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Convergence Effect Factors of Hypertension and Diabetes Mellitus on Depression and Suicidal Impulse

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고혈압과 당뇨병이 우울과 자살생각에 미치는 융합적인 영향 요인

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Abstract The purpose of this study is to investigate the effects of hypertension and diabetes mellitus on depression and suicidal impulse through the total inspection on specific rural areas in Gangwon-do. This survey selected adults over the age of 30 and conducted from May 19 to Sep. 30 in 2014. Of the 1,200 questionnaires distributed, 970 were completed and returned to be used for the study. To figure out the actual condition of hypertension and diabetes among the participants, the research examined the degree of their depression and suicidal impulse. It examined their smoking and exercise habits to check their health conditions. The research showed that patients diagnosed with hypertension and diabetes had a higher tendency of depression and suicidal impulse. The significant variable affecting depression is suicidal impulse($p<0.001$). Also, the significant variables affecting suicidal impulse are hypertension and depression. Based on these results, local health institutions need to include mental health services for the patients with hypertension and diabetes and coordinate them comprehensively and effectively.

• **Key Words** : Hypertension, Diabetes mellitus, Depression, Suicidal Impulse, Convergency Study

요 약 본 연구는 강원도 일 농촌지역의 주민들을 대상으로 고혈압과 당뇨병이 우울증과 자살의도에 미치는 영향력을 분석하고자 시도하였다. 설문조사는 2014년 5월19일부터 9월 30일까지 진행되었으며, 30세이상의 성인 1200명의 대상자 중 970명이 참여하였다. 조사 도구는 고혈압과 당뇨병 현황과 대상자들의 정신 건강 상태를 파악하기 위해 우울감과 자살생각 수준을 조사하였고, 건강생활 행태를 보기 위해 흡연과 운동여부를 조사하였다. 연구결과, 고혈압과 당뇨병으로 진단된 환자들의 우울감과 자살의도가 유의미하게 높았다($p<0.001$). 또한 자살의도에 가장 영향을 미치는 요인은 고혈압과 우울감이었다. 이러한 결과를 바탕으로 지역사회 중심의 고혈압, 당뇨병 관리 사업에 정신보건서비스를 반드시 포함시켜 포괄적이고 효율적인 운영이 되도록 노력하여야 한다.

• **주제어** : 고혈압, 당뇨병, 우울감, 자살의도, 융합연구

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I. INTRODUCTION

Recently, the world is witnessing rapid aging and longer life expectancy, raising the rates of chronic diseases such as heart related diseases, apoplexy, hypertension, and diabetes. This tendency rapidly is increasing the economical and psychological burden as well as individual and social concerns of the people.

Hypertension and diabetes mellitus are the most common diseases in westernized, industrialized civilizations, and the frequency of both diseases sharply increases with increasing age[1,2,3,4,5,6,7,8]. Many chronic medical conditions such as hypertension and diabetes mellitus are complicated by emotional and psychological disorders and associated with depressive syndromes. However, the emotional dimensions of such chronic medical conditions are often overlooked when medical care is considered[9].

Today, the Korean society is also rapidly aging and it goes through changes in lifestyle, raising the rates of hypertension and diabetes. This change contributes to the increasing cases of depression and suicide, with considerable psychological burden as well as increasing socio-economic costs. According to the 2014 Health Insurance Statistics Chronology [10], essential hypertension marked the highest medical cost amounting to 2,544,600,000,000 won for a single disease, followed by the chronic heart disease with 1,443,600,000,000 won, and insulin from diabetes with 1,350,100,000,000 won. Also, hypertension ranked first among major chronic diseases with 5,556,000 cases, followed by nervous system diseases with 2,640,000 cases, psychological and behavioral disorder with 2,520,000 cases, and diabetes with 2,410,000 cases. Psychological disorders like depression are one of the biggest concerns along with hypertension and diabetes.

