

Risk Factors for Cardiovascular Disease in People with Mobility Disabilities

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ABSTRACT

The study aimed to compare the proportion of people belonging to high-risk groups, such as those who had high blood pressure (BP), were overweight, had abnormal fasting blood glucose, or had high total cholesterol, between people with mobility disabilities and non-disabled individuals. Data were extracted from the National Health Insurance in 2016 and 2017. Among the health checkup data, BP, overweight, fasting blood glucose, and total cholesterol were compared between 448,000 people with mobility disabilities and 13,000,000 non-disabled individuals using descriptive statistics and chi square tests. The majority of people with mobility disabilities were men, and on average, non-disabled people were younger than people with mobility disabilities in 2016 and 2017. In 2016, instances of high blood pressure ($p < .001$), overweight ($p < .001$), and abnormal fasting blood glucose levels ($p < .001$) were significantly higher in people with mobility disabilities than in non-disabled people. In 2017, instances of high blood pressure ($p < .001$), overweight ($p < .001$), abnormal fasting blood glucose ($p < .001$), and high total cholesterol ($p < .001$), were significantly higher in people with mobility disabilities than non-disabled people. The proportion of people with mobility disabilities who had high blood pressure ($p < .001$), were overweight ($p < .001$), had abnormal fasting blood glucose ($p < .001$), and had high total cholesterol ($p < .001$) slightly increased in 2017 as compared to 2016.

The proportions of patients at risk for high BP, fasting glucose, and BMI were higher in people with mobility disabilities than in non-disabled people. This implies that it is necessary to establish an active health monitoring program for people with mobility disabilities.

Keywords: Blood pressure; Cardiovascular disease; Disability; Health check-up; Mobility

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INTRODUCTION

As the number of people with disabilities worldwide increases, interest in their health increases (Yun et al., 2014). Of the total population of people with disabilities, 50.5% of those in South Korea have mobility disabilities (Ministry of Health and Welfare, 2015). The proportion of people with disabilities increases with age (Hubert et al., 1993). These results can be associated with chronic disease prevalence. In particular, people with mobility disabilities have limited mobility, which is likely to increase the risk of cardiovascular disease (Murtagh et al., 2004). Representative cardiovascular risk factors are blood pressure, blood sugar, and blood cholesterol levels (Arnett et al., 2019), however, most risk factors are strongly related to individual lifestyle such as activities and eating patterns (Komajda et al., 2017). Among these, the association between the lack of mobility activity and an increased risk of cardiovascular disease has been studied extensively (Arnett et al., 2019; Komajda et al., 2017; Murtagh et al., 2004).

A previous study in 2015 showed that people with mobility disabilities had the highest prevalence of high blood pressure (BP) and a high rate of dyslipidemia (Ministry of Health and Welfare, 2015). People with mobility disabilities tend to perform non-aerobic activities, and those who are inactive are more likely to have chronic conditions such as heart disease (Hollis et al., 2020). Moreover, people with disabilities are limited not only in terms of medical resources but also in the social resources necessary to monitor their health due to restrictions on movement (Ministry of Health and Welfare, 2015). Self-reported data from the 2016 Behavioral Risk Factor Surveillance System (BRFSS) showed that health-related behaviors such as maintaining a healthy body weight of people

with disabilities were the lowest among those living in the rural community (Zhao et al., 2019). Based on the data, healthy lifestyle programs to promote quality of life for people with disabilities have been supported by the government in the United States, and studies have reported the effects and barriers of the program (Ingram et al., 2014; Matthews et al., 2017; Okoro et al., 2016; Sage et al., 2019).

However, in South Korea, research on people with disabilities is limited. The Korean government conducts a survey of the disabled every two years, however, this is not a health assessment. Identifying chronic disease risk factors for non-disabled people is the beginning of a very important study using health checkup data. Meanwhile, the Korean government conducts a regular health checkup program for all citizens regardless of their ability to monitor chronic disease risk factors such as cardiovascular disease (Cho et al., 2015). To prevent and detect chronic diseases early, the national health insurance service in Korea monitors the body mass index (BMI), BP, fasting blood glucose (FBG), and blood cholesterol levels once every two years. The government covers the health checkup and part of an individual's income is allocated for insurance every month.

