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Diet Pattern According to Socio-Economic status - Using the Fifth (2010-2012) Korea National Health and Nutrition Examination Survey

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Abstract

The purpose of our study is to analyze the effect of socio-economic status on the diet pattern of Korean adults. Raw data from the fifth (2010-2012) Korea National Health and Nutrition Examination Survey (KNHANES) were used, and finally 11,700 adults were analyzed as subjects. Results in consideration of the socio-economic status of the subjects, a linear trend was observed in men in which the odds ratio of having lunch (p for trend=0.006) and dinner (p for trend=0.0317) decreased as the level of education went down. In diet frequency, a decreasing trend (p for trend=0.0328) was observed in which the odds ratio of having 3 meals a day reduced as the household income lowered. For women, a linear trend (p for trend=0.0012) was observed in which the frequency of dinner decreased as the level of education became lower. A falling trend in the rate of having 3 meals a day was also observed (p for trend=0.0135). Our study analyzed the characteristics of the diet patterns of individuals according to their socio-economic status with the purpose of suggesting guidelines for correcting. To prevent this, we will need education and awareness and public attention for the practice of correct eating habits.

Keywords: *diet pattern, Korea National Health and Nutrition Examination Survey, irregular diet, socio-economic status, p for trend*

1. Introduction

As society advances along with economic growth, there is a growing interest in the extension of mean life span and health promotion. The general health level has improved up to a certain extent, however, the health inequality originating from the social polarization is becoming more serious. Health is the most fundamental right that should be guaranteed to citizens and is an essential element of the life of human beings, and a gap in health can ultimately lead to a gap in life[1, 2]. For this reason, numerous countries following the World Health Organization are suggesting “health for all” as their policy objective, exerting the effort to address the health inequality and achieve health equity[3]. As the interest in health equity continues to grow, many studies are being conducted and a variety of concept definitions and measuring methods is suggested.

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Health inequality is defined by the differences in health status, exposed environment, accessibility to medical service, and the quality of medical service of one group in comparison to another[4-6]. In terms of health, the inequality owing to gene map and aging is inevitable in modern medicine. However, there exists a type of health inequality between groups that can be avoided. The reason for a reduced average health level of a certain group compared to another is because the opportunity for them to promote their health is not equally provided. This kind of health inequality is deeply associated with socio-economic factors. Income, education level, and occupation of individuals are a few examples[7-10].

Among these, income is a direct indicator of physical resources and is the biggest influence on health among socio-economic indicators. It also has an effect on the prevalence of specific diseases and the mortality rate of populations [11, 12]. Income is also used as an important indicator in investigating the relationship with health inequality due to the fact that it directly reflects the standard of living. Another important variable that helps categorize social classes is the level of education. Different from occupation, it includes all varieties of people within a population such as currently working employees, unemployed persons, retirees, and homemakers. Moreover, it does not have changes both in the male and female groups. For example, it does not have the problem of reduced income in case of persons suffering a disease, and helps determine the cause and effect[13].

Population groups with low levels of socio-economic status commonly demonstrate a low-quality diet. They have a lower intake of fruits and vegetable[14-16] and are reported to have a high mortality rate as well as high morbidity with overweight and obesity[17,18], coronary heart diseases[19], stroke[20], and hypertension[21].

Diet is the foundation on which human beings build their life and health, and dietary pattern and health are very closely related[22]. In historic terms, diet reflects the frequency of meals per day and the proportion of each meal depending on the economic background and the cultural characteristics of each society[23]. In modern society, diet reflects the dietary preferences and patterns of individuals. It is closely related to many other factors, such as socio-demographic, dietary, and health-related factors[24]. In addition, diet is the cultural and social product of a certain area and is fundamental for humans to maintain their life and health, therefore, diet and health are very strongly associated with each other.

According to various studies conducted on diet, a regular diet belongs to a healthy diet pattern along with abstinence from smoking and drinking and regular exercise and is known to be related to the promotion of human health, life extension, and the prevention of obesity [25-27]. However, when nutrition intake is imbalanced, diet is irregular, or the frequency of daily food intake is less than 3 times, this kind of diet pattern can not only bring about various diseases due to under-nourishment, over-nourishment, or an imbalance in nourishment, but can also contribute to the development of obesity, increase the levels of cholesterol (TC), and low-density lipoprotein (LDL) cholesterol even further, and aggravate the occurrence of adult diseases such as atherosclerosis, colorectal cancer, diabetes, and hypertension[28-34].

Meanwhile, a study[35] conducted in Finland on 1,861 subjects found that the traditional 3-meals-per-day diet showed no significant difference in the degree of optimal nutrition intake compared to the 2-meals or one-meal-per-day patterns, thus arguing that the traditional diet pattern is not necessarily healthier than the others. Due to contradictory research findings on the frequency of diet, it is necessary to investigate this matter further.