The Ministry of Health and Welfare (2014) interviewed 10,452 senior citizens nationwide, and reported the result of the "Survey on senior citizens". According to the survey, 89.2% of the participants were suffering from chronic diseases such as hypertension (56.7%) and diabetes (22.6%), and 33.1% of them were suffering from depression, meaning that one third of the senior population have symptoms of depression[11].

According to the World Health Organization (WHO), depression is placed third among all the diseases and it is expected to be the most prevailing disease by 2030, surpassing cardiovascular diseases [12]. Since depression is one of the biggest related factors with suicide, systematic management and prevention efforts are needed[13].

The report on the "Causes of death in 2013 Korea" completed by Korea Statistics (2014), cancer related death marked first with 75,334 cases, followed by cardiovascular diseases with 25,447 cases, heart disease with 25,365 cases, suicide with 14,427 cases, diabetes with 18,888 cases, pneumonia with 10,809 cases, chronic lower respiratory diseases with 7,074 cases, liver disease with 6,665 cases, traffic accident with 6,028 cases, and hypertension with 4,732 cases [14], Suicide rate was the highest among OECD countries.

Through systematic management of patients with depression and chronic diseases such as hypertension and diabetes, socio-economical costs can be reduced, but management policies need to be revised and supplemented as prevention and proper management of those diseases are still insufficient.

This study aims to analyze the effects of hypertension and diabetes on depression and suicidal impulse by examining the residents of Gangwon province, where the morbidity rate of chronic diseases is pretty high with its large senior population. Also, based on the empirical data acquired by the study, we would like to provide basic data on mental health for the custom-built health promotion strategy, focusing on local communities.

II. METHOD

2.1 Study subjects and data collection method

This study used self-administered questionnaires and measurement from May 19th to September 31st in 2014. The total inspection was conducted to all 1,956 adults over the age of 30. Among the inspected adults,

1,200 were selected and were provided with questionnaires. Of the 1,200 adults, 970 completed the survey and usable questionnaires were returned, representing a response rate of 80.8%. The research method consisted of a researcher using a structured survey to visit the subject to conduct a 1:1 interview.

2.2 Survey measurement and analysis methods

The measurement tool used for this study was adopted by the researchers based from previous researches. The survey examined the social and demographic characteristics of the residents and the current condition of hypertension and diabetes to check the level of chronic diseases. To examine the participants' mental health, the study looked into the degree of their depression, sadness and suicidal impulse. Also, it checked the patients' sleeping hours and exercise habits to examine their health conditions.

The data was analyzed using SPSS (Statistical Package for the Social Science) 18.0 to validate the research model. Data processing and statistical analysis are as follows: To draw the survey result, a descriptive statistical analysis was used first with the patient's level data and the general characteristics of respondents were then applied. Second, this study used logistic regression analysis and all statistical values were set at 5% level of significance ($p < 0.05$).

III. RESULTS

3.1 The General Characteristics of the Participants

The general characteristics of the participants are as follows: In terms of gender, the number of female participants has a total of 496 (51.1%) respondents while the male has a total of 474(48.9%) respondents. The average age was 63.5. In terms of marriage status, the number of married people was 921 (94.4%). As far as education is concerned, people who only went to elementary school or below accounted for the majority with 566 (58.4%) respondents.

Among 970 people, there are 355 (36.6%) patients who were diagnosed with hypertension. 204 (57.5%) were females and 151 (42.5%) were males. Among the subjects with hypertension, over 70 years old is composed of 202 (56.9%) respondents, between the age of 50 and 69 there are 138 (38.6%) respondents. Married people have a total of 352 (99.2%) respondents. The hypertensive patients who graduated from primary school and below has 249 (70.1%) respondents.

Among the 970 people surveyed, there are 109 patients (11.2%) who were diagnosed with diabetes mellitus. 53 (48.6%) of whom were females and 56 (51.4%) were males. Among the subjects with hypertension, 58 (53.2%) respondents belong to the 70-year old and above group. Hypertension patients are composed of 72 (66.0%) respondents belonging to the group whose educational attainment was under the primary school graduate and below.

