



Differences in Health-Related Quality of Life of Adults with Cardiovascular or Metabolic Diseases Compared to the General Population

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Abstract

Background: We aimed to compare demographic, health-related characteristics, and quality of life between adults with cardiovascular or metabolic diseases and the general population.

Methods: Data from 25,712 adults assessed on the Korea National Health and Nutrition Examination Survey V & VI (2010–2013) were analyzed for differences in health-related quality of life.

Results: The corrected EuroQol-5 Dimension score mean among participants with cardiovascular or metabolic diseases was significantly lower than for the general population across all five dimensions ($P < 0.001$). Individuals with cardiovascular disease had lower quality of life than those with metabolic diseases.

Conclusion: Adults with cardiovascular or metabolic diseases reported lower health-related quality of life in all domains when compared to adults in the general population. Therefore, interventions and management to improve quality of life among patients with cardiovascular or metabolic diseases are necessary.

Keywords: Adult; Cardiovascular disease; Metabolic diseases; Nursing; Quality of life

Introduction

Cardiovascular and cerebrovascular diseases have been the second and third most common causes of death in South Korea over the past decade. The mortality rate of cardiovascular diseases, including vascular disorders such as cerebrovascular, peripheral vascular, and hypertensive diseases, has increased steadily over the past decade in Korea (1). Additionally, CVD is the leading cause of death in the United States, and continues to increase at older ages (2,3), with similar trends in Europe (4). Multiple risk factors combine to increase CVD risk, including diabetes, hypertension,

dyslipidemia, alcohol use, smoking, obesity, diet, lack of exercise, gender, age, and stress (5,6). Additionally, CVD consumes enormous societal resources for treatment and rehabilitation (7). Patients with CVD experience anxiety, fear, and depression, and their quality of life (QOL) is severely affected, as resulting complications may limit daily activities, work life, interpersonal relationships, and requires long-term health behavior change and management (8-12).



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Metabolic syndrome results from a combination of insulin resistance, abdominal obesity, hypertension, dyslipidemia, and hyperglycemia (10,13,14). This syndrome is observed in approximately 25% of the total population within both developed and developing countries; furthermore, metabolic syndrome is a key risk factor for early mortality (15,16). Metabolic syndrome may lead to chronic diseases, such as metabolic diseases and CVD. Physical and mental health can be deeply affected by the chronic nature of such disorders (17-20). For patients with chronic diseases, it is important to assess QOL within the physical, mental, and social domains. Health-related quality of life (HRQOL), which is closely related to an individual's physical and mental health, is subjectively assessed by the patient and is considered a key clinical indicator, along with mortality rates and hospital stays (21,22). It is considered a particularly sensitive outcome measure of interventions and treatments in patients with established CVD (23). Chronic diseases are associated with deterioration in HRQOL. Therefore, it is necessary to clarify differences in HRQOL according to one's disease state to provide concrete methods for improving disease management.

Metabolic syndrome is a major factor that deteriorates physical and mental quality of life due to chronic illness with a long duration (11,17-20). Previous studies have focused on QOL among patients with metabolic syndrome. Thus, the present study compared HRQOL in relation to chronic diseases with a focus on metabolic diseases and CVD, rather than just metabolic syndrome. The present study provides basic data useful for helping adults with cardiovascular or metabolic diseases maintain a healthy QOL by identifying differences in life quality between these two patient groups and healthy adults. The present study analyzed raw data from the Korea National Health and Nutrition Examination Survey (KNHANES) V & VI (2010–2013), which is a representative and reliable large-scale survey.

The specific purposes of this study were 1) to compare demographic and health-related characteristics of patients with CVD, metabolic diseases, and the general South Korean population and 2)

analyze differences in HRQOL between patients with CVD, metabolic diseases, and the general population.

Methods

Study data and participants

The Korea National Health and Nutrition Examination Survey (KNHANES) has been performed to identify the status of health and nutrition in South Korea since 1998 by the Korea Centers for Disease Control and Prevention (KCDC). The KNHANES was conducted with the approval of the KCDC's Research Ethics Committee, and the present study used raw data from the KNHANES V & VI (2010–2013) under official approval of the relevant institution. The KNHANES is a nationally representative, cross-sectional survey targeting non-institutionalized Korean adults, and comprises a health survey, nutrition survey, and an examination. Adults aged 19 years or older ($n = 25,712$) out of the KNHANES V & VI data ($n = 33,551$) were selected. A total of 1,089 adults with CVD (4.2%) and 3,378 adults with metabolic diseases (13.1%) were sampled. Adults with both diseases were included in the CVD group.

