Effects of Family Meal Frequency on Risk Factors for Cardiovascular Disease in Korean Elderly Males and Females

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Abstract

Background: In the case of the elderly who highly depend on family, serious health problems can be caused due to the reduction of family meals. Therefore, this study aims to suggest the fundamental data for management of cardiovascular disease, one of the major causes of death in elderly Koreans, by investigating the effects of family meal frequency on the risk factors for cardiovascular disease in Korean elderly males and females.

Methods: The raw data of the Fifth Korea National Health and Nutrition Examination Survey (KNHANES III) were utilized. Data of 1,236 respondents were extracted for analysis regarding anthropometry, blood, blood pressure, nutrients and total energy intake. For collected data, using SPSS 18.0 and Amos 18.0, the mean and standard deviation, and the path coefficient between groups through a multi-group analysis by structural equation model were checked

Results: As family meal frequency increased, triglyceride and fasting blood glucose in Korean elderly males were likely to decrease, which led to conflicting results with those of Korean elderly females.

Conclusion: Frequent family meal makes a positive effect on reducing several risk factors for cardiovascular disease in Korean elderly.

Keywords: Family meal frequency, Cardiovascular disease, Korean elderly

Introduction

Recently, the Seoul metropolitan government conducted a survey regarding Seoul citizen's health and frequency of family meals. According to the survey results targeting 2,425 citizens, 28.4% of respondents have a meal with their family 3~5 times a week, and 25% of them have a meal with their family 1~2 times a week (1).

Having a meal with one's family can be used as an opportunity to recognize family members as a living community as well as to express the bond among family members (2). In addition, it was revealed that the more the chance to have a meal with one's family, the higher the probability to have a balanced diet and healthy eating habits (3). However, in the rapidly changing modern society, the busy life of individuals causes a reduction of family meals; this result is due to an increase in the situation where each individual needs to take care of his/her meals rather than eating together with the family at home due to increased economic activity of married women in the Korean society as well as an increase in children's afterschool and private education activities (4). Such a different daily schedule of each family member leads to the

difficulty of eating together, thereby making individual meals a general trend.

The reduction of family meals makes a negative influence on family members' mental and physical health. In particular, family members who highly depend on family, such as the elderly, growing children or adolescents, are more likely to be affected. Thus, the effects of family meals on school adaptation of children and adolescents are often reported. Sung et al. reported that a lack of family meal affects the nutritional imbalance, social isolation and emotional instability (5). Moreover, schoolchildren who eat alone have a tendency to less enjoy the meal time and have a meal that may cause nutritional deficiencies than children who have a meal with their family (6).

A study associated with family meals in the elderly investigated the diversity of food type, chewing ability, and intellectual capability biannually from 1992 to 2000, targeting 417 Japanese elderly (7). Larrieu et al. examined the eating habits for 9,250 elderly aged over 65 years living in a community (8). As a result, the elderly who lives alone or has a lower education level is more likely to have an unbalanced diet, ultimately showing the importance of family meals. Moreover, Allen et al.'s study, which examined foods cooked by the wife within the family, targeting 83 middle-aged or older African Americans living in the United States showed that most males appreciate their wife's foods for family health, reminding the importance of eating at home (9).

Although there are several reports regarding the effect of family meals on weight or BMI, studies specifically identifying the effect of family meals on the health of the elderly are not sufficient. Berge et al. proved the significant inverse correlation between family meal frequency and adult BMI using BMI figures of 4,885 adults aged 25~64. However, the elderly aged over 65 years were not included in the study (10). Furthermore, Sobal & Hanson tried to figure out the association between family meals and weight by targeting 360 individuals aged 18~85; however, they did not divide the groups by age (11).

Currently, the elderly population accounts for a large proportion in the overall composition of the population in Korea. Based on reports in 2013, the elderly population aged 65 or older comprised 12.2% of the entire population, already exceeding the aging society; moreover, it is predicted that in 2017, the Korean society will enter the aged society (12). In the case of the elderly, when considering that they spend most of their time at home and highly depend on their family, the frequency of family meals may affect the health of the elderly; yet, previous research on this topic is not sufficient.

