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Fall prevalence, time trend and its related risk factors among elderly people in China

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ABSTRACT

Objectives: To study the fall prevalence, time trends and related risk factors among elderly people in the Chinese mainland from 2011 to 2013.
Methods: Our data were from China Health and Retirement Longitudinal Study in 2011 and 2013. The population sample included people aged 60 years and over. Whether the person had experienced fall accident in the last two years was used to measure fall incidence. The time trend and age groups were investigated through the chi-square test. The related risk factors were examined based on the binary logistic regression model.
Results: In 2011, 19.64% (95% CI, 18.66%, 20.67%) of elderly people experienced fall incidents and in 2013, 19.28% (95% CI, 18.46%, 20.13%) of elderly people experienced fall incidents. However, no significant difference was seen in the fall prevalence between 2011 and 2013. The fall prevalence among elderly people aged 66–70 declined significantly while that among people aged over 80 showed an increasing time trend. The fall prevalence was affected significantly by factors including age (66–70), gender, marital status, self-rated health, quantity of chronic diseases, quantity of disability items, activities of daily living and physical functioning.
Conclusions: It is revealed the fall prevalence showed no increment from 2011 to 2013 but at a high level. More efforts should be made to reduce the fall prevalence, and special attention should be paid to the elderly people aged over 80 and older.

1. Introduction

A fall is an accidental event that occurs when a person loses his balance and his center of gravity causes him to descend to the floor or other lower surface (Ungar et al., 2013). According to the World Health Organization's estimation, there are nearly 424,000 fatal fall incidents each year, which has become a common, challenging and dangerous public health problem. Falls can cause many severe consequences such as mobility restriction (Kosorok, Omenn, Diehr, Koepsell, & Patrick, 1992), the ability decline in conducting activities such as dressing, bathing, shopping or housekeeping (Tinetti & Williams, 1998) and loss of confidence (Sherrington & Tiedemann, 2015). Furthermore, falls can cause serious injuries including head trauma, laceration (Rubenstein & Josephson, 2002), fractures of the hip, spine, upper arm, forearm and bones of the pelvis, hand and ankle (Stevens & Olson, 2000). Falls deliver high burden to health care utilization, long-term pain and functional impairment (Hartholt et al., 2011). In the USA, estimates demonstrate that falls result in $19 billion annual cost (Stevens, Corso, Finkelstein, & Miller, 2006). Fall is somewhat delicate for elderly people since it happens more regularly to them because of their aging frailty.

China is challenged on a rapid aging speed. As indicated by 2010 censuses, the number of people aged 60 years and over exceeds 177 million (National Bureau of Statistics, 2010). It's expected that by 2050 the aging population of China will achieve an incredible level as many developed countries nowadays (Zhao, Smith, & Strauss, 2014). Fall and its affiliated injuries place high pressures on both the national health care and medical cost (Wang, Chen, & Song, 2010). Prior studies about fall research in China mainly concentrate on the circumstances (Pi, Hu, Zhang, Peng, & Nie, 2015), the incidence and prevalence (Jiang et al., 2015), epidemiology, risk factors and clinical strategies for fall or its affiliated injuries (Wang et al., 2010). However, previous studies don't provide comprehensive depiction of demographic and health characteristics about fall due to absence of representative national data. Meanwhile, nearly all of these studies exclude time trend. Time trend is critical because it provides dynamic information about fall prevalence to enable present better preventive project help design care policies on elderly people and allocate the health resources to fall prevention.

Abbreviations: BMI, body mass index; ADL, activities of daily living; IADL, instrumental activities of daily living; PF, physical function

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Considering the serious health outcomes of fall, the intensive health care, limited financial budget, enormous number of elderly population and the rapid aging speed in China, more comprehensive researches about fall are necessary and urgent, especially on time trend. In this research we aim to: (1) estimate the time trend of fall prevalence over the period 2011–2013; (2) examine the fall incidence among the elderly in the Chinese mainland based on different age groups; (3) distinguish the risk factors of fall incidence.

2. Methods

2.1. Study design and population

Data in this study originated from the China Health and Retirement Longitudinal Study (CHARLS) 2011 (n = 17,500) (Zhao et al., 2012) and 2013 (n = 18605) (Chen, Smith, Strauss, Wang, & Zhao, 2015). CHARLS adopts a multi-stage stratified PPS sampling, which provides a representative sample of national population. The individuals in CHARLS will be followed up every two years. CHARLS aims to gather high-quality data on demographic, family structure or transfer, health status and functioning, biomarkers, health care and insurance, retirement and pension, income and consumption, assets, and community-level information. More details of CHARLS information can be found on the official website. For our study and concerning the Chinese aging policies, we included people who were 60 years and older.

The variables used in this paper were coded according to a series of questions. Fall was assessed from the following question: have you fallen down in the last two years? If the answer is “no”, the value of the variable is coded as “0” following the answer is “yes” with the variable set as “1”.

