

A Study of Association Dining-out, Nutritional Intakes and Health Risk Factors among Korean Women using the Data of Korean National Health and Nutrition Examination Survey (KNHANES VI)

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ABSTRACT: The aim of this study was to investigate the association dining-out frequency, nutritional intake level and health risk factors related to metabolic syndrome among Korean women. The data in this study were obtained from the Korean National Health and Nutrition Examination Survey in 2013 (KNHANES VI). Sample of Korean women (n=3,413), aged over 20 with biochemical, dietary and health screening data, was divided into three groups according to dining-out frequency; "Rarely" (< 1 time / week), "Occasionally" (2~4 times / week) and "Frequently" (\geq 5 times / week). The results showed that there were significantly different intake levels in energy, water, protein, fat, calcium, sodium and vitamin A according to the dining-out frequency. Each dining-out frequency group was significantly associated to obesity and Low HDL Cholesterolemia. In conclusion, this study found significant association between dining-out frequency, nutritional intake and health risk factors among Korean women. Further studies are necessary to examine subdividing into age and dining-out frequency and health risk factors related to metabolic syndrome among Korean.

Keywords: dining-out frequency, Korean women, nutritional intake, health risk factors, metabolic syndrome, KNHANES VI

INTRODUCTION

Since 1970, there have been many changes in life style with economic growth, participation of females in economic activities, and family type increased individuals living alone or those living with single family in Korea (Bae HO 1993). At the same time, there have been shift disease patterns to metabolic related disease such as obesity, cardiovascular disease (CVD), type 2 diabetes, metabolic syndrome etc. The metabolic syndrome consists of more than three

clustering among five factors metabolically related cardiovascular risk factors which also predict a high risk of developing diabetes namely lower HDL cholesterol level, abdominal obesity, dyslipidemia, hys-risk not only diabetes but also CVD from the metabolic syndrome. There are imperious needs for plan to prevent the emerging global epidemic. Recent report suggested that there is association between dining-out behavior and nutritional imbalance as well as metabolic related diseases (Boon CS & Clydesdale FM 2005).

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In USA, the household food expenditure on dining-out increased from 26% to 42% in 2002 compared with 30 years earlier (Bezerra IN & Sichieri R 2009). In Belgium, the level of spending on dining-out of total food expenditures was increased from 14% in 1980s to 23% in 2000 (Facobs M & Scholliers P 2002). In China, food expenditure on 98.4 billion yuan in 1999 from 30.5 billion yuan in 1991 (Ma H et al 2006). Also dining-out frequency is consistently increasing in Korea too. In Korea, the restaurant industry has rapidly developed with annual growth rate of 13%: from 28 trillion won in 1996 to 42 trillion won in 2003 (Kang et al 2007; Park C 2004). The most frequency of dining-out was 'once a day' (27.2%) in men and '1~2 times a week' (24.1%) in women. A percentage of more than once a day to dining-out was 41.6% in men and 21.5% in women. (Korea Center for Disease Control and Prevention 2013). About 79.2% of female students and 62.3% of male students in the Seoul area dined out for dinner (Kim MJ 2008).

In general, dining-out foods have lower nutritional value than homemade food. USDA data presented that foods prepared outside from home were more energy concentrated than homemade food (Lin BH et al 1999). So, it is important to educate how to select healthy meals for dining-out and to teach wholesome eating behavior. However, few studies have yet focused on the association between dining-out, nutritional intakes, metabolic syndrome risk factors in female. Therefore, present study was to examine the relationship dining-out frequency, nutritional status and health risk factors related to metabolic syndrome in female group using 2013 Korean National Health and Nutrition Examination Survey (KNHANES) data.

LITERATURE REVIEW

Dining-out and Nutrition Intake

South Korea has experienced rapid economic growth and adoption of Western life style over the last decade. It lead to change Korean diet in especially the frequency of dining. Park JW & Ahn SJ(2001) studied the dining-out behaviors classified by age and gender. The result showed that young age groups had an irregular meal and the ratio of skipping

a meal is high. On the other hand, the dietary habits of 30 age groups are relatively good. Lim YH & Na MI studied dining-out behaviors and food habits of housewives. It showed that the younger, the higher in education, less in religion, the more professional in their husbands' jobs, fewer in number of family members and the more average family income per a month, they had more times of eating out. In old age group in Korea, they wanted to have a food for their health and to share with their spare time (Cho KJ & Han DH 2005).

