

# Management Behavior in Hypertension and Diabetes of Rural Adults in Korea

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## 일 농촌지역 성인의 고혈압과 당뇨병 관리 행태

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**Abstract** The purpose of this study was to analyze the management behavior in patients with hypertension and diabetes through the total inspection of a specific rural area. Data was collected through self-administered questionnaires from May 19th to September 21st in 2014. As the result, Among 355 (36.6%) patients who were diagnosed with hypertension, 337 (94.9%) were currently undergoing treatment, and among 109 (11.2%) patients who were diagnosed with diabetes mellitus, 96 (80.1%) were currently undergoing treatment. Among the total of 211 people in hypertension potential risk group, 89 (42.2%) were diagnosed with hypertension, and among the total of 356 people in hypertension potential risk group, 78 (22.0%) were diagnosed with diabetes mellitus. In conclusion, from the results of the analysis, we suggest that effective national strategies for prevention and management for patients with hypertension and diabetes should be established and implemented.

**Key Words** : Hypertension, Diabetes, Potential Risk Group, Total Inspection, Management Behavior

요 약 본 연구의 목적은 일 농촌지역의 전수조사를 통해 고혈압과 당뇨병 환자들의 관리 행태를 분석하기 위해 시도되었다. 조사는 2014년 5월 19일부터 9월 21까지 구조화된 설문지를 이용한 자기기입식으로 진행되었다. 연구 결과, 고혈압으로 진단 받은 사람 355명(36.6%) 중 현재 치료를 받고 있는 사람은 337명(94.9%)이었으며, 당뇨병으로 진단을 받은 사람 109명(11.2%) 중에서 현재 치료를 받고 있는 사람은 96명(88.1%)이었다. 고혈압 잠재위험군 총 211명 중 고혈압 진단을 받은 사람은 89명(42.2%)이었으며, 당뇨병 잠재위험군 356명 중에서 당뇨병 진단을 받은 사람은 78명(22.0%)이었다. 위 결과를 바탕으로 고혈압과 당뇨병 예방을 포함한 효과적인 관리 전략을 국가 차원에서 수립하고 실행하는 방안을 제안하고자 한다.

주제어 : 고혈압, 당뇨병, 잠재위험군, 전수조사, 관리 행태

## 1. INTRODUCTION

Chronic diseases have significant negative consequences for morbidity, mortality, quality of life,

and the national economy [1,2,3,4,5,6,7]. Especially, the prevalence of coexisting hypertension and diabetes appears to be increasing in industrialized nations because of are aging and both hypertension and

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diabetes mellitus incidence increases with age [8,9]. Korean citizens are also commonly suffering from hypertension, diabetes mellitus, dyslipidemia, and obesity which are the main risk factors of cardiovascular and cerebrovascular disease occurrences and especially this predicted that the number of hypertension or diabetic patients over the age of 30 will reach 14.0 million in 2020 and 16.8 million in 2030 [10].

Diseases such as hypertension, diabetes, and dyslipidemia raise healthcare utilization and personal spending and also by causing diverse indirect costs, it causes public health and financial burdens on individuals suffering from disease and the societies where they belong [11,12,13]. Also if these diseases are not managed properly, dangers of cardiovascular and cerebrovascular mortalities due to these diseases increase and could cause further social problems [14,15,16]. Therefore to manage these major chronic diseases, there is an emphasis on the importance of diagnosis and management for changes of the policy environment appropriate for chronic diseases management.

In Korea, the Ministry of Health and Welfare is conducting a chronic diseases management program such as the registration and case management of hypertension and diabetic patients at each regional public health centers for purpose of preventing cardiovascular and cerebrovascular diseases.