Setting aside the aspects of nutrition and food intake, however, studies on the degree of dietary practice and actual diet patterns as well as studies concerning the characteristics and problems in diet patterns for specific populations according to socio-economic factors such as income level, are rarely found. Studies related to general diet patterns have been conducted focusing on specific regions or certain population groups

such as the elderly or children, however, there are only a small number of studies regarding the actual general dietary practice of Korean adults.

Therefore, the question of whether diet pattern is related to the socio-economic level of the economically active population of Korea was investigated based on the fifth KNHANES in our study. Findings from past studies were also reflected upon in order to identify factors contributing to the formation of the diet patterns of the economically active population. Measures for improvement were considered concerning the factors that can be corrected, and base data were suggested that can serve to effectively maintain the health of today's economically active male and female adults and prevent possible health problems.

2. Methods

2.1 Study design

This is a descriptive study that investigated the regularity in diet according to the levels of income and education among socio-economic factors of adults aged 20 or higher.

2.2 Study subjects and data collection method

The raw data from the KNHANES fifth survey(2010-2012) was used[36-38]. Based on article 16 of the public health promotion law, KNHANES is conducted every three years by the Centers for Disease Control and Prevention(CDC) under the Ministry of Health and Welfare over the entire country as a national project in order to estimate the health and nutrition status of the public. The survey employs stratified cluster sampling to sample 20 households in each of the 192 regions every year and selects approximately 3,800 households. Approximately 10,000 household members aged 1 year or higher are selected, and participation consists of health checkups at mobile examination centers, a health survey, and a nutrition survey during an in-person visit to subjects' homes. The study data were collected from the CDC in accordance with the official protocol, and personal information was protected so that subjects could not be identified by the researchers.

For this study, the selected subjects were 14,857 individuals within the range of 19-64 years of age, which represent the economically active population, out of the 25,534 participants in the fifth KNHANES survey(2010-2012). Among these subjects, a further 3,157 people with missing data were eliminated, thus a total of 11,700 was selected as final subjects for analysis.

2.3 Definition of variables

2.3.1 Dependent variables

Having breakfast, lunch, and dinner was surveyed by questioning whether the subjects had had breakfast, lunch, and dinner during the 2 days prior to the day of the survey with the subject recalling the past concerning the question. According to the survey result, those who had breakfast on both days were categorized as the breakfast group, and those who skipped breakfast on one or both of the days were categorized as the non-breakfast group. Lunch and dinner were categorized in the same manner as breakfast. Concerning the daily diet frequency, 1 meal, 2 meals, and 3 meals per day were used as categories based on the described answers to the question "how was your diet for the last two days?" Subjects who had had all three meals of breakfast, lunch, and dinner, were categorized into the regular eater group (RE); subjects who had skipped one or more meals were categorized into the irregular eater group (IRE)[39].

2.3.2 Independent variables

Education level was categorized into: "6 years or less" (elementary school diploma or lower), "7-9 years" (middle school diploma or lower), "10-12 years" (high school diploma or lower), and "13 years or

more"(studying at university or higher). For household income, ″equivalised monthly household income″ (monthly household income /√ number of household members) was calculated for gender and age (by 5 year unit) and categorized into 4 quantiles of variables ″lowest (Q1),″ ″lower middle (Q2),″ ″higher middle (Q3)," and "highest (Q4)."

2.3.3 Control variables

2.3.3.1 Sociodemographic factors

In order to investigate the socio-economic factors depending on the regularity of diet, age, gender, marital status, health status, and occupation characteristics were used, which were included in the items of the health awareness practice survey. Marital status included 4 variables: having a spouse, divorced or separated, widowed, and single. For smoking habit, subjects were divided into smokers and non-smokers according to their smoking history based on the daily routine habit questionnaire. The drinking frequency was categorized into nondrinker (≤1g/day), normal drinker (1-29.9g/day), and high-risk drinker (≥30g/day). For the level of exercise, those who practiced a moderate level of physical activity 3 or more times per week were categorized into the exercise group and the rest into the non-exercise group.

2.3.3.2 Physical examination

In order to examine the general health status, disease morbidity, and obesity according to the diet regularity, the physical measurement data including height, weight, and biochemical values of blood were used, and the disease morbidity was calculated accordingly.

The physical examination and blood test were conducted as follows: for the former, height(cm), weight(kg), BMI (kg/m2),waist circumference(WC), and Blood Pressure(BP) were measured as dependent variables. For a more objective examination of hypertension, BP was measured 3 times in total, and the diagnosis of hypertension was decided by calculating the final BP through the average of the second and third measurement values.