〈Table 1〉 Demographic characteristics of hypertensive and diabetic mellitus patients

Unit: N(%)

Classification	30 years old ≤ (N=970)	Hyperten sion (N=355)	Diabetic mellitus (N=109)
Gender			
male	474(48.9)	151(42.5)	56(51.4)
female	496(51.1)	204(57.5)	53(48.6)
Age Group			
30-49	21(12.5)	16(4.5)	3(2.7)
50-69	488(50.3)	138(38.6)	48(44.1)
70≤	361(37.2)	202(56.9)	58(53.2)
Marriage			
unmarried	49(5.1)	3(0.8)	1(0.9)
married	921(94.9)	352(99.2)	108(99.1)
Level of Education			
≥ Elementary school	566(58.4)	249(70.1)	72(66.1)
middle school	157(16.2)	52(14.6)	15(13.8)
high school	194(20.0)	36(10.1)	13(11.9)
College≤	53(5.4)	18(5.2)	9(8.3)

3.2 Demographic characteristics of depression and Suicidal thinking

There are 99 people surveyed for depression<Table 2>. In each group, 60 (60.6%) respondents were females

and 39 (39.4%) respondents were males. Among the subjects with depression, 49 (49.5%) respondents belong to 70-year old and above group, 39 (39.4%) respondents belong to the age between 50 and 69. Many patients who had depression are composed of 66 (66.7%) respondents belonging to the group whose educational attainment was under the group of primary school graduate. The demographic and social variable that was significant for depression was gender($p<0.05$).

〈Table 2〉 Demographic characteristics of depression and Suicidal thinking

Unit: N(%)

Classification	Depression (N=99)	Suicidal thinking (N=119)
Gender		
male	39(39.4)	43(36.1)
female	60(60.6)	76(63.9)
χ^2(p)	4.264(0.039)	8.798(0.003)
Age Group		
30-49	11(11.1)	15(12.6)
50-69	39(39.4)	41(34.5)
70≤	49(49.5)	63(52.9)
χ^2(p)	9.645(0.140)	19.159(0.004)
Marriage		
unmarried	1(1.0)	0(0.0)
married	98(99.0)	100(100.0)
χ^2(p)	4.453(0.103)	8.194(0.017)
Level of Education		
≥ elementary school	66(66.7)	79(66.4)
middle school	12(12.1)	21(17.6)
high school	17(17.2)	16(13.4)
College≤	4(4.0)	3(2.5)
χ^2(p)	3.939(0.414)	6.923(0.140)

There are 119 people with suicidal thoughts<Table 2>. In each group 76 (63.9%) respondents were females and 43 (36.1%) respondents were males. Among the subjects with suicidal thoughts, 63 (52.9%) respondents belong to 70-year old and 49. Married people are composed of 119 (100%) respondents and many patients who had suicidal thoughts.

The demographic and social variable that was significant for suicidal impulse was gender ($p<0.01$), age ($p<0.01$), marital status($p<0.05$).

3.3 Demographic characteristics of smoking and exercise

The findings on the condition of participants' smoking and exercising habits are the following <table 3>.

〈Table 3〉 Demographic characteristics of smoking and exercise

Unit: N(%)

Classification	Smoking (N=200)	Exercise (N=187)
Gender		
male	189(94.5)	95(50.8)
female	11(5.5)	92(49.2)
χ^2(p)	470.984(0.000)	0.314(0.575)
Age Group		
30-49	40(20.0)	31(16.5)
50-69	111(55.5)	95(50.9)
70≤	49(24.5)	61(32.6)
χ^2(p)	38.457(0.000)	15.125(0.019)
Marriage		
unmarried	22(11.0)	21(11.2)
married	178(89.0)	166(88.8)
χ^2(p)	34.078(0.000)	20.053(0.000)
Level of Education		
≥elementary school	77(38.5)	80(42.8)
middle school	37(18.5)	34(18.2)
high school	77(38.5)	50(26.7)
College≤	9(4.5)	23(12.3)
χ^2(p)	92.506(0.000)	38.456(0.000)