Generally, it is ideal for the national hypertension and diabetes management programs to be focused on regional societies and this is because conducting tailored programs appropriate to accessibility of local residents and situations and the characteristics of local residents are effective in managing these major chronic diseases. However, although there are differences in the prevalence of hypertension and diabetes by cities and provinces, the reality is that there are almost no studies focusing on city, county, and ward units. Therefore, Korea's current chronic disease management programs for diseases such as hypertension and diabetes do not have a systematic establishment of

regional characteristics and health information about local residents which prevents reflection of the needs of local residents in program planning and performance.

To improve this, assuming that the regional society hypertension and diabetes management programs are conducted focusing on city, county, and ward units, there needs to be a systematic study identifying the prevalence of hypertension and diabetes as well as health behaviors based on city, county, and ward. In addition there needs to be activation of primary care following the reestablishment of medical facilities function, modification and supplementation of management policies reflecting external policies and governance appropriate for chronic diseases management with an enforcement of public health center integrated service.

Especially among regional societies, due to the rapid aging population in Naechon-myun, Hongcheon-gun, Kangwon-do, the prevalence of chronic diseases such as hypertension and diabetes is increasing and this eventually leads to the rapid increase in healthcare costs and it is expected that the individual and social burden will be increased which will desperately require appropriate prevention and health management measures.

For this, the study aims to explore accurate health status and behaviors of local residents of Naechon-myun, Hongcheon-gun, Kangwon-do to identify the various factors of hypertension and diabetes prevalence by region and based on this to provide basic data for effective achievement of tailored hypertension and diabetes management program focusing on regional society

## 2. METHODS

### 2.1 Study subjects and data collection

This study was a total inspection on 1,956 people over the age of 30 residing in Naechon-myun, Hongcheon-gun, Kangwon-do based on August 31, 2013 and the research subjects were individual

members of the household. For the necessary data collection, a total of 1,200 people were inspected excluding people who resides in a different place and not in the mailing address they originally stated, people who visited the hospital 2-3 times but whose contact information was lost, and people who were difficult to communicate with due to aging. The research method consisted of a researcher using a structured survey to visit the subject in order to conduct 1:1 interview and to get the measurement of their blood pressure and blood sugar levels.

To conduct the survey and to measure blood pressure and blood sugar levels, the consensus of the voluntary participation intended for survey and measurement of the subjects were conducted to satisfy basic research ethics standards. Preliminary inspection was conducted from May 19, 2014 to May 31, 2014 and the main inspection was conducted from June 1 to September 30. Finally, 970 (80.8%) subjects were studied in the actual analysis.

### 2.2 Survey measurement

The measurement tool used in the study was based on the survey from the 2013 National Health and Nutrition Examination Survey [15] which was reconfigured by the researcher to fit the purpose of the study. The composition of survey questions are largely divided into questions regarding chronic disease management behavior such as demographic characteristics, questions about hypertension and diabetes, healthcare use, medical information collection, and blood pressure as well as blood sugar levels.

### 2.3 Data analysis

The data collected in the study was analyzed through statistical program SPSS 18.0(Statistical Package for the Science). Frequency analysis was conducted to explore the general characteristics of hypertension and diabetes status and management behavior of the subjects. On the other hand, to explore

the differences in prevalence according to general characteristics, cross analysis was conducted. All statistical analysis was verified at 95% confidence level.

## 3. RESULTS

### 3.1 The prevalence rate and the treatment of hypertension by demographic characteristics

In <Table 1>, among the 355 people diagnosed with hypertension, 204 (57.5%) subjects were females and 151 (42.5%) subjects were males. The frequency was highest under the 70-79 age group with 139 (39.1%) subjects status and the elementary school graduates group with 249 (70.1%) subjects. In hypertension diagnosis, there were statistically significant differences in gender, age, marital status, and education level (p<0.01).

