Print ISSN: 2233-4165 / Online ISSN 2233-5382
JIDB website: http://www.jidb.or.kr
doi:http://dx.doi.org/10.13106/jidb.2021.vol12.no9.7

Analysis on the Correlation Between Occupation and Disease in Korea

Il-Won KANG[1], Lee-Seung KWON[2]

Received: July 21, 2021. Revised: August 30, 2021. Accepted: September 5, 2021

Abstract

Purpose: This study aims to investigate whether there is a difference in the prevalence of hypertension according to gender, occupational group, and occupational group according to gender. **Research design, data, and methodology:** This study classified the occupational groups according to the gender of men and women between the ages of 20 and 49 into office workers and non-office workers from the 7th 2017 National Health and Nutrition Examination Survey. A total of 2,691 people were surveyed, including 1,394 office workers and 1,297 non-office workers. Frequency analysis, chi-square, and Independent T-test for distribution difference analysis of categorical variables analysis for occupation and hypertension were applied. Statistical significance was verified at 0.001 to determine the validity analysis. All statistical analyses were performed using the IBM SPSS 24.0 program. **Results:** The main risk factors for hypertension were gender, age, education, obesity, smoking, drinking, family history, and chronic diseases. There were differences in the prevalence of hypertension among office workers and non-office workers. **Conclusions:** Men had a higher prevalence of hypertension than women, while non-office workers had a higher prevalence than office workers. In the case of women, non-office workers have a higher prevalence of hypertension than white-collar workers.

Keywords: Gender, Occupation, Hypertension, Obesity, Age

JEL Classification Code: I10, I10, I12, I14

1. Introduction

Hypertension is one of the factors influencing heart disease and cerebrovascular disease (Park, Kim, Jeon, & Jin, 2003). Adult diseases, such as hypertension, are associated with old age. The causes are highly complex and varied and usually cannot be addressed entirely. Hypertension s also characterized by high time requirement and cost of management (Martikainen, 1990; Chobanian, Bakris, Black, Cushman, & Green, 2003; Costa, Barcellos, Sclowitz, Timm, Castanheira, Maria, Maria, Denise, & Silvia, 2007; Lee, Kim, Kim, & Cho, 2009).

Hypertension is a chronic disease in which the blood pressure is higher than the normal range. Blood pressure is summarized by two measurements of the systolic highest blood pressure and diastolic lowest blood pressure. It is called hypertension when blood pressure is continuously above 140 / 90mmHg (Lee, Yoo, Youn, Ahn, Kim, Lee, Yoon, & Choi, 2014).

Hypertension can be seen as a product of Korea's own spicy, salty eating habits, fermented ingredients, and soy, miso, and soup meals (Kim & Han, 2006; Kim, Lee, Na, & Hong, 2013).

Hypertension, which acts as a major risk factor for stroke, myocardial infarction, heart failure, vascular aneurysm, and lower extremity aneurysms, can also cause chronic renal failure (Lee et al., 2014). It is one of Korea's national diseases, with a prevalence of approximately 30% among adults over 30 years of age (Ministry of Health and Welfare, 2017; National Health and Nutrition Survey, 2019). About one-third of adults in the world (estimated to be 1.1 billion people) have pre-existing hypertension. It is the number one cause of death worldwide and is the

1 First Author. Professor, College of Social Science, Catholic Kwandong University. Korea. Email: kiw58@cku.ac.kr
2 Corresponding Author. Professor, Department of Health Care Management, Catholic Kwandong University. Korea
Email: leokwon1@cku.ac.kr

leading cause of cardiovascular disease (WHO, 2009).
Meanwhile, most adults have "occupation" (Park, Lee, & Lee, 2015) as a means of living. Since these jobs become one of the socio-economic factors, they have a particular pattern of life or behavior related to the eating behavior of the body and mind. After all, it can be said that the causal relationship between occupation and disease, such as professional working environment, income level, workload, intensity of work, form of work, stress, shift work, and physical or mental labor, is established (Kim, Cho, Lee, Youn, Oh, Cha, & Gho, 2011; Yong, Kim, Yae, & Kim, 2011).

Therefore, this study intends to analyze the relationship between gender occupation and hypertension under the premise that there is a correlation between occupation and hypertension and provide health and health care policy and administration implications for managing and preventing hypertension by occupation.

Concerning hypertension research, correlation studies such as nutrition and hypertension are mainly performed, but studies on hypertension among workers according to gender are almost rare. The role of occupation in managing cardiovascular risk factors, including hypertension, is not well-known (Davila, Kuklina, Valderrama, Yoon, Rolle, & Nsubuga, 2012). The role of occupation is closely related to the physical activities among workers (Barder, Rao, & Manee, 2021; Bokaba, Kebogile, & Mokwena, 2021).

In addition, many studies have investigated the relationship between diseases and occupation, including hypertension and other diseases (e.g., diabetes mellitus, coronary heart disease) (Lim, Park, Kong, Sim, Kim, Kim, & Choi, 2017; Jia, Chun-li, & Yang, 2021; Kunyahamu, Daud, & Jusoh, 2021).

This study aims to classify occupational groups according to gender and determine how these gender occupational groups relate to hypertension. The specific objectives to be explored in order to achieve the above objectives are as follows. The first is gender hypertension, including male and female workers. The second is the identification of hypertension by occupational groups.

2. Theoretical Background

2.1. Definition of Hypertension

Hypertensive patients have a systolic blood pressure of 140 mmHg or higher, or diastolic blood pressure of 90 mmHg or higher among those who have blood pressure measurement results and are currently taking blood pressure control drugs to control blood pressure as a result of a health survey (Ministry of Health & Welfare, 2009).