Measures

Cardiovascular disease (CVD) and metabolic diseases

In this study, CVD included stroke, myocardial infarction, and angina. Metabolic diseases included diabetes mellitus and hyperlipidemia. Participants diagnosed with any of these diseases by a doctor through the health interview survey were included in the analysis.

Health-related quality of life (HRQOL)

The EQ-5D (EuroQol-5 Dimension) and EQ-5D index developed by the EuroQol Group were used to assess HRQOL (24). The EQ-5D was developed to simply measure overall health for clinical and economic evaluation. The measure assesses five HRQOL dimensions: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression. Each dimension can be responded to

with the following three options: “no problems,” “some problems,” or “severe problems.” In the present study, “some problems” and “severe problems” were grouped together as “yes.” The EQ-5D index, which is the actual HRQOL score, is calculated by applying a weight to each of the five dimensions. The range of values is between 1 point, which means a completely healthy condition, and -1 point, which represents a more serious health condition (25).

Covariates

Covariates included demographic and health-related variables based on prior studies (17,18,26). The demographic variables were age, gender, education, marital status, living alone, body mass index (BMI), economic status, and employment status. The health-related variables included smoking, alcohol use, and physical activity. Education was categorized as elementary school graduate and non-elementary school graduate, middle school graduate, high school graduate, college graduate, and graduate school degree. Marital status was categorized as single, married, and/or living alone. BMI was calculated using the formula $\text{weight (kg)}/\text{height (m)}^2$. Economic status was divided into quartiles as equivalent income (monthly average household income/ $\sqrt{\text{number of household members}}$), which corrected household income by number of household members. Employment was categorized as currently employed or unemployed. Current smoking was classified as “yes,” and non-smoking was classified as “no.” In terms of alcohol use, based on drinking experience over the past year, drinking more than once a month was classified as “yes,” and if not, was classified as “no.” For physical activity, moderate physical activity (2 hours and 30 minutes weekly), intense physical activity (1 hour and 15 minutes weekly), or moderate and intense physical activity were performed in combination; these cases were categorized as “yes,” and if not, “no” (27,28). Moderate physical activity refers to activity in which a slight increase in breathing and heart rate is induced. This can include walking fast (during work), carrying light objects, cleaning, and parenting children (bathing, holding a child). Intense physical activity

results in a rapid increase in breathing and heart rate. These activities can include lifting or carrying heavy objects (about 20kg or more), working at a construction site, and carrying objects up a flight of stairs.

Statistical analyses

Data were calculated as $M \pm SD$ for continuous variables or as n (%) for categorical variables. The SAS survey procedure (ver. 9.3; SAS Institute Inc., Cary, NC, USA) was used to run a complex sample design based on data analysis from the survey data. Statistical significance was set at $P < .05$.

Group differences (CVD, metabolic diseases, and general population) on the demographic characteristics, health-related characteristics, and HRQOL were assessed using t -tests and χ^2 tests. Demographic and health-related characteristics were used as covariates in an analysis of covariance to examine associations between the three groups and the EQ-5D index. Demographic and health-related characteristics were adjusted in logistic regression analyses to investigate the association between the three groups and EQ-5D subtypes. Odds ratios (OR) were calculated for the two patient groups, and the general population was used as a reference.

Results

Demographic and health-related characteristics by group

Differences between the CVD, metabolic diseases, and general population groups on the demographic and health-related characteristics are shown in Table 1. There were significant differences between groups on all variables ($P < .001$). Adults with CVD were the oldest, and there was a higher proportion of women with metabolic diseases and in the general population, whereas a higher proportion of men had CVD. Less educated adults accounted for a higher proportion of those with CVD or metabolic diseases, and both employment and economic statuses were lower among adults with CVD or metabolic diseases. The three groups also differed on marital status,

but most participants were married. Although the majority of participants did not live alone, more adults with CVD or metabolic diseases lived alone. BMI was higher, and moderate to intense physical

activity was lower, among adults with CVD or metabolic diseases. Current smoking status was lower among adults with CVD or metabolic diseases, while alcohol use was slightly higher.

