

대사증후군과 주의군 간의 영향요인 차이 분석

이현주

중원대학교 보건행정학과 부교수

An Analysis on the Difference of Influential Factors between Metabolic Syndrome Group and Attention Group

Hyun-Ju Lee

Associate Professor, Department of Health Administration in Jungwon University

ABSTRACT

목적: 본 연구의 목적은 대사증후군 주의군 대비 대사증후군의 위험요소를 식별하여 예방을 위한 중재방안을 마련하기 위한 것이다.

방법: 한국의료패널 2015년도 데이터를 활용하여 당뇨병만 앓고 있는 사람을 주의군으로 당뇨병, 고혈압, 이상지질혈증을 모두 앓고 있는 사람을 대사증후군으로 구분하여 추출한 다음 가중치를 부여하여 총 1,559,884명을 대상으로 하였다. 주의군 대비 개인적 특성, 건강생활습관 특성, 삶의 질 특성, 의료이용 특성에 대한 대사증후군의 영향요인을 분석하였다.

결과: 개인적 특성에서는 40대미만 연령대에 비해 연령에 비례하여 대사증후군 위험이 증가하다 70대에 40대미만과 유사한 수준으로 떨어졌다. 남성보다는 여성, 고졸이하보다는 대졸이상, 중소지역에 비해 서울시 거주자, 장애가 없는 군보다는 있는 군, 의료급여가입자보다는 건강보험 가입자, 경제활동을 안하는 군보다는 경제활동 군의 대사증후군 위험이 높았다. 건강생활 습관 특성에서는 비흡연자보다는 흡연자, 술을 안마시는 군보다는 주 2-3회 이상 음주자, 운동을 하는 군보다 안하는 군, BMI가 정상인 군보다는 30 이상인 군에서 대사증후군 위험이 높았다. 삶의 질 특성에서는 일상 활동에 지장이 없는 군보다 있는 군, 통증이나 불편이 없는 군보다 있는 군, 주관적 건강상태가 보통이상보다는 나쁜 군, 섭식문제가 없는 군보다 있었던 군에서 대사증후군 위험이 높았다. 의료이용 특성에서는 미충족 의료이용 경험이 없는 군보다 있었던 군, 약제비가 부담이 안되는 군보다 부담이 되는 군에서 대사증후군 위험이 높았다.

결론: 당뇨병을 앓고 있는 그룹 중 본 연구를 통해 확인된 대사증후군 위험 요소가 많은 이들에 대해 우선적으로 대사증후군 예방 보건교육을 집중하는 방안을 제언한다.

주제어: 대사증후군, 주의군, 위험요소, 보건교육, 한국의료패널

접수일 : 2022년 05월 02일, 수정일 : 2022년 05월 11일, 채택일 : 2022년 05월 11일

교신저자 : 이현주(28024, 충북 괴산군 괴산읍 문무로 85)

Tel: 043-830-8858, Fax: 043-830-8089, E-mail: hyun525h@jwu.ac.kr

I. Introduction

After Reaven first suggested in 1988 the term “X Syndrome” which means the complicated metabolic disorders including alpha-lipoproteinemia, hypertriglyceridemia, hyperinsulinism, and hypertension, it is named metabolic syndrome (Kopelman et al., 2008; Reaven, 1988). Metabolic syndrome has five risk factors: abdominal obesity, hypertension, diabetes(hyperglycemia), hypertriglyceridemia, and low HDL hypercholesterolemia. If a person has at least three out of the five risk factors, he or she is considered to have metabolic syndrome; if a person has one or two risk factors, he or she is considered to have attention to metabolic syndrome (Oh & Lee, 2018; NHIS, 2017). Relevant studies revealed that metabolic syndrome was related to smoking, drinking, obesity, BMI (body mass index), sex, age, stress, exercise, chronic diseases, family history of chronic diseases, and perception of health(Kim & Kim, 2018; Hong et al., 2018; Oh et al., 2018; Yu et al., 2018; Kim et al., 2012).

