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Preservation of a traditional Korean dietary pattern and emergence of a fruit and dairy dietary pattern among adults in South Korea: secular transitions in dietary patterns of a prospective study from 1998 to 2010

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ABSTRACT

Transitions in nutrition patterns tend to emerge through industrialization and economic development. We hypothesized that the dietary patterns among South Korean adults who were 20 years or older have changed significantly from 1998 to 2010. Herein, a repeated cross-sectional analysis of data was followed for 140601 adults. We noted changes in consumption, after adjusting for age, sex, body mass index, and exercise, and tested the trends across the study period. Factor and cluster analyses were used to derive dietary patterns. A decrease in traditional Korean food consumption, including cereals, vegetables (252-176 g), and Kimchi (127-82 g), occurred, whereas fruit (172-252 g), egg, and fried food intakes increased ($P < .05$). Total daily energy intake declined steadily from 1931 in 1998 to 1691 kcal in 2010. Carbohydrate intakes were unchanged over the study period; however, fat-derived energy intake increased slightly from 19.7% to 20.0% ($P < .05$). Our factor and cluster analyses identified 3 dietary patterns: “Korean” diet (rice, vegetables, and Kimchi), “Western” diet (soda, eggs, and oil), and “New” diet (low sugar and high fruit and dairy product intakes). Compared to 1998, approximately 40% of participants still followed a Korean diet in 2010. Interestingly, the popularity of the Western diet fell by approximately 20%, whereas the new diet pattern increased 2-fold over the study period. Overall, these

Abbreviations: BMI, body mass index; BP, blood pressure; HDL-C, high-density lipoprotein cholesterol; KNHANES, Korea National Health and Nutrition Examination Survey; TG, triglyceride.

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data show secular trends in dietary patterns that included a preservation of the traditional Korean diet and the emergence of a new diet pattern, and it demonstrated a unique transition in food and nutrient intakes in Korea.

1. Introduction

Nutrition transition is a sequence of dietary and nutritional characteristics resulting from large shifts in overall dietary structure related to changing social economic factors [1]. Dietary patterns generally tend to change with industrialization and economic development. More specifically, we define that nutrition transition is referred to the shift toward the diet-related noncommunicable disease phase [2]. Increasing economic development in Asian countries means that lifestyles have shifted to include increases in dietary fat and animal product consumption as well as more sedentary behaviors, which are cited as contributing to these noncommunicable diseases [3-7].

South Korea has experienced earlier and greater economic change compared with most other Asian countries. In the late 1990s, there were several big changes in South Korea, which included becoming members of the Organization for Economic Cooperation and Development, hosting the World Cup, and increasing Gross Domestic Product (GDP) per capita. There were also many changes made to the lifestyles of the Korean population, and consequently, changes in disease patterns that coincided with economic improvements in South Korea emerged [8]. For example, the prevalence of obesity (body mass index [BMI], ≥25 kg/m^2) among South Korean adults increased from 26.0% in 1998 to 30.9% in 2010 [8]. The prevalence rate of colorectal cancer increased by 17.8% (21.2%-39.0%), during the same periods of 1998 to 2010 [9].

A few previous studies have shown a nutrition transition among Koreans [6,10,11], and they revealed that intakes of plant foods, including total cereal consumption, decreased, whereas animal food intakes increased from 1970 to the beginning of the 1990s [6,10]. Interestingly, it appears that the amount and rate of increase in fat intake have remained low in South Korea [10]; however, these data are mainly based on 10-year-old data. Furthermore, these studies did not examine dietary patterns using factor analysis or cluster analysis and focused more on food groups or nutrients than overall dietary patterns. Because of the fact that people eat foods and meals with complex combinations of nutrients that are likely to be interactive or synergistic, dietary pattern analysis examines the effects of the overall diet rather than only single nutrient or food. Hence, it provides a more realistic representation of dietary intakes and accounts for complicated interactions and cumulative effects [12].

We hypothesized that dietary patterns among adults who were 20 years or older in South Korea have changed significantly from 1998 to 2010. The specific research objectives to test this hypothesis included identifying the aspects of nutrition transition each year and exploring and comparing trends in dietary patterns using factor and cluster analyses among South Koreans adults who were 20 years or older, over the 13-year period.

Table 1 – Daily intakes of nutrients and validity test between 3-day diet records and the dietary assessment instrument [a]

	3-d records	Brief dietary assessment instrument [b]	Pearson's correlation coefficients	
			r	*P*
Energy (kcal)	1649.0 ± 357.2 [c]	1699.0 ± 338.2	**0.50032**	**<.0001**
Carbohydrate (g)	243.3 ± 61.0	274.8 ± 57.8	**0.55561**	**<.0001**
Protein (g)	74.5 ± 27.5	62.9 ± 15.6	**0.40525**	**.0013**
Fat (g)	43.1 ± 11.9	39.0 ± 8.3	0.06384	.6280
Calcium (mg)	583.2 ± 240.6	591.7 ± 177.5	0.21560	.0980
Iron (mg)	13.7 ± 3.9	15.2 ± 3.7	0.07530	.5674
Vitamin A (μg RE)	891.7 ± 394.9	1163.4 ± 463.2	0.02192	.8680
Vitamin B1 (mg)	1.1 ± 0.3	1.0 ± 0.2	0.08194	.5337
Vitamin B2 (mg)	1.2 ± 0.3	1.4 ± 0.3	0.23198	.0745
Vitamin C (mg)	114.5 ± 55.1	170.1 ± 70.0	**0.36039**	**.0047**

[a] The data collected from 60 subjects (30 males and 30 females) among the participants of this prospective study from April 2009 to August 2012.
[b] Developed by Moon et al [16]. The questionnaire included 17 food items from 7 food groups: (1) fish, meat, eggs, and soy bean products; (2) milk and dairy products; (3) vegetables; (4) fruits; (5) cereals and potatoes; (6) sugars and candies; and (7) fats and oils.
[c] Values expressed as are means ± SD. Values in boldface are significant at $p < 0.05$.

2. Methods and materials

2.1. Study population and database

Data from a prospective study were used in which the subjects underwent health examinations at a health examination center from 1998 to 2010 in Seoul, South Korea (n = 142719). Study participants included people who were older than 20 years, whereas the participants who were missing diet assessment data (n = 621) for a major variable were excluded. Immigrants and pregnant women were also excluded (n = 1490). Participants reporting typical energy intakes more than 5000 kcal/d or less than 500 kcal/d were excluded (n = 7) from the analysis because these values are considered to be biologically implausible as a typical intake. Our final study sample included 140601 examinees with complete primary data (eg, diet, lifestyle, and laboratory tests). The study was approved by the Institutional Review Board of Human Research of Yonsei University (Seoul, South Korea), and each participant who donated blood samples provided a signed informed consent.

2.2. Data collection

Each subject completed a structured questionnaire to collect data on sociodemographic characteristics and health habits, such as