Therefore, this study aims to identify the associations between family meal and elderly health. Specifically, it explores the effects of family meal frequency on the risk factors for cardiovascular disease in Korean elderly males and females. Cardiovascular disease is the largest cause of elderly death, and every year, over 17 million elderly die from cardiovascular disease (13). In Korea, due to the settlement of westernized eating habits, the prevalence of cardiovascular disease has rapidly increased over the last 30 years; moreover, it is regarded as one of the three major causes of death in Koreans (12). Thus, it is expected that the results obtained by this study can be utilized as fundamental data for management of cardiovascular disease.

Methods

Data Collection

This study used the 3rd year subjects' data of the Fifth Korea National Health and Nutrition Examination Survey (2010-2012, V-3) conducted by Korea Centers for Disease Control and Prevention. Data of the Fifth Korea National Health and Nutrition Examination Survey consist of a health survey, medical examination and nutrition survey. The health survey and medical examination were conducted at a mobile examination center, and the nutrition survey was performed through a one-to-one interview by the nutrition survey team directly visiting the target households. The survey items of this study include the subject's gender, age, family meal frequency, height, weight, Body mass index (BMI), waist circumference, blood lipids (total cholesterol, triglyceride, HDL-cholesterol, LDL-

cholesterol), fasting blood glucose, blood pressure (SBP and DBP), nutrients (carbohydrate, protein, fat, sodium, potassium, calcium) and total energy intake.

Study Subject

The total number of survey participants was 8,058 persons. The elderly population aged 65 or older was 1,666 persons. Among these, excluding 430 participants' data whose response was not sufficient or the medical examination result was miss-

ing, a total of 1,236 persons were selected as the final subjects. Their general characteristics are as follows in Table 1.

Definition of Family Meal

Family meal can be defined in a variety of ways. For example, depending on the frequency of meal with family and the number of family members attending the meal, the category of family meal may vary.

Table 1: General characteristics of study subjects

Characteristics	Male (n=527)	Female (n=709)	Total
Age (yr)	72.15±4.85	72.52±5.29	72.36±5.11
Height (cm)	165.24±5.53	150.92±5.96	157.03±9.14
Weight (kg)	64.07±9.56	55.61±8.79	59.22±10.04
Family Meal Frequency (times/day)	2.14±1.10	1.60±1.31	1.83±1.25

In addition, depending on whether the meal with family has regularity, the definition of family meal may differ (14-15). If it is a study targeting older adults, family meal can be defined by being expanded as 'the shared mealtime experience shaped by social relationship' (16). This study defines family meal as a meal with more than one family member. More specifically, it is defined as having breakfast, lunch, or dinner together with family members, sharing a certain part of family life and staying in the same living space.

Measurement and Analysis Method

1) Family meal frequency

Average family meal frequency per day for the last one year was asked based on the definition of family meal in this study, extracting the respondents who have a meal three times a day among the entire elderly respondents. For analysis, making the case of no family meal at all 0, one family meal per day was coded as 1, two family meals per day as 2, and three family meals per day as 3.

2) BMI, waist circumference, blood pressure

Body mass index (BMI) was calculated by dividing the weight by the square of height (kg/m^2), and for waist circumference, the midpoint between the lowest point of the rib and the highest point of

the pelvis, measured with a tapeline. For blood pressure, systolic and diastolic blood pressures were measured by a nurse who was in charge of blood pressure measurement in the survey performance team of Korea Centers for Disease Control and Prevention; the adjusted blood pressure adjusting the error values induced by the difference of height of the arm was also used (17).

3) Blood Testing:

Blood lipids (total cholesterol, triglyceride, HDL-cholesterol, LDL-cholesterol) and fasting blood glucose were measured using an automatic biochemical analyzer (Hitachi, Japan).