Obesity was measured using physical examination data. For the physical examination, height, weight, and body mass index (BMI: weight(kg) /height(m)2] were measured. Subjects wore thin clothes and the height was measured up to the tenth decimal place using a height measuring unit nr 225 (SECA, Germany). For BMI calculation, the formula [weight(kg) / height(m)2] was used, and obesity was determined if the BMI was 25 kg/m2 or higher, in accordance with the WHO standards. Abdominal obesity was measured using the physical examination data of WC. The middle point between the lower area of the last rib and upper area of the iliac crest, felt on a line from the center of the armpit, was marked with a water based marker and was measured when subjects exhaled. If the measurement was over 102 cm for males, and 88 cm for females, the subject was diagnosed as obese.

For the accuracy of the blood test, the subjects were instructed to fast from 7 pm in the evening right before the test day (water, roasted barley tea, and mineral water were allowed), and to not take in anything but water on the day of testing. For the assessment of diabetes and metabolic syndrome, TC, triglyceride(TG), high-density lipoprotein (HDL), fasting blood sugar(FBS), and glycated hemoglobin(HbA1c) were measured. The morbidities of metabolic syndrome and diabetes were calculated based on these measurements. The morbidity of metabolic syndrome was calculated with the 5 symptoms of metabolic syndrome(FBS [110mg/dl or higher], WC [over 90 cm for males, and over 85 cm for females], TG [150 mg/dl or higher], HDL [below 40 mg/dl for males, and below 50 mg/dl for females], and abnormal BP range [130 mmHg or higher in systole, and 85 mmHg or higher in diastole]). If subjects had 3 or more out of the 5 symptoms, they were diagnosed with metabolic syndrome; subjects with 2 symptoms or fewer were diagnosed as normal.

FBS and HbA1c values were used to calculate the morbidity of diabetes.

2.4 Data analysis

The socio-demographic characteristics of the subjects were technically analyzed. A chi-squared test was performed for the bivariate analysis to investigate the correlation between the dependent variables. Multiple logistic regression analysis was conducted for multivariate analysis on the variables concerning the regularity of diet according to the levels of income and education, and the odds ratio(OR) and the range of OR in 95% confidential interval(CI) were calculated. A linear trend was confirmed using test for trend. A statistics program SAS 9.3 Ver. was used for the analysis of all data, and SAS SURVEY procedure was employed for analysis in consideration of the complex sample design. The definition of statistical significance was $p<0.05$.

3. Results

3.1 General characteristics of subjects

The total number of subjects for this study was 11,700, consisting of 4572 males and 7128 females. The average age of men was 40 years, ranging between 19 and 64 years, and the education level consisted of 3840 men with high school diploma or higher, and 732 men with middle school diploma or lower. For income range, 458 men belonged to Q1, and 4,114 men belonged to Q2 or higher. The average age of women was 41 years, with a distribution from 19 to 64 years. Education level consisted of 5417 women with a high school diploma or higher, and 1,711 women with a middle school diploma or lower. For income level, 712 women fell into Q1, and 6416 women fell into Q2 or higher (Data was not shown).

When the subjects were categorized into the 3 meal groups (1 meal, 2 meals, and 3 meals per day), a significant correlation was found for men between meal frequency and the socio-demographic characteristics of age ($p<.0001$), BP ($p<.0001$), metabolic syndrome ($p=0.0069$), smoking ($p<.0001$), exercise ($p=0.0356$), spouse ($p<.0001$), education level ($p<.0001$), and household income ($p=0.0071$). For women, age ($p<.0001$), obesity ($p=0.0152$), WC ($p<.0001$), BP ($p<.0001$), metabolic syndrome ($p<.0001$), smoking ($p<.0001$), drinking ($p<.0001$), exercise ($p=0.0096$), spouse ($p<.0001$), and education level ($p<.0001$) showed a significant difference between the 3 meal groups[Table 1].

3.2 Diet pattern according to the socio-economic level

The relationship between breakfast, lunch, and dinner and the socio-economic level was examined[Table 2] for all 11,700 subjects in this study. The socio-economic level was measured through education level and household income. The former was categorized into 4 groups of “6 years or less,” “7-9 years,” “10-12 years,” and “13 years or more,” and the latter also into 4 groups of “lowest,” “lower middle,” “higher middle,” and “highest.”

The pattern of having breakfast, lunch, and dinner according to the level of education showed a significant difference in breakfast ($p<.0001$) and dinner ($p=0.0283$) for men. Among the four education level groups, the response rate of “I had breakfast” was 89.5% for the “6 years or less” education group, and 66.3% in the “13 years or more” education group. In short, longer education demonstrated a lower rate of having breakfast. However, the response rate of “I had dinner” was 94.2% in the “6 years or less” group, 93% in the “7-9 years” group, 94.9% in the “10-12 years” group, and 96.4% in the “13 years or more” group. Therefore, except for the “7-9 years” group, the rate of having dinner increased along the length of education. For women, there was a significant difference in breakfast ($p<.0001$) and lunch ($p=0.0262$). The trend for women having breakfast was the same as for men; a longer period of education showed a gradual decrease in having

breakfast. In regard to lunch, the rate of having lunch for the "6 years or less" education group was 90.9%, the highest among the four groups. Therefore, women with a shorter period of education exhibited a stronger pattern of having breakfast and lunch.

