cooked vegetables (Namul)	4.18 ± 1.92	4.61 ± 1.80	0.037*	3.70 ± 1.95	4.50 ± 1.67	0.000***
Raw vegetables	4.68 ± 1.84	4.51 ± 1.75	0.348	4.34 ± 1.96	4.54 ± 1.62	0.123
Kimchi	1.63 ± 0.56	3.93 ± 1.08	0.000***	1.82 ± 0.39	4.23 ± 1.25	0.000***
Carbohydrates						
Rice	4.23 ± 1.99	6.03 ± 1.38	0.000***	4.16 ± 1.92	6.00 ± 1.13	0.000***
Potatoes	5.23 ± 1.48	4.40 ± 1.75	0.000***	4.69 ± 1.55	4.15 ± 1.62	0.000***
Ramen	2.93 ± 2.04	4.21 ± 2.22	0.000***	2.40 ± 1.76	3.32 ± 1.61	0.000***
Bread, cakes	4.95 ± 2.03	4.03 ± 2.14	0.000***	4.02 ± 2.19	3.88 ± 1.82	0.249
Meat						
Beef	5.18 ± 1.71	4.26 ± 2.07	0.001**	5.04 ± 1.48	4.12 ± 1.73	0.000***
Pork	3.76 ± 2.29	4.38 ± 2.07	0.039*	3.33 ± 2.11	4.59 ± 1.69	0.000***
Fried chicken	3.74 ± 2.21	4.27 ± 1.87	0.012*	2.87 ± 1.75	3.28 ± 1.51	0.009**
Boiled chicken	4.00 ± 2.18	4.25 ± 2.01	0.135	2.96 ± 1.84	3.11 ± 1.70	0.302
Lamb	5.21 ± 1.91	3.50 ± 2.31	0.000***	4.10 ± 1.94	3.00 ± 1.87	0.000***
Processed meat products	4.71 ± 1.97	3.89 ± 2.07	0.002**	3.88 ± 2.00	3.55 ± 1.90	0.043*
Marine products						
Fish	2.99 ± 1.81	3.94 ± 2.04	0.000***	2.52 ± 1.79	3.04 ± 1.67	0.000***
Seafood	2.53 ± 2.19	3.11 ± 2.25	0.003**	1.53 ± 1.24	2.47 ± 1.66	0.000***
Fast foods						
Hamburger	2.42 ± 1.68	2.54 ± 1.83	0.428	2.08 ± 1.31	2.35 ± 1.26	0.009**
Pizza	2.57 ± 1.78	2.99 ± 1.95	0.012*	1.92 ± 1.24	2.34 ± 1.22	0.000***
Beverages						
Coffee	3.92 ± 2.01	5.16 ± 1.92	0.000***	4.25 ± 1.95	5.62 ± 1.65	0.000***
Black tea	5.43 ± 1.90	4.76 ± 2.02	0.004**	5.36 ± 1.77	4.91 ± 1.84	0.002**
Green tea	4.96 ± 2.14	4.28 ± 2.18	0.002**	4.80 ± 2.05	4.38 ± 2.00	0.002***

Values are expressed as mean ± SD. Values are presented as 7-point Likert scale: 7 = 2–3 times/day, 6 = once/day, 5 = 5–6 times/week, 4 = 2–4 times/week, 3 = once/week, 2 = 1–3 times/month, 1 = less than once/month.
HHP, high health perception towards Korean food group; LHP, low health perception towards Korean food group.
*p < 0.05; **p < 0.01; ***p < 0.001.