Dining-out is influential in nutritional intakes. Dining-out was a risk factor for higher energy and fat intake lower micronutrient intake (Lachat C et al 2012). Clemens LHE & Slawson DL, Klesges RC studied that the effect of eating out on quality of diet in premenopausal women. That results showed that the high dining-out group was found to be consuming significantly more total energy, fat, sodium and marginally more carbohydrate and protein. The Dietary Reference Intakes for Koreans(KDRIs) is 3 servings of grains, 2 servings of milk & milk products, 4 servings of meats and beans, 2 servings of fruits, 5 servings of vegetables, and 4 servings of fat and sweets per day for women (Paik HY 2008). Oh C et al (2015) study suggested 9 nutrients(energy, water, protein, fat, carbohydrates, calcium, sodium, vitamin A, carotene) by KDRIs to compare dining-out and nutritional intake.

Definition of Health Risk Factors related to Metabolic Syndrome

We employed and modified the original criteria for the metabolic syndrome proposed by the previous study (Oh C et al 2015). Obesity was assessed based on the BMI cut-offs proposed by the WHO which presented that 25.0 kg/m² or greater in Asian populations. Abdominal obesity was defined as WC \geq 80 cm in females; hypertriglyceridemia \geq 150 mg/dL; low HDL-cholesterol \geq 50 mg/dL; hypertension as blood pressure \geq 130/85 mmHg; hyperglycaemia as fasting plasma glucose level \geq 100 mg/dL (Oh C et al 2015).

METHOD

Study Sample

The data used in the present study were acquired

from the 2013 KNHANES that samples non-institutionalized Korean civilians. In brief, the 2013 KNHANES consisted of four components: a health interview; a health behavior survey; a health examination; a nutrition survey (Song Y & Joung H 2013). Using a stratified, multi-stage probability sampling design, a total of 10,589 individuals were selected for the KNHANES VI (Korean National Health and Nutrition Examination Survey 2013).

A final sample of 3,413 subjects who aged 20 years or older women and had completed the health examination and the nutrition survey were included in the present study.

Ethics

All the participants in the KNHANES were informed that they had been randomly chosen to participate in the survey with the right to refuse to be involved in further analyses, and signed an informed consent form. As the KNHANES data are available publicly, ethical approval was not required for the present study.

Measurements

Waist circumference (WC), height and weight were measured using standardized techniques and calibrated equipment. BMI was calculated as weight (kg)/height²(m²). Blood pressure was measured using a sphygmomanometer (Baumanometer; W. A. Baum Co., Inc.) with the subject in a sitting position. First, three consecutive blood pressure measurements were performed on all subjects at 5 min intervals, and then the average of the second and third measurements was used in the analysis. Blood samples were collected in the morning after the subjects had fasted for at least 8h. Fasting insulin levels were measured by immunoradiometric assay (Biosource) using a g-counter(1470 Wizard; Perkin Elmer). Total cholesterol, TAG and HDL-cholesterol concentrations were analyzed in a central, certified laboratory using a Hitachi Automatic Analyzer 7600. A general questionnaire was administered to collect basic demographic and health-related information. Age (in years) was classified into six categories: 20s, 30s, 40s, 50s, 60s, 70s and over. Family income was categorized as: 500,000 won; 500,000~1,500,000 won; 1,500,000 won. The educational level was categorized

Table 1. Percentage of the Korean women

Variable	Group	No.(%)
Age (years)	20~29	311(16.0)
	30~39	543(19.3)
	40~49	593(21.0)
	50~59	581(19.3)
	60~69	464(12.3)
	70+	509(12.3)
Family income (won/month)	<500,000	2,288(74.1)
	500,000~1,500,000	667(25.1)
	>1,500,000	23(0.8)
Educational level	Elementary	832(23.0)
	Middle school	281(9.8)
	High school	904(35.2)
	College	804(32.0)
Marital status	Married	2,059(67.8)
	Widowed/divorced	610(17.0)
	Single	319(15.2)
Occupation	Non-physical	511(20.5)
	Physical	826(28.7)
	Other ¹⁾	1,485(50.7)

1) Student, house wife, unemployed.

ized as: elementary school or less; middle school; high school; college. Marital status was divided into three categories: married; widowed/ divorced; single. Occupational status was classified as: non-physical; physical; 'other'. A question on dining-out frequency asked about meals prepared outside the home, including restaurant food, delivery food, take-out food, food service, etc. Dining-out frequency was measured based on a week period, it was divided to three groups, such as "Rarely" (< 1 time / week), "Occasionally" (2~4 times / week) and "Frequently" (≥ 5 times / week). Dietary intake was measured using the single 24 hours dietary recall method. A trained staff instructed the respondents to recall and describe all foods and beverages consumed in the previous day. Food models and measuring bowls, cups and spoons were used to assist in estimating

portion sizes.