<Table 1> The prevalence rate and the treatment of hypertension Unit: n(%)

Classification	Hypertension		
	diagnosed (N=355)	treated (N=337)	untreated (N=18)
Gender			
male	151(42.5)	141(41.8)	9(50.0)
female	204(57.5)	196(58.2)	9(50.0)
$\chi^2(p)$	8.845(.003)	0.466(.495)	
Age Group			
30-39	4( 1.1)	3( 0.9)	1( 5.5)
40-49	12( 3.4)	9( 2.7)	3(16.7)
50-59	65(18.0)	59(17.5)	5(27.8)
60-69	73(20.6)	68(20.2)	4(22.2)
70-79	139(39.1)	137(40.6)	3(16.7)
80 ≤	63(17.8)	61(18.1)	2(11.1)
$\chi^2(p)$	111.375(.000)	17.340(.008)	
Marriage			
unmarried	3( 0.8)	2( 0.6)	1( 5.6)
married	351(98.9)	334(99.1)	17(94.4)
others	1( 0.3)	1( 0.3)	0( 0.0)
$\chi^2(p)$	22.104(.000)	5.070(.079)	
Level of Education			
≥ elementary school	249(70.1)	244(72.4)	6(33.3)
middle school	52(14.6)	49(14.5)	(16.7)
high school	36(10.1)	28( 8.3)	7(38.9)
College ≤	18( 5.2)	16( 4.8)	2(11.1)
$\chi^2(p)$	41.075(.000)	21.906(.000)	

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

It was investigated the 355 people who were diagnosed by doctors with hypertension, that among the 337 people were being treated for hypertension but among the 18 did not receive hypertension treatment. In the hypertension treatment status, there were statistically significant differences according to age and education level ( $p<0.01$ ).

<Table 2> Hypertension risk group by demographic characteristics Unit: n(%)

Classification	Hypertension risk group(N=211)		$\chi^2(p)$
	diagnosed(89)	undiagnosed(122)	
Gender			
male	46(51.7)	63(51.6)	0.008 (0.928)
female	43(48.3)	59(48.4)	
Age Group			
30-39	1( 1.1)	1( 0.8)	14.836 (0.022)*
40-49	1( 1.1)	10( 8.2)	
50-59	18(20.2)	36(29.5)	
60-69	13(14.6)	27(22.1)	
70-89	39(43.8)	34(27.9)	
80≤	17(19.2)	14(11.5)	
Marriage			
unmarried	1( 1.1)	3( 2.5)	2.709 (0.253)
married	88(98.9)	116(95.1)	
others	0( 0.0)	3( 2.5)	
Level of Education			
≥elementary school	60(67.4)	84(68.9)	2.738 (0.603)
middle school	15(16.9)	15(12.3)	
high school	11(12.4)	19(15.6)	
College≤	3( 3.3)	4( 3.3)	

\* $p<0.05$  \*\* $p<0.01$  \*\*\* $p<0.001$

<Table 2> compared the group that was diagnosed by doctors and the group that was not diagnosed among potential risk groups who had systolic blood pressure measurement value of over 141mmHg. It was investigated that there were a total of 211 people within the potential risk group with systolic blood pressure of over 141 mmHg. Within this group, 89 (42.2%) subjects were diagnosed with hypertension by doctors and 122 (57.8%) subjects were not diagnosed. Among the 89 people who were diagnosed with hypertension by doctors, 46 (51.7%) subjects were males and 43 (48.3%) subjects were females. The highest frequency in the age group undergoing hypertension treatment was

under the 70-79 age group with 39 (43.8%) subjects. For marital status 88 (98.9%) subjects were under the married group and 1 (1.1%) subject under the unmarried group. For education level, the highest frequency belongs under the elementary school graduate with 60 (67.4%) subjects. However, there were 122 people who were not diagnosed with hypertension by doctors and 63 (51.6%) subjects were male and 59 (48.4%) subjects were females. The highest frequency in the age group was shown in the 50-59 age group with 36 (29.5%) subject, only age showed statistically significant differences ( $p<0.05$ ).