The consumption frequency of 22 food items after immigration to South Korea by health awareness change

After moving to Korea, the perception of their health was categorized into 3 groups and the difference in their frequency of food intake was analyzed (**Table 5**). The respondents were categorized into 3 groups according to their health awareness change after their immigration to Korea: 'health Improvement group (HI)' who responded their health improved, 'no change group (NC)' who saw no particular change in their health condition, 'health deterioration group (HD)' who saw health deterioration after their immigration to Korea. Food intake frequency before and after immigration to Korea was identified by group. **Table 5** shows the differences in food intake frequency by group. Intakes of Namul. Kimchi, rice, fish, seafood increased while those of fruits, potato, bread, cake, beef, lamb, sausage significantly decreased in HI. There was a significant increase in Namul and Kimchi intake in HI and NC, but no significant difference in Namul intake was observed in HD. In HD, there was a significant increase in intakes of Kimchi, rice, pork, fish, seafood, coffee, and a significant decrease in intakes of potato, beef, lamb, sausage while there was no significant decrease in bread intake. On the other hand, pork intake significantly increased, which is expected as the effects of Korean culture of company dinner in which pork, especially fatty pork belly is usually consumed.

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Table 5. Consumption frequency of 22 food items before and after immigration to South Korea by health awareness change

Characteristics	HI (n = 74)			NC (n = 81)			HD (n = 24)		
	Before	After	t-value	Before	After	t-value	Before	After	t-value
Fruits and vegetables									
Fresh fruits	4.89 ± 1.73	4.53 ± 1.68	0.046*	4.45 ± 1.93	4.55 ± 1.67	0.620	4.04 ± 2.10	4.08 ± 1.86	0.896
Cooked vegetables (fried)	4.10 ± 1.69	4.15 ± 1.63	0.828	4.37 ± 1.90	4.67 ± 1.64	0.061	4.04 ± 1.64	4.08 ± 1.54	0.874
Cooked vegetables (Namul)	3.85 ± 2.00	4.65 ± 1.75	0.001**	4.15 ± 1.94	4.55 ± 1.75	0.024*	4.00 ± 1.83	4.48 ± 1.59	0.053
Raw vegetables	4.59 ± 1.75	4.74 ± 1.56	0.409	4.68 ± 1.90	4.57 ± 1.62	0.548	4.21 ± 2.21	4.17 ± 1.97	0.846
Kimchi	2.00 ± 0.00	4.13 ± 1.25	0.002**	1.71 ± 0.53	4.06 ± 1.18	0.000***	1.38 ± 0.52	3.88 ± 0.99	0.000***
Carbohydrates									
Rice	4.70 ± 1.93	6.12 ± 1.02	0.000***	3.74 ± 1.88	6.05 ± 1.30	0.000***	4.21 ± 2.06	5.71 ± 1.55	0.003**
Potatoes	4.83 ± 1.55	4.31 ± 1.68	0.001**	4.99 ± 1.57	4.31 ± 1.69	0.000***	5.08 ± 1.47	3.96 ± 1.76	0.007**
Ramen	2.92 ± 2.12	3.91 ± 2.08	0.000***	2.46 ± 1.70	3.73 ± 1.90	0.000***	2.36 ± 1.84	3.05 ± 1.73	0.151
Bread, cakes	4.34 ± 2.05	4.01 ± 2.03	0.025*	4.62 ± 2.20	4.01 ± 1.92	0.001**	4.21 ± 2.25	3.71 ± 2.03	0.076
Meat									
Beef	5.03 ± 1.59	4.35 ± 1.89	0.004**	5.11 ± 1.55	4.15 ± 1.86	0.001**	5.58 ± 1.41	4.21 ± 1.86	0.004**
Pork	4.27 ± 2.12	4.66 ± 1.91	0.202	3.07 ± 2.10	4.38 ± 1.85	0.000***	3.22 ± 2.26	4.50 ± 1.79	0.041*
Fried chicken	3.40 ± 1.78	4.00 ± 1.79	0.003**	3.32 ± 2.07	3.65 ± 1.68	0.087	3.17 ± 2.20	3.63 ± 1.86	0.252
Boiled chicken	3.78 ± 2.00	4.06 ± 1.95	0.098*	3.39 ± 2.01	3.41 ± 1.80	0.934	2.96 ± 2.24	3.38 ± 2.04	0.187
Lamb	4.30 ± 2.22	3.13 ± 2.16	0.000***	4.80 ± 1.84	3.40 ± 2.11	0.000***	4.54 ± 2.00	2.83 ± 1.83	0.003**
Processed meat products	4.54 ± 1.92	3.98 ± 2.05	0.019*	4.04 ± 2.00	3.64 ± 1.86	0.067	4.08 ± 2.04	3.08 ± 1.93	0.040*
Marine products									
Fish	3.21 ± 1.78	3.70 ± 1.86	0.009**	2.59 ± 1.73	3.40 ± 1.95	0.000***	1.96 ± 1.69	2.91 ± 1.62	0.000***
Seafood	2.41 ± 2.06	3.33 ± 2.10	0.000***	1.91 ± 1.70	2.51 ± 1.81	0.001**	1.45 ± 1.50	2.23 ± 1.80	0.005**
Fast foods									
Hamburger	2.38 ± 1.49	2.69 ± 1.62	0.005**	2.26 ± 1.52	2.44 ± 1.55	0.236	1.83 ± 1.27	1.88 ± 1.08	0.883
Pizza	2.57 ± 1.62	3.00 ± 1.72	0.000***	2.07 ± 1.40	2.45 ± 1.44	0.011*	2.26 ± 1.86	2.52 ± 1.93	0.398
Beverages									
Coffee	4.50 ± 1.96	5.60 ± 1.73	0.000***	3.92 ± 1.95	5.49 ± 1.72	0.000***	3.61 ± 2.02	4.70 ± 1.94	0.006**
Black tea	5.31 ± 1.86	4.91 ± 1.95	0.039*	5.44 ± 1.88	4.83 ± 1.91	0.002**	5.75 ± 1.39	4.75 ± 1.92	0.014*
Green tea	5.08 ± 1.96	4.71 ± 1.98	0.083*	4.79 ± 2.16	4.04 ± 2.15	0.000***	4.61 ± 2.29	4.13 ± 2.12	0.094