The aims of this study was to compare the proportion of people belonging to risk groups with high BP, BMI, FBG, and serum total cholesterol between people with mobility disabilities and non-disabled persons in 2016 and 2017.

MATERIALS & METHODS

Sample and sampling

Data were extracted from the National Health Insurance Service (NHIS) in 2016 and 2017.

From 2016 data, 13,257,400 non-disabled and 448,774 people with mobility disabilities were included. From 2017 data, 13,507,733 non-disabled and 440,912 people with mobility disabilities participated in the health checkup program.

Before data extraction, the Institutional Review Board (JIRB2019070801-01-190710) approved all research procedures, and the NHIS approved the extraction of the sample (NHIS-2019-1-457). Data were separated into two groups: mobility disabilities and non-disabled individuals.

Factors

Mobility disabilities: A person with mobility disabilities refers to a person with joint, amputation, spinal cord, or deformity disorders registered in the Ministry of Health and

Welfare of Korea.

Severity of disability: Severity of disability can be classified into six index (from 1 to 6) by a physician. According to legal standards, physicians are required to indicate if the severity is very severe (grade 1) to mild (grade 6) on the medical record.

Risk factors: The criteria for determining the risk groups with high BP, BMI, FBG, and serum total cholesterol follow the Korea Center for Disease Control(K-CDC) guidelines. Those with a resting blood pressure above 140/90 mmHg, 126 mg/dL or higher FBG, and serum total cholesterol level of above 240 mg/d are considered at risk.

The detailed criteria are presented in Table 1.

Table 1: Health checkup items and its criteria

Health checkup items	Criteria for risk
High Blood Pressure (BP)	Systolic BP \geq 140mmHg Diastolic BP \geq 90mmHg
Overweight (Body Mass Index)	BMI \geq 25kg/m ²
Abnormal fasting blood glucose (FBG)	\geq 126 mg/dL
High level of serum total cholesterol	\geq 240 mg/dL

Statistical Analysis

Descriptive statistics and χ^2 -tests were performed to compare the distribution of risk groups based on health factors between the groups using the SAS software program (Carey, NC, USA). Missing data were excluded from the analysis if they were missing items. The significance level was set at .05.

RESULTS AND DISCUSSION

General characteristics of participants in 2016 and 2017

Table 2 presents the general characteristics of health checkup participants in 2016 and 2017.

The proportion of men with mobility disabilities was higher than that of women in 2016 and 2017, whereas the proportion of men with disabilities was similar in 2016 and 2017. The mean age of people with disabilities was 61.7 years in 2016 and 61.9 years in 2017, for while the mean ages for the non-disabled group in 2016 and 2017 were 52.9 years and

52.6 years, respectively. The mean number of disabled people participating in health checkups was higher than that of non-disabled people. These results are consistent with recent studies(Hubert et al., 1993; Murtaghet al., 2004), which consider various problems with health functions due to the ageing.

Table 2: General characteristics

Characteristics	Categories	2016		2017	
		Mobility disability	Non-disabled	Mobility disability	Non-disabled
Sex	Male, n (%)	276,483 (61.6)	7,010,648 (52.9)	272,840 (61.9)	7,106,969 (52.6)
	Female, n (%)	172,292 (38.4)	6,246,752 (47.1)	168,072 (38.1)	6,400,764 (47.4)
Age, years	Mean (\pm SD)	60.77 (12.30)	48.77 (14.02)	61.24 (12.29)	49.06(14.05)
Severity of disability	1-2index, n (%)	28,647 (6.4)	-	27,572 (6.3)	-
	3-4index, n (%)	124,544 (27.8)	-	120,552 (27.3)	-
	5-6index, n (%)	295,584 (65.8)	-	292,788 (66.4)	-

Risk factors of people with mobility disabilities and the non-disabled people

Figure 1 shows the comparison of risk factors between people with mobility disabilities and the non-disabled in 2016.