According to 2016 National Health Screening Statistical Yearbook of National Health Insurance Service, 25% of those who received health examination had metabolic syndrome(NHIS, 2017). This figure increased by 1.0% in 2015 and by 1.9% in 2014. Since it is on the constant rise, metabolic syndrome is recognized as an issue(NHIS, 2015-2016). In particular, persons who had at least one out of five risk factors, including those who had attention to metabolic

syndrome, accounted for 72.6%, or over 2/3 of all persons who had health examination in 2016, so that the figure was on the annual rise from 71.8% in 2014 and 72.2% in 2015(NHIS, 2015-2017).

The group of persons who need attention to metabolic syndrome has the risk of developing into metabolic syndrome so that it is meaningful in terms of health science in the preventive dimension. The attention group outnumbers twice the metabolic syndrome group. If there is no prevention before the development into metabolic syndrome, it is unavoidable to increase the number of persons with metabolic syndrome. Given the gradual rise in the number of those with such chronic diseases as obesity and diabetes which are highly related to metabolic syndrome, it is required to get interested in the attention group as well as the metabolic syndrome group (Li et al., 2019; NHIS, 2015-2017; Kim et al., 2012). Therefore, this study is aimed at finding a plan for preventing the attention group from developing into metabolic syndrome. To do that, this researcher find different characteristics between metabolic syndrome and attention to metabolic syndrome, and to identify the risk factors that influences the development of the attention group into metabolic syndrome. In addition, with the use of the identified risk factors, this study tries to come up with an intervention plan for preventing metabolic syndrome.

II. Methods

1. Study subjects

This study made use of the 2015 Korean Health Panel data which was the latest as of Feb. 2019. Korean Health Panel data is the statistical data of persons aged 18 years and older in the unit of households and individuals according to Article 18 of Statistics Act(Kim et al., 2017). With the data, it is possible to find not only the general characteristics of individuals including health condition, an income level, economic activity, medical service use, and activities of daily living, but also various aspects.

Korean Health Panel data does not include information on abdominal obesity among five risk factors of metabolic syndrome. Also, in the data, hypertriglyceridemia and low HDL hypercholesterolemia were integrated into dyslipidemia without any separation. Therefore, the use of the data was partially restricted. Diabetes as a sort of endocrine disease caused by hormone disorder is different from hypertension and dyslipidemia which are related to blood vessels. In this sense, there are differences between the risk factors of metabolic syndrome. Therefore, persons who had diabetes only were categorized into the metabolic syndrome attention group which was compared with the metabolic syndrome group.

For sampling bias correction, this study gave a weight to 740 persons who had diabetes only

or all of three hypertension, diabetes, and dyslipidemia among chronic diseases related to the risk factors of metabolic syndrome and thereby used a total of 1,559,884 persons as study subjects.

2. Explanatory variables

The variables used in this study were classified into four parts according to the Korean Health Panel, as shown in Table 1. Firstly, eight values including age, sex, and education were chosen as the variables of personal characteristics. Secondly, four variables including smoking and drinking were chosen as the variables of health living conditions. Thirdly, four variables including activities of daily living and pain or inconvenience were chosen as the variables of quality of life. Fourthly, as the variables of medical service use were chosen two variables: the experience of medical service dissatisfaction which means no medical treatment and examination even though such things should have done at hospital or clinics over the last one year; a burden of medicine cost for chronic diseases like diabetes, hypertension, and dyslipidemia. The study subjects were divided into two groups: metabolic syndrome group and attention group. The attention group had diabetes only, whereas the metabolic syndrome group had diabetes, hypertension, and dyslipidemia among metabolic syndrome related diseases.