Values are expressed as mean ± SD. Values are presented as 7-point Likert scale: 7 = 2–3 times/day, 6 = once/day, 5 = 5–6 times/week, 4 = 2–4 times/week, 3 = once/week, 2 = 1–3 times/month, 1 = less than once/month.
HI, health Improvement group; NC, no change group; HD, health deterioration group.
*p < 0.05; **p < 0.01; ***p < 0.001.

DISCUSSION

In the fertile Oasis of southeastern Uzbekistan, fruits and vegetables are grown, and such seasonal fruits as watermelons, grapes, and all sorts of berries are abundant. It can be said that fruit and vegetable intake among immigrant workers from the 3 countries (Kazakhstan, Uzbekistan, and Kyrgyzstan) decreased due to higher fruit prices in Korea than in the 3 countries. In contrast, as fruit trees are scarce in Mongolia, fruits are in short supply and usually import-dependent; grapes, oranges, watermelons, pineapples, tangerines are imported from China and Turkey [16]. Consequently, Mongolian immigrant workers' intake of fruits was low in Mongolia because of the high price and a limited variety of fruits. After immigration to Korea, their fruit intake increased and it is because there are a variety of fruits even though the prices are higher than in Mongolia, and some fruits are available at affordable prices in Korea. Korea has the world's second highest vegetable intake rate among Organization for Economic Cooperation and Development countries [26], and one of the reasons for this can be found in the traditional Korean recipes for vegetables. Generally, 'Namul' refers to traditional Korean side dishes made of seasoned vegetables [27].

Tibetan Buddhism, introduced in the 16th century [16] is the state religion of Mongolia practiced by 53% of the country's population [28]. Kazakhstan, Uzbekistan, and Kyrgyzstan

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are basically nomadic societies and belong to Islamic culture with strict dietary discipline prohibiting pork, alcohol, however, Kim and Park [16] argued that, as Central Asia follows the moderate Sunni Islam with a relatively free dietary discipline, there seems to be no strict rule against pork and liquor. In Korea, pork (36.6%) is the most preferred and consumed meat at home, followed by chicken (30%) and beef (28.7%) [29]. Although they did not consume pork and chicken much in their homeland, Mongolians' frequency of pork and chicken intake has increased after immigration to Korea. Processed meat products available in Korea are usually pork ham and sausage while Kazakhstan has a variety of horse meat products such as sausage, boiled meat [16]. In Central Asia, processed meat products made from lamb, beef, chicken, and intestines are well-developed [16]. Therefore, one of the reasons for the decrease of processed meat products consumption can be found in the different ingredients of processed meat products in Korea, which is usually limited to pork while those in their homelands use a wide variety of meat, having different tastes.