In 2016, the proportion of people with mobility disabilities belonging to the high-risk group with high blood pressure versus those who didn't have high blood pressure was significantly higher than that in non-disabled people ($p < .001$). That is, 20.45% of people with mobility disabilities had high blood pressure, while 12.45% of non-disabled individuals had high blood pressure in 2016. The proportion of patients with high BMI ($p < .001$) and FBG level ($p < .001$) were also greater for people with mobility disabilities than for those without. The proportion of overweight patients with mobility disabilities was 6.9%, while 5.1% of non-disabled individuals were overweight. The proportion of

people with mobility disabilities having highFBGwas 13.04%, while 7.27% of non-disabledindividuals had high FBGlevels (Figure 1).

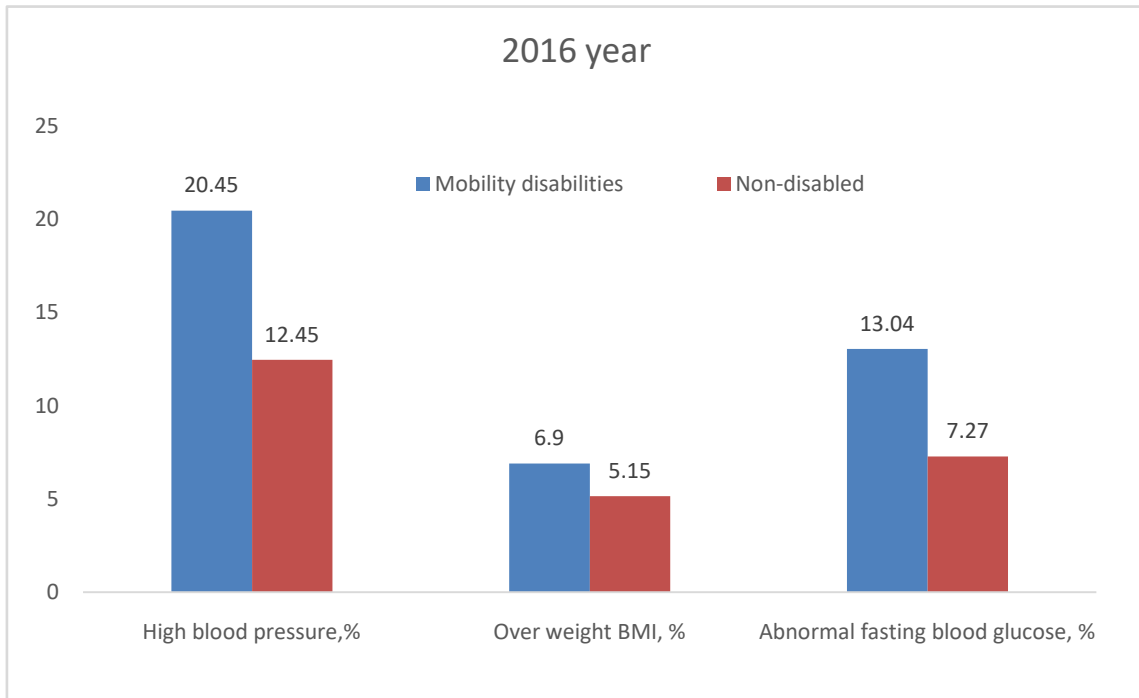


Figure 1: Proportions of people with high BP, high BMI, and abnormal fasting blood glucose in 2016

Figure 2 presents the comparison of the proportions of people with risk factors between people with mobility disabilities and the non-disabled in 2017. In 2017, the proportion of people with high blood pressure was 20.62% in people with mobility disabilities and 12.64% in non-disabled persons ($p<.001$). The proportion of patients with high BMI was 7.19% in people with mobility disabilities and 5.52% in non-disabled persons ($p<.001$). The proportion of people with highFBGlevels was 13.55% in people with mobility disabilities and 7.52% in non-disabled individuals. The proportions of at-risk patients with high BP, BMI, FBG, and cholesterol levels were significantly different between people with mobility disabilities and those with non-disabilities (Figure 2).

