



## Research Article

# Effects of Hypertension, Diabetes, and/or Cardiovascular Disease on Health-related Quality of Life in Elderly Korean Individuals: A Population-based Cross-sectional Survey



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## SUMMARY

**Purpose:** This study explored health-related quality of life (QoL) in Korean elderly individuals with hypertension, diabetes, and/or cardiovascular disease (CVD).

**Methods:** This study used a population-based cross-sectional design. Data were obtained from the Fourth Korean National Health and Nutrition Examination Survey 2008, which involved a nationally representative sample. Data on health-related QoL were collected using the EuroQoL-5 Dimension instrument and via health interviews. The sample consisted of 1,467 Korean individuals aged 60 years and older. A multiple linear regression model was used to analyze health-related QoL.

**Results:** After controlling for sociodemographic and lifestyle variables, individuals with one of the aforementioned chronic diseases had lower EuroQoL-5 Dimension scores, ranging from 0.186 among those with only hypertension to 0.469 among those with hypertension plus CVD, compared with those without a chronic disease (higher scores are indicative of more limitations). The impact of comorbid diseases was greater than that of any single disease except diabetes. CVD had a stronger negative impact on QoL than did any other single disease studied. Whereas the physical elements of QoL were influenced by all diseases, the psychological components were influenced only by hypertension plus diabetes and hypertension plus CVD.

**Conclusion:** We found that both the number and the type of diseases affected QoL scores. Efforts to prevent or manage diabetes, CVD, and related risk factors should include psychological support.

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## Introduction

As the population of the world ages, the proportion of individuals with more than one disease (i.e., comorbidity) is increasing (Piccirillo et al., 2008; Weale, 2009). A previous study showed that the prevalence of comorbid conditions increased with age, from 10% in those 0–19 years of age to 78% in those aged 80 and older (van den Akker, Buntinx, Metsemakers, Roosb, & Knottnerusa, 1998). As in most other countries, in Korea, the number of people at 60 years of age and older is increasing, accounting for approximately 18.0% of the total population in 2011. Indeed, Korea is expected to be the most aged country in the world in 2050 (Korea National Statistical Office, 2006).

The presence of comorbid conditions complicates the relationship between a specific disease and outcome variables (Rijken, Kerkhof, Dekker, & Schellevis, 2005). Data have shown that comorbid conditions were associated with poorer functional status, a higher risk of dying, and greater use of health services (van Weel & Schellevis, 2006). Therefore, efforts to manage chronic diseases should be directed at both the disease itself and the ability to function in daily life, that is, health-related quality of life (QoL) (van Manen et al., 2003). Moreover, the presence of comorbid conditions is a general problem, but the negative effect is greater in older than in younger individuals (Schäfer et al., 2010).

Despite its importance, no accurate definition of comorbidity is available. Valderas, Starfield, Sibbald, Salisburly, and Roland (2009) defined comorbidity as the existence of more than one definite condition in an individual or the co-occurrence of several chronic diseases in one person. Comorbidity has also been defined as the presence of additional diseases in relation to an index disease in one individual (Piccirillo et al., 2008; Weale, 2009). One etiological

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model (Valderas et al., 2009) identified five categories of comorbidity: comorbid conditions with no etiological association, those involving direct causation, those sharing associated factors, those with heterogeneous relationships, and those that are independent. Schäfer et al. (2010) identified three patterns of multimorbidity. The first involved cardiovascular/metabolic disorder, which occurs primarily in elderly individuals, especially in Korea. Indeed, more than 60% of elderly patients suffer from hypertension, and about 22% suffer from diabetes. Moreover, cardiovascular disease (CVD) was the second leading cause of death in Korea, exceeded only by malignant neoplasm (Ministry of Health and Welfare, 2009; Statistics Korea, 2010). Given these data, it would not be surprising if Korean elderly individuals suffered from multiple conditions. Accordingly, this study focused on three diseases (hypertension, diabetes, and CVD) and their comorbid relationships.

Previous studies about QoL in those with hypertension, diabetes, and/or CVD have suffered from several limitations. First, many studies operationalized comorbidity in terms of the number of diseases, severity, or diseases pairs. The first approach simply adds the number of conditions without regard to severity (Lima et al., 2009a,b; Walker, 2007). Comorbidity indices such as the Charlson Index, the Cumulative Illness Rating Scale, and the Index of Coexisting Diseases include both the number and the severity of diseases but do not examine how a specific disease affects QoL when it co-occurs with other diseases (Maddigan, Feeny, & Johnson, 2005; Walker).

Second, several studies exploring comorbidity have relied on a restricted sample (Gijzen et al., 2001) or have presented results without adjusting for age, sex, lifestyle, and so on (Kang, Kim, Park, & Lee, 2006). Additionally, several studies have not included a no-disease group as a control group (Poljčanin et al., 2010). These limitations have made it difficult to judge the degree to which a specific disease reduces QoL.

