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Original Article

Age and Gender Differences in the Relationship Between Self-rated Health and Mortality Among Middle-aged and Elderly People in Taiwan—Results of a National Cohort Study☆

Yu-Ning Hu [1], Pei-Chun Chen [2], Chien-Chi Hsu [3], Hui-Kung Yu [4], Kuo-Liong Chien [2], Chin-Ching Li [5], Gwo-Chi Hu [6] *

[1] Institute of Economics and Social Studies, National United University, Miaoli, [2] Institute of Epidemiology and Preventive Medicine, College of Public Health, National Taiwan University, [3] Department of Psychiatry, Mackay Memorial Hospital, [4] Department of Nursing, School of Nursing, National Yang-Ming University, Taipei, [5] Department of Nursing, Mackay Medical College, New Taipei City, [6] Department of Rehabilitation Medicine, Mackay Memorial Hospital, Taipei, Taiwan

A R T I C L E   I N F O

S U M M A R Y

Background: Self-rated health (SRH) is known to be a valid indicator for the prediction of mortality among middle-aged and older adults, but findings regarding age and gender differences are inconsistent. This study aimed to determine the association of SRH with subsequent mortality risk among middle-aged and elderly people in Taiwan.

Methods: This study was based on data from the "Taiwan Longitudinal Survey on Aging" (TLSA). A total of 2553 men and 2192 women aged ≥ 50 years of age comprised the major analytic cohort (mean age, 66.8 ± 9.1 years). SRH was categorized into good, fair, and poor health. Cox regression methods were used to examine the association between SRH and mortality.

Results: During the follow-up period (median: 10.1 years), 1644 deaths occurred. Participants with poor SRH were at higher risk of mortality [relative risk (RR), 1.35 95% confidence interval (CI), 1.16—1.55)] than those with good SRH. This SRH-mortality association was more pronounced among men (RR, 1.56, 95% CI, 1.30—1.87) than women (RR, 1.01, 95% CI, 0.80—1.27). The associations decreased with increasing age. The SRH-mortality associations were significant for the oldest age group among men, but among women, there was no significant SRH-mortality association across all age groups.

Conclusion: Low SRH was associated with increased risk of mortality among middle-aged and older adults. The association varied across different age and gender groups. The association was strongest in the group of men aged 50—59 years. The factors that might explain the differences in the associations warrant further research.

1. Introduction

Self-rated health (SRH), which constitutes a dynamic evaluation of health, incorporating past health experience with current health conditions and future health expectations, is the most widely adopted tool of health status assessment[1]. SRH has been considered a relevant and important predictor of major health outcomes including morbidity, healthcare utilization, disability, and mortality[2—5].

Although the actual underlying mechanism is still unclear, many studies and meta-analyses have reported that poor SRH was associated with increased mortality risk. The relationship still persisted even after adjusting for demographic, psychosocial, and lifestyle variables and other health indicators[6—8]. Although the association between SRH and mortality is quite consistent in different populations, its strength may differ between men and women, but also by age[9]. Some studies suggested age itself might modify the

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association between SRH and mortality, because the predictive ability of SRH for mortality seemed to decrease with increasing age[10,11], but others showed no association. Although some studies reported a strong association for men[12], others suggested this association was not affected by gender[13]. Moreover, some studies argued that when patient age and other factors are adequately controlled for, the apparent gender difference is often diminished or becomes statistically insignificant[14].

Understanding the different types of association is important when comparing and interpreting the SRH-mortality association among different population subgroups. The aim of our study was to investigate the relationships of SRH and mortality in relation to age and gender.

2. Methods

The analyses were based on the dataset of the "Taiwan Longitudinal Survey on Aging" (TLSA), a nationally representative survey of Taiwanese elderly[15,16]. This ongoing cohort study, which aims to understand the impact of socioenvironmental changes on health, healthcare use, and quality of life, was undertaken by the Bureau of Health Promotion, Department of Health in Taiwan. The survey employed a three stage proportionate sampling process to draw a population-representative sample of older Taiwanese adults. The survey was started in 1990 with an initial cohort of 4049 men and women aged ≥ 60 years. In 1996, 2462 persons aged 50–66 years, drawn using the same methods, were added to maintain and extend the age range of the cohort. Sociodemographic, lifestyle, and health information was collected by in-person interviews using a structured questionnaire every 3 years or 4 years. The 1996 survey served as a baseline for this study. The protocol of the TLSA was approved by a group of government-appointed representatives. All participants signed an informed consent form. The current study was reviewed by the Institutional Review Boards of the Bureau of Health Promotion (Health Promotion Administration, Ministry of Health and Welfare), Taipei City, Taiwan, and the Health and Welfare Data Science Center, Ministry of Health and Welfare has also approved the use of TLSA data. Furthermore, TLSA is population-based with nationally representative samples, and all personally identifiable information is encrypted for patient protection.