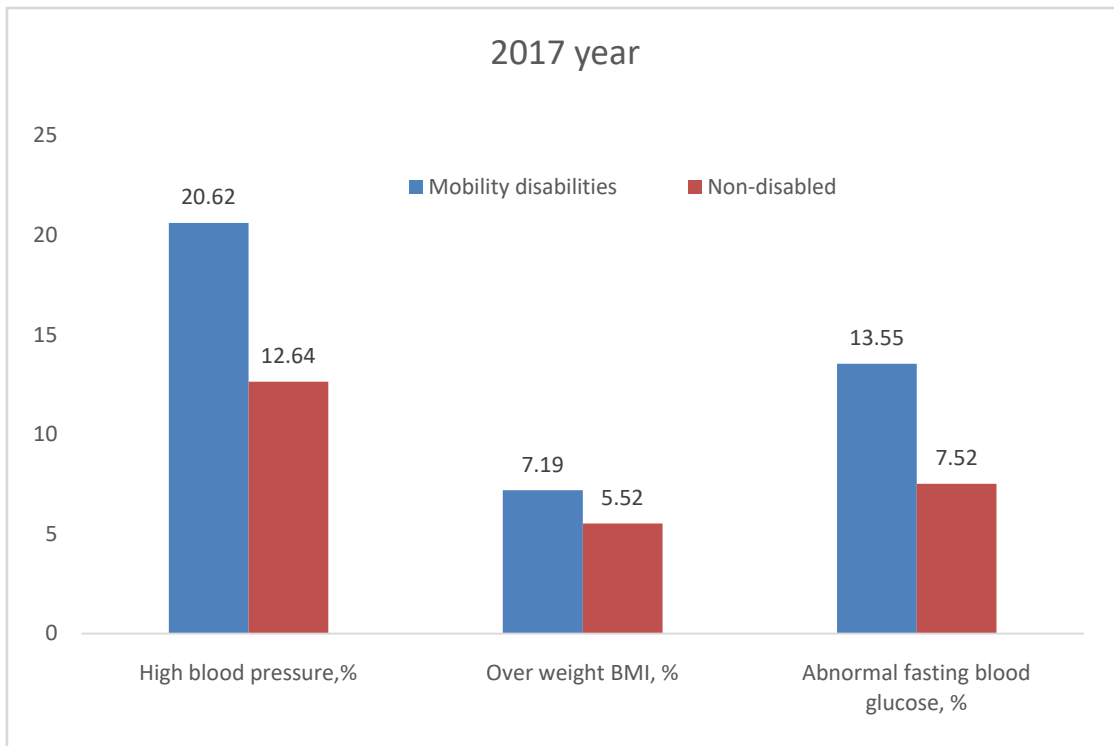


Figure 2: Proportion of people with high BP, high BMI, and abnormal fasting blood glucose in 2017

Figure 3 shows the changes the BP, BMI, FBG, and serum total cholesterol in people with mobility disabilities between the years 2016 and 2017. Upon comparing the BP, BMI, FBG, and serum total cholesterol of people with mobility disabilities between the years 2016 and 2017, BP, BMI, and FBG slightly increased in 2017 as compared to 2016. That is, the proportion of people with high blood pressure in those with mobility disabilities slightly increased from 20.45% in 2016 to 20.62% in 2017, but this difference was not significant. The proportion of overweight people in those with mobility disabilities also increased from 6.9% in 2016 to 7.19% in 2017. The abnormal FBG group of people with mobility disabilities increased from 13.04% in 2016 to 13.55% in 2017. However, the serum total cholesterol level of people in the mobility disability group decreased from 11.83% in 2016 to 11.28% in 2017 (Figure 3).