Table 1: Demographic and health-related characteristics by group

<i>Characteristic</i>		<i>Total (N = 25,712) Mean ± SD^d or n (%)</i>	<i>CVD^a (n = 1,089) Mean ± SD or n (%)</i>	<i>Meta^b (n = 3,378) Mean ± SD or n (%)</i>	<i>General^c (n = 21,245) Mean ± SD or n (%)</i>	<i>P</i>
Age(yr)		50.4 ± 16.7	66.6 ± 10.0	61.6 ± 11.4	47.7 ± 16.5	< .001
Gender	Male	11,121 (43.25)	568 (52.2)	1,390 (41.2)	9,163 (43.1)	< .001
Education	≤ Elementary school	5,876 (25.3)	562 (51.9)	1,425 (42.2)	3,889 (20.7)	< .001
	Middle school	2,496 (10.8)	172 (15.9)	535 (14.9)	1,789 (9.5)	
	High school	7,815 (33.7)	229 (21.1)	880 (26.1)	6,706 (35.8)	
	≥ College	7,030 (30.2)	121 (11.1)	534 (15.8)	6,375 (34.0)	
Marital status	Married	21,918 (85.5)	1,073 (98.6)	3,298 (97.7)	17,547 (82.8)	< .001
	Unmarried	3,728 (14.5)	15 (1.4)	78 (2.3)	3,635 (17.2)	
Living alone	yes	1,904 (7.4)	157 (14.4)	407 (12.0)	1,340 (6.3)	< .001
BMI ^e		23.7 ± 3.4	24.7 ± 3.1	24.8 ± 3.3	23.4 ± 3.3	< .001
Economic status	Very low	5,040 (19.9)	451 (41.8)	971 (29.0)	3,618 (17.3)	< .001
	Low	6,624 (26.1)	257 (23.9)	919 (27.5)	5,448 (26.0)	
	High	6,768 (26.7)	199 (18.4)	718 (21.5)	5,851 (27.9)	
	Very high	6,937 (27.3)	172 (15.9)	735 (22.0)	6,030 (28.8)	
Employment (current)	yes	13,624 (58.7)	395 (36.5)	1,577 (46.7)	11,652 (62.1)	< .001
Smoking (current)	yes	6,899 (26.7)	168 (15.4)	564 (16.7)	6,137 (28.9)	< .001
Drinking (current)	yes	15,781 (61.4)	684 (62.8)	2,167 (64.2)	12,930 (60.9)	< .001
Physical activity (moderate)	yes	1,840 (7.9)	61 (5.7)	259 (7.7)	1,520 (8.1)	.014

^a cardiovascular disease, ^b metabolic diseases, ^c general population, ^d standard deviation, ^e body mass index

HRQOL according to group

Differences in HRQOL between the three groups are shown in Table 2. Significant differences were observed on all EQ-5D areas and EQ-5D indices ($P < .001$). Participants with CVD had the most problems with mobility, usual activity, and pain/discomfort, followed by the metabolic disease group. Problems with self-care were also

highest among those with CVD, followed by the general population. However, anxiety/depression was highest among adults in the general population, followed by those with CVD. The average EQ-5D index was highest among the general population group, followed by adults with metabolic diseases.

Table 2: Differences in health-related QOL according to group (N = 25,712)

EQ-5D ^a	Group			P
	CVD ^b (n = 1,089) n (%) or mean ± SD ^e	Meta ^c (n = 3,378) n (%) or mean ± SD	General ^d (n = 21,245) n (%) or mean ± SD	
Mobility (yes problem)	490 (45.0)	969 (28.7)	4,800 (22.6)	< .001
Self-care (yes problem)	222 (20.4)	303 (9.0)	3,091 (14.6)	< .001
Usual activity (yes problem)	348 (32.0)	649 (19.0)	3,911 (18.4)	< .001
Pain/discomfort (yes problem)	501 (46.0)	1,197 (35.4)	6,389 (30.1)	< .001
Anxiety/depression (yes problem)	260 (23.9)	570 (16.9)	4,373 (32.0)	< .001
EQ-5D index	0.83 ± 0.20	0.90 ± 0.15	0.95 ± 0.11	< .001

^aEuroQol-5 Dimension, ^bcardiovascular disease, ^cmetabolic diseases, ^dgeneral population, ^estandard deviation

Table 3 provides results regarding associations with HRQOL between the three groups. Model 1 was adjusted for age and gender. Model 2 was adjusted for age, gender, education, living alone,

marital status, economic status, BMI, employment, physical activity, smoking, and alcohol use.