Statistical Analysis

All statistical analyses were conducted using SPSS 20.0 version for Windows (SPSS, Inc.). The associations between socioeconomic characteristics and dining-out frequency were assessed. General linear models were constructed to assess the associations between dining-out frequency and nutritional intakes. Logistic regression models were used to calculate OR with 95% CI for the associations between dining-out frequency and metabolic syndrome risk factors. An association was considered statistically significant if the *P* value was >0.05.

RESULTS

The socio-economic characteristic of the subjects are shown in Table 1. From the study population, 21% were 40's, both 30' and 50' were 19.3%, 16% were 20' and 12.3% were 60' and over 70'. 74.1% of respondents had a family income below 500,000 won per month. Most subjects (67.2%) had over high education. But 23% of subjects had elementary (or less) education. Marital status showed that 67.8% of respondents lived with a spouse and 32.2% of respondents lived without a spouse (widowed, divorced or single). With regard to occupation, most

of subjects are other group (50.7%) who were student, housewife or unemployed. 28.7% were physical laborers like primary industry workers. 20.5% had non- physical occupation.

Table 2 presents the nutritional intakes classified by dining-out frequency. There were greatly associations between nutritional intakes and frequency of dining-out. These data had significant difference in the between nutritional intakes; energy, water, protein, fat, calcium, sodium and vitamin A and dining-out except carbohydrates and carotene. As dining-out frequency increased, so did energy. Energy was 1,602 kcal in rarely group, 1,785 kcal in occasionally group and 1,897 kcal in frequently group. Also other nutrients are increased following groups. Especially, Energy and sodium were distinguished from among the groups. Frequently group took fat about 64% higher than rarely group as well as sodium about 27% higher than rarely group.

Table 3 showed that adjusted OR and 95% CI for metabolic syndrome risk factors according to dining-out frequency. Dining-out frequency was related to obesity and Low HDL Cholesterolemia. The others were not significant difference. Frequently group exhibited a 26%, 33% higher likelihood of obesity than respectively occasionally group and rarely group. Frequently group was performed 24%, 65% higher likelihood of low HDL-cholesterol level than those

Table 2. Nutrient intakes among Korean female adults, stratified by dining-out frequency

Nutrients	Frequency of dining-out			<i>p</i> ¹⁾
	Rarely	Occasionally	Frequently	
Energy (kcal)	1,602.98±25.83 ²⁾	1,785.96±22.13	1,897.31±39.92	0.000
Water (g)	826.96±19.61	1,034.91±21.70	1,071.93±25.47	0.000
Protein (g)	53.24±1.04	63.74±1.16	68.73±2.15	0.000
Fat (g)	28.48±0.95	39.55±0.85	46.77±1.78	0.000
Carbohydrates (g)	277.79±4.57	284.57±3.54	287.72±5.25	0.286
Calcium (mg)	405.24±10.22	457.74±8.63	490.66±15.72	0.000
Sodium (mg)	3,048.92±82.95	3,565.09±87.51	3,895.58±116.23	0.000
Vitamin A (µg RE)	604.25±28.72	668.59±24.03	717.33±30.69	0.009
Carotene (µg)	3,119.03±166.77	3,153.97±110.97	3,395.40±165.75	0.311

1) *P* values were obtained from general linear models that were adjusted for age.

2) Mean±SD.

Table 3. Metabolic syndrome risk factors among Korean female adults, according to dining-out frequency(odds ratios and 95% confidence intervals)

Variables	Rarely	Occasionally			Frequently		
	OR	OR	95% CI	<i>p</i> ¹⁾	OR	95% CI	<i>P</i>
Obesity ²⁾	1	1.264	0.961~1.662	0.094	1.339	1.016~1.766	0.038
Abdominal obesity ³⁾	1	1.272	0.889~1.820	0.188	1.310	0.923~1.858	0.130
High fasting glucose ⁴⁾	1	1.242	0.781~1.973	0.359	1.276	0.827~1.970	0.270
Low HDL cholesterol ⁵⁾	1	1.692	1.067~2.684	0.025	1.652	1.024~2.664	0.040
Hypertriglyceridemia ⁶⁾	1	1.385	0.980~1.956	0.065	1.130	0.840~1.571	0.417
Elevated blood pressure ⁷⁾	1	0.897	0.649~1.241	0.511	1.019	0.759~1.368	0.901

1) Logistic models used to calculate the OR were adjusted for age.

2) Body mass index ≥ 23 kg/m².

3) Waist circumference >80 cm.

4) Fasting glucose > 100 mg/dL.

5) HDL cholesterol <50 mg/dL.

6) Triglyceride ≥ 150 mg/dL.