Their increased intake of fast foods can be explained by the fact that Korea has a wide variety of foods for delivery service; also, all sorts of fast-food restaurants on the street make it easier for them to access fast foods. This result is consistent with the findings of a previous study reporting that coffee intake increased as Chinese students' length of time grew in the country [5]. In Central Asia, tea (green tea and black tea) plays an important role, outdoing alcoholic drinks or coffee, and milk tea (milk green tea), i.e., any tea drink with all sorts of milk added, is very popular [16]. It is thought that the practice of tea drinking became popular during the late 16th century when Mongolians embraced Buddhism [20]. In Uzbekistan, tea was initially introduced from China and afterwards, influenced by Russian tea culture [16], however, the tea culture of Uzbekistan is different from that of Russia in that the former usually enjoys milk tea [30]. However, after immigration to Korea, they adapted to the patterns of beverage consumption in Korea, as coffee is the most preferred beverage in Korea. Consequently, their intake of red and green tea decreased, and frequency of coffee intake increased instead.

This study analyzed the dietary trends among Central Asian immigrant workers living in South Korea, and we found that there were both differences and similarities in changes in the intake frequency of 22 food items between Mongolia and the former Soviet Union Republics. For similarity, the intake frequency of Namul (cooked vegetables), rice, glutinous rice, Ramen, pork, seafood, seaweed, and coffee was increased while that of potatoes, lamb, processed meat products, black tea, and green tea decreased among Central Asian immigrant workers after immigration to Korea. It was observed that the foods with high consumption in their homelands are subject to variation, a decrease or an increase in intake frequency, during their acculturation to Korean food culture after immigration to Korea. Comparing changes in frequency of food intake among female marriage immigrants from China and Vietnam, intake frequency of Kimchi, vegetables, fruits, and meat increased among the Chinese participants [31] while that of meat, fish, dairy products, vegetables, and fruits increased among the Vietnamese participants [32], showing differences in frequency of food intake by country during their acculturation to Korean food. Lamb is the second most widely consumed meat next to beef among Central Asians, but in Korea, lamb is an imported item and relatively expensive; that explains the decrease in lamb intake and the increase in that of pork or chicken as a lamb substitute among Central Asians after immigration to Korea.

Intake of fish and seafood increased among the Central Asian workers from the 3 countries, Mongolia, Uzbekistan, and Kyrgyzstan, after immigration to Korea. For the 3 countries except Kazakhstanis, this change is positive dietary acculturation from a meat protein-based diet

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to a balanced diet embracing marine products known good for health. With an abundance of fish and seafood, in the country, Kazakhstanis have relatively higher consumption of fish and seafood compared to the other Central Asian countries, which explains no significant increase in their intake of fish and seafood after immigration. As Mongolia is a landlocked state, Mongolian diet seldom consumes marine products of fish served in the workplace meals contributed to an increase in fish intake among Mongolians after immigration to Korea.