Table 3: Associations between group and health-related QOL dimensions

		EQ-5D ^a				
		Mobility OR ^c (95% CI) ^d	Self-case OR (95% CI)	Usual activity OR (95% CI)	Pain/discomfort OR (95% CI)	Anxiety/depression OR (95% CI)
Model 1						
CVD ^e	0.87±0.004	1.34(1.17, 1.52)	0.92(0.79, 1.08)	1.15(0.99, 1.31)	1.27 (1.11, 1.44)	0.92(0.80, 1.07)
Meta ^f	0.92±0.002	0.77(0.71, 0.84)	0.41(0.36, 0.46)	0.66(0.60, 0.72)	0.89(0.82, 0.96)	0.63(0.57, 0.70)
General ^g	0.94±0.001	1	1	1	1	1
P-value	< .001					
Model 2						
CVD ^e	0.88 ± 0.003	2.08 (1.79,2.41)	2.69 (2.24,3.24)	2.15 (1.83,2.52)	1.79 (1.56,2.05)	1.93 (1.64,2.27)
Meta ^f	0.93 ± 0.001	1.24 (1.12,1.37)	1.32 (1.13,1.54)	1.33 (1.18,1.49)	1.30 (1.19,1.42)	1.34 (1.20,1.50)
General ^g	0.94 ± 0.001	1	1	1	1	1
P-value	< .001					

Model 1: Adjusted for age and gender

Model 2: Adjusted for age, gender, education, living alone, marital status, economic status, BMI, employment, physical activity, smoking, and alcohol use.

^a EuroQol-5 Dimension, ^b standard deviation, ^c odds ratio, ^d confidence interval, ^e cardiovascular disease, ^f metabolic diseases, ^g general population

In Model 1, the overall HRQOL of the metabolic disease group was lower than the general population group. Even after correcting for the demographic and health variables, all HRQOL areas revealed significant results. The corrected mean of the EQ-5D index was highest in the general population, followed by adults with metabolic diseases ($P < .001$). In terms of the EQ-5D, when setting the general population group as a reference, the odds ratio (OR) for mobility was 2.08 for adults with CVD (95% confidence interval (CI): 1.79 to 2.41) and 1.24 for adults with metabolic diseases (95% CI: 1.12 to 1.37). The OR for self-care was 2.69 in the CVD group (95% CI: 2.24 to 3.24) and 1.32 in the metabolic disease group (95% CI: 1.13 to 1.54). The OR for usual activity was 2.15 in the CVD group (95% CI: 1.83 to 2.52) and 1.33 in the metabolic disease group (95% CI: 1.18 to 1.49). The OR for pain/discomfort was 1.79 in the CVD group (95% CI: 1.56 to 2.05) and 1.30 in the metabolic disease group (95% CI: 1.19 to 1.42). Finally, the OR for anxiety/depression was 1.93 in the CVD group (95% CI: 1.64 to 2.27) and 1.34 in the metabolic disease group (95% CI: 1.20 to 1.50).

Discussion

Significant differences were observed in terms of age, gender, marital status, education, economic status, BMI, smoking, alcohol use, and physical activity between patients with CVD and those with metabolic diseases, which is consistent with previous research (17,18,29,30). The relationship between metabolic syndrome and general and health-related characteristics has been analyzed in many previous studies, and these findings have been used to inform interventions for preventing and managing metabolic syndrome.