The pattern of having breakfast, lunch, and dinner according to the level of household income showed a significant difference in breakfast ($p=0.0438$) and lunch ($p<.0001$) for men. The rates for breakfast were 72.4% in the "lowest" income group, 70.8% in the "lower middle" group, and 66.1% in the "higher middle" group. The gradual decreasing tendency rose up again in the "highest" group with 71.4%. The rates for lunch showed 80.2% of the "lowest" income group and 92.2% of the "highest" income group responded to have had lunch. Along the increase of income, the rate of having lunch also increased. Women showed a significant difference in breakfast ($p=0.02$) and lunch ($p=0.0089$), similar to men. For breakfast, the "higher middle" household income group demonstrated the lowest breakfast rate of 67.2% among the 4 groups, and the "highest" group showed the highest breakfast rate of 73.1%. In terms of lunch, the "lower middle" group had the lowest lunch rate of 86.4%, and the "highest" group had a 90.9% rate, which was significantly high. Therefore, the "highest" household income in women raised the rate of having breakfast and lunch, which was a contrary result compared to the decreasing rate of having breakfast and lunch along the increase of women's education level.

3.3 Socio-economic status according to meal frequency

The result of the meal frequency according to the level of education and household income is demonstrated in diagram form [Fig. 1 & Fig. 2]. In terms of meal frequency according to the level of education [Fig. 1], the proportion of the group having 3 meals per day decreased along the increase of education in men, and the rate slightly increased in the education group of "13 years or more." In the 2-meals-per-day group, the proportion of the 2-meals-per-day population gradually increased as the period of education increased, and the increasing rate fell as it showed a 0.2% gap with the "10-12 years" of education group and "13 years or more" education group. For women, the 3-meals-per-day population decreased as the period of education increased, and increased a little in the "13 years or more" education group, showing the same pattern as the 3-meals-per-day group in men. The 2-meals-per-day group increased more along the increase of education level. It showed a 0.5% gap with the "10-12 years" and "13 years or more" groups, with a slight fall in the increase rate, exhibiting the same pattern as men.

In terms of the relationship between household income and meal frequency [Fig. 2], in men, the 3-meals-per-day group showed the lowest rate (56.1%) in the "lowest" income group and the highest rate (64.2%) in the "highest" income group. The 2-meals-per-day group showed the lowest rate(31.9%) in the "highest" income group and the highest rate (37.2%) in the "higher middle" income group. In women, the 3-meals-per-day group showed the highest rate (61.7%) in the "highest" income group, and the 2-meals-per-day group had the lowest rate (32.1%) in the "highest" income group, showing the same results as men.

3.4 Effect of socio-economic level on diet pattern

3.4.1 Correlation of men's socio-economic level and diet pattern

In order to investigate the effect of the socio-economic level of men on their diet pattern, a multiple regression analysis was conducted which controls a set of independent variables. The result is shown in [Table 3]. Age was adjusted in model 1; level of education was adjusted for age, smoking, high-risk drinking, exercise, obesity, and household income in Model 2; and household income was adjusted for age, smoking, high-risk drinking, exercise, obesity, and level of education in Model 2.

In Model 2, which is the final analysis result, the effects of the levels of education on diet pattern were compared. A linear trend (p for trend=0.0317) was observed in which the frequency of having dinner decreased as the level of education became lower. Compared to the group with the highest education level (13 years or more), the rate of having dinner fell to 0.447 times in the "7-9 years" of education group. In terms of household income, a trend (p for trend=0.006) was observed in which the odds ratio of having lunch fell along the decrease of household income. Compared to the highest household income group, the odds ratio of the lowest household group decreased to 0.427 times for lunch and to 0.533 times for dinner. In terms of meal frequency, a trend (p for trend=0.0328) of a decreasing odds ratio of 3 meals a day was observed as the household income fell. Compared to the group with the highest household income, the odds ratio of having 3 meals per day decreased to 0.594 times in the group with the lowest household income. On the other hand, for breakfast, no significant result was observed in the relationship between level of education and household income with having breakfast, lunch, and dinner, and meal frequency.

3.4.2 Correlation of women's socio-economic level and diet pattern

In order to investigate the effect of women's socio-economic level on their diet pattern, a multiple regression analysis was performed which controls a set of independent variables, and the results are shown in [Table 4]. Age was adjusted in Model 1; level of education in Model 2 was adjusted for age, smoking, high-risk drinking, exercise, obesity, and household income; household income in Model 2 was adjusted for age, smoking, high-risk drinking, exercise, obesity, and level of education.

