Postprint: Health-Related Quality of Life and Its Influencing Factors Among Older Adults with Multiple Chronic Diseases in China

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Abstract

Background With population aging, the prevalence of chronic diseases in China has been increasing year by year, and the situation of multiple chronic conditions has become more common. Currently, research on quality of life in China mostly focuses on specific diseases, such as diabetes, hypertension, cardiovascular diseases, etc., while research on quality of life related to multiple chronic conditions is relatively scarce.

Objective To understand the health-related quality of life and its influencing factors among elderly patients with multiple chronic conditions in China, and to provide a basis for improving the health level of this population.

Methods Using data from the China Health and Retirement Longitudinal Study (CHARLS) 2018, 3,361 patients with multiple chronic conditions aged $\geq$ 55 years with complete key variable values were selected as study subjects. The European Quality of Life Five-Dimension Three-Level (EQ-5D-3L) scale was used to assess health-related quality of life; the age-adjusted comorbidity index was used to calculate ten-year survival rates; Mann-Whitney or Kruskal-Wallis tests and Tobit models were used to analyze factors influencing health-related quality of life.

Results The health utility value of elderly patients with multiple chronic conditions was 0.888 (0.709, 0.964). The dimension with the highest proportion of "some problems" was pain/discomfort [2,430 (72.30%)], while the dimension with the highest proportion of "severe problems" was mobility [593 (17.64%)]. The ten-year survival rate calculation results showed that the highest ten-year survival rate was 90.15%, achieved by only 2.44% (82/3,361) of patients; most patients [848 (25.23%)] had a ten-year survival rate of 21.36%, and 43.59%

(1,465/3,361) of patients had a ten-year survival rate close to 0. Tobit regression results showed that primary school education or above and non-smoking behavior were protective factors for health-related quality of life; female gender, age >60 years, widowed status, self-rated poor health, non-drinking behavior, insufficient or excessive sleep duration, no moderate-intensity physical activity, having four or more chronic diseases, and more than 3 outpatient visits were risk factors for health-related quality of life (P<0.05).

Conclusion The health-related quality of life of elderly patients with multiple chronic conditions in China is relatively poor. Factors such as marital status, education level, sleep duration, physical activity, and number of diseases deserve focused attention. Health lifestyle guidance for elderly patients with multiple chronic conditions should be strengthened to further improve the quality of life of this population.

Full Text

Health-Related Quality of Life and Its Influencing Factors among Elderly Patients with Multimorbidity in China

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Abstract

Background: With population aging, the prevalence of chronic diseases in China is increasing annually, contributing to a growing incidence of multimorbidity. Existing research on quality of life in China has primarily focused on specific diseases such as diabetes, hypertension, and cardiovascular disease, with relatively few studies examining multimorbidity populations. **Objective:** To investigate the health-related quality of life (HRQoL) and its influencing factors among elderly patients with multimorbidity in China, providing evidence for improving health outcomes in this population. **Methods:** Using data from the 2018 China Health and Retirement Longitudinal Study (CHARLS), we selected 3,361 patients aged $ $55 years with multimorbidity and complete key variable data. HRQoL was assessed using the EQ-5D-3L instrument. The Age-Adjusted Charlson Comorbidity Index (ACCI) was used to calculate ten-year survival rates. Mann-Whitney or Kruskal-Wallis tests and Tobit regression models were

employed to analyze factors influencing HRQoL. **Results:** The mean health utility value for elderly patients with multimorbidity was 0.888 (0.709, 0.964). The dimension with the highest proportion of "difficulty" was pain/discomfort [2,430 (72.30%)], while the dimension with the highest proportion of "severe difficulty" was mobility [593 (17.64%)]. Ten-year survival rate calculations showed a maximum rate of 90.15%, achieved by only 2.44% (82/3,361) of patients. The majority [848 (25.23%)] had a ten-year survival rate of 21.36%, while 43.59% (1,465/3,361) had rates approaching zero. Tobit regression revealed that primary school education or above and non-smoking behavior were protective factors for HRQoL, while female gender, age >60, widowhood, poor self-rated health, non-drinking behavior, insufficient or excessive sleep duration, absence of moderate-intensity physical activity, having $ $4 chronic diseases, and >3 outpatient visits were risk factors (P<0.05). **Conclusion:** HRQoL among Chinese elderly patients with multimorbidity is relatively poor, with marital status, education level, sleep duration, physical activity, and disease burden warranting particular attention. Health lifestyle guidance for elderly multimorbidity patients should be strengthened to improve their quality of life.