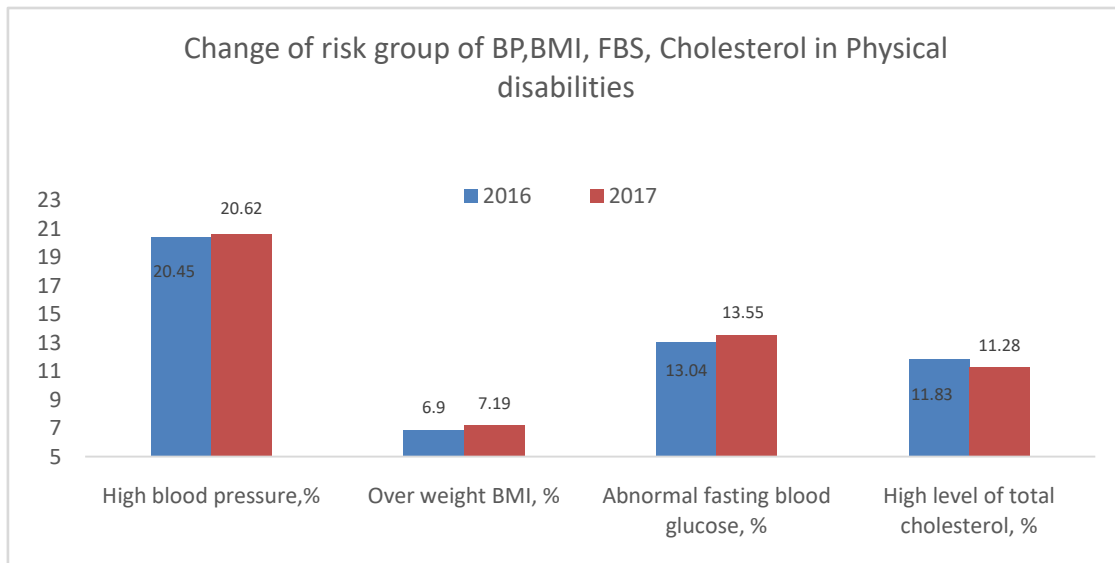


Figure 3: Changes in BP, BMI, and FBS of people with mobility disabilities

Based on the health checkup data in 2016 and 2017, there was a higher proportion of people with mobility disabilities belonging to the cardiovascular risk group as compared to non-disabled people. As mentioned previously, inactive people with disabilities are three times more likely to have a chronic disease such as heart disease (Bandini et al., 2005). Many studies have reported that limitation of movement causes chronic conditions such as high blood pressure in people with mobility disabilities (Bandini et al., 2005; Chen et al., 2010; Ells et al., 2006; Finkelstein et al., 2009; Ogden et al., 2007). For example, in the United States, obesity is more prevalent among people with disabilities than among people without disabilities (Bandini et al. 2005). Studies have reported that it is difficult for people with mobility disabilities to find healthy food choices, control their weight, and access resources such as social support (Bandini et al., 2005; Chen et al., 2010; Ells et al., 2006; Finkelstein et al., 2009; Ogden et al., 2007). People with disabilities who are overweight or obese can increase the risk of cardiovascular disease such as type 2 diabetes, high blood pressure, and lipid disorders (for example, high total cholesterol).

As such, prior studies have indicated that individual with disabilities have more risky behaviors such as poor physical activities and diet patterns. A study by Loprinzi et al. has also reported that people with mobility limitations had worse risk factors for chronic disease than those without mobility limitations and suggested that increasing even low-intensity activities and reducing sitting time may improve health outcomes (Loprinzi et al.,

2014).

According to the CDC guidelines, people with disabilities need to participate in moderate-intensity aerobic physical activity for a total of at least 2 hours and 30 minutes a week, such as wheeling oneself in a wheelchair (Centers for Disease Control and Prevention, 2019). However, people with mobility disabilities cannot easily may have a difficult time meeting these physical activity guidelines. Health care providers should encourage their physical activity appropriately using a systematic program. Moreover, the government should monitor and compare the health problems and health issues of people with and without mobility disabilities to improve health policies, and address the factors which increase the risk of cardiovascular disease in people with mobility disabilities in Korea.

CONCLUSION

It was concluded that the proportions of people belonging to risk groups with high BP, fasting glucose, and BMI were higher in people with mobility disabilities than in non-disabled people in 2016 and 2017. Among people with mobility disabilities, the proportion of people with high blood pressure, who were overweight, and had high fasting blood glucose levels increased in 2017. Based on these results, it is necessary to develop an active health-monitoring program which encourages people with mobility disabilities to participate in aerobic exercise and gives them access to healthy food. Moreover, the government should implement a continuous specific health monitoring system for people with mobility disabilities.

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