In the final analysis result of Model 2, the effects of the levels of education on diet pattern were compared, and the result was significant for lunch, dinner, and meal frequency. A linear trend (p for trend=0.0012) of a decreasing dinner frequency was observed along the fall in education level. Compared to the group with the highest education level (13 years or more), the rate of having dinner decreased for each level that education went down, with lowered odds ratios of 0.716, 0.535, and 0.48, respectively In terms of lunch, the group with 7-9 years of education showed a decreased rate of having lunch of 0.625 times in comparison to the group with the highest education level (13 years or more). As the level of education became lower, a decreasing trend (p for trend=0.0135) in having 3 meals per day was observed, and the odds ratio of meal frequency decreased to 0.783, 0.721, and 0.717 for every level that education dropped, respectively, and it was confirmed that the rate of having 3 meals per day decreased.

In terms of the effect of household income level on diet pattern, the lowest income group had an odds ratio for breakfast which decreased to 0.814 compared to the highest income group, and the odds ratio for lunch decreased to 0.669 times in the lower middle group.

4. Discussion

Various confounding variables were adjusted and analyzed in this study, including socio-demographic characteristics, general health status, and health-related behaviors of Korean adults. It was found that the household income and level of education were correlated with the meal frequency and regularity of the subjects.

The meal frequency and regularity, assessed trough household income and level of education, showed a trend of a decreasing odds ratio of dinner along the decrease of education level both in men and women and so did the meal frequency. As household income fell, the odds ratio of lunch decreased in men, as well as the meal frequency. This was similar to past study results. Recent studies conducted in the US and Europe reported that obesity and nutritional imbalance were on an increase in populations with low economic

capacity, education level, and poor living environment[40-43], and that people of low income, low education level, blue-collar jobs, and lower position at work had unhealthy patterns of serum lipid, unhealthy diet, and higher risk of malnutrition[41]. People who regularly have 3 meals a day had a lesser chance of becoming obese[44, 45] and breakfast had little to do with obesity, whereas dinner was closely correlated with it[46]. Considering the previous studies on having meals and meal frequency in Korea, a study which investigated the elderly reported that the risk of obesity significantly decreased when they had lunch and dinner, and the meal frequency was set at the regular 3 meals a day [47]. In addition, in the case of elderly, if they skip a meal, they get to eat more at the next meal, and the repetition of this skipping practice programs the body to react in a way that tends to store the energy, which, in turn, leads to an easy accumulation of fat in the body[48]. Skipping meals leads to overeating, binge eating, and snacking, makes it easy to intake excessive calories and is closely related to the morbidity of obesity. The imbalance in diet is correlated with the socio-economic level, which confirms that it leads to health imbalance.

In recent studies, irregular diet patterns were observed in young people and it was concluded that it led to the imbalance of nutrition intake [49]. The same goes for Korea, where the diet pattern of Koreans has changed a great deal compared to the past due to the busy rhythm of professional life and social engagement of women. The diet pattern thus demonstrates big differences and it has become a significant factor that decides health[50]. In modern society, the diet pattern is changing to a more simple breakfast and a growing size of dinner. This diet pattern is indicated as a so-called "unhealthy habit" in relation to the major health problems of a modern society[51]. Equally as important as the relationship between the pattern of food intake and health, is to have regular meals without skipping, as study results [39, 52] suggest that population groups that had nutritionally balanced diets had a lower morbidity of chronic diseases, a lower rate of meal skipping, and had meals regularly. Breakfast did not show a significant result in the regression analysis for the diet patterns of men and women, and its direction corresponded to past studies. In previous studies conducted on meal frequency, the "low" income level group lacked the practice of consuming a greater variety of foods and bland diet but had a significantly high rate of breakfast habit compared to other income groups. The "low" income group showed the lowest rate of skipping breakfast[53]. As the level of income decreased, the frequency of dining out decreased and subjects had a relatively higher chance of eating at home[54]. Therefore, when the socio-economic level was lower, the rate of skipping breakfast decreased. According to our study, males in the lowest income group had a higher breakfast rate than those in the highest income group, contrarily, however, the breakfast rate increased in women from the highest income group. Considering studies related to the breakfast patterns of women, Smith et al.[55] argued that skipping breakfast had a negative effect on health, and the skipping breakfast group among women aged between 18~45 years from a socio-economically poorer group had less interest in health. Moreover, they reported that the group skipping breakfast was less knowledgeable regarding nutrition and had less physical activity than the breakfast group, showing that the women with low income who skip breakfast had a lower level of health. In previous studies[56-58] concerning the correlation of socio-economic level and health, women with lower income had a significantly increased risk of morbidity including obesity and metabolic syndrome, whereas no significant correlation was observed in men. Considering this fact, socio-economic factors have a greater influence on the health and occurrence of disease in women.

5. Conclusions

The purpose of our study is to analyze the effect of socio-economic status on the diet pattern of Korean adults. Results consideration of the socio-economic status of the subjects, a linear trend was observed in men

in which the odds ratio of having lunch (p for trend=0.006) and dinner (p for trend=0.0317) decreased as the level of education went down. In diet frequency, a decreasing trend (p for trend=0.0328) was observed in which the odds ratio of having 3 meals a day reduced as the household income lowered. For women, a linear trend (p for trend=0.0012) was observed in which the frequency of dinner decreased as the level of education became lower. A falling trend in the rate of having 3 meals a day was also observed (p for trend=0.0135).