After immigration to Korea, frequency of red and green tea intake decreased among the other 3 Central Asian countries except Mongolians while that of coffee intake increased among Central Asian immigrant workers from all 4 countries, which can be seen as a negative change. In their homelands, they had a tea culture in which milk is added to brewed green or black tea, and this milk tea was also consumed as a meal replacement. However, after immigration to Korea, they adapted to the patterns of beverage consumption in Korea. Consequently, their intake of red and green tea decreased, and frequency of coffee intake increased instead. Coffee is the most preferred beverage in Korea, and average annual per capita coffee consumption for adults has reached 353 cups, about 2.7 times the world average of 132 cups [33]. Coffee mix, a mixture of instant coffee, sugar, and creamer in a single serve pack, is frequently consumed at work, and it is likely that this kind of coffee culture has influenced Central Asian immigrant workers. In the group that perceived Korean food as healthy Intakes of such healthy food as cooked vegetable 'Namul', Kimchi, seafood increased in the group that perceived Korean food as healthy who perceived Korean food as healthy. Intakes of Namul, Kimchi, rice, Ramen, pork, chicken, fish, seafood, coffee, increased in the group who responded that their health improved after immigration to Korea. This result can be interpreted that those who were well settled in Korea and ate from various food groups saw their health improved. Central Asian workers' consumption of Kimchi increased after immigration to Korea, but they didn't eat often. Foreign students living in Korea have significantly improved their adaptation to cabbage Kimchi, a representative of Korean food culture, starting from 2 years [5]. In addition, the longer the residence period, the better the degree of adaptation to Korean cooking methods such as stew (Jorim) and Namul [5].

Intake of instant food such as Ramen and fast food such as pizza and hamburger increased among all 4 countries. It needs to be cautious, against excessive consumption of instant or fast food, which may cause a nutritional imbalance. Since the opening of the former Soviet Union, Korean Ramen has been regarded as a high-quality food in their homelands, so they have a preference for Ramen. In a study for international students in Korea, Wang et al. [34] have found that international students have a high frequency of Ramen intake in spite of its nutritionally undesirable attributes, and this is because Ramen attracts them as a simple and affordable meal option. This result is also consistent with the findings of previous study reporting that consumption of high calorie foods such as pork cutlet, hamburger, and pizza was found to increase among Chinese students in Korea as their length of time grew in the country because hamburger and pizza are popular and easily accessible in Korea [5]. According to a study on the dietary changes among Greek university students who lived away from home, in other cities within Greece or moved to England [11], the result of negative changes in the eating habits of students studying in Glasgow through a food intake frequency survey was found. This study was to verify the rapid negative change, called the Glasgow effect, in the eating habits of Greek students living in Glasgow. A self-administered questionnaire was used to assess the diet before and after starting college for Greek students residing at home (n = 43) or in Greece (n = 37) or Glasgow (n = 55) [11].

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The study reported that their intake of cheese, fruits, cooked vegetables which they usually ate in Greece decreased, and that of unhealthy foods as well as snacks, convenient foods, frozen foods, take-away foods, and fast foods increased. After leaving home, especially after migrating to a Nordic environment, young Greek adults have had a hard time maintaining a traditional Mediterranean diet known as a healthy diet [11]. Thus, it can be said that foreign workers immigrated to Korea have a different process of dietary acculturation according to environmental and cultural differences of their homelands even though they share regional similarity. Also, their dietary practices have been observed to change in a positive or negative or neutral way, adjusting to Korean dietary practices since they immigrated to Korea. Although this study did not accurately measure the amount of food intake, we could see the change in eating behavior through a significant change in the frequency of food intake. We concluded that it had a positive or negative effect on the diet, which could be considered as nutritional significance. In order to help them adjust to Korean food culture, it is necessary to identify and prepare for positive or negative dietary changes by investigating the process of dietary acculturation of foreign workers by country of origin. Proper education and guidance on dietary practices will make it possible for them to achieve a healthy diet and successful dietary acculturation, thus leading to overall acculturation to improve the quality of life. According to World Health Organization's healthy diet [35], it is recommended to take fruit, vegetables, legumes (e.g., lentils and beans), nuts and whole grains (e.g., unprocessed maize, millet, oats, wheat, and brown rice). And the intake of saturated fats should be reduced to less than 10% of and trans-fats to less than 1% of total energy intake. Positive dietary changes have resulted in increased consumption of rice, boiled vegetables, fresh fruits, and marine products. On the other hand, an increase in the intake of instant noodle, coffee and decrease in the intake of tea could be perceived as negative changes. After immigration to Korea, Central Asian workers whose diet used to be meat and dairy product based have maintained a nutritionally balanced diet by eating a variety of foods.

