



The mediating role of depression on the relationship between housebound status and cognitive function among the elderly in rural communities: A cross-sectional study



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ABSTRACT

Objective: To explore the relationship among housebound status, depression and cognitive function, and further to study whether depression can take on a mediator among elders in rural communities.

Methods: A cross-sectional survey was conducted among 720 community residents aged ≥ 60 years from March to May in 2016 in Hebei province, China. We used the Chinese version of Housebound scale, the Rasch-Derived of the Center for Epidemiological studies Depression scale (CES-D-R), and the Minimal State Examination Scale (MMSE) to estimate housebound status, depression, and cognitive function separately. Correlation, multiple linear regression, and structural equation modeling was used to data analyses.

Results: 712 completely replied questionnaires were finally used in the data analyses among 720 questionnaires, which indicated that effective response rate was 98.9%. Results indicated that the scores of housebound status were positively correlated with the MMSE scores. Being housebound correlated negatively with MMSE scores. Housebound status and three dimensions of CES-D-R (i.e. negative affect, positive affect, and interpersonal problems) were deemed as significant predictors of cognitive function among rural elders. The effect of housebound status on cognitive function was fully mediated by depression.

Conclusions: Not all subscales of CES-D-R can affect MMSE scores among rural elders. There may be full mediation effects of depression within the impact of housebound status on cognitive function, mainly through negative affect, positive affect and interpersonal problems. It indicates that preventing the elderly from housebound status could relieve the decline of cognitive function by the intermediary role of depression.

1. Introduction

The Chinese population has begun aging and will continue to age rapidly in the future. It has been estimated that the elderly population will reach more than 400 million by 2050 (Wang, Li, Shen, & Wang, 2013). Consequently, China is facing a growing elderly population which comes along with its ensuing challenges to health-care systems in the country. As a result, age-related diseases have gradually become an emergency, of which dementia is a primary concern (Li et al., 2013). Alzheimer's disease (AD) is a degenerative brain disease and the most common cause of dementia (Barker et al., 2002; Wilson et al., 2012), which accounts for 60% to 80% of dementia. But due to incomplete understanding of its complicated pathology, available treatments for AD have limited ability to modify the disease. Currently available interventions demonstrate only modest benefits on cognitive and global

ability (Herrmann, Chau, Kircanski, & Lanctot, 2011). Deaths from AD have gradually increased (2016 Alzheimer's disease facts and figures); this situation is more serious in developing countries, which have a larger population base and poorer financial status.

Mild cognitive impairment (MCI) may occur several years before a clinical diagnosis of dementia and increases risk of developing dementia at an early stage. To some extent, MCI has been thought of a distinct stage between normal cognitive aging and dementia (Kaduszkiewicz et al., 2014; Mariani, Monastero, & Mecocci, 2007; Petersen et al., 2009) or regarded as an early stage of AD (Areosa & Grimley, 2002). Up to now, no effective medicine has been available for the prevention and treatment of AD. Cognitive disorder is the main clinical factor of MCI. Therefore, it is critical to identify potentially protective factors that guard against cognitive disorders to prevent the normal elderly from further developing into AD. Epidemiological

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findings indicated that depression was a preventable risk factor for normal subjects progressing to cognitive disorders (Byers & Yaffe, 2011; Lavretsky, 2016; Steenland et al., 2012). Ulbricht found that 26% of newly admitted nursing home residents had depression; 47% of these residents also had cognitive impairment. Of those who had staff assessments of depression were more commonly experienced by residents with cognitive impairment than residents without cognitive impairment (Ulbricht, Rothschild, Hunnicutt, & Lapane, 2017).

“Homebound” is also called “Housebound”. It was defined as going out of the house once a week or less (Cohen-Mansfield, Shmotkin, & Hazan, 2010). Previous studies found that elder age, lower education leave (Bruce & McNamara, 1992), lower income, arthritis (Ganguli, Fox, Gilby, & Belle, 1996), without physical exercise (Jing, Wang, & Zhang, 2015) were risk factors of being housebound. In 2015, Jing conducted a study to examine the prevalence and influencing factors of housebound among community elderly in Hebei province (Jing et al., 2015). They found that the prevalence of homebound was 15.8% among the 1359 elderly. Another study reported that up to 17% of homebound elders have undiagnosed cognitive impairments (Setter et al., 2009). Community-based studies also found that being housebound was significantly associated with more depressive symptoms and higher prevalence of cognitive disorders (Fujita et al., 2006; Ganguli et al., 1996; Zeltzer & Kohn, 2006). Therefore, there is plentiful theoretical support in the existing literature for depression as a mediator of housebound on cognitive function, without the relationship being tested previously. To figure out this issue based on the present research we try to analyze the association between housebound status and cognitive function, and the latent mediating effect of depression on this relationship among rural elders. We strive to understand the complexity of how housebound status influences cognitive function better and offer a reference for further cohort study.