Public health and medicine policy cannot sufficiently intervene to achieve the promotion of socio-economic standards. Through the results of this study, however, social class and its many factors related to unhealthy dietary patterns can provide education on diet patterns, and support for practice and intervention to correct and improve undesirable health habits. Therefore, this study will contribute to preventing chronic diseases and obesity, and help those suffering from diseases to lead a healthier daily life.

The advantages of our study are as follows.

1. This study distinguishes itself from existing studies that limited their subjects to the elderly who are more vulnerable to contracting chronical diseases, by extending the range of subjects to cover adults of all ages.

2. It utilized the data from KNHANES conducted at a national scale, adjusted various confounding variables to verify the association of diet pattern with the socio-economic levels of subjects. Therefore, this paper is more objective and representative compared to the past studies, and thus, is significant.

3. Household income, education level, and gender were stratified and analyzed in detail.

4. A linear trend was confirmed using a test for trend.

The limitations of this work are:

1. It was a sectional study, not a prospective study. It suggested the association of the diet pattern and the socio-economic level of the subjects, however, it did not demonstrate the relationship of the cause and effect.

2. The results obtained using the recall method concerning the diet pattern within the last 48 hours were used as a variable, and a record of only two days is not sufficient to represent the usual intake.

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Table 1. General characteristics of the study participants.

Characteristics	Categories	Meal Patterns (per 1 day)							
		Men				Women			
		IRE		RE		IRE		RE	
		1 time (n=179)	2 times (n=1349)	3 times (n=3044)	*p*	1 time (n=406)	2 times (n=2166)	3 times (n=4556)	*p*
Age	Year	35+1	36.3+0.3	43.5+0.3	<.0001***	34+0.6	37.7+0.3	43.9+0.2	<.0001***
Obesity	BMI(kg/m2)	24.5+0.4	24.3+0.1	24.1+0.1	0.2621	22.9+0.2	22.9+0.1	23.3+0.1	0.0152*
Abdominal Obesity	WC(cm)	84.2+0.9	83.9+0.4	83.9+0.2	0.9561	75.5+0.6	75.9+0.3	77.7+0.2	<.0001***
HTN	Yes	20.8(3.4)	22.7(1.3)	29.4(1)	<.0001***	7.4(1.5)	11.8(0.7)	18.5(0.7)	<.0001***
MS	Yes	17.5(3.1)	21.5(1.3)	25.4(0.9)	0.0069*	12.8(1.9)	15.4(0.9)	22.6(0.8)	<.0001***
Smoking	Current	62.5(3.8)	49.3(1.6)	37.6(1.1)	<.0001***	11.5(2)	8.2(0.8)	2.6(0.3)	<.0001***
Drinking	≥ 30g/day	38.8(4.3)	31.7(1.4)	31.7(1)	0.1952	11.7(2)	7.8(0.7)	3.6(0.4)	<.0001***
Exercise	3 times/wks	29.8(4.3)	21.1(1.4)	24.9(1)	0.0356*	20.4(2.5)	15(1)	18.6(0.7)	0.0096*
Marital status	Married	70.9(5.3)	76(2.1)	87.5(0.9)	<.0001***	69.7(3.6)	78.6(1.5)	87.3(0.7)	<.0001***
Education Level	≤10-12years	85.8(2.6)	90(0.9)	80.6(0.9)	<.0001***	86.9(1.9)	80.7(1)	72.2(1)	<.0001***
Household Income	Lowest	83.4(3.2)	90.2(1.1)	91.4(0.7)	0.007**	89.1(1.9)	89.7(1)	89.4(0.6)	0.9315

*** $p<.0001$ ** $p<.001$ * $p<.05$

BMI(body mass index: kg/m2), WC(waist circumference: cm), HTN(hypertension: mmHg), DM(diabetes mellitus), MS(metabolic syndrom)

Table 2.Distribution of characteristics according to Dietary behavior in Socioeconomic status.

