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Association of Diabetes, Hypertension and Dyslipidemia with Dietary Supplements Intake in Koreans

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Abstract

Background/Objectives: Wrong lifestyle could be leads to chronic disease or serious disease in combination with various causes.The purpose of this study was to investigate dietary supplements intake had different effects depending on demographic factors, health status factors, diabetes, hypertension, and hyperlipidemia factors.

Methods/Statistical analysis: The data for this study were used in the 8th Korea National Health and Nutrition Examination Survey, KNHANES VIII (2019). Whether or not to take dietary supplements was investigated for more than 2 weeks in the past year, and the relationship with the type of disease caused by lifestyle was investigated. IBM SPSS 21.0 was used for the arrangement and statistical analysis of the collected data, and the significance level (α) of all analyzes was set to 0.05 or less.

Findings: There was a significant difference between gender (56.9% for female and 48.5% for male) and dietary supplement intake for 2 weeks or more during the past year ($p<0.05$). The average monthly household income showed a significant difference with <1 million (47.1%), 1 million-2 million (51.7%), 2 million-3 million (53.8%), and ≥3 million (57.7%) ($p<0.05$). The educational level showed a significant difference with elementary or below (53.1%), middle (46.1%), high (54.0%), college or higher (56.5%) ($p<0.05$). Diagnosis of diabetes hypertension did not show a significant association with the dietary supplement intake for more than 2 weeks in the past year ($p>0.05$). Diagnosis of dyslipidemia and the presence or absence of dietary supplement intake for more than 2 weeks in the past year showed a significant difference ($p<0.05$) as 60.3% of the patients with disease and 66.1% of the dietary supplement intake in the group without disease ($p<0.05$). This study observed a significant association between hyperlipidemia, one of lifestyle-related diseases, and dietary supplement intake, and in particular, a significant association between health status factors and dietary supplement intake.

Improvements/Applications : It makes it possible to write about the results of the improved research and other applications. In addition, it is expected that this study based on education and guidance on correct information on dietary supplements will contribute to health promotion.

Keywords: Lifestyle Disease, Dietary Supplements, Dyslipidemia, Diabetes, Hypertension, Health promotion

1. Introduction

The Republic of Korea is making efforts to activate various health promotion programs, secure food intake stability, and reduce the gap in the proportion of the population practicing healthy eating between income levels.

The Republic of Korea established the National Health Promotion Comprehensive Plan (Health plan 2010) and set 10 major health indicators. These 10 major health indicators consisted of lifestyle habits, physical and social environment, and health problems affecting individual and community health, and 5 of them were lifestyle-related factors. Lifestyle improvement projects focused on exercise, overweight, obesity control, and smoking cessation to prevent chronic degenerative diseases [1].

Lifestyle refers to eating habits, exercise, smoking, drinking, stress, and rest. Therefore, 'lifestyle-related diseases' is a primary preventive concept that can prevent the occurrence and progression of diseases through

improvement of lifestyle, and the concept of having a correct lifestyle from childhood was included [2].

Before this concept was introduced, chronic degenerative diseases were called 'adult diseases' in Korea. However, chronic degenerative diseases did not only occur in adults, and different names were used in different countries, and many countries used terms meaning lifestyle-related diseases, so the name has been modified [3].

In Korea the concept of “lifestyle-related disease” was introduced to correct the wrong conception of chronic degenerative diseases and to suggest the right direction to the people. It was known from various studies that the onset and exacerbation of diseases such as diabetes, high blood pressure, cancer, cerebrovascular disease, and heart disease were often closely related to lifestyle habits such as diet, exercise, and rest [4].

In controlling dyslipidemia, probiotic yogurt, soy protein, green tea, and marine-derived omega-3 fatty acids were effective in regulating plasma lipid levels and these lifestyle modifications and pharmacotherapy were helpful [5]. Nutritional and dietary therapy, weight loss, and exercise have used to treat dyslipidemia [6].

The consumption of dietary supplements for the management of diseases such as diabetes and high blood pressure has skyrocketed and is expected to increase over the next two decades. It was said that the treatment of the disease requires pharmacological interventions such as dietary supplements along with the latest technology [7].

In the United States, alternative therapies and herbs were used for people with high blood pressure and other cardiovascular diseases [8].

Recently, interest in dietary supplement intake has been very high, but related papers between dietary supplement intake and lifestyle-related diseases were lacking. Therefore, the aim of this study was the relationship between lifestyle-related diseases and dietary supplements was investigated, and the effect of dietary habits on lifestyle-related diseases and the degree of correlation based on this study was investigated.

2. Materials and Methods

2.1. Participants

The subjects of this study were those who participated in the 8th 1st year (2019) [Korea Health Statistics 2019: Korea National Health and Nutrition Examination Survey (KNHANES VIII-1)] [9]. Korea Health Statistics 2019 was divided into health survey, screening survey, and nutrition survey, and the number of participants was total 8,110 subjects.