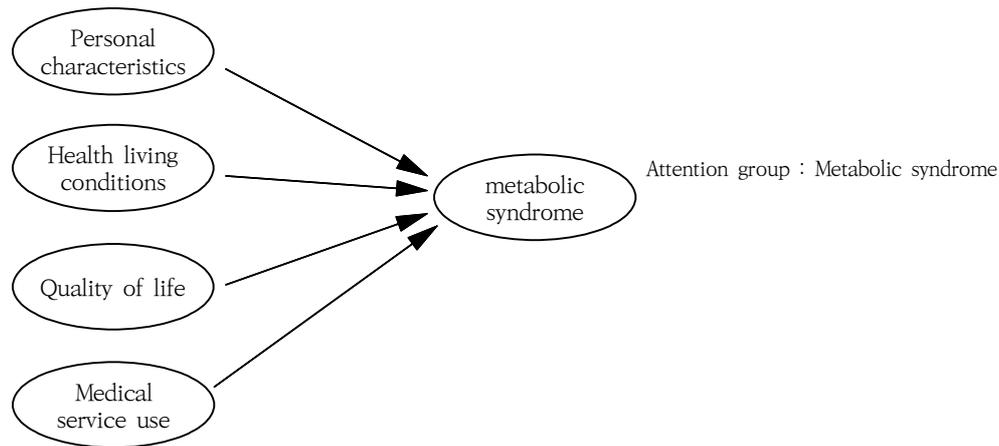
〈Table 1〉 Summary of explanatory variables

Explanatory variables	Level or Value
Age	Years of age
Sex	Male=1, Female=2
Education	Graduated from middle school and lower=1, Graduated from high school=2, Graduated from college and higher=3
Region	Seoul=1, Metropolitan city=2, Small & medium city=3
Household income quintile groups	Group 1=1, Group 2=2, Group 3=3, Group 4=4, Group 5=5
Medical security type	Health insurance=1, Medical aid=2
Disabilities	No disabilities=1, Disabilities=2
Economic activity	Activity=1, No activity=2
Smoking	Non-smoking=1, Smoking=2
Drinking	Never drink in the whole life=1, No smoking over the last 1 year=2, Smoking once or less a week=3, Smoking 2-3 days a week=4, Smoking everyday=5
Vigorous physical activity for one week	Activity=1, No activity=2
BMI	Low weight/Normal=1, Over weight=2, Obesity=3
Activities of daily living	No activities=1, Activities=2
Pain & inconvenience	No=1, Pain & inconvenience=2
Subjective health condition	Better than normal level=1, Bad=2
Food intake trouble	No trouble=1, Trouble=2
Experience of medical service dissatisfaction	No experience=1, experience=2
A burden of medicine cost for chronic diseases	No burden=1, Burden=2

3. Study model

To find how study subjects' personal characteristics, health living conditions, quality

of life, and medical service use influence the metabolic syndrome group, the risk group, and their relation, this study designed the study model as shown below(Figure 1).



〈Figure 1〉 Study model

4. Statistical analysis

The data saved separately in multiple files were integrated with the use of Excel function, and then were analyzed with PASW Statistics ver. 18.0. They were divided into metabolic syndrome group and attention group, and cross-tabulation analysis was conducted to find characteristics of the study subjects. In terms of age, independent sample t-test was conducted. With the use of the variables that showed significant differences in univariate analysis, the difference of influential factors between the attention group and the metabolic syndrome group was analyzed in binomial logistic regression in which entry method was applied.

III. Results

1. Personal characteristics of study subjects

The study subjects were divided into metabolic syndrome attention group and into metabolic syndrome group in order to find their personal characteristics. All variables were statistically and significantly different between the attention group and the metabolic syndrome group (Table 2). The average age of the metabolic syndrome group was 65.1 years, 7.5 years older than the attention group. In the metabolic syndrome group, women accounted for 56.8%. In terms of education, in the attention group, study subjects who graduated from middle school and lower accounted for 38.9%; those who graduated from high school

38.6%; and those who graduated from college and higher 22.5%, and in the metabolic syndrome group, study subjects who graduated from middle school and lower accounted for 53.0%. In terms of household income quintile groups, in the attention group, the quintile group 5 was the largest, but in the metabolic syndrome group, the quintile group 1 was the

largest and the higher quintile group, the lower rate. In terms of medical security type, in the attention group, health insurance subscribers accounted for 96.1%, and in the metabolic syndrome group, there was 92.5%. In terms of economic activity, in the attention group, those with economic activity accounted for 63.5%, in the metabolic syndrome, there was 44.1%.

〈Table 2〉 The difference of personal characteristics between metabolic syndrome group and attention group

(Unit: N(%), Mean±S.D.)