	Men			Women		
	Breakfast	Lunch	Dinner	Breakfast	Lunch	Dinner
Education Level						
≤6 years	89.5(1.8)	89.9(1.8)	94.2(1.4)	85.7(1.6)	90.9(1.2)	89.8(1.2)
7-9 years	81.3(2.2)	91.1(1.7)	93(1.4)	82.3(1.9)	87.1(1.6)	90.5(1.3)
10-12 years	67.1(1.4)	89.5(0.9)	94.9(0.6)	66.4(1.2)	87.4(0.8)	89.5(0.8)
≥13 years	66.3(1.4)	92.4(0.8)	96.4(0.5)	66.1(1.4)	89.9(0.8)	91.9(0.7)
p	<.0001***	0.0538	0.0283*	<.0001***	0.0262*	0.0917
Household Income						
Lowest	72.4(2.9)	80.2(2.8)	93.1(1.4)	71.6(2.5)	88.2(1.7)	89.6(1.5)
Lower middle	70.8(1.7)	90.3(1)	94.9(0.8)	70.8(1.5)	86.4(1)	90.3(0.9)
Higher middle	66.1(1.6)	93(0.8)	95.2(0.7)	67.2(1.3)	88.8(0.9)	90.6(0.8)
Highest	71.4(1.4)	92.2(0.8)	96.4(0.5)	73.1(1.3)	90.9(0.8)	90.8(0.8)
p	0.0438*	<.0001***	0.0871	0.02*	0.0089*	0.9006

*** $p<.0001$
** $p<.001$
* $p<.05$

Table 3.Odds ratios (95% CIs) for Dietary behavior according to Socioeconomic status in Men.

	Men							
	Breakfast		Lunch		Dinner		Meal patterns of RE	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Education Level								
≤6 years	1.58 (1.05,2.39)	1.26 (0.81,1.97)	0.40 (0.24,0.66)	0.62 (0.36,1.09)	0.47 (0.24,0.91)	0.53 (0.25,1.15)	0.98 (0.70,1.38)	1.00 (0.69,1.45)
7-9 years	1.11 (0.81,1.52)	1.18 (0.81,1.70)	0.55 (0.34,0.91)	0.66 (0.38,1.14)	0.42 (0.23,0.77)	0.44 (0.21,0.91)	0.88 (0.66,1.17)	0.92 (0.67,1.27)
10-12 years	1.13 (0.95,1.34)	1.09 (0.89,1.35)	0.73 (0.55,0.96)	0.87 (0.62,1.22)	0.69 (0.47,1.01)	0.65 (0.4,1.05)	1.03 (0.88,1.20)	1.03 (0.85,1.25)
≥13 years	1	1	1	1	1	1	1	1
p for trend	0.023	0.1696	<.0001	0.0749	0.0025	0.0317	0.8045	0.9483
Household Income								
Lowest	1.02 (0.73,1.43)	0.79 (0.53,1.18)	0.33 (0.22,0.51)	0.42 (0.25,0.72)	0.50 (0.28,0.87)	0.53 (0.29,0.96)	0.65 (0.48,0.88)	0.59 (0.41,0.85)
Lower middle	1.04 (0.8,1.30)	0.97 (0.75,1.25)	0.81 (0.58,1.11)	0.87 (0.58,1.31)	0.68 (0.44,1.06)	0.81 (0.48,1.34)	0.94 (0.77,1.15)	0.91 (0.72,1.14)
Higher middle	0.83 (0.68,1.01)	0.81 (0.63,1.02)	1.16 (0.84,1.60)	1.13 (0.77,1.67)	0.72 (0.47,1.11)	0.84 (0.51,1.39)	0.84 (0.70,1.01)	0.82 (0.67,1.02)
Highest	1	1	1	1	1	1	1	1
p for trend	0.5663	0.5136	<.0001	0.006	0.0155	0.0713	0.0501	0.0328

*** $p<.0001$
** $p<.001$
* $p<.05$

Model 1 Adjusted ORs for age

Model 2 Adjusted ORs for age, smoking, drinking, exercise, BMI, education or income

OR, odds ratio; CI, confidence interval

Table 4. Odds ratios (95% CIs) for Dietary behavior according to Socioeconomic status in Women.

	Women							
	Breakfast		Lunch		Dinner		Meal patterns of RE	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Education Level								
≤6 years	0.91 (0.65,1.26)	1.01 (0.7,1.43)	0.56 (0.37,0.84)	0.80 (0.49,1.30)	0.39 (0.26,0.57)	0.48 (0.3,0.77)	0.57 (0.44,0.75)	0.71 (0.52,0.97)
7-9 years	0.99 (0.74,1.33)	1.14 (0.84,1.54)	0.47 (0.33,0.68)	0.62 (0.42,0.91)	0.51 (0.35,0.74)	0.53 (0.35,0.80)	0.60 (0.47,0.77)	0.72 (0.55,0.93)
10-12 years	0.86 (0.73,1.01)	0.84 (0.70,1.01)	0.72 (0.59,0.9)	0.78 (0.60,1.02)	0.69 (0.55,0.88)	0.71 (0.54,0.95)	0.77 (0.66,0.90)	0.78 (0.66,0.92)
≥13 years	1	1	1	1	1	1	1	1
p for trend	0.3561	0.9668	0.0002	0.1952	<.0001	0.0012	<.0001	0.0135
Household Income								
Lowest	0.75 (0.57,0.99)	0.81 (0.61,1.08)	0.68 (0.46,1.01)	1.01 (0.64,1.56)	0.80 (0.55,1.14)	1.22 (0.79,1.88)	0.72 (0.57,0.91)	1.03 (0.78,1.34)
Lower middle	0.86	0.99	0.63	0.66	0.93	1.04	0.78	0.94