2.2. Review of Literature

There are considerably few related studies or papers in Korea that analyze the correlation between men and women occupational groups and hypertension. However, the most similar research to this study is that of Kim, Rhee, & Song (2014) in Korea, which analyzed the relationship between hypertension and working environment conditions. This study used the Korean Working Conditions Survey (KWCS) data centered on "stress" as one of the significant incidence factors of hypertension rather than hypertension according to the occupational environment. They used variables such as autonomy of work, working hours, wages, support from the boss, and job instability based on stress caused by excessive workload or complaints.

In an elderly East German population, Schumann, Seidler, Kluttig, Werdan, Haerting, and Greiser (2011) explored the association between occupational group and prevalent hypertension. This work showed that in men, the highest age-adjusted prevalence ratios were observed in metal-processing workers, carpenters/painters, and electricians; in women, the highest PRs were found in technicians /forewomen.

The prevalence of hypertension among office workers was analyzed in studies such as the research of Lee and Kim (2013). Meanwhile, Kim and Kim (2015) studied the factors affecting dyslipidemia and hypertension in office workers in a cross and descriptive correlation study, classifying them into job factors, life factors, and body factors of hypertension. The 2014 study by Kim and Kim (2014) was conducted among 10,365 white-collar workers, excluding non-wage and blue-collar workers, who participated in the 3rd work environment survey conducted by the Korea Occupational Safety and Health Research Institute in 2011. A study of Kim and Kim (2015) study covered 34,788 employees (wage workers) who participated in the 3rd work environment survey conducted by the Korea Occupational Safety and Health Research Institute in 2011. Employers and self-employed workers, excluding wage workers, were excluded from the study because they differed in working conditions and socio-psychological work environment. It shows that working conditions, environment, physical activity, and stress may vary depending on the type of job.

In addition, there is a study of hypertension among office workers (Han, 1994), male workers in a company (Park, Suh, Lee, Jee, & Kim, 1999), and Busan workplace workers (Kim, Kim, Park, Bae, Jung, You, Hong, & Kim, 2012). In more detail, Han (1994) conducted a study on workers who had undergone regular health check-ups for 6 years at a workplace. In this study, the subjects who were normal for 5 years but were judged to be hypertensive

ureter observers and present in the last 6 years were classified as the patient group, and those who were judged normal for 6 consecutive years served as the control group; the differences between the 2 groups were compared.

Park et al. (1999) applied a case-control study within a cohort based on temporal continuity, focusing on 2,365 male workers who underwent medical examinations at the same medical institution for three consecutive years. Barder et al. (2021) explored gender differences among sedentary occupation workers concerning risk for high blood pressure, quality of life, physical activity. Qiu, Wang, Sa, & Liu (2021) showed the prevalence and its risk factors of hypertension in Northwest China. Among Hispanic/Latino adults, the prevalence of hypertension status and awareness varies by occupation type was studied (Rosenberg, Eldeirawi, Durazo-Arvizu, Chambers, Davis, Gonzalez, Perreira, Schneiderman, Tarraf, & Daviglus, 2018).

On the other hand, compared to the hypertension study of white-collar workers, the study of hypertension of non-office workers was very diverse and tried in various aspects. Hypertension studies were conducted on highway bus drivers (Lee, Lee, Lee, & Kim, 2011), taxi drivers (Moon & Lee, 2018), apartment management workers (Kang, Kim, Kim, & Koo, 2002), self-employed workers (Lee, Lee, & Kim, 2017), temporary construction workers (Kim, 2019), and farmers (Um, Lee, Park, Ahn, & Chung, 2008; Lee et al., 2009; Lee et al., 2014). Among the studies of hypertension by occupational type, studies related to farmers or rural areas (Um, et al., 2008; Lee et al., 2009; Lee et al., 2014) accounted for a relatively large portion. The regions with high hypertension were Gangwon-do, Jeollanam-do, Jeollabuk-do, and Gyeongsangbuk-do. A study (Kim, 2019) was conducted on examinees who underwent medical examinations among male temporary field workers at 126 construction workplaces.

Hypertension was also studied for all workers, regardless of white-collar and non-office workers (Kim et al., 2014). Davila et al. (2012) demonstrated that protective service workers may benefit the most from worksite hypertension management programs. Interestingly, hypertension and occupation among seniors were explored (Leigh & Du, 2009). Although not a profession, the relationship between income and high blood pressure has also been studied (Leigh & Du, 2012). Among 18 occupational groups, Artamonova, Maximov, Ogarkov, Makarov, Skripchenko, Indukaeva, Shapovalova, Yankin, Mulerova, and Kozyreva (2012) also analyzed the relationship between income and high blood pressure. In this paper, occupation should be regarded as an important predictor of AH and an effect modifier for other predictors, such as age, BMI, or marital status.

In the research of occupational stress and hypertension, the literature is replete with conflicting results regarding the relationship (Rosenthal & Alter, 2012). For this reason, they demonstrated that further analysis of this relationship, including the many facets of job strain, may lead to operative proposals at the individual and public health levels designed to reduce the effects on health and well-being.

As mentioned above, few studies in the literature have probed the relationship between the occupational groups classified into office workers and non-office workers and hypertension. This is because the occupational classification of white-collar workers and non-office workers may differ from country to country, and there may be mechanisms to control hypertension in each workplace or individual. In addition, individual variables, such as age, gender, income, BMI, and physical activity, may be directly related to hypertension rather than occupational groups. Nevertheless, as in this study, finding the commonalities between the occupational group classification of office workers and non-office workers and examining the relationship between hypertension and hypertension can provide a basic framework for managing hypertension for occupational characteristics.

3. Research Methodology

3.1. Survey Subjects

The 7th year raw data (2017.01.01 - 2017.12.31), the 2017 National Health and Nutrition Survey (NHNS), was used as the survey data. A total of 4,190 people aged 20 to 59 (1,920 males and 2,270 females) were surveyed, and data marked as "no answer" or "unknown" were exempted from the results.