Variable	Attention Group (n=745,966)	Metabolic Syndrome Group (n=853,918)	Total (n=1,599,884)	x ² /t-value	P	
Age	57.6±12.62	65.1±10.32	61.6±12.05	21130.439	0.000	
Sex	Male	474,249(63.6)	368,790(43.2)	843,039(52.7)	66386.937	0.000
	Female	271,717(36.4)	485,128(56.8)	756,845(47.3)		
Education	≤ middle school	289,867(38.9)	452,333(53.0)	742,200(46.4)	36494.896	0.000
	High school	288,310(38.6)	281,687(33.0)	569,997(35.6)		
	≥ College	167,789(22.5)	119,898(14.0)	287,687(18.0)		
Region	Seoul	145,307(19.5)	220,655(25.8)	365,962(22.9)	9143.914	0.000
	Metropolitan city	166,603(22.3)	177,375(20.8)	343,978(21.5)		
	Small & medium city	434,056(58.2)	455,888(53.4)	889,944(55.6)		
Household income quintile groups	Group 1	115,282(15.5)	214,914(25.2)	330,196(20.6)	60468.267	0.000
	Group 2	123,558(16.6)	210,996(24.7)	334,554(20.9)		
	Group 3	188,551(25.3)	158,885(18.6)	347,436(21.7)		
	Group 4	124,734(16.7)	136,539(16.0)	261,273(16.3)		
	Group 5	193,841(26.0)	132,584(15.5)	326,425(20.4)		
Medical security type	Health insurance	717,227(96.1)	789,621(92.5)	1,506,848(94.2)	9828.879	0.000
	Medical aid	28,739(3.9)	64,297(7.5)	93,036(5.8)		
Disabilities	No disabilities	682,769(91.5)	731,450(85.7)	1,414,219(88.4)	13374.016	0.000
	disabilities	63,197(8.5)	122,468(14.3)	185,665(11.6)		
Economic activity	Activity	473,425(63.5)	376,933(44.1)	850,358(53.2)	59701.968	0.000
	No activity	272,541(36.5)	476,985(55.9)	749,526(46.8)		

2. Health living conditions of study subjects

The health living conditions of the attention group and the metabolic syndrome group were analyzed. As a result, all variables were statistically and significantly different between the attention group and the metabolic syndrome group (Table 3). In the attention group, current smoker accounted for 55.3%, higher than the metabolic syndrome which had

44.6%. In terms of daily drinking, the attention group had 4.0%, whereas the metabolic syndrome had 6.6%. In terms of vigorous physical activity for one week, the attention group had 19.4%, whereas the metabolic syndrome had 10.0%. In terms of BMI, the overweight and obesity rate of the metabolic syndrome group was 40.8%, higher than that of the attention group which was 28.6%.

〈Table 3〉 The difference of health living conditions between metabolic syndrome group and attention group

(Unit: N(%), Mean±S.D.)

Variable		Attention Group (n=745,966)	Metabolic Syndrome Group (n=853,918)	Total (n=1,599,884)	χ^2 -value	p
Smoking	No smoking	333,171(44.7)	473,395(55.4)	806,566(50.4)	18491.334	0.000
	Smoking	412,795(55.3)	380,523(44.6)	793,318(49.6)		
Drinking	Never drink in the whole life	174,150(23.3)	322,311(37.7)	496,461(31.0)	59290.228	0.000
	Not drink over the last one year	110,374(14.8)	137,378(16.1)	247,752(15.5)		
	Drink once or less a week	322,212(43.2)	255,707(29.9)	577,919(36.1)		
	Drink 2-3 days a week	109,112(14.6)	82,493(9.7)	191,605(12.0)		
	Drink everyday	30,118(4.0)	56,029(6.6)	86,147(5.4)		
Vigorous physical activity for one week	Activity	144,447(19.4)	85,965(10.1)	230,412(14.4)	27913.616	0.000
	No activity	601,519(80.6)	767,953(89.9)	1,369,472(85.6)		
BMI	Low weight & normal	532,828(71.4)	505,062(59.1)	1,037,890(64.9)	28207.638	0.000
	Overweight	190,926(25.6)	298,241(34.9)	489,167(30.6)		
	Obesity	22,212(3.0)	50,615(5.9)	72,827(4.6)		