	(0.71,1.04)	(0.80,1.23)	(0.49,0.80)	(0.5,0.89)	(0.72,1.20)	(0.75,1.44)	(0.66,0.92)	(0.78,1.13)
Higher middle	0.78 (0.65,0.93)	0.81 (0.67,0.99)	0.79 (0.60,1.04)	0.82 (0.59,1.13)	0.98 (0.75,1.29)	1.01 (0.71,1.40)	0.81 (0.68,0.95)	0.89 (0.74,1.07)
Highest	1	1	1	1	1	1	1	1
p for trend	0.0535	0.4492	0.0009	0.1308	0.2362	0.4169	0.0018	0.9223

*** $p<.0001$
** $p<.001$
* $p<.05$

Model 1 Adjusted ORs for age
Model 2 Adjusted ORs for age, smoking, drinking, exercise, BMI, education or income
OR, odds ratio; CI, confidence interval

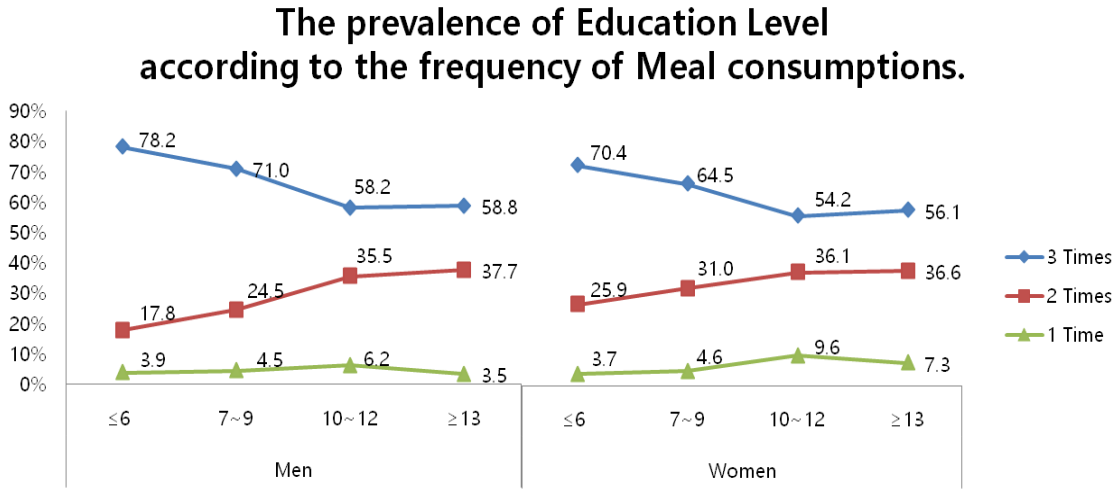

Fig. 1. The prevalence of Education Level according to the frequency of Meal consumptions

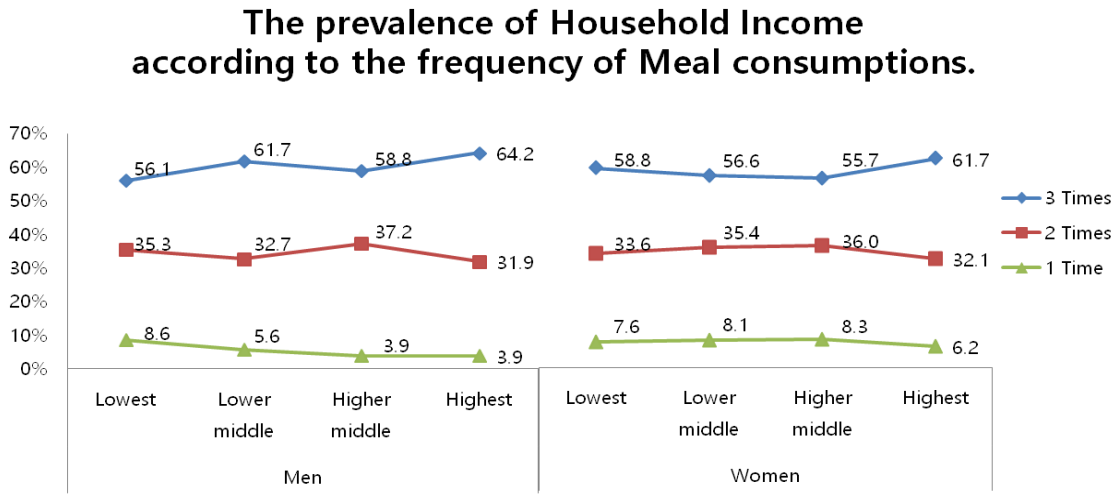

Fig. 2. The prevalence of Household Income according to the frequency of Meal consumptions.