Adults aged 60 years or older were more likely to have CVD and metabolic syndrome, and older adults reported lower HRQOL, which is in keeping with past research (3,10,17). Metabolic syndrome is associated with lifestyle habits such as obesity, smoking, drinking, and physical activity (10), and increasing age increases the likelihood of

metabolic syndrome if these lifestyle habits persist (3,10). This highlights the importance of prevention and management of CVD in old age. We also observed that BMI and current alcohol use was higher among adults with CVD and metabolic diseases, and physical activity was low. This suggests that these disease states are indicative of having an unhealthy lifestyle.

Adults with CVD or metabolic diseases reported problems with mobility, self-care, usual activities, pain/discomfort, and anxiety/depression. Additionally, the corrected EQ-5D index mean was lower within these groups. However, adults with CVD demonstrated lower HRQOL than adults with metabolic diseases. In the presence of metabolic syndrome, HRQOL tends to also decrease (13,17,29). Results for our CVD sample are consistent with previous studies reporting low HRQOL across all domains (9,12,15).

Among the HRQOL areas, problems with mobility, usual activities, and pain/discomfort were quite high in the CVD group. These factors can work in concert, as physical pain leads to limited amounts of physical activity, which negatively affects EQ-5D (22). Research has also shown that women who do not participate in physical activities have higher levels of anxiety and depression, while women with higher levels of physical activity report higher subjective health status and QOL (9,14). Furthermore, middle-aged women with sarcopenic obesity report lower levels of physical activity and take more time to move their joints than women at a healthy weight (31). This decrease in muscle strength reduces daily activities among older adults and is a major factor in diminished QOL (32,33). As an intervention to improve HRQOL, it is necessary to consider measures to increase mobility and daily activities, reduce pain and discomfort, and improve exercise routines.

Interestingly, anxiety and depression were more prevalent in the general population than in the CVD and metabolic disease groups. However, after adjusting for covariates, depression and anxiety symptoms were more prevalent in the disease groups relative to the general population. Anxiety and depression are important facets of HRQOL that are negatively affected by CVD and metabolic

diseases. Depression increases with age, and women may experience depression after menopause (34). Furthermore, hormonal changes during menopause may have an influence on metabolic syndrome and CVD (14,16,26). However, more research is needed to confirm this possibility. Depression is associated with developing CVD and can impede CVD treatment (8,35). Thus, anxiety and depression need to be recognized as a public health problem that lowers HRQOL, but could be improved with the assistance of proper social support systems.

Over time, people with metabolic syndrome suffer from various health problems, resulting in poor HRQOL. Participants with CVD reported anxiety and depression due to the nature of their disease, and physical and mental health were seriously affected by disease complications, as the ability to perform daily life activities was limited, which required changes and management in health habits (10,12). Therefore, HRQOL appeared to be lower among patients with CVD than among patients with metabolic diseases, likely due to the fact that those with metabolic diseases were only at risk for low HRQOL without experiencing specific symptoms.

Given that all areas of HRQOL were lower among adults with CVD or metabolic diseases when compared to the general population, we must develop multidisciplinary intervention programs that take into account both the physical and mental domains of QOL. It is also necessary to help improve QOL through continuous care and research.

The major strengths of this study include the large size and representativeness of the sample. However, a few limitations should be noted. First, as information regarding the severity of CVD or metabolic disease could not be determined, we could not study differences in HRQOL according to disease severity. Second, only diabetes mellitus and hyperlipidemia were included as metabolic diseases. Further research is needed that includes additional metabolic diseases (i.e., hypertension) to better assess differences in HRQOL. Third, given the cross-sectional nature of this study, causal relationships could not be determined. Future re-

search with longitudinal designs are needed to investigate specific mechanisms underlying differences in disease states that impact HRQOL. Lastly, there may be potential sources of bias and measurement error with our survey design, potentially limiting our conclusions. Despite these limitations, the present study is meaningful in that it is the first study to clarify HRQOL among Korean adults with CVD or metabolic diseases in comparison to healthy adults in the general population.

Conclusion

Adults with CVD or metabolic diseases demonstrated poor HRQOL compared to adults in the general Korean population. These results suggest a need for social awareness and consensus on adults with CVD or metabolic diseases, whereby active and specific health promotion and education programs are needed considering nuances of specific disease states. Furthermore, various efforts are needed to improve HRQOL among patients with CVD or metabolic diseases.

Ethical considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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Conflict of interest

The authors declare that there is no conflict of interests.

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