Alleviating Socioeconomic Disparities in Disability Progression through Healthy Lifestyle: Prospective Cohort Studies in China and South Korea

Extended Abstract

1. Introduction

Increased age is associated with a higher risk of degenerative diseases among older people, which leads to progressive disability [1]. Both China and South Korea are experiencing rapidly aging populations and share similarities in social contexts. However, By 2020, the proportion of older adults aged 65 and older has risen to 16% in South Korea and 13% in China [2]. The increasing aging population implies a likely rise in the number of disabled older people. In 2021, the estimated number of disabled people reached three million in South Korea and 85 million in China [3,4]. Previous research reported that the prevalence of disability among the old population has exceeded 18% in South Korea and reached 15% in China in 2015-2016 [5,6]. It is essential to explore the principles governing the development of human society in the context of aging populations.

Research has demonstrated the profound impact of maintaining healthier lifestyles on various aspects of older people's well-being, including functional maintenance [7]. However, the impact of healthy lifestyles on disability may not be uniform across different socioeconomic backgrounds. Both income and educational achievements play a critical role in shaping individuals' capacities and resources to engage in and maintain healthy behaviors [8]. As a result, socioeconomic disparities may contribute to lead to variations in the adoption and maintenance of healthy lifestyles among older adults [8]. Furthermore, disability is a costly condition requiring long-term care, and the care provision differs depending on socioeconomic status [9]. Disabled individuals from low socioeconomic backgrounds are confronted with barriers to accessing needed care due to financial constraints [9].

This study focused on South Korea and China due to their similar aging challenges and social contexts, yet distinct differences in the aging process, economic development, and long-term care systems. This prompts an investigation into how healthy lifestyles may differently alleviate socioeconomic disparities in disability progression among older adults. In 2018, South Korea transitioned into an aged society and is expected to reach super-aged status by 2025 [10]. In contrast, China is currently classified as an aging society [10]. Furthermore, South Korea, as a developed nation, has experienced more equitable economic growth and maintains a lower Gini Index compared to China (in 2008: 0·13 in South Korea vs. 0·43 in China) [11]. Additionally, South Korea has implemented a nationwide long-term care insurance (LTCI) program, which caters to the needs of older adults requiring assistance with daily activities. In contrast, China's LTCI program is still confined to pilot cities and excludes most rural residents [12].

Although existing literature has identified the benefits of healthy lifestyles on functional maintenance [1], critical research gaps continue to exist. Firstly, researchers also have not gone far to examine the effects of lifestyles on disability progression among socioeconomically disadvantaged older people. Secondly, lifestyle choices are closely intertwined with socioeconomic status [8]. The differential effects of lifestyles in mitigating disparities in disability progression in relation to income and educational levels have not been thoroughly investigated. Limited data availability has led to a scarcity of cross-nation comparative studies investigating whether healthy lifestyles can help reduce socioeconomic-related differences in disability progression among older adults. Fortunately, the cohorts of older adults in South Korea and China provide the possibility for international comparison. This comparative cohort study will not only provide valuable empirical evidence for identifying older people at risk of accelerated disability but also contribute insights into strategies for alleviating socioeconomic disparities in disability within the global community.

Thus, drawing data from the Korean Longitudinal Study of Aging (KLoSA) and the Chinese Longitudinal Healthy Longevity Survey (CLHLS) collected between 2008 and 2018, this study aimed to investigate the role of healthy lifestyles in mitigating socioeconomic disparities in disability progression among older adults in South Korea and China.

2. Data

2.1 Study design and participants

This study drew data from KLoSA and CLHLS, collected in four waves: 2008, 2011-2012, 2014, and 2018. KLoSA is a nationwide survey conducted every two years since 2006, targeting non-institutionalized Koreans aged 45 or older [13]. CLHLS is also a nationally representative and prospective cohort that has been conducted since 1998, covering the population aged 45 and above [14]. Both KLoSA and CLHLS employed a multistage, stratified cluster sampling design to collect information on physical function, lifestyles, and socioeconomic characteristics [13,14]. The KLoSA and CLHLS datasets have minimal missing values for most items, with an item non-response rate of 2% or less [13,14]. Thus, the measurements included in KLoSA and CLHLS align well with the objectives of this study.

Considering the differences in the age profile between the two datasets, we applied an age threshold (60-90) at baseline to result in a fairly comparable age measure. This study initially involved 10159 participants who were assessed in both the baseline (first survey) and the second survey. Subsequently, we excluded 528 participants lost to follow-up before the third survey and an additional 1227 participants before the fourth survey. Finally, our study population consisted of 8 404 participants, comprising 3952 from the KLoSA cohort and 4452 from the CLHLS cohort.