Ethical note

This survey was conducted under the approval of the Research Ethics Review Committee of Korea Centers for Disease Control and Prevention, and the protocol of this study was approved by the Bioethics Institutional Review Board of Konkuk University. (Project No. 7001355-201405-E-017).

Statistical Analysis

Collected data were processed using SPSS 18.0 and Amos 18.0. For the general characteristics of study subjects and the general characteristics of risk factors for cardiovascular disease, descriptive

statistics were conducted, including the mean and standard deviation, kurtosis and skewness, etc. Further, in order to identify the effects of family meal frequency on the risk factors of cardiovascular disease in Korean elderly males and females, the path coefficient was tested through a multi-group analysis by the structural equation model. For all statistical analyses, the significance level was set to .05.

Results

General Characteristics of Risk Factors for Cardiovascular Disease in Korean Elderly Males and Females

Table 2 shows the results of the general characteristics of risk factors for cardiovascular disease in Korean elderly males and females.

Table 2: General characteristics of risk factors of cardiovascular disease in Korean elderly males and females

	Gender	M±SD	Min.	Max.	Skewness	Kurtosis
Waist Circumference (cm)	Male	84.94±8.80	60.50	115.10	.14	.18
	Female	83.06±9.12	56.00	124.00	.28	.68
BMI (kg/m²)	Male	23.42±2.89	15.13	33.56	.22	.10
	Female	24.36±3.24	14.58	38.31	.62	1.17
Total Cholesterol (mg/dl)	Male	181.03±35.08	95.00	341.00	.52	1.23
	Female	196.88±36.63	106.00	318.00	.37	.07
Triglyceride (mg/dl)	Male	131.82±101.70	26.00	1573.00	6.50	78.50
	Female	136.09±74.68	28.00	1121.00	3.91	42.43
HDL-Cholesterol (mg/dl)	Male	46.65±11.43	22.99	90.58	.74	.45
	Female	49.39±11.50	21.09	107.72	.85	1.74
LDL-Cholesterol (mg/dl)	Male	140.76±25.53	106.00	232.00	.96	.72
	Female	120.88±38.13	18.00	232.00	.22	-.49
Fasting Blood Glucose (mg/dl)	Male	105.27±21.27	78.00	203.00	2.07	5.02
	Female	101.49±16.81	78.00	189.00	1.87	4.68
Systolic Blood Pressure (mmHg)	Male	127.97±17.16	81.00	184.00	.55	.36
	Female	131.31±17.10	90.00	221.00	.67	1.53
Diastolic Blood Pressure (mmHg)	Male	73.91±10.167	48.00	105.00	.20	-.13
	Female	74.36±9.23	50.00	106.00	.27	.20
Total Energy Intake (kcal)	Male	1954.24±727.44	356.81	5412.42	1.19	2.89
	Female	1484.47±581.17	176.67	4377.19	.95	1.89
Protein Intake (g)	Male	66.15±37.76	7.13	462.17	3.33	24.87
	Female	48.02±25.77	4.08	253.23	2.12	9.59
Fat Intake (g)	Male	29.68±24.85	1.16	202.71	2.50	10.02
	Female	20.66±17.64	.80	143.88	2.27	7.54
Carbohydrate Intake (g)	Male	341.93±123.24	71.13	919.13	.97	2.18
	Female	280.78±112.19	32.61	947.33	1.11	3.13
Calcium Intake (mg)	Male	475.72±327.02	27.16	2674.62	2.28	8.43
	Female	390.91±397.03	5.19	5917.27	6.18	66.56
Potassium Intake (mg)	Male	2986.53±1668.38	267.58	11878.48	1.79	4.82
	Female	2405.52±2140.60	97.00	35462.73	8.23	106.02
Sodium Intake (mg)	Male	4646.12±2960.59	362.18	22086.53	1.97	6.31
	Female	3453.21±2621.41	126.39	27963.26	2.94	17.07

The structural equation model used for accomplishing the purpose suggested by this study should satisfy the condition of the normal distribution of collected data. However, it was found that triglyceride, fasting blood glucose, protein intake, fat intake, calcium intake, potassium intake, and sodium intake factor did not satisfy the condition of normal distribution (kurtosis<2, skewness<4), as suggested by Hong et al. (18). Therefore, to apply the statistical method, for the data of risk factors for cardiovascular disease, log transformation was used to satisfy the standard of kurtosis and skewness.