Socio-demographic characteristics include age, gender, marital status, registered residence, educational level, annual household income, insurance. We classified age into five groups: 60–65 years, 66–70 years, 71–75 years, 76–80 years and over 80. For marital status, we had two levels: married or unmarried. We considered the marital status answer “separated”, “divorced”, “widowed” or “never married” as unmarried. And we treated “cohabit” as married. Registered residence implied whether a man lived in rural or urban areas. Registered residence could be changed only if a person completed a series of official transfer procedures. Here we focused on the individual’s current registered residence status: rural or urban. Concerning the educational level, we sorted the individual who did not complete primary school to illiteracy group. We assigned the older-style private school to primary school. Annual household income was figured based on the summary of the following six sections: (1) wage and salary income, (2) individual transfer income, (3) agricultural income, (4) self-employment income, (5) governmental transfer income, and (6) capital income. China mainly had nine types of insurance: (1) urban employ medical insurance; (2) urban resident medical insurance; (3) new cooperative medical insurance; (4) urban and rural resident medical insurance; (5) government medical insurance; (6) medical aid; (7) private medical insurance bought by respondent’s union; (8) private medical insurance bought by individual and (9) other medical insurance. When the respondent said he held any one of the insurance above, we coded the insurance variable as “1”, otherwise it would be set as “0”.

We evaluated self-rated health from the accompanying two questions: (1) how would you rate your health status? Would you say your health is very good, good, fair, poor or very poor? (2) Would you say your health is excellent, very good, good, fair or poor? All respondents would be solicited to answer one of the two questions as indicated by the predefined rule. The answer: very good, good, or excellent was assigned with “1” while fair, poor or very poor was set as “0”. We figured the BMI index based on the body weight and height of the physical examination data. We sorted the BMI into three levels: (1) BMI $<$ 25, (2) BMI $>$ $=$ 25 and BMI $<$ $=$ 30, and (3) BMI $>$ 30.

Regarding the chronic disease status, we ascertained quantity of the chronic diseases diagnosed by a doctor for each respondent. The question was: have you been diagnosed with [disease listed below, read one by one] by a doctor? There were 14 sorts of chronic disease in the answer list: (1) hypertension, (2) dyslipidemia, (3) diabetes or high blood sugar, (4) cancer or malignant tumor, (5) chronic lung diseases, (6) liver disease, (7) heart disease, (8) stroke, (9) kidney disease, (10) stomach or other digestive disease, (11) emotional, nervous, or psychiatric problems, (12) memory-related disease, (13) arthritis or rheumatism and (14) asthma. Once the respondent had one type of above chronic diseases, the variable value would plus one. The maximum value for chronic status was 14, and the base was 0. The disability coding guideline was similar to the chronic disease status. We computed the disability variable based on this question: do you have one of the following disabilities? Five answers: (1) physical disabilities; (2) brain damage/mental retardation; (3) vision problem; (4) hearing problem and (5) speech impediment were provided. The maximum value of the disability variable was 5 with the minimum one as 0. Activity of daily living (ADL) was surveyed by these questions: because of health and memory problems, do you have any difficulty with dressing, bathing or showering, eating such as cutting up your food, getting into or out of bed, using the toilet, including getting up and down, controlling urination and defecation? If the answer was “no, I don’t have any difficulty”, at that point we would consider he had no difficulty and coded it as “0”, otherwise if the answer was the following ones: “I have difficulty but can still do it”, “yes, I have difficulty and need help” or “I can’t do it”, it would be coded as “0” as for such answer we considered he had difficulty regardless of what the difficulty level was. We computed the aggregate of the above each item as the value of ADL. Instrumental activity of daily living (IADL) was similar to ADL with the difference existing in the inquiry items. The inquiry items for IADL were: doing household chores, preparing hot meals, shopping for groceries, making phone calls, taking medications, managing money. Physical functioning’s (PF) count complied with the same rule as ADL or IADL but had more items. The items were used to assess PF including running or jogging about 1 km, walking 1 km, walking 100 m, getting up from a chair after sitting for a long time, climbing several flights of stairs without rest, stooping, kneeling or crouching, reaching or extending your arms above the shoulders, lifting or carrying over 5 kg such as a heavy bag of groceries, picking up a small coin from a table.

2.2. Statistical analysis

All of our work was performed through R language programming (R Core Team, 2016). First, we conducted the descriptive statistics analysis of the variables in 2011 and 2013 survey data. Then we compared the fall incident prevalence and time trend through the chi-square test for the period 2011–2013 according to the classified age groups. The annual fall incident prevalence was also calculated and compared with this period. A binary logistic regression model was used to identify the related risk factors. We estimated the coefficients and odds ratios with 95% confidence interval for the logistic regression model.

3. Results

Table 1 demonstrated the variable distribution according to study of the elderly in this research. In 2011, there were 6114 elderly people in the study, and in 2013, 8683 elderly people were incorporated. Over the period 2011–2013, the mean age increased a little but notably (2011: 68.2 $\pm$ 6.7; 2013: 68.5 $\pm$ 7.12; $p < 0.01$). More in detail for age groups, we found the number of elderly people in age group 66–70 and over 80 increased significantly while other age groups did not. The gender proportion kept stable in this period and so did the marital status. There was a little higher proportion of female elderly people than male and for the marital status, married elderly people were three times more than unmarried elderly people. However, the registered residence percentage changed significantly. We found that elderly

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