2.2. Demographic factors

Gender, age, household income and education level were used to identify demographic characteristics related to dietary supplement intake. Age was reclassified into groups such as under 20 years old, 20-44 years old, 45-64 years old, and over 65 years old. Household income and education level background were used as questions investigated in KNHANES VIII-1.

2.3. Dietary supplement intake rate

Whether or not to consume dietary supplements was determined using the questionnaire in the Dietary Survey of Nutrition Survey. The question regarding dietary supplements was ‘Have you been taking continuously for more than 2 weeks in the past year?’. Those who answered ‘yes’ to one of these questions were classified as intake, and those who answered ‘no’ were classified as non-intake.

2.4. Health status factors

Health status was evaluated by subjective health status related items and medical history. Subjective health status related items were classified into subjective health awareness, weight change for 1 year, weight control for 1 year, and subjective body shape recognition. Medical history was represented using the current prevalence of dyslipidemia, hypertension, and diabetes (present or not present).

2.5. Statistical Analysis

The relationship between body shape, subjective body shape, subjective health status, and dietary supplement intake was identified and the data were analyzed using IBM SPSS (21.0 version, Chicago, IL, USA). Chi-squared test was performed to analyze the independence and relevance between two variables. Logistic regression analysis was performed for the causal relationship between the subject's characteristics and dietary supplements intake, and the odds ratio (OR) and 95% confidence interval (C.I.) were shown. Statistical

significance was set to $p<0.05$.

2.6. Ethical considerations

This study was conducted after receiving approval from the Bioethics Review Committee of Kwangju Women's University (IRB No. 1041465-202109-HR-002-33). The raw data of the 8th Korea National Health and Nutrition Examination Survey provides de-identified data so that individuals cannot be estimated.

3. Results and Discussion

3.1. Diabetes, dyslipidemia and hypertension status factors of the subjects

The study was to investigate the relationship and causal relationship between diabetes, dyslipidemia and hypertension, which are related to lifestyle at all ages, and dietary supplement intake, based on data from the 8th Korea National Health and Nutrition Examination Survey conducted on Koreans. As data to find out whether or not dietary supplements were consumed in Korea, the results of intake of dietary supplements for more than 2 weeks in the past year were presented. Excluding missing values, 53.2% of the 8,110 subjects in the group that took the supplement and 46.8% of the group that didn't. Men (40.6%) and women (59.4%) took dietary supplements, with women taking more.

In dietary supplements, 53.2% responded that they had taken dietary supplements for 2 weeks or more in the past year as shown in Table 1. Diagnosis of diabetes was 'yes' at 7.5% and 'not applicable' at 92.3%. Diagnosis of dyslipidemia was 'yes' at 12.9% and 'not applicable' at 84.3%. Diagnosis of hypertension was 'yes' at 19.2% and 'not applicable' at 79.8%. The response rate of not applicable was very high in the question about the prevalence and treatment of the diabetes, dyslipidemia and hypertension.

In 2009, 33.8% took dietary supplements, and in 2019, 56.3% intake it [10]. In a paper based on the data of the 4th National Health and Nutrition Examination Survey, 13.6% of men and 20.5% of women said that women consumed more dietary supplements.

Table 1. Diabetes, dyslipidemia and hypertension status factors of the subjects

Variables	Classification	Frequency N(%)
Dietary Supplements	Yes	3,759(53.2)
	No	3,310(46.8)
Diagnosis of Diabetes	No	17(0.2)
	Yes	572(7.5)
	Not applicable	7,049(92.3)
Diagnosis of Dyslipidemia	No	212(2.8)
	Yes	986(12.9)
	Not applicable	6,440(84.3)
Diagnosis of Hypertension	No	75(1.0)
	Yes	1,466(19.2)
	Not applicable	6,098(79.8)

3.2. The relationship between general characteristics and dietary supplements

The result of analyzed the relationship between the general characteristics of the subjects and the intake of dietary supplements for 2 weeks or more in the past year as shown in Table 2. There was a significant difference between gender (56.9% for female and 48.5% for male) and dietary supplement intake for 2 weeks or more during the past year ($p<0.05$). The average monthly household income showed a significant difference with <1 million (47.1%), 1 million-2 million (51.7%), 2 million-3 million (53.8%), and ≥3 million (57.7%) ($p<0.05$). The educational level showed a significant difference with elementary or below (53.1%), middle (46.1%), high (54.0%), college or higher (56.5%) ($p<0.05$).

In particular, among adults over 20 years of age, females were higher at all ages, but among 50-64 years of age, 24.4% of females and 15.0% of males were found [11]. Analyzing the preceding data, it was found that

interest in and production of dietary supplements increased.