After a survey area is selected through a sample design, households to be surveyed are selected through a household member confirmation survey.

The investigator of the household member confirmation survey confirms the boundary of the survey area and the appropriate number of households with the cooperation of the local public health center and community center. According to the appropriate number of households in the survey area, two districts are extracted from the districts (20 households per district), and 25 households are selected from the extracted districts. To households selected for the survey, a “Notice of Household Selection for the National Health and Nutrition Examination Survey” is distributed one month before the survey in the name of the head of the competent municipality, the survey time is determined, and the survey is conducted.

3.2. Occupational Groups

The occupational group used the vocational reclassification item of the health survey questionnaire and the Korean Standard Vocational Classification item of the NHNS. In the 7th NHNS, the 7th Korea Standard Occupational Classification of Statistics Korea (2018) was classified into 10 occupations. There were two predominant groups in relation to occupation: office workers and non-office workers. Managers, experts, office workers, and related workers were classified as office workers. Non-office workers were categorized into service workers, sales workers, skilled workers in agriculture, forestry, fisheries, skilled workers and related skilled workers, equipment machine operation and assembly workers, and daily labor workers.

3.3. Analytical Methodology

The survey variables were analyzed to represent the Korean people using the method of analyzing the composite sample design data and considering the colony extraction variables, variance estimation layers, and weights presented in the 2017 NHNS data. Analysis of general characteristics and essential variables yielded percentages, means, and standard deviations. In order to test the distribution of categorical variables, the analysis of hypertension and components according to the occupational group by gender was performed using chi-square analysis. In contrast, the correlation between essential variables of subjects and systolic blood pressure and diastolic blood pressure was treated with an independent sample t-test. Analysis of variance was performed to determine whether the mean was different from hypertension according to the classification. The post analysis to verify the reliability and validity of statistical analysis was tested using Tukey's analysis method. All statistical analysis was performed using the IBM SPSS 24.0 program, with the significance level performed at $p<0.001$, $p<0.01$, and $p<0.05$.

4. Research Results

4.1. General Characteristics of the Subjects

A total of 4,190 subjects were male and female research subjects aged 20 to 59 years, among which 1,920 were men (45.8%) and 2,270 were women (54.2%). Based on the differences among the age groups of the subjects, 17.4% were in their 20s, 23.3% were in their 30s, 28.7% were in their 40s, and 30.6% were in their 50s. As regards the income level of the surveyed subjects, the middle class was about 50% of the surveyed subjects if the total surveyed subjects were classified into the four categories of lower, middle, upper, and higher classes. When looking at the income level of the surveyed subjects in Table 1, the middle class was about 50% of the surveyed subjects if the total surveyed subjects were classified into the four categories of income levels.

Table 1: Classification of Income Level

Income		Number	Proportion (%)	Cumulative proportion (%)
Lower		1,052	25.2	25.2
Middle	Lower	1,048	25.1	50.3
	Upper	1,038	24.8	75.1
Upper		1,040	24.9	100.0
Total		4,178	100.0	100.0

Table 2 is a chart showing the occupational groups in which the surveyed subjects are classified. The entire occupational groups are largely classified into three categories in this table: office workers, non-office workers, and others (unemployed). Office workers account for 37.7% of managers, experts, and related researchers, whereas non-office workers are service and sales workers, agricultural and forestry workers, skilled fishing workers, skilled workers, machinery and assembly workers, and daily labor workers, accounting for 34.9%.

There was no significant difference in the ratio of office workers to non-office workers, but there were more office workers. In addition, unemployment without a clear job accounted for about 27.6%. The total survey respondents were 4,190, with only 2,691 responding to have jobs, and the remaining 1,024 responding to be unemployed and with no clear jobs, or having temporary, daily, or part-time jobs.

Table 2: Frequency Analysis of the Occupational Groups of the Survey Subjects

Job	Classification	Number	Proportion (%)	Cumulative proportion (%)
Type	Office worker	1,394	37.5	37.5
	Non-office worker	1,297	34.9	72.4
	Unemployed	1,024	27.6	100
Total		3,715	100.0	100.0

Table 3: Survey Subjects' Response to Hypertension

Hypertension	Number	Proportion (%)	Cumulative proportion (%)
No	3,524	89.5	89.5
Yes	413	10.5	100.0
Total	3,937	100.0	100.0

Table 3 is a chart showing the occupational groups in which the surveyed subjects are classified. The entire occupational groups are largely classified into three categories in this table: office workers, non-office workers, and others. Office workers account for 37.7% of managers, experts, and related researchers, whereas non-office workers are service and sales workers, agricultural and forestry workers, skilled fishing workers, skilled workers, machinery and assembly workers, and daily labor workers, accounting for 34.9%. There was no significant difference in the ratio of office workers to non-office workers, but there were more office workers. In addition, unemployment without a clear job accounted for about 27.6%. The total survey respondents were 4,190, with only 2,691 responding to have jobs, and the remaining 1,024 (27.6%) responding to be unemployed and with no jobs, or having temporary, daily, or part-time jobs.

4.2. Cross-Analysis of the Social Characteristics of the Survey Subjects

Table 4, which shows the relationship between essential variables and hypertension, includes variables related to hypertension by gender, age, number of household members, education level, marital status, subjective body type recognition, obesity, smoking, and chronic diseases. Among the essential variables, there was a statistically significant relationship in terms of gender, age, education level, number of household members, marital status, subjective body perception, obesity, smoking, drinking, binge drinking, and family history of chronic diseases. In terms of gender, men were found to have a higher prevalence of hypertension than women. However, there was no direct relationship between hypertension in the income quartile and stress perception. It is not easy to see that the quartile of income has a statistically significant correlation with a significance level of 0.145. Likewise, it is difficult to say that stress is directly related to the significance probability because it is higher than the significance level of 0.05.