2.1. Assessment of SRH

SRH was assessed at baseline by a single item: "Regarding your state of health, do you feel it is very bad, bad, fair, good, or very good?" Given the low frequency of responses in the extreme categories, we modified the SRH variable by combining the two highest categories (good SRH) and the two lowest categories (poor SRH), as others have done[17,18].

2.2. Covariate measurements

Demographic variables included age, gender, education, marital status, occupation, and satisfaction with economic status. Educational level was divided into illiterate, elementary school, high school, or college degree or above. Marital status was categorized as with or without spouse. Occupational status was classified as working or nonworking. Satisfaction with economic status was defined as satisfied or dissatisfied. Functional disability included activities of daily living (ADL) and instrumental ADL (IADL). ADL disability was defined as having difficulty or partial difficulty with one or more of the following items: dressing, washing, bathing, eating, transferring, using the toilet, and incontinence. Disability in IADL included 10 items: grooming, housework, preparing meals,

doing laundry, going outside, using public transportation, shopping, managing money, using the telephone, and taking medicine.

Chronic medical conditions included the presence of stroke, heart disease, diabetes, hypertension, cancer, and arthritis, which were diagnosed by physicians. The participants were categorized into three groups on the basis of the number of chronic medical conditions they had (none, 1, or more than 2). Alcohol drinking status was defined as nondrinker or current drinker, and smoking status as nonsmoker or current smoker. Participants engaging in at least three activity sessions per week were classified as highly physically active and those with less than three as having a low level of activity. Depressive syndromes were assessed using the Center for Epidemiologic Studies Depression Scale. A cut-off score ≥ 10 for depression was used.

Mortality data were taken from the TLSA and confirmed by the National Death Register in Taiwan. The date and cause of death according to the International Classification of Diseases, 9th revision were recorded. Follow up was started at baseline and ended on December 31, 2007.

2.3. Statistical analysis

Participants were classified on the basis of categories of SRH. Demographic data were expressed as proportions for categorical variables. The baseline characteristics of different SRH groups were compared using Chi-square tests. Death rates were estimated using the Kaplan−Meier product-limit method, and the death rates of participants by SRH groups were compared using the log-rank test. To examine the SRH-mortality association, Cox proportional hazard regression analysis was used to calculate the crude and adjusted relative risk (RR) with 95% confidence intervals (CIs). The good SRH group was used as a reference. Analyses were adjusted for the following potentially confounding factors: demographics, health behavior, chronic disease, and physical function. We also examined relative risks in subgroups, stratified by gender and age groups (age 50–59, age 60–69, and age ≥ 70). The likelihood-ratio test was used to evaluate the association between SRH and mortality modified by age and gender. All tests were two-tailed, and a p value < 0.05 was considered statistically significant. Analyses were carried out using SAS, version 9.2 (SAS, Cary, NC, USA).

3. Results

Table 1 shows the baseline characteristics in relation to the SRH categories. Overall, 196 (4.1%) of the participants reported "very poor health", 1197 (26.3%) reported "poor health", 1605 (33.8%) reported "fair health", 1089 (23.1%) reported "good health", and 658 participants (13.8%) reported "very good health" at baseline. Participants with worse SRH were more likely to be female, older, nonworking, less educated, and physically inactive, and to smoke, drink alcohol, live without a spouse, have more chronic diseases, and have a high prevalence of ADL disability and IADL disability.

During a median follow up of 10.1 years, 1644 of 4745 participants (34.6%) had died. The most common causes of mortality were cancer (26.2% of deaths), cardiovascular disease (25.3% of deaths), and respiratory disease (12.5% of deaths). The survival rates differed significantly relative to the categories of SRH ($p < 0.001$, log-rank test). The mortality rate in the poor SRH group was approximately two times higher than that in the high SRH group. Survival curves are illustrated in Figure 1.

Table 2 shows the association between categories of SRH and the risk of mortality. The RR of mortality for individuals with poor SRH, compared with those with good SRH, was 1.35 (95% CI, 1.16−1.55). A significant linear trend of an increased RR with categories of SRH was found (p for trend < 0.001), which indicated a