2.2 Measurements

The outcome of the disability analysis is the disability progression, identified based on activities of daily living (ADL) limitations. KLoSA and CLHLS assessed the severity of individuals' needs for assistance in six ADL items: eating, dressing, bathing, toilet use, continence, and transferring [13,14]. Each item was graded on a scale of three: 0 = no limitation, 1 = partial limitation, and 2 = totally limited. We summed up the scores of the six ADL items to create a continuous variable: disability score, ranging from 0 to 12, where a higher score indicates greater disability. Disability progression was assessed by calculating the rate of change in disability scores. This rate was calculated as the difference between the disability score at baseline and the last survey when the individual reported the disability score, divided by the number of years between the two assessments ((disability score at baseline − disability score at the last survey when the individual reported the disability score)/the interval between two assessments, in years) [15]. Subsequently, we categorized the rate of change in the disability score into three groups: no disability (a rate of change in disability score equal to or greater than zero, the reference group), gradual disability (a rate of change in disability scores below zero but equal to or greater than the median of those showing disability), and accelerated disability (a rate of change in disability score less than the median of those showing disability) [15].

This study focuses on three variables of interest: the healthy lifestyle score (HLS), equivalized income, and education. Firstly, we assessed lifestyle status by four modifiable lifestyle factors: smoking, drinking alcohol, physical activity, and social contact [16,17]. The categories of non-current smoking and non-current drinking were deemed as the healthy level [16]. For physical activity, KLoSA asked, 'Do you exercise at least once a week', while CLHLS asked 'Do you exercise at present'. To harmonize the data, we considered individuals as 'healthy' if they reported exercising at present or at least once a week [18] (regular exercise thereafter). Similarly, for social contact (participation in social activities, visiting friends or relatives), we considered individuals as 'healthy' if they engaged in social contact at least once weekly in this study (weekly social contact thereafter). For each lifestyle factor, we created a dichotomized variable assigning 1 point for the healthy level and constructed an HLS variable, ranging from 0 to 4, with higher scores indicating healthier lifestyles. Secondly, regarding equivalized income, we adjusted the household income from the previous year for inflation and expressed in 2008 prices using the Consumer Price Index [19]. We further adjusted this variable by the household size using the equivalence scale method, then logarithmically transformed it, and applied winsorization at the 0.5% quantile on both ends [20]. Thirdly, the education variable in this study is a binary variable 'illiteracy': 0= 'literate' (≥1 year of schooling) and 1 = 'illiterate'.

Guided by previous studies [14], the covariates in this study include age (years), gender, marital status, self-rated health, number of chronic diseases, and social health insurance (SHI).

3. Methods

Our empirical strategies consist of three steps. In the first step, as noted in the measures section, disability progression was modeled as a categorical variable (no disability, gradual disability, and accelerated disability). The individual weight was applied to the summary statistics. In the second step,

logistic regression models were established to explore the association between lifestyle, socioeconomic factors, and disability progression. All control covariates were included in the logistic regression models. *P*-value less than 0·05 was considered statistically significant and coefficients along with the 95% confidence interval (CI) were reported in the models. In the third step, subgroup analyses were conducted to examine the relationships between healthy lifestyles and disability progression among individuals in different income tertiles and educational levels. The coefficients of HLS for these subgroups were compared to examine the role of healthy lifestyles in alleviating socioeconomic inequalities within disability.

Finally, additional analyses were also conducted to ensure the robustness of the findings. This study first substituted the binary 'education' variable with a categorical variable (no formal education (the reference group), primary or secondary education, and high school education or above). Furthermore, considering socioeconomic status might be associated with place of residence [12], this study repeated the logistic regression analyses by further adjusting for place of residence as an additional covariate. Place of residence is a binary variable defined as 'rural' and 'urban' areas (the reference group). All statistical analyses were performed through Stata 17.

4. Findings

4.1 Added value of this study

The novelty of this study lies in examining the differential impact of adopting healthier lifestyles on mitigating socioeconomic disparities in disability progression among older adults, using nationally representative cohorts from China and South Korea. The result of this study shows that in South Korea, healthier lifestyles can potentially reduce accelerated disability risk for socioeconomically disadvantaged older adults but not for those with higher socioeconomic statuses. Conversely, in China, this impact is stronger for individuals from higher socioeconomic backgrounds. While adopting healthier lifestyles may help alleviate socioeconomic disparities in disability progression among older people in South Korea, its effectiveness seems limited in China.

4.2 Implications of all the available evidence

In developed countries like South Korea, which have entered the aged society, attention needs to be directed towards socioeconomically disadvantaged groups to improve their healthy lifestyles and reduce health inequalities. In rapidly aging developing countries like China, the lower socioeconomic segments display a higher propensity for unhealthy lifestyle choices; thus, interventions promoting healthy lifestyles are crucial, particularly among marginalized populations in impoverished regions. Considering China is actively engaged in poverty alleviation efforts, there should be a simultaneous emphasis on enhancing health literacy to delay disability onset among vulnerable groups and prevent the risk of households slipping back into poverty.

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