Keywords: Multimorbidity; Multiple chronic conditions; Health-related quality of life; EQ-5D-3L; Tobit model

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Introduction

As China's population ages, over 180 million elderly individuals currently suffer from chronic diseases, with multimorbidity affecting up to 75% of this population [1]. Multimorbidity leads to physical functional decline, increased economic burden, higher mortality risk, and greater consumption of healthcare resources [2-5], imposing serious negative impacts on both individuals and society. Health-related quality of life (HRQoL) is an indicator that reflects overall health status by measuring the impact of disease, physical or psychological impairment on comprehensive health quality [6]. Multimorbidity, defined as the coexistence of $ $2 chronic conditions in an individual, causes significant declines in physical function and markedly affects HRQoL [7]. International studies have demonstrated that having $ $2 chronic diseases reduces activities of daily living and directly impacts quality of life [8-9]. Domestic research on HRQoL among chronic disease patients has primarily focused on single conditions such as hypertension [10], diabetes [11], and chronic pulmonary disease [12], with limited studies addressing multimorbidity populations. This study analyzed data from 3,361 CHARLS participants aged $ $55 years with multimorbidity to examine HRQoL and its influencing factors, providing evidence to improve health outcomes and advance healthy aging initiatives that enable elderly populations to "live longer and live better."

Methods

1.1 Data Source This study utilized data from the 2018 CHARLS database, which employs multistage random sampling covering 28 provincial-level administrative units and 150 county-level units nationwide. We selected patients aged $ $55 years with $ $2 chronic diseases, excluding those with missing key variable information, resulting in a final sample of 3,361 valid cases. The sample selection process is illustrated in [Figure 1: see original paper].

1.2 Variable Selection Data were extracted from five modules: "Basic Information," "Health Status and Function," "Healthcare and Insurance," "Income, Expenditure and Assets," and "Cognition and Depression." The basic information module included gender, age, education, marital status, and residence. The health status and function module included presence of chronic diseases (hypertension, dyslipidemia, diabetes, heart disease, and 10 other conditions), smoking, alcohol consumption, sleep, physical activity, and self-rated health. Nighttime sleep duration was categorized as insufficient (<7 hours), normal (7-9 hours), or excessive (>9 hours) [13]. Corresponding questions for the EQ-5D-3L instrument were selected from the health status and cognition modules: mobility (DB006: difficulty bending, kneeling, or squatting), self-care (DB017: difficulty cooking), usual activities (DB016: difficulty doing household chores), pain/discomfort (DA041_{W4}: frequent pain), and anxiety/depression (DC011: feeling depressed). The healthcare and insurance module included medical insurance type and outpatient visits in the past month. The income module included annual household income (wages, transfers, agricultural income, business income, and asset rental income).

1.3 Measurements 1.3.1 Comorbidity Index and Ten-Year Survival Rate Calculation

We used the Age-Adjusted Charlson Comorbidity Index (ACCI) to assess comorbidity burden. The ACCI is a scoring system that predicts mortality by classifying and weighting coexisting disease conditions, incorporating information on comorbidity number, severity, and age [14]. ACCI = Comorbidity Index + Age Index. The comorbidity index assigns weighted scores to 19 diseases [15], while the age index adds 1 point for each decade above age 40 (50-59 years: 1 point; 60-69 years: 2 points; 70-79 years: 3 points; $ $80 years: 4 points). Ten-year survival rate (Z) was calculated using the formula:

$$Z = 0.983[e^{(c\times 0.9)}] \quad \text{(Equation 1.3.1)}$$

where c represents the ACCI score.

1.3.2 Health-Related Quality of Life Measurement

HRQoL was measured using the EQ-5D-3L instrument, which comprises five dimensions: mobility, self-care, usual activities, pain/discomfort, and

anxiety/depression. Each dimension has three levels: "no difficulty" (can perform independently), "some difficulty" (can perform with difficulty or with assistance), and "severe difficulty" (cannot perform). Overall health states are converted to utility values using a scoring system. This study applied the health utility value system established by Zhuo et al. [16], with scores ranging from 0.170 to 1.000, where higher values indicate better quality of life.