The number of male smokers was composed of 189 (94.5%) respondents, by far making a huge gap with that of female smokers with 11 (5.5%) respondents. The demographic and social variable that was significant for smoking was gender, age, marital status, and education level ($p<0.001$).

In terms of exercise, 95 (50.8%) male respondents answered that they exercise while 92 (49.2%) female respondents answered, People in their fifties and sixties are composed 95 (50.9%) respondents. The demographic and social variable that was significant for exercise was age ($p<0.05$), marital status ($p<0.001$), and education level ($p<0.001$).

3.4 Health behavior of hypertensive and diabetic mellitus patients

Among the 355 people diagnosed with hypertension,

50 (14.2%) respondents were feeling depressed. Among these factors, the sense of depression ($p<0.01$), suicidal impulse ($p<0.001$), and smoking ($p<0.001$) turned out to be significant in diagnosing hypertension.

Among 109 people diagnosed with diabetes, 17 (15.6%) respondents were feeling depressed. 21 (19.3%) respondents had suicidal impulse. 10 (9.2%) respondents were smokers. 25 (22.9%) respondents were exercising. Among these factors, the sense of depression ($p<0.05$), suicidal impulse($p<0.05$), and smoking ($p<0.01$) were considered significant in diagnosing diabetes.

〈Table 4〉 Health behavior of hypertensive and diabetic mellitus patients

Unit: N(%)

Classification	Hypertension (N=355)		Diabetic mellitus (N=109)	
	diagnosis	un-diagnosis	diagnosis	un-diagnosis
Depression				
Yes	50(14.2)	49(8.1)	17(15.6)	82(9.6)
N0	303(85.8)	558(91.9)	92(84.4)	771(90.4)
χ^2(p)	8.956(0.003)**		3.895(0.048)*	
Suicidal thinking				
Yes	67(18.9)	52(8.6)	21(19.3)	98(11.5)
N0	288(81.1)	556(91.4)	88(80.7)	757(88.5)
χ^2(p)	22.043(0.000)***		5.441(0.020)*	
Smoking				
Yes	41(11.5)	158(26.0)	10(9.2)	190(22.2)
N0	314(88.5)	420(74.0)	99(90.8)	665(77.8)
χ^2(p)	28.497(0.000)***		10.010(0.002)**	
Exercise				
Yes	65(18.3)	122(20.1)	25(22.9)	162(19.0)
N0	290(81.7)	484(79.9)	84(77.1)	691(81.0)
χ^2(p)	0.474(0.491)		0.960(0.327)	

*p<0.05 **p<0.01 ***p<0.001

3.5 factors having effect on depression and sucidal thinking

To examine the effects on the surveyed participants, we conducted the binominal logistic regression analysis. After examining the adequacy of the final model from this research, the value of -2LL was 432,793 and 486,109 respectively, and the value of Model Chi Square was 198.161 (df = 13, p= 0.000) and 227.095 (df = 13, p= 0.000), proving that the final logistic regression model was adequate. The examination of Hosmer &Lemeshow showed that the model was adequate, with Chi-Square = 10.522 (df = 8, p = .230) and 4.080 (df = 8, p = .850). Also, the outcome of Nagelkerk's R2 = 0.388 and 0.403 showed that the explanatory power of variations that affect depression was 38.8% and for suicidal impulse, it was 40.3%.