Effects of Family Meal Frequency on Risk Factors for Cardiovascular Disease in Korean Elderly Males and Females

Table 3 displays the results of the effects of family meal frequency on the risk factors for cardiovascular disease in Korean elderly males and females. In particular, the fit indices of the study model fulfill the standard values suggested by Browne & Cudeck and Bentler [X^2=7,741.586 (df=306,

P=.000), CFI=.938, TLI=.908, RMSEA=.040] (19, 20). This is the result of measuring the fit indices for the model equally by fixing the loadings of all factors for each latent variable of Korean elderly males and females. Therefore, it was confirmed that there was no problem in testing the path coefficient depending on gender.

Triglyceride (3.992), HDL-cholesterol (26.705), fasting blood glucose (14.174), total energy intake (13.278), protein intake (8.895), fat intake (6.576), carbohydrate intake (5.700), potassium intake (5.799), and sodium intake (14.635) factor showed a statistically significant difference depending on the gender of elderly Koreans (P <.05). The result, that the influences of several risk factors for cardiovascular disease are different depending on the gender, was obtained.

In detail, as the frequency of family meal increased, in Korean elderly males, fasting blood glucose (-.024) and triglyceride (-.024) were likely to decrease, hence revealing conflicting results with those of elderly females.

Table 3: Comparison of gender difference for path coefficient

Path Coefficient between Variables	df Change	CMIN	P	Path Coefficient by Gender	
				Male	Female
Waist Circumference	1	1.963	.161	-.003 (-.036)	.004 (.046)
BMI	1	.929	.335	-.004 (-.038)	.002 (.017)
Total Cholesterol	1	.496	.481	.000 (-.001)	-.007 (-.047)
Triglyceride	1	3.992*	.046	-.024 (-.049)	.027 (.072)
HDL-Cholesterol	1	26.705***	.000	.005 (.025)	-.023 (-.134)
LDL-Cholesterol	1	.578	.447	.005 (.031)	.014 (.053)
Fasting Blood Glucose	1	14.174***	.000	-.024 (-.149)	.007 (.061)
Systolic Blood Pressure	1	.648	.421	-.009 (-.072)	-.004 (-.036)
Diastolic Blood Pressure	1	.681	.410	-.004 (-.013)	-.003 (-.028)
Total Energy Intake	1	13.278***	.000	-.017 (-.060)	.041 (.154)
Protein Intake	1	8.895**	.003	-.019 (-.041)	.055 (.138)
Fast Intake	1	6.576*	.010	-.056 (-.078)	.044 (.071)
Carbohydrate Intake	1	5.700*	.017	-.003 (-.009)	.043 (.133)
Calcium Intake	1	3.238	.072	-.007 (-.011)	.055 (.089)
Potassium Intake	1	5.799*	.016	-.002 (-.005)	.063 (.136)
Sodium Intake	1	14.635***	.000	-.036 (-.064)	.086 (.157)

* P <.05, ** P <.01, *** P <.001/X2=7,741.586 (df=306, P =.000), CFI=.938, TLI=.908, RMSEA=.040

In elderly females, nutrients, except for fat [carbohydrate (.043), protein (.055), potassium (.063), calcium (.055), sodium (.086)] intake and total energy intake (.041)factor, were likely to increase, whereas the HDL-cholesterol reduction (-.23) factor was likely to decrease, thereby showing conflicting results with those of elderly males.

Discussion

This study aimed to investigate the effects of family meal frequency on the risk factors for cardiovascular disease in Korean elderly males and females, and to use the study results as fundamental data for management of cardiovascular disease, one of the major causes of elderly death. As a result, differences in fasting blood glucose, triglyceride, HDL-cholesterol, and nutrient intake were revealed between males and females.