### 3.3 The prevalence rate and the treatment of diabetes by demographic characteristics

<Table 3> The prevalence rate and the treatment of diabetic patients by demographic characteristics Unit: n(%)

Classification	Diabetes mellitus		
	diagnosed(N=109)	treated(N=96)	untreated(N=13)
Gender			
male	53(48.6)	45(46.9)	8(61.5)
female	56(51.4)	51(53.1)	5(38.5)
$\chi^2(p)$	0.006(0.940)	1.672(0.196)	
Age Group			
30-39	1( 0.9)	1( 1.0)	0( 0.0)
40-49	2( 1.8)	0( 0.0)	2(15.4)
50-59	28(25.7)	21(21.8)	7(53.8)
60-69	20(18.3)	20(20.8)	0( 0.0)
70-89	42(38.5)	39(40.6)	3(23.1)
80≤	16(14.7)	15(15.6)	1( 7.7)
$\chi^2(p)$	21.772(0.001)	23.052(0.000)	
Marriage			
unmarried	1( 0.9)	1( 1.0)	0( 0.0)
married	107(98.2)	94(98.0)	13(100)
others	1( 0.9)	1( 1.0)	0( 0.0)
$\chi^2(p)$	4.549(0.103)	0.255(0.880)	
Level of Education			
≥elementary school	72(66.1)	69(71.8)	3(23.1)
middle school	15(13.8)	12(12.5)	3(23.1)
high school	13(11.9)	9( 9.4)	4(30.7)
College≤	9( 8.3)	6( 6.3)	3(23.1)
$\chi^2(p)$	9.086(0.059)	11.368(0.010)	

\* $p<0.05$  \*\* $p<0.01$  \*\*\* $p<0.001$

<Table 3> shows treatment rates and non-treatment rates of people diagnosed with diabetes mellitus. Among 109 people diagnosed with diabetes by doctors, 56 (51.4%) subjects were females and 53 (48.6%) subjects were males. The highest frequency and age groups was shown in the 70-79 age group with 42 (38.5%) subjects. For marital status, 107 (98.2%) subjects were under the married. For education level, the frequency was highest under the elementary school graduate group with 72 (66.1%) subjects. In the diagnosis of diabetes mellitus, only age showed statistically significant differences ( $p < 0.001$ ).

96 (88.1%) people were currently being treated for blood sugar management and 13 (11.9%) were not receiving treatment. Among the 96 people 51 (53.1%) subjects were female and 45 (46.9%) subjects were male.

For people who received diabetes mellitus treatment, the highest frequency was in the 70-79 age group with 39 (40.6%) subjects. For marital status, 94 (98.0%) subjects were under the married group. For education level, the highest frequency belong under the elementary school graduate group with 69 (71.8%) subjects.

However, 13 people among the 109 people who were diagnosed with diabetes mellitus by doctors did not receive diabetes treatment. 8 (61.5%) subjects were male and 5 (38.5%) subjects were female. The frequency was highest under the 50-59 age group with 7 (53.8%) subjects. For marital status, 13 (100.0%) subjects were under the married group. For education level, the highest frequency was shown in high school graduate group with 4 (30.7%) subjects, and there were 3 (23.1%) each under the elementary school graduate. In treatment of diabetes mellitus, age and level of education showed statistically significant differences ( $p < 0.01$ ).

<Table 4> compared the group that was diagnosed by doctors and the group that was not diagnosed among potential risk groups that had blood sugar measurement values of over 141mg/dl, 2 hours after

their meal. It was investigated that there were 355 people within the potential risk group with blood sugar levels of over 141mg/dl. Among them, 78 (22.0 %) subjects were diagnosed by doctors with diabetes mellitus and 277 (78.0%) subjects were not diagnosed. For diabetes mellitus potential risk group, there were no statistically significant differences according to gender, age, marital status, and education level.