Table 4: Chi-square Analysis for the Subject's Social Characteristics and Hypertension

Variables	Classification		Hypertension				P
	Detail		No	(%)	Yes	(%)	
Gender	male		1,515	85.3	261	14.7	0.001
	female		2,009	93	152	7	
Age	20's		663	98.7	9	1.3	0.001
	30's		891	97.5	23	2.5	
	40's		1,043	91.7	95	8.3	
	50's		927	76.4	286	23.6	
Number of family members	1		293	86.4	46	13.6	0.001
	2		612	84.8	110	15.2	
	3		1,094	89.5	128	10.5	
	4		1,182	91.4	111	8.6	
	5		283	94.6	16	5.4	
	more than 6		60	96.8	2	3.2	
Income	lower		859	88.4	113	11.6	0.145
	middle	lower	895	90.1	98	9.9	
		upper	887	91.1	87	8.9	
	upper		875	88.5	114	11.5	
Education	under elementary school		112	70	48	30	0.001
	under middle school		205	80.7	49	19.3	
	under high school		1,188	88.3	157	11.7	

	more than college		1,815	92.6	144	7.4	
Marriage	married		2,607	87.6	369	12.4	0.001
	unmarried		917	95.4	44	4.6	
Stress	less		2,399	89.1	294	10.9	0.284
	much		1,088	90.3	117	9.7	
Subjective body Recognition	slim		102	87.2	15	12.8	0.001
	thin		456	95.2	23	4.8	
	normal		1,409	93.1	6.9	104	
	fat		1,208	85.8	200	14.2	
	obese		314	82	69	18	
Obesity	under weight		170	98.3	3	1.7	0.001
	normal		1,533	95.9	66	4.1	
	pre - obese		709	87.4	102	12.6	
	obese	1 stage	899	82.3	194	17.7	
		2 stage	143	77.7	41	22.3	
		3 stage	37	86	6	14	
Smoking	non-smoking		2,756	90.1	304	9.9	0.018
	smoking		731	87.2	107	12.8	
Alcohol	non-alcohol		603	87.3	88	12.7	0.041
	alcohol		2,886	89.9	323	10.1	
Binge drinking	never		1,642	90.5	173	9.5	0.001
	less than once per month		631	91.8	56	8.2	
	once per month		503	90.5	53	9.5	
	once per week		519	85.9	85	14.1	
	every day		193	81.4	44	18.6	
Family history of disease	no		1,323	94	84	6	0.001
	yes		2,169	87	325	13	

4.3. Independent Sample T-test for General Characteristics and Disease of Subjects

Table 5 shows the results of the analysis of the independent sample t-test between systolic and diastolic blood pressures and essential variables and diseases. According to gender, whether regarding smoking, family history of chronic diseases, hypercholesterolemia, high triglyceride, stroke, and diabetes, the mean difference between systolic and diastolic blood pressure was significant. On the other hand, in the case of stress perception rate, myocardial infarction, and angina, it is difficult to see a difference in mean between systolic and diastolic blood pressures. Also, in the case of drinking or not, only the diastolic blood pressure had an average difference.

Table 5: Independent Sample T-test for the Subject's Variables and Disease and Hypertension

Variable	Type	Hypertension							
		Systolic				Diastolic			
		N	Mean	S.D.	P	N	Mean	S.D.	P
Gender	male	1,773	79.74	10.01	0.001	1,773	79.74	10.01	0.001
	female	2,158	111.34	14.70		2,158	73.68	9.36	
Stress	less	2,688	114.57	14.44	0.978	2,688	76.36	9.96	0.531
	much	1,204	114.59	15.27		1,204	76.58	10.46	

Drink	no	690	113.94	14.91	0.206	690	75.06	8.99	0.001
	yes	3,204	114.72	14.65		3,204	76.73	10.32	
Smoking	no	3,056	113.82	14.58	0.001	3,056	75.76	9.89	0.001
	yes	836	117.35	14.83		836	78.86	10.56	
Chronic disease Family history	no	1,405	112.94	14.04	0.001	1,405	75.21	9.94	0.001
	yes	2,494	115.46	14.96		2,494	77.07	10.18	
Hypercholesterolemia	no	3,088	113.51	14.12	0.001	3,088	75.75	9.95	0.001
	yes	664	119.27	15.91		664	79.61	9.98	
Hypertriglyceridemia	no	2,546	113.08	14.21	0.001	2,546	75.31	9.55	0.001
	yes	429	121.44	15.57		429	82.21	10.68	
Stroke	no	3,692	114.29	14.63	0.001	3,692	76.3	10.12	0.008
	yes	37	122.84	14.03		37	80.7	9.61	
Myocardial infarction	no	3,719	114.38	14.64	0.893	3,719	76.35	10.12	0.31
	yes	10	115	19.94		10	73.1	12.05	
Angina pectoris	no	3,704	114.33	14.60	0.089	3,704	76.33	10.12	0.412
	yes	25	121.24	19.44		25	78.00	10.61	
Diabetes mellitus	no	3,764	114.36	14.68	0.001	3,764	76.34	10.16	0.018
	yes	165	119.28	13.94		165	78.06	8.99	

Table 6: Cross-analysis of Occupations and Gender

Variables	Type	Male (N=1,920)		Female (N=2,270)		P
		N	(%)	N	(%)	
Occupations	Office-workers	678	40.8	716	34.8	0.001
	Non-office workers	728	43.9	569	27.7	
	Out of work	254	15.3	770	37.5	

Table 6 shows the cross-analysis table for the occupational groups of the study subjects according to gender. As a statistically significant characteristic for the male and female gender, there is a definite difference between occupational groups ($p<0.001$). There were more non-white-collar workers in men and more white-collar workers in women ($P<0.001$).