The results of this paper show that unlike previous papers men's intake of dietary supplements tends to increased. In addition, it was found that there was a significant relationship between education level and dietary supplement intake, and it was analyzed that 'less than elementary school graduate' and 'middle/high school graduate and above' were statistically significant, and they consumed 2.1 times more dietary supplements.

Table 2. The relationship between general characteristics and dietary supplements

Variables	Classification	Dietary Supplements		X^2	p
		Taking	Not taking		
		N(%)	N(%)		
Gender	Male	1,525(48.5)	1,620(51.5)	49.969	.000*
	Female	2,234(56.9)	1690(43.1)		
Age(y)	<20	689(48.8)	723(51.2)	63.408	.000*
	20-44	981(48.6)	1037(51.4)		
	45-64	1,277(59.5)	868(40.5)		
	≥65	812(54.4)	682(45.6)		
Income	<1 million	581(47.1)	652(52.9)	36.579	.000*
	1 million - 2 million	906(51.7)	847(48.3)		
	2 million - 3 million	1,082(53.8)	931(46.2)		
	≥3 million	1,186(57.7)	871(42.3)		
Education	<Elementary	1,142(53.1)	1,009(46.9)	21.871	.000*
	Middle	307(46.1)	359(53.9)		
	High	937(54.0)	798(46.0)		
	≥College	1,105(56.5)	852(43.5)		

*p<0.05

3.3. The relationship between health status factors and dietary supplements

Table 3 shows the relationship between health status factors and dietary supplements. Subjective health awareness did not show a significant association with the presence or absence of dietary supplement intake for more than 2 weeks in the past year (p>0.05). Weight control for 1 year showed a significant difference with weight loss efforts (54.2%), weight maintenance efforts (56.7%), weight gain efforts (51.4%), and never tried to lose weight (49.8%) (p<0.05). Subjective body shape recognition showed a significant difference as very skinny (51.9%), a little skinny (50.8%), commonly (53.2%), slightly overweight (54.5%), and very obese (47.5%) (p<0.05). Subjective health perception did not show a significant correlation with the presence or absence of dietary supplement intake for more than 2 weeks in the past year (p>0.05).

Table 3. The relationship between health status factors and dietary supplements

Variables	Classification	Dietary Supplements		X^2	p
		Taking	Not taking		
		N(%)	N(%)		
Subjective health awareness	Very good	333(52.9)	297(47.1)	3.463	.629
	Good	952(52.5)	860(47.5)		
	Normal	1,627(54.1)	1,378(45.9)		
	Bad	471(55.3)	380(44.7)		
	Very bad	117(50.2)	116(49.8)		
Weight change for 1 year	no change	1,953(55.3)	1578(44.7)	11.865	.018*
	weight loss	332(50.0)	332(50.0)		

	weight gain	656(53.6)	567(46.4)		
Weight control for 1 year	Weight loss efforts	1261(54.2)	1065(45.8)	45.329	.000*
	Weight maintenance efforts	651(56.7)	498(43.3)		
	Weight gain efforts	208(51.4)	197(48.6)		
	never tried to lose weigh	1,205(49.8)	1,214(50.2)		
Subjective body shape recognition	very skinny	137(51.9)	127(48.1)	37.859	.000*
	a little skinny	422(50.8)	409(49.2)		
	commonly	1,363(53.2)	1,199(46.8)		
	slightly over weight	1,146(54.5)	955(45.5)		
	very obese	257(47.5)	284(52.5)		

*p<0.05

3.4. The relationship between diabetes, dyslipidemia and hypertension status factors and dietary supplements

Table 4 shows the relationship between diabetes, dyslipidemia and hypertension status factors and dietary supplements. Diagnosis of diabetes hypertension did not show a significant association with the dietary supplement intake for more than 2 weeks in the past year (p>0.05). Diagnosis of dyslipidemia and the presence or absence of dietary supplement intake for more than 2 weeks in the past year showed a significant difference (p<0.05) as 60.3% of the patients with disease and 66.1% of the dietary supplement intake in the group without disease (p<0.05). Regardless of the presence or absence of disease, dietary supplements have been taken for at least 2 weeks in the past year.