1.4 Statistical Analysis Data were analyzed using Stata 17.0. Kolmogorov-Smirnov tests indicated that health utility values were not normally distributed, so descriptive statistics were presented as median (P25, P75). Mann-Whitney or Kruskal-Wallis tests were used to compare health utility values across groups. Tobit regression models were employed to calculate partial regression coefficients and 95% confidence intervals, with $P<0.05$ considered statistically significant. Original weights provided by the CHARLS project were applied, and all results presented are weighted estimates.

Results

2.1 Sample Characteristics The final sample included 3,361 elderly patients with multimorbidity, comprising 1,604 males (47.72%) and 1,757 females (52.28%). The mean age was (68.2$±$10.4) years. The majority were married [2,777 (82.62%)], had primary school education or below [1,387 (41.27%)], and resided in rural areas [2,147 (63.88%)]. Approximately half [1,761 (50.40%)] had annual household income <10,000 yuan. Most had urban-rural resident medical insurance [2,346 (69.80%)], and about half [1,644 (48.91%)] rated their health as fair. Non-smokers accounted for 59.92% (2,014/3,361), 69.65% (2,341/3,361) did not consume alcohol in the past year, 43.65% (1,467/3,361) engaged in weekly moderate-intensity physical activity, and the majority [1,703 (50.67%)] had normal nighttime sleep duration (7-9 hours). Most [2,541 (75.60%)] had no outpatient visits in the past month.

2.2 Disease Patterns and Ten-Year Survival Rates Regarding disease count, 2,037 patients (60.61%) had 2 chronic conditions, 808 (24.04%) had 3 conditions, and 516 (15.35%) had $ $4 conditions. The most prevalent individual conditions were dyslipidemia [1,240 (36.89%)], hypertension [1,199 (35.67%)], and digestive diseases [906 (26.96%)]. The most common dyad was hypertension + dyslipidemia [463 (13.78%)], and the most common triad was hypertension + dyslipidemia + diabetes [345 (10.26%)]. Ten-year survival rate calculations showed a maximum rate of 90.15%, achieved by only 2.44% of patients. The largest proportion [848 (25.23%)] had a ten-year survival rate of 21.36%, while 43.59% (1,465/3,361) had rates approaching zero. Detailed distributions are shown in .

2.3 HRQoL Measurement Results Health utility values ranged from 0.170 to 1.000, with a median of 0.888 (0.709, 0.964). Only 8.72% (293/3,361) achieved

the maximum theoretical utility value, indicating no significant ceiling effect. The proportions of patients experiencing difficulty ("some difficulty" or "severe difficulty") across the five dimensions were: mobility 51.74% (1,739/3,361), self-care 20.05% (674/3,361), usual activities 25.59% (860/3,361), pain/discomfort 72.30% (2,430/3,361), and anxiety/depression 62.93% (2,115/3,361). The dimensions with highest rates of "severe difficulty" were mobility (17.64%) and anxiety/depression (15.44%). Detailed distributions are presented in .

2.4 Univariate Analysis of Health Utility Values Univariate analysis revealed statistically significant differences in health utility values across gender, age, marital status, education, residence, household income, insurance type, health status, smoking, alcohol consumption, nighttime sleep duration, moderate-intensity activity, disease count, and outpatient visits ($P<0.05$). Detailed results are shown in .

2.5 Multivariate Analysis of Health Utility Values Tobit regression analysis, using health utility value as the dependent variable and significant factors from univariate analysis as independent variables, showed that education level of primary school or above and non-smoking behavior were protective factors for HRQoL. Risk factors included female gender, age >60, widowhood, fair/poor/very poor self-rated health, non-drinking behavior, insufficient or excessive sleep, absence of moderate-intensity physical activity, having $ $4 chronic diseases, and $ $3 outpatient visits ($P<0.05$). Detailed results are presented in .