2. Methods

2.1. Participants and data collection

A cross-sectional survey on the rural elderly aged ≥ 60 years was conducted in Qian'an, Hebei province from March to May in 2016. We chose one town conveniently, and nine villages were selected from all thirty-six villages in this town. Finally, the target number of participants was decided by the criterion raised by Kendall in 1975 (i.e. 10-fold the number of items). Three measurements covered 44 items in total, so a sample of 440 elderly people was needed. Given the greater sampling error of convenience sampling, finally, 712 subjects took part in this investigation.

Before the investigation, in order to reduce the error, all the interviewers were trained. The content of training included the purpose, method and meaning of this study. In the course of this investigation, all the investigators took surveys in household. We went home of the elders to carry out a questionnaire survey face-to-face. The elderly were taught systematically to confirm that everyone who agreed to take part in this survey could fully understand each item before response. And then these questionnaires of which being less than 80% completed or low writing quality were excluded from this survey.

2.2. Instruments

2.2.1. Depression

The Rasch-Derived of the Center for Epidemiological studies Depression Scale (CES-D-R) is a valid and reliable questionnaire for measuring depression (Cole, Rabin, Smith, & Kaufman, 2004; Feng, Guo, & Liu, 2016). In this instrument, 10 individual items generate four dimensions: negative affect, positive affect, somatic and retarded activity, and interpersonal problems. The dimension of negative affect represents negative emotion in daily life. The represented item of this dimension is that I feel lonely. The dimension of positive affect

represents positive emotion in daily life. The represented item of this dimension is that I am hopeful about my future life. The dimension of somatic and retarded activity represents physical factors. The represented item of this dimension is that I feel that doing anything is hard. The dimension of interpersonal problems represents relationships with others. The represented item of this dimension is that I don't think people are very friendly to me. Each item of the CES-D-R is scored between 0 and 3, and two of them reversed scored (item 3 and 6). The total score range from 0 to 30. The higher scores indicate the severity of depression. In the present study, the Cronbach's α coefficient was 0.735.

2.2.2. Cognitive function

The Minimental State Examination Scale (MMES) has been widely used to measure cognitive function and is highly reliable and valid (Mamikonyan et al., 2009). This scale is composed of 30 items and 5 subcategories: orientation of time and place, language (including repeat, denomination, command understanding), mental arithmetic, immediate and short-term auditory word memory, structure of the imitation. Making a correct note with 1 point and a wrong note with 0 point, the total score range from 0 to 30. The respondents would be recognized as cognitive disorders if they get a MMES global score < 17 in the group of lacking of education (years of schooling = 0), < 20 in the primary sections (years of schooling ≤ 6), and < 24 in the junior high school sections and above. In the present study, the Cronbach's α coefficient was 0.875.

2.2.3. Housebound

The Chinese version of Housebound scale including two subscales is used to measure the housebound in the elderly (Wang, Guo et al., 2013). The first subscale is used to measure whether the elderly are housebound status. And the second one is used to measure the reasons of being housebound status. Only the first sub-scale being used in this study as we just talked about the housebound status. The first subscale includes 4 items: 1. Do you spend more time at home than going out, and it often occurs? 2. How many times do you go out due to shopping, walking and going to the hospital? ((1) More than once a day (2) Two or three days at a time (3) once a week (4) Hardly ever go out) 3. How often do you meet or communicate with friends, neighbors or relatives working outside? ((1) Two or three days at a time (2) once a week (3) once a month (4) Hardly ever) 4. If you go out, do you need help? Two of them are yes-no question (item 1, 4), making a yes note of 2 points and a no note of 1 point; two of them are scored between 1 and 4 (item 2, 3). The higher scores indicate the severity of housebound status. In the present study, the Cronbach's α coefficient was 0.810.

2.3. Statistical analyses

Data analyses was performed with SPSS version 23.0 (IBM Corporation, Armonk, NY, USA) and AMOS version 23.0 (IBM Corporation, Armonk, NY, USA). Those participants with missing data were excluded. Descriptive statistics for socio-demographic variables, housebound status, depression, and cognitive function scores were presented using frequencies, percentages, means, and standard deviations. Correlation coefficients were used to examine the relationship among the housebound status, depression dimensions, and cognitive function dimensions. Multiple linear regression was used to evaluate whether housebound status and depression could significantly affect the outcome variable of cognitive function. Epidemiological investigations of cognitive function

showed that age, sex, marital status, education level and self-assessment of health were closely related to the prevalence of cognitive disorders (Li et al., 2013; Luck, Luppá, Briel, Matschinger et al., 2010; Sun, 2008; Unverzagt et al., 2011). Thus, five socio-demographic variables (i.e. age, sex, marital status, education level and self-assessment of health) were admitted in Model I to control their effects. At the

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