〈Table 5〉 Analysis of factors having effect on depression and sucidal thinking

Unit: N(%)

Variables	Depression		Suicidal thinking	
	ß	Exp (B)	ß	Exp (B)
Gender				
male	1		1	
female	0.105	1.111	0.407	1.502
Age Group				
70≤	1		1	
30-49	0.221	1.248	-0.600	0.549
50-69	0.106	1.112	0.553	1.739
Marriage				
married	1		1	
unmarried	-0.551	0.576	-18.708	0.000
Education				
College≤	1		1	
≥elementary school	-17.718	0.000	-18.106	0.000
middle	-17.057	0.000	-18.712	0.000
high	-17.964	0.000	-17.783	0.000
Hypertension				
undiagnosed	1		1	
diagnosed	-0.022	0.978	0.742**	2.100
Diabetic mellitus				
undiagnosed	1		1	
diagnosed	0.300	1.349	0.124	1.132
Depression				
No			1	
Yes			3.371***	29.111
Suicidal thinking				
No	1			
Yes	3.393***	29.762		
Smoking				
No	1		1	
Yes	-0.169	0.845	0.035	1.036
Exercise				
No	1		1	
Yes	-0.252	0.778	0.242	1.274
Constant	15.189	394927 0.473	48.831	0.998

*p<0.05 **p<0.01 ***p<0.001

The analysis showed that depression was affected by suicidal impulse and had its statistical significance ($p<0.001$). The odds ratio of depression was 29.7 times higher among people who had suicidal impulse than

people who did not. Also, suicidal impulse was affected by diagnosis with hypertension and depression, and had statistical significance($p<0.01$). People who were diagnosed with hypertension had 2.1 times more suicidal impulse than people who were not. Also, the odds ratio of suicidal impulse among people who had depression was 29 times higher than people who did not.

IV. CONCLUSION

Korea is witnessing more cases of hypertension and diabetes as it is rapidly aging and this phenomenon contributes to the increasing socio-economic burden caused by the growing mental and psychological diseases such as depression and suicidal impulse. This study aimed to provide the basic data for adequate management by trying to find connections between diseases and to examine how the management and health conditions of hypertension and diabetes affect depression and suicidal impulse.

The results drawn from the study are as following:

First, among 970 survey participants, 355 (36.6%) respondents were diagnosed with hypertension and 109 (11.2%) respondents were diagnosed with diabetes. This number is higher than that of the country's average hypertension diagnosis rate (31.5%) and diabetes diagnosis rate (9.9%)[15].

Second, among the participants, the number of women who responded that they felt depressed continuously for the past 2 weeks was bigger than that of men. Women and older people tend to have more suicidal impulse, which showed statistical significance($p<0.05$). This result accords with the report "Analysis on the trend of the medical use of patients with depression (2004-2008)"[16,17], suggested by Health Insurance Review & Assessment Service, which shows that the morbidity rate of depression in women is twice as high as that of men and that the older the patients are, the higher the rate is.

Third, people diagnosed with hypertension and diabetes showed more tendency to have depression and suicidal impulse, bearing statistical significance ($p<0.05$). The research conducted by Park and Hwang showed the same result [18].

Lastly, analysis on the factors affecting the depression of participants shows that the strongest factor was suicidal impulse. Also, the significant variables affecting suicidal impulse are hypertension and depression.

The study shows that the diagnosis rate of hypertension and diabetes in Gangwon province is higher than that of the country's average. Also, people who are diagnosed with hypertension and diabetes have more tendencies to have depression and suicidal impulse than people who are not. Based on the study, we would like to suggest an effective way of management which includes mental health services in taking care of local hypertension and diabetes. First, we need to minimize possible complications by adequately managing hypertension and diabetes. Also, by providing programs that can enhance the self-efficacy of the residents, we need to minimize the occurrence of mental and psychological diseases caused by chronic diseases.

The limitation that this study has lies on the condition that the representativeness of the samples could not be secured since the survey was conducted among adults 30 and above. Further research should be done for a detailed examination on the effects of hypertension and diabetes on mental and psychological diseases through various variables.

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