Excessive blood glucose, blood HDL-cholesterol and triglyceride level increase the risk of cardiovascular disease due to diabetes and dyslipidemia. Diabetes is considered one of the risk factors for cardiovascular disease; in recent years, diabetes itself tends to be treated the same as cardiovascular disease (21). In this study, family meal frequency significantly affected the decrease of fasting blood glucose of elderly males. As a reason, it is thought that the meal pattern of eating with family engendered the speed of eating relatively slower than that of eating alone. Eating slowly, namely, slow eating habit suppresses excessive increase of blood glucose as well as helps ingested foods to be digested sufficiently in the body (22). In particular, since the fast eating speed of men compared to women may cause insulin resistance (23), it is thought that family meals can be an efficient way to effectively prevent diabetes and manage risks of cardiovascular disease in elderly males. In this study, the increase of family meal frequency significantly associated with reduction of the level of triglyceride in elderly males. In the background of this result, although elderly males' triglyceride level is lower than that of elderly females (24), it is thought that the reduction of fasting blood glucose of elderly males due to family

meals also affected it. Kim explained that excessive intake of carbohydrates can increase the level of triglyceride (25). Caarey et al. reported that whenever triglyceride increases by 23 mg/dl, coronary artery disease increases by 20% (26). Therefore, it is thought that a decrease of fasting blood glucose due to an increase of family meal frequency led to a decrease of triglyceride. Thus, it shows that family meal can help decrease cardiovascular disease in Korean males.

HDL-cholesterol improves the level of cholesterol in the body and reduces the risk of cardiovascular disease (27) by taking a role of 'reverse cholesterol transport' that carries the excessive cholesterols, which are not consumed in tissue cells back to the liver (28). Blood HDL-cholesterol tends to decrease as aging progresses. According to Upmeier et al., a low level of HDL-cholesterol increases the risk of cardiovascular disease in the elderly aged 70 or older. Therefore, maintaining the normal range of blood HDL-cholesterol can be an effective factor for cardiovascular health of the elderly (29).

According to this study result, the increase of family meal frequency significantly related with reduction of level of blood HDL-cholesterol in elderly females, it is difficult to think that family meals are positive for promoting the health of elderly females. This result appears to have an association with total energy and nutrient intake of elderly females, depending on family meal frequency. According to the study result, in the case of elderly females, the more the frequency of family meals, the greater the total energy intake; further, nutrient intake, except for fat, also increased. In the background, this seems to be associated with the fact that women are responsible for most of the housework. In the meal preparation process, women repeat the behavior of tasting foods, and during the preparation for various foods, tasting behaviors before meals are accumulated. Moreover, the Korean food culture, sharing foods contained in a plate, causes trouble in taking care of leftover foods produced after eating. In this case, Korean women, who are in charge of housework, tend to eat the leftover foods in order to reduce the housework after eating. As a result, women

having family meals more frequently are likely to intake more foods. Therefore, when eating with family, elderly females need to be more careful. However, it is difficult to conclude that family meal intimidates the health of elderly females based on this result. Looking at the general characteristics of the study subjects, the total energy intake of elderly females is far short of the recommended amount (30). In the light of this result, if management of several risk factors is accompanied, elderly females' family meal can be used as an effective way to fulfill the consumption of insufficient nutrients.

Conclusion

This study showed differences between males and females in fasting blood glucose, triglyceride, HDL-cholesterol, and nutrient intake, and found a meaning of family meal, in that frequent family meals make a positive effect on reducing several risk factors for cardiovascular disease in Korean elderly males and females. Considering this, at the personal level, elderly Koreans should make efforts to have meals together with the family, and the difference by gender needs to be recognized. At the government level, a policy for encouraging family meals should be made and further, related campaigns should be planned in order to help the public rethink. Meanwhile, in this study, family meal was restricted as having a meal with family members only, and the consideration of a shared meal with members other than the family was not made. Therefore, in a future study, a comparison between family meal and shared meal should be performed.

Ethical considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

Acknowledgments

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