Regarding food intake differences among the 3 groups, there was a significant increase in intakes of Namul, rice, ramen, beef, pork, chicken, fish, seafood, hamburger, pizza, coffee, black tea in HI who reported health improvement. We can infer that health improved among those who were well settled in Korea and ate from the various food groups. An increase in coffee intake and a decrease in black tea and green tea intake were commonly observed in all 3 groups. This result reflects the fact that coffee is very popular and a part of daily culture in Korea and it takes the place of black tea popular in their homelands. Beef intake decreased in all 3 groups and it is understood that this is because beef costs more in Korea than in their homelands. Among the participants who perceived their health improved after immigration, positive changes have been observed in their eating habits; their meat-based diet has turned into a healthy one in which nutritional balance can be achieved by consuming the various food groups. Among those who perceive Korean food as healthy food, consumption of representative healthy Korean food, i.e., Namul and seafood increased.

In the previous study, it was found that eating habits of immigrants changed as they adapted to the food culture of the new country. Their eating habits changed in a way that consumed more instant and high-calorie foods in the new settlement than in native lands. In the case of immigrants who practiced a high-calorie diet in their native lands (Latinos), when they immigrated to the United States, they made a positive dietary change by eating a variety of foods. Immigrants who came to Korea showed changes in their eating habits in the process of adapting to Korean food, which was similar to the findings of previous research. In addition, there were positive effects observed such as intake of various foods in the process

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of adapting to Korean food known as healthy food and at the same time negative effects of increased Westernized food intake. In this study, the difference in the intake frequency of food according to the period of residence could not be investigated, so the change in intake of Namul, Kimchi, fish, Ramen and coffee was not known. As a follow-up study, a study on the difference in intake frequency according to the period of residence is necessary. Also, it is hard to say that this study accurately reflects the actual health condition because it was measured in response to the respondents' subjective judgment to determine the change in their health condition. To objectively identify the health change of foreign workers, it is necessary to identify health measure such as BMI and blood test results for further study This study examined 186 visitors to Uijeongbu Support Center for Foreign Workers and the generalizability of these results is subject to certain limitations stemming from its sample size. As the number of Central Asian workers in Korea is considerably limited, and furthermore, the participant of this study is confined to Central Asian workers who visit Uijeongbu Support Center for Foreign Workers, the generalizability of the results of this study is subject to certain limitations stemming from the sample size. However, with the future research extended to Central Asian immigrant workers who visit Support Center for Foreign Workers in other areas (Incheon, Changwon, Kimhae) of the country, the findings of this study could be extended to the entire population of Central Asian immigrant workers living in Korea. In a later study, we will increase the number of samples and conduct a study on how much of workers' salaries are used for food.

SUMMARY

This study was designed to help develop strategies to promote healthy and desirable dietary practices for Central Asian immigrant workers living in Korea by analyzing their dietary intake and changes. It has been found that the consumption of beef and lamb by immigrant workers has decreased while that of pork has increased, and as they adapt to Korean food culture, the consumption of vegetables, Kimchi, rice and fisheries products has increased but that of potatoes has decreased. Participants who made a positive change in their eating habits after immigration reported their health improvement. Their meat-oriented diet has turned into a healthy and balanced diet by consuming a variety of food groups. However, negative dietary changes were also observed; the consumption of instant food, fast food, and coffee increased while that of black tea and green tea decreased. Therefore, Central Asian immigrant workers living in Korea have regional similarities, however, the changing process of their diet varies depending on the environmental and cultural differences of their native lands. For them to adapt to Korean food culture in the positive direction, it is necessary to identify and prepare for their dietary changes by investigating the adjusting process of the diet of foreign immigrant workers from each country. Also, if the support center for immigrant workers opens Korean food classes to develop and provide dietary education materials for foreign immigrant workers, it will help them to adapt to traditional Korean food culture and minimize the possibility of negative dietary changes to unhealthy eating habits. The findings of this study will contribute to the development of dietary policies to help understanding of and acculturation to Korean food culture among foreign workers who will be living in Korea in the future.

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