<Table 4> Diabetes mellitus risk group by demographic characteristics

Unit: n(%)

Classification	Diabetes mellitus risk group(N=355)		$\chi^2(p)$
	diagnosed (N=78)	undiagnosed (N=277)	
Gender			
male	39(50.0)	28(46.2)	0.351 (.608)
female	39(50.0)	149(53.8)	
Age Group			
30-39	1(1.3)	4(1.4)	7.422 (.284)
40-49	1(1.3)	19(6.9)	
50-59	22(28.2)	69(24.9)	
60-69	14(17.9)	66(23.8)	
70-89	27(34.6)	78(28.2)	
80 ≤	13(16.7)	41(14.8)	
Marriage			
unmarried	1(1.3)	9(3.2)	0.877 (.645)
married	76(97.4)	265(95.7)	
others	1(1.3)	3(1.1)	
Level of Education			
≥ elementary school	53(67.9)	199(71.8)	4.167 (.384)
middle school	12(15.4)	33(11.9)	
high school	8(10.3)	37(13.4)	
College ≤	5(6.4)	8(2.9)	

\* $p < 0.05$  \*\* $p < 0.01$  \*\*\* $p < 0.001$

### 3.4 Management of hypertension and diabetes mellitus

<Table 5> shows the management behavior for hypertension and diabetes mellitus by the respondents.

The most frequent period of being first diagnosed with hypertension was the 60-69 age group with 108 (30.4%) subjects, and then the 50-59 age group with 107 (30.1%) subjects, and 70-79 age group with 62 (17.5%) subjects. However, prevalence of hypertension in the age ranges 30s and 40s was also investigated to be at 18.3%. The place of treatment for hypertension,

hospitals and clinics were the most frequent with 281 (79.2%) subjects and it was found that there was a serious lack of people who received education about preventing and managing hypertension with just 235 (24.2%) subjects. The place of education was in the order of health subcenter (36.3%), Primary Health Post (31.2%), and hospitals and clinics (27.4%). For the path of receiving health information about hypertension, mass media (61.9%) was the most frequent, and it was investigated that subjects were receiving information also from nurses and professionals (19.7%) and acquaintances (8.6%).

<Table 5> Management behavior of hypertension and diabetes mellitus Unit: n(%)

Classification		Hyper-tension	Diabetes mellitus
First Diagnosis time	30-39	14( 3.9)	4( 3.7)
	40-49	52(14.7)	15(13.8)
	50-59	107(30.1)	37(33.9)
	60-69	108(30.4)	37(33.9)
	70-79	62(17.5)	13(11.9)
	80 ≤	12( 3.4)	3( 2.8)
Treatment Institutions	Public Health Center	5( 1.4)	1( 0.9)
	health subcenter	44(12.4)	7( 6.4)
	Primary Health Post	11( 3.1)	0( 0.0)
	Hospitals and clinics	281(79.2)	90(82.6)
Education Attainment	Other	114( 3.9)	11(10.1)
	Yes	235(24.2)	182(18.8)
	No	735(75.8)	788(81.2)
Education Attainment Place	Public Health Center	8(3.7)	7(4.3)
	health subcenter	78(36.3)	60(36.6)
	Primary Health Post	67(31.2)	57(34.8)
	Hospitals and clinics	59(27.4)	36(21.9)
	Other	3(1.4)	4(2.4)
Information Collection	Mass media	600(61.9)	593(61.1)
	Internet	39(4.0)	39(4.0)
	Books and magazines	20(2.1)	22(2.3)
	Acquaintances	83(8.6)	90(9.3)
	Professionals (Doctors, nurses, etc.)	191(19.7)	188(19.4)
	Other	37(3.7)	38(3.9)

The period of being first diagnosed with diabetes was the highest in the 50-59 and 60-69 age groups with 37 (33.9%) subjects each per group, the prevalence the age groups 30s and 40s was also found to be at 17.5%. For the institution where subjects were being treated for diabetes, hospitals and clinics were the most frequent with 90 (82.6%) subjects and it was found that there was a serious lack of people who received education about preventing and managing diabetes with just 182 (18.8%) subjects. For the place of education, it was in the order of health subcenter(36.6%), primary health post(34.8%), and hospitals and clinics (21.9%). The path to receiving health information about hypertension was most frequent in mass media (61.1%) and it was found that subjects were receiving information from nurses and professionals (19.4%) and acquaintances (9.3%).