4.4. Cross-analysis of Office Workers and Non-office Workers on Hypertension

Table 7 is a chart showing the relationship between the occupational group and the hypertension of the subjects. In the chi-square test between occupations and diseases, occupational groups and hypertension showed statistically significant results. In particular, the prevalence of hypertension among non-office workers was nearly twice that of office workers.

Table 7: Cross-analysis of Office Workers and Non-office Workers on Hypertension

Disease	Type	Office workers		Non-office workers		Out of work		P
		N	(%)	N	(%)	N	(%)	
Hypertension	No	1,277	91.6	1,110	85.6	930	90.8	0.001
	Yes	117	8.4	187	14.4	94	9.2	

As shown below in Table 8, it is cross-analysis of hypertension. There was a significant difference in the prevalence of hypertension between white-collar workers and non-office workers ($p<0.001$). In female workers, hypertension was higher in non-office workers than in office workers, with a difference more than twice that of

white-collar workers. In the case of male workers, non-office workers had a slightly higher prevalence of hypertension than white-collar workers, but it is difficult to say that there is a statistically significant difference.

Table 8: Cross-analysis of Occupation and Gender

Gender & Disease		Male (N=1,406)				ρ
		Office-workers(N=678)		Non-office workers (N=728)		
		N	(%)	N	(%)	
Hypertension	No	589	86.9	606	83.2	0.057
	Yes	89	13.1	122	16.8	

Gender & Disease		Female (N=1,285)				ρ
		Office-workers(N=716)		Non-office workers(N=569)		
		N	(%)	N	(%)	
Hypertension	No	689	96.1	504	88.6	0.001
	Yes	504	3.9	65	11.4	

5. Discussions

5.1. Occupational Factors on Hypertension

5.1.1. Influence Factors by Occupation, Such As Office Workers and Non-Office Workers

The study results of this occupational group and hypertension showed a significant level of difference in the prevalence of hypertension between 1,394 office workers and 1,297 non-office workers of 2,691 jobs ($p<0.001$). Specifically, there were 117 people out of 1,277 office workers with hypertension (9.1%) and there were 187 out of 1,110 non-office workers with hypertension (16.8%). This result can be interpreted that white-collar workers are more protected in managing and controlling hypertension than non-office workers. In this sense, protective service workers may benefit the most from worksite hypertension management programs (Davila et al., 2012). On the contrary, sedentary occupation workers reported a modest quality of life and high risk of hypertension (Barder et al., 2021). It can be said that high blood pressure is more closely related to work hours (Trudel, Brisson, Gilbert-Ouimet, Vézina, Talbot, & Milot, 2020), physical activity (Barder et al., 2021), and stress (Sitorus, Satria, Hanafi, & Simbolon, 2021) rather than simply office work or non-office work.

It was also found that there was significance ($p<0.001$) in variance analysis with occupations analyzed by classifying blood pressure into systolic blood pressure and diastolic blood pressure in more detail. Both systolic and diastolic blood pressures were similar for the white-collar workers and unemployed, but it was thought that there was a difference between white-collar and non-white-collar workers. It is difficult to clearly distinguish the difference in physical activity between white-collar workers and non-office workers or between occupations. The evidence is less convincing for occupational activity and not significant for commuting activity (Barengo, Hu, Kastarinen, Lakka, Pekkarinen, Nissinen, & Tuomilehto, 2005).

In the results of hypertension study (Kim et al., 2014) related to commercial workers over 15 years of age, 4.11% of commercial workers, 6.34% of temporary workers, and 10.52% of daily workers were temporary workers and daily workers who had a more unstable working environment than commercial workers. The prevalence of hypertension was higher. Kim et al. (2012), who studied office workers and non-office workers in the Busan area, had a high prevalence of hypertension, with 7.2% being office workers and 7.6% being non-office workers (production workers). The high prevalence of production workers was the reason for the relatively elderly population, drinking, and smoking. For a more in-depth discussion of this, the risk of hypertension decreases as the physical activity increases in the study of hypertension related to obesity and physical activity by the study of Park et al. (2015).

However, the study showed that such a tendency was not observed in men, and the increase in physical activity did not attenuate the increase in the risk of hypertension caused by BMI. Other factors such as drinking, smoking, or

irregular work patterns are thought to be factors leading to increased blood pressure. Moderate occupational, physical activity, in terms of both duration and intensity, is associated with a lower risk of new-onset hypertension among both males and females, whereas heavy, moderate, occupational, and physical activity was related to increased risk of new-onset hypertension in females (Li, Li, Zhang, Zhang, He, Zhang, Liu, Zhou, Li, Liu, & Qin, 2021).

5.1.2. Influencing Factors Related to White-Collar or Non-White-Collar Jobs

The prevalence factors of hypertension in male and female white-collar workers are job size, night work (Kim & Kim, 2015), stress (Rosenthal & Alter, 2012), working hours (Trudel et al., 2020), and gender differences (Barder et al., 2021), while the significant factors affecting work experience, working hours, stress, and exercise are factors affecting hypertension among male white-collar workers. In this study, we found that the white-collar workers were primarily sedentary, and the main factors were working hours, career, stress, and physical activity. Working hours are not always associated with hypertension. The data do not clearly explain this mixed result (Kudo & Belzer, 2020). Dose-response relationship was confirmed between working hours and hypertension risk (Cheng, Gu, He, & Yang, 2021). The result is mixed; however, work-related factors are essential for hypertension, while the management and operation of prevention programs related to hypertension and diseases at work remain vital. Production occupation groups are associated with an increased likelihood of hypertension (Mendy, Vargas, Ogungbe, & Zhang, 2020).