Table 4. Relationship between diabetes, dyslipidemia and hypertension status factors and dietary supplements

Variables	Classification	Dietary Supplements		X^2	p
		Taking	Not taking		
		N(%)	N(%)		
Diagnosis of Diabetes	No	8(47.1)	9(52.9)	4.242	.236
	Yes	257(50.1)	256(49.9)		
	Not applicable	3,338(53.9)	2,852(46.1)		
Diagnosis of hypertension	No	36(55.4)	29(44.6)	3.227	.199
	Yes	728(55.8)	577(44.2)		
	Not applicable	2,839(53.1)	2,512(46.9)		
Diagnosis of Dyslipidemia	No	123(66.1)	63(33.9)	33.497	.000*
	Yes	529(60.3)	348(39.7)		
	Not applicable	2,951(52.2)	2,706(47.8)		

*p<0.05

There was no significant difference in diabetes and hypertension as a result of taking dietary supplements for more than 2 weeks in the past year, but dyslipidemia showed a significant difference. These data show that hypertension and diabetes prevalence and dietary supplement intake are far from optimal. However, herbal remedies, supplements, and alternative therapeutic items are also used by many patients with hypertension and cardiovascular disease [12].

In the United States, over 15 million people consume herbal remedies or high-dose vitamins, costing them $30 billion in annual out-of-pocket expenses. In particular, most of the treatment by the elderly is said to be dietary supplements [13].

3.5. Validation of the effect of dietary supplement intake with regression analysis

Table 5 shows the effect of dietary supplement intake and analysis by regression analysis. For females, the odds ratio was 1.454 (95% Cl: 1.316-1.605) compared to males. In the case of household income, compared to <1 million, 1 million - 2 million is 1.520 (95%Cl:1.299-1.779), 2 million - 3 million is 1.263 (95%Cl:1.102-1.448), and ≥3 million 1.147 (95% Cl: 1.007-1.307). The education level was 1.402 (95% Cl: 1.170-1.680) with an odds ratio of high school graduates compared to elementary school graduates or less.

Table 5. Validation of the effect of dietary supplement intake with regression analysis

Variables	Classification	OR	95%Cl	p
Gender	Male	-	-	-
	Female	1.454	1.316-1.605	.000**
Household income	<1 million	-		.000
	1 million - 2 million	1.520	1.299-1.779	.000**
	2 million - 3 million	1.263	1.102-1.448	.001**
	≥3 million	1.147	1.007-1.307	.038*
Educational level	<Elementary	-		.003**
	Middle	1.047	.919-1.193	.491
	High	1.402	1.170-1.680	.000
	≥College	1.053	.923-1.202	.442
Weight control for 1 year	Weight loss efforts			.005**
	Weight maintenance efforts	1.032	.062-17.269	.983
	Weight gain efforts	.951	.057-15.937	.972
	never tried to lose weigh	1.162	.069-19.600	.917
Subjective body shape recognition	very skinny			.115
	a little skinny	1.228	.073-20.780	.887
	commonly	1.306	.078-21.899	.853
	slightly over weight	1.242	.074-20.756	.880
	very obese	1.211	.072-20.268	.894
Diagnosis of Dyslipidemia	No			.000
	Yes	.000	0.000	1.000
	Not applicable	.000	0.000	1.000

*p<.05, **p<.01

The use of dietary supplements is widespread among the elderly in the United States. The risk of malnutrition and malnutrition in older adults may be due to decreased appetite with aging, poor diet, and drug-induced nutrient depletion (among many other factors). Nutritional deficiencies are common in this population and can negatively affect neurological and cardiovascular health, mood, immune function, vision, blood sugar control, and bone strength [14]. The use of dietary supplements among the elderly is steadily increasing due to the expectation of reducing the risk of developing chronic diseases [15].

This study observed a significant association between hyperlipidemia of lifestyle-related diseases and dietary supplement intake. As the results are presented as a cross-sectional study, there is a limit that cannot determine the causal relationship as to whether the intake of dietary supplements due to hyperlipidemia or whether the intake of dietary supplements showed significant results for hyperlipidemia. In addition, health status factors such as subjective health awareness, weight change for 1 year, weight control for 1 year, and subjective body shape recognition were dependent on subjective experience.

Currently, there are not many prior studies on dietary supplements in Korea elder people, and surveys on intake are not conducted smoothly. It is thought that further studies or repeated studies are needed. In addition, more research is needed on whether these dietary supplements are related to lifestyle-related diseases, and I suggest that education on proper dietary supplement intake is necessary. As interest in dietary supplement intake

by generation, type, and characteristics is gradually increasing, it is expected that various and extensive studies on dietary supplements will be conducted in the future.

4. Conclusion

This study was a large-scale study using the National Health and Nutrition Examination Survey to examine the relationship between the intake of dietary supplements and diseases in Korean people by dividing them into various aspects. This study found that dietary supplement intake had different effects depending on demographic factors, health status factors, diabetes, hypertension, and hyperlipidemia.

In further studies, it is necessary to evaluate the risk of overdose in men and older age groups whose dietary supplement intake is increasing day by day, and to examine drug interactions according to their health status. In addition, since dietary supplement intake and health behavior are closely related, it is expected to be used as basic data for making dietary guidelines programs that consider these factors. In addition, it is expected that, based on this study, education and guidance on correct information on dietary supplements will contribute to health promotion.

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