3. Study subjects' quality of life

The difference of quality of life between the metabolic syndrome group and the attention group was analyzed. As a result, all variables were statistically and significantly different between the two groups (Table 4). In terms of the difficulty with activities of daily living, the metabolic syndrome group had 20.0%, higher than the attention group which had 10.2%. In terms of pain & inconvenience, the metabolic

syndrome had 54.6%, higher than the attention group which had 29.3%. In terms of subjective health condition, 35.2% of the metabolic syndrome group replied that their health was in bad condition, and the figure was higher than that of the attention group (21.1%). In terms of the difficulty with food intake which is caused by dental or oral problems over the last one year, the metabolic syndrome group had 42.9%, higher than the attention group which had 24.6%.

〈Table 4〉 Difference of the quality of life between metabolic syndrome group and attention group
(Unit: N (%))

Variable		Attention Group (n=745,966)	Metabolic Syndrome Group (n=853,918)	Total (n=1,599,884)	χ^2 -value	p
Activities of daily living	No activities	650,906(89.8)	674,592(80.0)	1,325,498(84.5)	29133.696	0.000
	Activities	73,609(10.2)	169,160(20.0)	242,769(15.5)		
Pain & inconvenience	No pain & inconvenience	512,486(70.7)	383,316(45.4)	895,802(57.1)	101910.007	0.000
	Pain & inconvenience	212,029(29.3)	460,436(54.6)	672,465(42.9)		
Subjective health condition	Better than normal level	571,551(78.9)	546,671(64.8)	1,118,222(71.3)	37856.991	0.000
	Bad	152,964(21.1)	297,081(35.2)	450,045(28.7)		
Food intake	No problem	562,343(75.4)	487,255(57.1)	1,049,598(65.6)	59241.499	0.000
	Troubled	183,623(24.6)	366,663(42.9)	550,286(34.4)		

4. Medical service use of study subjects

The difference of medical service use between the metabolic syndrome group and the attention group was analyzed. As a result, all variables were statistically and significantly different between the two groups (Table 5). In terms of the experience of medical service

dissatisfaction over the last one year, the attention group had 11.6%, higher than the metabolic syndrome group which had 15.3%. In terms of a burden for medicine cost for metabolic syndrome or diabetes, 83.6% of the metabolic syndrome group replied that they had a burden, and the figure was 14.6% higher than that of the attention group (69.0%).

〈Table 5〉 Difference of medical service use between metabolic syndrome group and attention group
(Unit: N (%))

Variable		Attention Group	Metabolic syndrome	Total	χ^2 -value	p
Experience of medical service dissatisfaction	No experience	643,481(88.4)	723,062(84.7)	1,366,543(86.4)	4471.683	0.000
	experienced	84,601(11.6)	130,369(15.3)	214,970(13.6)		
	total	728,082(100.0)	853,431(100.0)	1,581,513(100.0)		
A burden of medicine cost for chronic diseases	No burden	209,835(31.0)	132,752(16.4)	342,587(23.0)	44352.996	0.000
	A burden	467,857(69.0)	678,064(83.6)	1,145,921(77.0)		
	total	677,692(100.0)	810,816(100.0)	1,488,508(100.0)		

5. The difference of influential factors between metabolic syndrome group and attention group

The difference of influential factors between the metabolic syndrome group and the attention group was analyzed in binomial logistic regression. As a result, all variables were statistically and significantly different between the two groups (Table 6). In terms of personal characteristics, the risk of change from metabolic syndrome attention to metabolic syndrome increased in proportion to years of age (2.423 times higher in the age group of 40s than in the age groups of less than 40s, 4.940 times higher in the age group 50s, and 7.295 times higher in the age group of 60s) but fell in the age group of 70s as much as to the level of the age group of 40s. Women had 2.387 times higher risk than men, and the higher they were educated, the higher they had the risk of metabolic syndrome. Study subjects living in Seoul had 1.777 times higher risk than those living in small and middle regions. Study subjects in the group 2 and group 4 of

household income groups had higher risk than those in group 5. Study subjects with disabilities had 1.219 times higher risk than those without disabilities. Medical aid beneficiaries had 0.915 times lower risk than health insurance subscribers. Study subjects without economic activity had 0.946 times lower risk than those with economic activity.