Agriculture is the representative occupational group of non-office workers. Among the 10 occupational groups in Korea, the prevalence of hypertension among farmers is 32.0%, which is the highest among the 10 occupational groups (Lee, 2017). The main risk factors for hypertension in this study are age, diabetes, and alcohol consumption. Age and obesity (Kim, Lee, Na, Kim, Cho, & Hong, 2005), BMI, family history, diabetes, drinking (Lee & Lee, 2012; You, Lee, Lee, & Lee, 2009), BMI, triglycerides, drinking, and the variables of thumb (2008) were concluded to be the main risk factors for hypertension. Physical activity in production occupation groups is associated with hypertension. However, it is important to consider the stress associated with the work of production occupation groups. The higher likelihood of hypertension among installation, repair, and maintenance workers could be due to occupational strain or stress (Rosenthal & Alter, 2012).

6. Conclusions

6.1. Summary and Conclusion of the Study

This study used the 7th National Health and Nutrition Survey in 2017 (2017.01.01 - 2019.12.31). This covered clerical workers (managers, experts, and office workers) and non-office workers (service sales and machinery workers and simple labor workers, among others) and was based on the gender of individuals between 20 and 49 years of age to find out how the male and female occupational groups related to hypertension. A total of 4,190 respondents (1,920 males, 45.8%; 2,270 females, 54.2%) were surveyed, but 1,394 office workers and 1,297 non-office workers were excluded, except for 1,024 people who said that they had no jobs or were unemployed. Missing data were also removed from the tally. In the end, 2,691 people were surveyed.

The average age of the survey participants was about 42 years old, with an average sleep time of about 7 hours per day, and with most of them living in Gyeonggi (25.7%), Seoul (20.6%), and Incheon (6.6%). The number of co-resident households was usually 32.9% for 4 people and 31.3% for 3 people, and the income level was almost the same in the four categories: lower, middle, upper, and upper-middle class. Education was highest among college graduates (52.7%) and high school graduates (36.2%). Of the working categories, 37.5% were white-collar workers, 34.9% were non-white workers, and 27.6% were unemployed. The average height of the subjects was about 165cm, their bodyweight about 65kg, their systolic blood pressure 115mmhg, and their diastolic blood pressure 76mmhg. Those with a family history of chronic diseases were about 64%, and those with obesity about 33.8%. There were almost no chronic diseases such as stroke, myocardial infarction, and diabetes, and the prevalence of hypertension was 10.5%.

The primary research conclusions derived from this study were as follows.

First, the main variables related to the prevalence of hypertension were gender, age, income, education, number of household members, marriage, obesity, smoking, drinking and binge drinking, and family history.

Second, the prevalence of hypertension was higher in males than females, with 63.2% for men and 36.8% for women ($p<0.001$). At the educational level, the prevalence of high blood pressure between high school graduates and college graduates accounted for 75.62% of the total ($p<0.001$); that is, the higher the educational background was, the higher the prevalence of hypertension was.

Third, at the income level, the lower-income group exhibited an average difference from the groups above the upper-middle-income group regarding systolic blood

pressure (p<0.012). However, diastolic blood pressure was not significant (p<0.835).

Fourth, major chronic diseases and factors related to hypertension were stroke, myocardial infarction, angina, diabetes, high cholesterol, and triglycerides (p<0.001).

Fifth, there was a difference (p<0.001) in the prevalence of hypertension between white-collar workers and non-white-collar workers.

Unlike previous studies, this study's result showed that stress did not have a special significance as regards hypertension, whereas income level also did not have a significant relationship with diastolic blood pressure or systolic blood pressure. In addition, it had no significant relationship with respiratory diseases.

In conclusion, the prevalence of hypertension among male workers was higher than that of female workers (P<0.001) in the results of this study, and the prevalence of hypertension among non-office workers was higher than that of white-collar workers (P<0.001). Looking at the prevalence of workers according to gender, non-office workers had a slightly higher prevalence of hypertension than white-collar workers for men, but it is difficult to find statistical significance. In women, the prevalence of hypertension was higher among white-collar workers, which was nearly three times higher than that of bar-clearing workers (P<0.001).

6.2. Research Limitations and Suggestions for Future Research

In the previous study related to hypertension, stress was considered a major risk factor for hypertension; this study found that it had no clear significance. It classified the job groups in further detail to find the correlation between the work characteristics of each job group and hypertension. It was decided that there should be policy implications or requirements in the management and prevention of hypertension.

References

Artamonova, G. V., Maximov, S. A., Ogarkov, M. Y., Makarov, S. A., Skripchenko, A. E., Indukaeva, E. V., Shapovalova, E. B., Yankin, M. Y., Mulerova, T. A., & Kozyreva, N. N. (2012). Arterial Hypertension Predictors and Occupation. *Russian Journal of Cardiology, 12*(3), 62-67.

Barder, H. E., Rao, S., & Manee, F. (2021), Gender differences in quality of life, physical activity, and risk of hypertension among secondary occupation workers. *Quality of Life Research, 30*(5), 1365-1377.

Barengo, N. C., Hu, G., Kastarinen, M., Lakka, T. A., Pekkarinen, H., Nissinen, A., & Tuomilehto, J. (2005). Low physical activity as a predictor for antihypertensive drug treatment in 25-64-year-old populations in Eastern and south-western Finland. *Journal of Hypertension, 23*(2), 293-299.

Bokaba, M., Kebogile, P. M., & Mokwena, E. (2021). Undiagnosed Hypertension in a Workplace: The Case of a Logistics Company in Gauteng, South Africa. *Healthcare, 9*(8), 964-979.

Cheng, H., Gu, X., He, Z., & Yang, Y. (2021). Dose–response relationship between working hours and hypertension. *Medicine (Baltimore), 100*(16), e25629. doi.10.1097/MD.0000000000025629.

Chobanian, A. V., Bakris, G. L., Black, H. R., Cushman, W. C., & Green, L. A. (2003). The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure: the JNC 7 report. *The Journal of the American Medical Association, 289*(19), 2560-2632.