#### 4. CONCLUSIONS

The study was conducted to explore the hypertension and diabetes mellitus level and management behaviors of Naechon-myun, Hongcheon-gun, Kangwon-do which is a fast aging region with 29.3% of the elderly population over the age of 65 and to provide plans and basic data for effective performance of tailored hypertension and diabetes mellitus management programs focusing on regional society.

To discuss based from the above study results is as follows:

First, it was investigated that there were 355 (36.6%) people who were diagnosed with hypertension and this is in a higher level compared to the national average of 31.5% [17], with the Hongcheon-gun average of 28.9% [18]. It was investigated that among the subjects who were diagnosed, the prevalence was higher in females than in males. There were 109 (11.2%) people who were diagnosed with diabetes mellitus and this was in a similar level to the national average of 9.9% [17] with the Hongcheon-gun average of 11.4% [18].

Second, 337 people among those who were diagnosed with hypertension were being treated which resulted in a treatment rate of 94.9% and this was in a higher level compared to the Hongcheon-gun average of 91.0% [18]. Among the people who were diagnosed with diabetes mellitus, 96 were being treated which resulted in a treatment rate of 88.1% which was lower than the Hongcheon-gun average of 95.4% [18].

Third, it was investigated that there were a total of 211 people within the potential risk group with systolic blood pressure over 141 mmHg. Among them, there were 89 (42.2%) who were diagnosed with hypertension by doctors and 122 (57.8%) who were not diagnosed. It was investigated that there were 355 people in the potential risk group whose blood sugar measurement was over 141mg/dl 2 hours after their meal. Among these people, there were 78 (22.0%) who were diagnosed with diabetes by doctors, and 277 (78.0%) who were not diagnosed. According to the 2012 National Health Statistics [17], the national blood pressure control rate is 42.5% and the blood sugar control rate is 28.1%. And it was investigated that about 70% of the patients failed to conduct adequate management and the study also confirmed that along with the failure for adequate management by patients who were diagnosed, there was a low awareness about the diseases.

Fourth, it was investigated that the period where people are generally first diagnosed with hypertension or diabetes was in their 50s and 60s and because this cannot be seen to match prevalence and diagnosis periods, there needs to be measures for early detection. Also, it was found that there was only 20% of people with experience and educational background for prevention and management of hypertension and diabetes. Health education was received generally at healthcare branch offices, public health centers, and hospitals and clinics. The most common form of receiving health information was through the mass media and it was investigated that people were also receiving information from nurses and professional as

well as acquaintances.

Looking at the study results, the hypertension and diabetes diagnosis rate in Naecheon-myun, Hongcheon-gun is higher than the national average. Also, it is determined that adequate blood pressure and blood sugar management is not being done and that there are many potential risk groups. Based on the above results, the study suggests a plan for effective performance of chronic diseases management program for diseases such as hypertension and diabetes in Naecheon-myun.

First, with intensive management of potential risk groups, morbidity rate by chronic diseases would be lowered and for people with chronic diseases, there needs to be an adequate treatment and prevention of aggravation through registration management. Second, there needs to be activation of primary healthcare institutions based on regional characteristics and conditions. Third, there needs to be health education for disease prevention and management and this need to be provided considering the knowledge levels and accessibility of the subjects. Fourth, there needs to be provision of timely and accurate health information by figuring out the health information search path of local residents.

The limitation of this study is that because it investigated adults over the age of 30 in a single area, it has difficulty in obtaining representativeness of sample. In future studies there is a need to identify region specific variation factors through comparison and analysis of diverse regions.

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