7) Systolic blood pressure ≥ 130 mmHg or Diastolic blood pressure ≥ 85 mmHg.

who dined out each occasionally group and rarely group.

DISCUSSION

In this cross-sectional study, we found that there was a significant difference in the nutritional intake, depending on frequency of eating out. Subjects were supposed to take sufficient energy, protein, vitamin A by recommended (KDRIs). However, respondents showed lower level of water and calcium than KDRIs (water: 1,800~2,100 mL, calcium: 650~700 mg/day). Otherwise, intake level of sodium is twice higher than KDRIs. The Korean Nutrition Society revised the KDRIs in 2010 and released a new nutritional model, the Food Balance Wheel, to replace the food Pyramid. It emphasized the importance of water balanced meal and exercise. The Korea ministry of health and welfare presented reimbursement of diseases associated with high sodium, then they recommend to reduce the level of sodium intake. Lack of water causes several diseases. Low intakes of water from foods and magnesium are independently associated with an increasing prevalence of functional constipation (Murakami K et al 2007). Reduced sodium intake and weight loss con-

stitute a feasible, effective, and safe nonpharmacologic therapy of hypertension in the elderly (Whelton PK et al 1998). Therefore, we need to focus on the nutritional education for food service consumer for helping their menu selection.

We found that dining-out frequency was positively associated with health risk factors such as obesity and low HDL cholesterol in Korean women. This results were consistent with previous study. The frequency of consuming restaurant food was positively associated with increased body fatness in adults (McCrary MA et al 1999). And dining-out was associated with overweight and obesity only among men, whereas, among women, eating sit-down meals out of home was protective for obesity, suggesting that women make healthier food choices (Bezerra I, Sichieri R 2009). Obesity is also associated with complications of pregnancy, menstrual irregularities, hirsutism, stress incontinence, and psychological disorders (Panel NOEIE 1998). It was previously suggested that obesity may increase the risk for cardiovascular disease by inducing a state of low-grade inflammation, which may ultimately lead to insulin resistance (Yudkin JS et al 1999). There was related between dining-out frequency and low HDL cholesterol as it have been already mentioned. Compared

with some studies which showed dining-out patterns, we can consider that dining-out for Korean food with high level of carbohydrates can influence on reducing level of HDL cholesterol. These results were similar with Song Y & Joung H (2012) and it predicted that dining-out frequency was higher, HDL cholesterol level was lower. When we educate nutritional value and dietary patterns to women, we have to emphasize functions and problems of carbohydrate as well as merits of compound carbohydrates.

There were several limitations in our present study. First, ages of subjects were comprehensive. Second, it was a cross-sectional study and, thus no causal inference could be drawn from it. The recognition that foods prepared outside the home are more energy dense and less healthful than those prepared at home may motivate individuals to modify their dining-out behavior. The present study suggests that nutrition education about nutritional value and dietary patterns to women. Further studies are necessary to examine subdividing into age and dining-out frequency and health risk factors related to metabolic syndrome among Korean men.

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Received: 7 September, 2015

Revised: 8 October, 2015

Accepted: 20 October, 2015

한국 여성의 외식 빈도에 따른 영양섭취 및 건강 위험 인자

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국문초록

본 연구는 한국 성인 여성을 대상으로 외식빈도, 영양섭취, 대사증후군과 관련된 건강위험 인자의 관계를 조사하고 자 하였다. 2013년 국민건강영양조사(KNHANES VI)의 자료를 이용하여 SPSS 20.0 통계 패키지 프로그램을 활용하여 분석하였다. 이를 위하여 20세 이상 여성(3,413명)을 대상으로 생화학적 지표, 검진자료를 바탕으로 외식빈도를 세 그룹(주 1회 미만, 주 2~4회, 주 5회 이상)으로 나누어 각 변수들의 차이를 분석하였다. 그 결과, 외식빈도와 열량, 수분, 단백질, 지방, 칼슘, 나트륨, 비타민 A가 유의적으로 차이가 있었다. 외식빈도에 따른 각 그룹은 비만과 저 HDL 콜레스테롤혈증 수치에도 유의적 차이가 있었다. 마지막으로 본 연구는 대한민국 성인 여성의 외식빈도에 따라 대사증후군 관련 건강인자에 유의적 차이를 발견하였다. 향후 연령을 세분화 하고, 한국의 성인을 대상으로 외식빈도와 영양소 섭취, 대사증후군 관련 건강 위험 인자에 대한 연구가 필요하겠다.

주제어: 외식빈도, 한국 성인 여성, 영양섭취, 건강 위험 인자, 대사증후군, 국민건강영양조사 VI