Discussion

3.1 Disease Burden and HRQoL Are Concerning Among Chinese Elderly with Multimorbidity Our findings indicate that dyslipidemia (36.89%), hypertension (35.67%), and digestive diseases (26.96%) are the most prevalent chronic conditions among elderly multimorbidity patients. The most common dyad was hypertension + dyslipidemia (13.78%), and 43.59% of patients had ten-year survival rates approaching zero, reflecting the serious threat posed by multiple coexisting diseases. The median health utility value of 0.888 is lower than that reported in developed countries such as Italy (0.93) [17], Germany (0.90) [18], and Australia (0.91) [19], but higher than Asian countries including India (0.85) [20] and South Korea (0.82) [21]. It is also lower than domestic estimates from Yichang City (0.947) [23] and the Pearl River Delta region (0.902) [24], and below values for single chronic disease patients such as hypertension (0.94) [25], diabetes (0.89) [26], and cardiovascular disease (0.91) [27]. This may be partly explained by the relatively low education level in our sample, with 41.27% having primary school education or below and 21.27% below primary school, limiting access to health knowledge and disease prevention information. Additionally, HRQoL decreased with increasing disease count, consistent with Cheng et al. [28], likely due to cumulative physical discomfort and adverse effects of polypharmacy. Jowsey et al. [29]

demonstrated that increasing disease count exponentially raises economic burden, further reducing HRQoL.

3.2 Sociodemographic Characteristics Influence HRQoL Female patients exhibited poorer HRQoL than males, consistent with numerous domestic studies [30-32], possibly because women bear greater burdens of household labor and caregiving while also engaging in physically demanding work, leading to physical exhaustion and psychological vulnerability that may exacerbate chronic disease impacts. Advancing age reduces physiological function, diminishing mobility and self-care capacity while increasing physical and psychological impairment from chronic diseases, thereby lowering HRQoL [33]. Married patients with living spouses had higher HRQoL than other marital status groups, consistent with Dai et al. [34], likely reflecting the positive emotional and practical support provided by partners. Higher education was associated with better HRQoL, possibly because educated elderly have higher incomes, better access to healthcare resources, and greater health awareness.

3.3 Healthy Behaviors and Lifestyles Improve HRQoL Moderate physical activity can slow degenerative changes, increase muscle strength, and improve both physical and mental health by enriching leisure time [35]. Both insufficient and excessive sleep duration reduced health utility values. Shen et al. [36] found that abnormal sleep duration is a risk factor for depression in elderly, while other studies show it increases hypertension risk [37], both reducing HRQoL. Interestingly, alcohol consumption was associated with higher utility values, consistent with Zhao [38] and Wang [39]. While alcohol is a known risk factor for chronic disease, drinking behaviors often occur during celebrations or social gatherings with family and friends, providing positive social interaction and mental health benefits [40-41]. Frequent outpatient visits correlated negatively with HRQoL, consistent with Wang et al. [42], likely because frequent users have poorer baseline health.

Conclusion

HRQoL among Chinese elderly patients with multimorbidity is relatively low. Beyond sociodemographic factors like age, gender, and marital status, unhealthy behaviors and multiple chronic diseases significantly reduce health utility values. While multimorbidity is gaining attention, effective management models remain underdeveloped. Future research should develop targeted interventions for common disease combinations to improve health quality. This study benefits from large, nationally representative CHARLS data and rigorous face-to-face interviews. Limitations include potential bias from using secondary CHARLS data rather than primary EQ-5D surveys, self-reported chronic disease assessment, and cross-sectional design preventing causal inference. Future studies should utilize longitudinal CHARLS data for causal analysis.

Author Contributions: TIAN Wei conceptualized the study and drafted the

manuscript; TIAN Wei and TAO Mengmeng performed data cleaning and analysis; HOU Guoqiang and LI Kunkun revised the manuscript; CAO Wenjun supervised quality control and review.

Conflict of Interest: None declared.

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[**Figure 1: see original paper**] Sample screening flow chart

**** Frequency distribution table of ACCI and 10-year survival rate for elderly patients with multimorbidity

**** Distribution of EQ-5D-3L in elderly people with multimorbidity

**** Comparison of health utility values of elderly people with multimorbidity by characteristics

**** Tobit analysis of influencing factors of health utility value in elderly people with multimorbidity

Note: Figure translations are in progress. See original paper for figures.