In terms of health living conditions, smokers had 1.438 times higher risk of non-smokers; study subjects who drink 2-3 days a week had higher risk than those who never drink in their whole life; study subjects who didn't take vigorous physical activity for one week 1.270 times higher risk than those who did; study subjects who were overweight and obese in BMI had 1.816 times and 4.429 times, respectively, higher than those with low weight and normal weight.

In terms of quality of life, study subjects who had difficulty with activities of daily living 1.100 times higher risk than those who didn't; study subjects who had any pain & inconvenience had 1.568 times higher risk than those who didn't; study subjects who were subjectively in bad

health condition 1.152 times higher risk than those who were subjectively in normal or better condition; study subjects who had difficulty with food intake 1.694 times higher risk than those who didn't.

In terms of medical service use, study

subjects who experienced medical service dissatisfaction had 1.043 times higher risk than those who didn't; study subjects who had a burden of medicine cost for diabetes or metabolic syndrome had 1.753 times higher risk than those who didn't.

〈Table 6〉 Influential factors of metabolic syndrome group on attention group

Variable		OR	95% CI	p	
Personal characteristics	Age groups (< 40s)	40s	2.423	2.393 - 2.455	0.000
		50s	4.940	4.872 - 5.008	0.000
		60s	7.295	7.178 - 7.414	0.000
		70s and older	2.859	2.799 - 2.921	0.000
	Sex(Male)	Female	2.387	2.356 - 2.420	0.000
	Education (≤ middle school)	High school graduates	1.552	1.536 - 1.567	0.000
		≥ College	1.603	1.583 - 1.624	0.000
	Region (small & medium city)	Seoul	1.777	1.759 - 1.794	0.000
		Metropolitan city	0.717	0.710 - 0.724	0.000
	Household income quintile groups (Group 5)	Group 1	0.827	0.814 - 0.839	0.000
		Group 2	1.137	1.122 - 1.152	0.000
		Group 3	0.913	0.902 - 0.924	0.000
		Group 4	1.582	1.562 - 1.603	0.000
	Medical security type (health insurance)	Medical aid	0.915	0.896 - 0.935	0.000
	Disabilities (No)	Disabilities	1.219	1.203 - 1.235	0.000
	Economic activity (activity)	No activity	.946	0.937 - 0.955	0.000
Health living conditions	Smoking (No smoking)	Smoking	1.438	1.420 - 1.457	0.000
	Drinking (Never drink in the whole life)	Not drink over the last one year	0.812	0.802 - 0.822	0.000
		once or less a week	0.787	0.779 - 0.795	0.000
		2-3 days a week	1.029	1.014 - 1.044	0.000
		everyday	2.206	2.161 - 2.251	0.000
	Vigorous physical activity for one week (activity)	No activity	1.270	1.256 - 1.284	0.000
BMI (≤ Normal)	Overweight	1.816	1.801 - 1.831	0.000	
	Obesity	4.429	4.336 - 4.524	0.000	

Variable		OR	95% CI	p
Quality of life	Activities of daily living (No problem) Problem	1.100	1.086 - 1.115	0.000
	Pain & inconvenience (No) Pain & inconvenience	1.568	1.553 - 1.583	0.000
	Subjective health condition (\geq normal) Bad	1.152	1.141 - 1.163	0.000
	Food intake (Problem) No problem	1.694	1.680 - 1.709	0.000
Medical service use	Experience of medical service dissatisfaction (No experience) Experienced	1.043	1.031 - 1.055	0.000
	A burden of medicine cost for chronic diseases (No burden) A burden	1.753	1.736 - 1.769	0.000

IV. Discussion

The results of this study are consistent with the results of previous studies as follows: regarding personal characteristics, women had higher risk of metabolic syndrome than men. With regard to health living conditions, smokers had higher risk than non-smokers; those who drink more than 2-3 days a week had higher risk than those who never drink in their whole life; those who didn't take vigorous physical activity had higher risk than those who did; those who were overweight and obese in BMI had higher risk than those with low or normal weight. In terms of quality of life, those who were subjectively in bad health condition had higher risk than those who were subjective in normal or better health condition (Fan et al., 2019; Kim & Kim, 2018; Hong et al., 2018; Lee et al., 2017; Najat et al., 2017; Oh et al., 2018; Pacheco et al., 2017; Tran et al., 2017; Li et al., 2016; Kim et al., 2012).