Costa, J. S., Barcellos, F. C., Sclowitz, M. L., Sclowitz, I. K., Timm, O. M., Castanheira, A., Maria, T. M., Maria, B. G., Denise, P. F., & Silvia, M. C. (2007). Hypertension Prevalence and Its Associated Risk Factors in Adults: A Population-Based Study in Pelotas. *Arquivos Brasileiros de Cardiologia, 88*(1), 59-65.

Davila, E. P., Kuklina, E. V., Valderrama, A. L., Yoon, P. W., Rolle, I., & Nsubuga, P. (2012). Prevalence, Management, and Control of Hypertension among US Workers Does Occupation Matter? *Journal of Occupational and Environmental Medicine, 54*(9), 1150-1156.

Han, M. K. (1994). Analysis of the trend of employee's health status: a case control study for hypertensive, liver diseased employees. *Korean Journal of Occupational Health Nursing, 4*, 84-101.

Jia, J., Chun-li, X., & Yang, W. (2021). Analysis on the prevalence and risk factors of metabolic syndrome among occupational population aged 35-75 years old in Shunyi District of Beijing. *Occupation and Health, 37*(1), 56-62.

Kang, S. H., Kim, H. J., Kim, Y. K., & Koo, J. W. (2002). Effectiveness and Factors Associated with the Control of Hypertension in Apartment Management Workers-Provided with Occupational Health Services. *Annals of Occupational and Environmental Medicine, 14*(4), 426-435.

Kim, C. B., & Kim, K. S. (2014). The relationship between occupational characteristics of office workers and hypertension. *The Korean Society of Occupational and Environment, 5*, 135-136.

Kim, C. B., & Kim, K. S. (2015). Association of Work-related Characteristics and Hypertension among White Collar Workers. *Journal of Korean Society of Occupational and Environmental Hygiene, 25*(3), 418-427.

Kim, C. H., & Han, J. S. (2006). Hypertension and Sodium Intake. *Korean Journal of Family Medicine, 27*(7), 517-522.

Kim, D. W., Lee, M. S., Na, B. J., & Hong, J. Y. (2013). Health-related Dietary Behaviors and Lifestyle Factors associated with Sodium Hyper ingestion in Korean Adults. *Korea Academy Industrial Cooperation Society, 14*(7), 3326-3337.

Kim, H. S., Kim, Y. J., Park, J. H., Bae, E. J., Jung, I. W., You, C. H., Hong, Y. S., & Kim, J. Y. (2012). Prevalence of hypertension among workers in Busan area

and related factors. *The Korean Society of Occupational and Environment, 2012*(11), 389-390.

Kim, J. G., Lee, M. S., Na, B. J., Kim, K. Y., Cho, H. W., & Hong, J. Y. (2005). A Cross-sectional Study on the Risk Factors for the Development of Hypertension in Some Rural Area. *Korean Public Health Research, 31*(2), 101-114.

Kim, S. K., Cho, I. J., Lee, G. H., Youn, J. H., Oh, S. S., Cha, B. S., & Gho, S. B. (2011). Epidemiological characteristics of occupational-related injuries and occupational-related diseases according to the domestic standard industry classification. *The Korean Society of Occupational and Environment, 4*, 434-443.

Kim, S. Y. (2019). Association of Lifestyle and Stress on Hypertension Among Temporary Employee, Working in Small and Medium Sized Construction Company. *Journal of the Korea Academia-Industrial Cooperation Society, 20*(7), 363-371.

Kim, Y. S., Rhee, K. Y., & Song, S. W. (2014). Distribution of Hypertension According to Working Conditions among Korean Worker. *Journal of Korean Society of Occupational and Environmental Hygiene, 24*(4), 556-565.

Kudo, T., & Belzer, M. H. (2020). Excessive work hours and hypertension: Evidence from the NIOSH survey data. *Safety Science, 129*(September), 104813.

Kunyahamu, M. S., Daud, A., & Jusoh, N. (2021). Obesity among Health-Care Workers: Which Occupations Are at Higher Risk of Being Obese? *International Journal of Environmental Research, 18*(8), 4381.

Lee, D. T., & Lee, Y. S. (2012). The Age-Related Trend in Blood Pressure and the Prevalence of Hypertension in Korean Adults. *Journal of Life Science, 22*(2), 148-155.

Lee, E. K., & Kim, O. S. (2013). The Factors related to Dyslipidemia and Hypertension among Male Office Workers. *Korean Journal of Adult Nursing, 25*(4), 432-443.

Lee, G. J., Kim, S. K., Kim, J. H., & Cho, K. J. (2009). Prevalence Rates of Major Chronic Adult Diseases among Korean Employees. *Korean Journal of Clinical Laboratory Science, 41*(4), 196-207.

Lee, J. A. (2017). Relationship between Grip Strength and Prevalence of Hypertension in Korean adults: the Sixth Korea National Health and Nutrition Examination Survey (2015). *Health & Sports Medicine, 19*(3), 53-60.

Lee, J. O., Kim, S. L., & Lee, S. D. (2008). The Risk of Onset of the Illnesses Based on Gender, Age, and Monthly Income; Focusing on cancer, hypertension, stroke, diabetes, arthritis, cardiac disorders. *Korean Journal Oriental Preventive Medical Society, 12*(1), 19-48.

Lee, J. W., Lee, N. S., Lee, K. J., & Kim, J. J. (2011). The Association Between Hypertension and Lifestyle in Express Bus Drivers. *Korean Journal Occupation Environmental Medicine, 23*(3), 270-278.