Third, research on chronic disease-related QoL has focused primarily on analyzing differences in QoL related to specific diseases without considering comorbidity or the comorbidity of serious diseases, such as schizophrenia, cancer, CVD, diabetes mellitus, chronic obstructive pulmonary disorder (COPD), and so on. CVD is the second most common cause of mortality among Korean elderly individuals (Korea National Statistical Office, 2006) and is characterized by a high prevalence as well as long periods of morbidity (Schram et al., 2008). Hypertension and diabetes are frequently associated with CVD (Poirier et al., 2006). These diseases are expected to significantly affect QoL, as they are often not completely treated, require lifestyle changes to manage, and may result in disability if poorly managed (Di Libero, Fargnoli, Pittiglio, Mascio, & Giaquinto, 2001; Guilick, 1997; Kim, Chae, & Cho, 2009). Thus, research regarding the relationship of hypertension, diabetes, and/or CVD with QoL based on population-based data is needed. For these reasons, this study examined the individual and joint effects of hypertension, diabetes, and CVD, which are the most common diseases among Korean elderly individuals, on QoL in this population. Indeed, QoL may differ according to the kind and number of comorbid diseases. We also compared groups of elderly individuals with hypertension, diabetes, CVD, and combinations thereof with a no-disease control group, all of whom were drawn from a national sample, to study differences in QoL.

## Methods

### Study design

This population-based cross-sectional study explored QoL in elderly Korean individuals aged 60 years and older using data collected in the health interviews and health examinations of the

Fourth Korean National Health and Nutrition Examination Survey (KNHANES IV 2008), a nationwide representative cross-sectional survey of the noninstitutionalized Korean population conducted by the Korean Centers for Disease Control and Prevention. This study was approved by the institutional review board of the Korean Centers for Disease Control and Prevention (No. 2008-04EXP-01-C). KHANES IV 2008 used a stratified, multistage, probability-cluster, complex sampling design to select household units based on region, sex, and age. Data were assigned weights to assure the equal probability of being sampled and of covering missing data to represent Korea's population. A total weight was assigned to each participant in three steps: (a) calculation of the base weight (1/final probability), (b) adjustment for nonresponses, and (c) post-stratification adjustment to match the 2005 National Census Registry population control totals. Final probability was calculated by multiplying four factors: the probability of the primary sampling unit being selected (264,186 sampling units), the probability of a segment of the primary sampling unit being selected, the probability of each household being selected (each sampling unit included approximately 60 households), and the probability of an individual being selected. The health interview was performed by trained examiners, and diagnoses were made following scientific and medical principles based on a physician's decision about whether or not participants had a given disease.

### Settings and samples

In 2008, 12,528 subjects were invited to participate in the present study, and 9,744 agreed to do so. The sample for this study was limited to elderly Korean individuals aged 60 years and older who had hypertension, diabetes, and/or CVD or had no disease (controls), yielding a final sample of 1,467 individuals. We limited the final sample to six groups: those with hypertension only ( $n = 712$ ), those with diabetes only ( $n = 168$ ), those with CVD only ( $n = 71$ ), those with hypertension plus diabetes ( $n = 186$ ), those with hypertension plus CVD ( $n = 80$ ), and those with no disease ( $n = 250$ ) (Figure 1). Individuals with other serious diseases such as cancer, COPD, arthritis, and psychosocial problems, were excluded because these conditions exert a negative effect on QoL. Only groups with at least 20 members were used in analyses.

### Measurements and instruments

#### Measures of hypertension, diabetes, CVD, and comorbidity

We compared specific pairs of diseases to assess QoL in elderly individuals with comorbid conditions. Hypertension, diabetes, and CVD were identified based on the health interview and clinical data. Individuals were identified as suffering from hypertension, diabetes, and CVD if they met one of the following criteria according to the health examination: having been diagnosed with or prescribed treatment for one or more of these conditions by a doctor, having a systolic blood pressure of 140 mmHg or higher and a diastolic blood pressure of 90 mmHg or higher (hypertension), or a fasting blood glucose level of 126 mg/dL or higher (diabetes). CVD included angina pectoris, myocardial infarction, and stroke. Comorbidity was defined as having two of the chronic diseases listed above.

Blood pressure was checked using a mercury sphygmomanometer (Baumanometer, W. A. Baun Co., New York, USA). The elderly subjects were asked not to drink caffeine or smoke for 30 minutes prior to the measurement, and all rested for at least 10 minutes before measurement. The blood pressure of all participants was checked twice, separated by a 5-minute interval, and the average of the measurements was used in the final analysis. If the first two measurements differed by more than 5 mmHg, additional

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