On contrary, some results of this study are inconsistent with the results of previous studies as follows: the risk of metabolic syndrome increased in proportion of years of age by the age group of 60s, just as in previous studies (Li et al., 2019; Kim et al., 2012). After elderly persons were divided into the age group of 60s and the age group of 70s and older, those in their 60s had 7.295 times higher risk than those in their 40s and younger, whereas those in their 70s and older fell to 2.859 times, which is the level of the age group of 40s. In this study, the higher they were educated, the higher risk of metabolic syndrome they had, which is different from the results of previous studies (Pacheco et al., 2018; Tran et al., 2017). In terms of household incomes, unlike the result of the previous study in which the lower household incomes (Tran et al., 2017), the higher risk of metabolic syndrome, this study revealed that an income quintile was not proportional to the risk of metabolic syndrome. Those living in Seoul

had 1.777 times higher risk than those living in small and middle regions, which was similar to the result of the previous study in which urban residents had a higher prevalence rate of metabolic syndrome than rural residents(Li et al., 2019), but, in this study, those living in six metropolitan cities had 0.717 times lower risk than those living in small and middle regions. This was attributable to the mixture of rural and urban areas in small and middle regions, and there was a restriction of the secondary data used in this study in terms of classification. Therefore, it will be necessary to compare equal conditions with the use of the primary data. In addition, the aforementioned different results seem to be attributable to different comparative groups of metabolic syndrome. Unlike previous studies, this study chose the group of diabetic patients which is subject to 'metabolic syndrome attention group', rather than 'non-metabolic syndrome group', as the control group of metabolic syndrome. Therefore, for more accurate verification, it will be necessary to use different types of national data in the same research method.

Compared to previous studies, this study compared the group of diabetic patients which is subject to metabolic syndrome attention group with the metabolic syndrome group so as to the risk factors of metabolic syndrome for the group of diabetic patients. Some results of this study were different from those of previous studies. Accordingly, by separating the group of study subjects who had diabetes only from the attention group, it is necessary to perform the preventive plan of metabolic syndrome.

Regarding the group of those who had diabetes only, by selecting first the groups that were found to have the highest risk of each factor and concentrating on the preventive activity for them, it is expected to maximize the preventive effect. In other words, a total of 18 types of persons, including a person in their 50s and 60s, a woman, a person who graduated from college graduate and higher, a resident living in Seoul, a health insurance subscriber, a person with disabilities, a person with economic activity, a current-smoker, a person who drinks every day, a person who never does exercise, an obese person who has 30 and more in BMI, a person who has difficulty with activities of daily living, a person who has any pain & inconvenience, a person who has difficulty with food intake, a person who experienced medical service dissatisfaction, and a person who has a burden of medicine cost for diabetes, had high risk of metabolic syndrome for diabetes. Therefore, this study suggests a selection and concentration plan which is to select first diabetic patients who have a large number of types among the 18 types and then to give them intensive preventive education of metabolic syndrome. People in their 50s and 60s and obese persons with 30 and higher in BMI have 4 times higher risk than reference group so that it is necessary to pay more attention to them.

V. Conclusion

This study made use of the Korean Health Panel data that take into account regions, age,

and sex of the people across the nation. The persons who had metabolic syndrome and attention to metabolic syndrome were categorized into patient group (or metabolic syndrome group) and control group (or attention group) in order to find the characteristics of each group. By identifying the risk factors of metabolic syndrome, this study tried to find a plan for preventing the development of the attention group into metabolic syndrome. The persons who suffered from diabetes, hypertension, and dyslipidemia among chronic diseases were classified into the metabolic syndrome group, and the persons who had diabetes only, which is the risk factor of metabolic syndrome, were classified into the attention group. In the Korean circumstance where metabolic syndrome is on the constant rise (NHIS, 2017), this study is timely and meaningful in the point that it tried to identify the factors for preventing the attention group from developing into metabolic syndrome. In addition, it is meaningful in the point that the quality of life and medical service use which didn't tried before related to metabolic syndrome were analyzed.