Lee, J. W., Yoo, B. S., Lee, J. H., Youn, Y. J., Ahn, S. G., Ahn, M. S., Kim, J. Y., Lee, S. H., Yoon, J. H., & Choi, E. H. (2014). Blood Pressure Change and the Associated Factors in a Middle-Aged Korean Rural Population: Atherosclerosis Risk of a Rural Area Korean General Population (ARIRANG) Study. *Journal of the Korean Society of Hypertension, 20*(2), 31-41.

Lee, S. J., Lee, T. W., & Kim, S. H. (2017). Predictors of Hypertension among Middle-aged and Elderly Self-employed Workers: Results from a Baseline Survey of the Korean Longitudinal Study of Aging. *Korean Journal of Occupational Health Nursing, 26*(4), 247-260.

Leigh, J. P., & Du, J. (2009). Hypertension and Occupation Among Seniors. *Journal of Occupational and Environmental Medicine, 51*(6), 661-671.

Leigh, J. P., & Du, J. (2012). Are low wages risk factors for hypertension? *European Journal of Public Health, 22*(6), 854–859.

Li, Q., Li, R., Zhang, S., Zhang, Y., He, P., Zhang, Z., Liu, M., Zhou, C., Li, H., Liu, C., & Qin, X. (2021). Occupational Physical Activity and New-Onset Hypertension: A Nationwide Cohort Study in China. *Hypertension, 78*, 220–229.

Lim, M. S., Park, B. J., Kong, I. G., Sim, S. G., Kim, S. Y., Kim, J. H., & Choi, H. G. (2017). Leisure sedentary time is differentially associated with hypertension, diabetes mellitus, and hyperlipidemia depending on occupation. *BMC Public Health, 17*(1), 278-287.

Martikainen, P. T. (1990). Unemployment and Mortality among Finnish Men, 1981-5. *BMJ, 301*(6749), 407- 411.

Mendy, V. L., Vargas, R., Ogungbe, O., & Zhang, L. (2020). Hypertension among Mississippi Workers by Sociodemographic Characteristics and Occupation, Behavioral Risk Factor Surveillance System. *International Journal of Hypertension, 2020*, 2401747.

Ministry of Health & Welfare. (2009). Korea Centers for Disease Control & Prevention, The Fourth Korea National Health and Nutrition Examination Survey, 2009.

Moon, H. K., & Lee, J. H. (2018). Analysis of life patterns related to hypertension in taxi drivers. *Asia-pacific Journal of Multimedia Services Convergent with Art, Humanities, and Sociology 8*(1), 649-656.

Park, N. W., Suh, I., Lee, T. Y., Jee, S. H., & Kim, S. H. (1999). Determinants on Occurrence of Hypertension in the Korean Adult Male Workers in an Industry: A Nested Case-Control Study. *Korean Journal of Occupational and Environmental Medicine, 11*(4), 505-515.

Park, S. J., Lee, G. S., & Lee, H. J. (2015). The Effects of the Obesity and Physical Activity on the Prevalence of Hypertension in Korean Adults. *The East Asian Society of Dietary Life, 25*(3), 432-439.

Park, Y. L., Kim, H. S., Jeon, M. Y., & Jin, C. J. (2003). A Study on the Prevalence Rate of Hypertension and Diabetes among Adults in the Urban Communities. *Journal of Korean public health nursing, 17*(1), 144-152.

Qiu, L., Wang, W., Sa, R., & Liu, F. (2021). Prevalence and Risk Factors of Hypertension, Diabetes, and Dyslipidemia among Adults in Northwest China. *International Journal of Hypertension, 2021*, 5528007. https://doi.org/10.1155/2021/5528007.

Rosenberg, N., Eldeirawi, K., Durazo-Arvizu, R., Lash, J., Chambers, E., Davis, S., Gonzalez, H., Perreira, K., Schneiderman, N., Tarraf, W., & Daviglus, M. (2018). Occupation Type, Hypertension Status and Awareness Among Hispanic/Latino Adults: Findings from the Hispanic Community Health Study/ Study of Latinos (HCHS/SOL). *Circulation, 135*, Supplement AP184.

Rosenthal, T., & Alter, A. (2012). Occupational stress and

hypertension. *Journal of the American Society of Hypertension, 6*(1), 2-22.

Schumann, B., Seidler, A., Kluttig, A., Werdan, K. Haerting, J., & Greiser, K. H. (2011). Association of occupation with prevalent hypertension in an elderly East German population: an exploratory cross-sectional analysis. *International Archives of Occupational and Environmental Health, 84*(4), 361-369.

Sitorus, N., Satria, A., Hanafi, A. S., Simbolon, D. (2021). Joint effect of high blood pressure and physical inactive on diabetes mellitus: a population-based cross-sectional survey. *Journal of Preventive Medicine and Hygiene, 61*(4), E614–E620.

Trudel, X., Brisson, C., Gilbert-Ouimet, M., Vézina, M., Talbot, D., & Milot, A. (2020). Long Working Hours and the Prevalence of Masked and Sustained Hypertension. *Hypertension, 75*, 532-538.

Um, J. S., Lee, T. R., Park, S. J., Ahn, Y. J., & Chung, Y. J. (2008). The Risk Factors of the Pre-hypertension and Hypertension of Rural Inhabitants in Chungnam-do. *The Korean Journal of Nutrition, 41*(8), 742-753.

World Health Organization. (2009). Global health risks: mortality and burden of disease attributable to selected major risks. Geneva, Switzerland: Available at: http://www.who.int/healthinfo/

Yong, J. S., Kim, J. W., Yae, B. J., & Kim, S. H. (2011). The relationship between occupation and metabolic syndrome based on the 2018 Korean National Health and Nutrition Survey. *Annals of Occupational and Environmental Medicine, 2011*(11), 266-276.

You, D. K., Lee, S. Y., Lee, T. Y., & Lee, E. H. (2009). Concordance of Hypertension in Husband and Wife Living in a Rural Area. *Korea Academy Industrial Cooperation Society, 10*(3), 634-641.