In this study, there was some limited analysis because of the secondary data based on the already surveyed one. Nevertheless, given that the Korean Health Panel data used in this study is national statistical data and secures representatives, this study is meaningful. The group of metabolic syndrome attention is highly likely to develop into metabolic syndrome. Therefore, it will be necessary to research other conditions related to metabolic syndrome than diabetes.

References

1. Kim CG, Kim YG. (2018). The Prevalence and Associated Factors of the Metabolic Syndrome in Pre-menopausal Housewives: An Analysis of the 2010-2015 Korean National Health and Nutrition Examination Survey. *J Korean Acad Community Health Nurs.*, 29(1), 108-119.
2. Kim MS, Jeon JA, Seo JH. (2017). 2015 Korea Health Panel basic analysis report(II). *Korea Institute for Health and Social Affairs*, 20-110.
3. Kim NL and 5 others. (2012) Related Clinical Factors to Number of Diagnosing Criteria of Metabolic Syndrome. *J Health Info Stat.*, 37(2), 37-45.
4. Hong EJ, Joe SY, Song J. (2018). Convergent Analysis of Health Examination Results for Military Workers in Korea at the Age of 40, a Life Transition Period: focused on risk factor of metabolic syndrome. *JKCS.*, 9(4), 65-74.
5. National Health Insurance Service. (2015). 2014 National health Screening Statistical Yearbook. Wonju: *National Health Insurance Service*.
6. National Health Insurance Service. (2016). 2015 National health Screening Statistical Yearbook. Wonju: *National Health Insurance Service*.
7. NHIS.org. Sejong: National Health Insurance Service. Press release 2017. Retrieved from <http://www.nhis.or.kr/bbs7/boards/B0039/24877>
8. Oh EJ, Gang MH, Kim MS. (2018). A convergence Study on Associated Factors on Metabolic Syndrome among Inpatients with Schizophrenia. *JDC.*, 16(10), 313-321.
9. Oh HS, Lee WJ. (2018). Influencing Factors for

- the Development of Metabolic Syndrome by the Number of Metabolic Syndrome Diagnostic Components in Korean Adolescents. *JKSSCHE*, 19(3), 1-14.
10. Yu HN, Kim HS, Lee SW, Seo BN, Baek YH. (2018). Effects of Stress and Obesity on the Prevalence of Metabolic Syndrome to the Sasang Constitution. *J Sasang Constitut Med*, 30(1), 58-65.
 11. Fan J, and 7 others. (2019). Small dense LDL cholesterol is associated with metabolic syndrome traits independently of obesity and inflammation. *Nutrition & Metabolism*, 16(1), 1-9.
 12. Kopelman PG, Caterson ID, Dietz. (2008). *Clinical obesity in Adults and Children* 2nd ed. Oxford: Blackwell
 13. Lee JA, Cha YH, Kim SH, Park HS. (2017). Impact of combined lifestyle factors on metabolic syndrome in Korean men. *J Public Health*, 39(1), 82-89.
 14. Li W and 6 others. (2019). The association of metabolic syndrome components and diabetes mellitus: evidence from China National Stroke Screening and Prevention Project. *BMC Public Health*, 19(1), 192.
 15. Li Rand and 6 others. (2016). Prevalence of metabolic syndrome in Mainland China: a meta-analysis of published studies. *BMC Public Health*, 16(1), 1-10.
 16. Najat Y and 6 others. (2017). Prevalence of Metabolic Syndrome and Its Individual Components Among Midwestern University Students. *J Community Health*, 42(4), 674-687.
 17. Pacheco LS and 5 others. (2017). Prevalence and Correlates of diabetes and metabolic syndrome in a rural indigenous community in Baja California, Mexico. *BMC Public Health*, 18(1), 1397.
 18. Reaven GM.(1988). Role of insulin resistance in human disease. *Diabete*, 37, 595-607.
 19. Tran BT, Jeong BY, Oh JK. (2017). The prevalence trend of metabolic syndrome and its components and risk factors in Korean adults: results from the Korean National Health and Nutrition Examination Survey 2008-2013. *BMC Public Health*, 17(1), 1-8.