Risk factors for depression among elderly subjects with hypertension living at home in China

Lina Ma¹,², Zhe Tang¹, Fei Sun¹, Lijun Diao¹, Yun Li², Jieyu Wang², Ming Feng², Yuying Qian²

¹Department of Epidemiology and Social Medicine, Xuan Wu Hospital, Capital Medical University, Key Laboratory for Neurodegenerative Disease of Ministry of Education, Center of Alzheimer’s Disease, Beijing Institute for Brain Disorders, Beijing 100053, China; ²Department of Geriatrics, Xuan Wu Hospital, Capital Medical University, Beijing 100053, China

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Abstract: Objective: Studies of factors associated with symptoms of depression in the elderly in China are scarce, especially for those with hypertension residing at home in the general population. Methods: We conducted a cross-sectional study to determine the risk factors for depression in a hypertensive population residing in Beijing in 2004. The sample population consisted of 1064 people aged ≥ 60 years dwelling in an urban district, a suburb, and in mountain country. Statistical sampling techniques included cluster, stratification, and random selection. Trained staff using a comprehensive geriatric assessment questionnaire, a standard survey instrument in China, completed the assessments. During person-to-person interviews, data were collected regarding demographic characteristics and living and health conditions. Results: Symptoms of depression were scored according to the Center for Epidemiologic Studies-Depression (CES-D) screening test. We showed that factors that were associated with a higher incidence of depression were living in a rural area, being illiterate, without a mate, low income, experiencing a significant stressful life event, poor sleep pattern, poor functional status, and poor cognitive function. Logistic regression analysis indicated that elderly participants with hypertension were significantly more likely to develop depression symptoms under conditions of illiteracy, experiencing a significant stressful life event, poor sleep habits, and poor functional status. Conclusions: Our study determined risk factors for depression in elderly patient with hypertension, and these risk factors are modifiable. This indicates that depression in these patients can be prevented by appropriate lifestyle changes and psychological health education.

Keywords: Hypertension, depression, geriatrics

Introduction

Hypertension is a common disease that compromises the health of the elderly. It is a main risk factor for stroke, heart disease, and renal failure [1]. The prevalence of hypertension was about 27.2% in the year 2000 in China [2], and is increasing year-by-year [3].

Primary hypertension has psychosomatic aspects and has been associated with depression; depression can increase the risk of sudden cardiac death [4]. In one report from the Netherlands, the incidence of depression among people with hypertension was 20%-30% [5, 6], but in China it is 15.8% [7]. The present cross-sectional study explored the depression status of elderly individuals with hypertension in Beijing, and determined associated factors.

Methods

Study design

This is a retrospective study. Data for these analyses came from the Beijing Longitudinal Study of Aging. This cross-sectional study comprised 1064 people aged ≥ 60 years dwelling at home in the general population in Beijing in 2004. Sampling was taken from an urban district, a suburb, and the country (mountain) using the well-established statistical sampling techniques cluster, stratification, and random selection. Specifically, sampling was performed in three stages. Firstly, 18 administrative divisions...
Risk factors for depression among elderly hypertension

The literacy status of participants was recorded as illiterate or literate. Those who had attended primary school or higher were considered literate. Marriage was divided into the categories married and not married, with married defined as legal marriage, and not married defined as divorced, widowed, or never married. Subjects were also stratified by monthly income: < US$90, US$90-180, and ≥ US$180. Occupations were recorded as either white-collar or physical laborer. A significant stressful life event is defined as an important family event such as a divorce, financial problems, severe disease, or a natural disaster. Sleeping quality was divided into 2 groups: well and not well. The course of hypertension was divided into 2 groups: < 5 years and ≥ 5 years.

Functional status was based on activities of daily living (ADL) and the instrumental ADL (IADL) [9]. The ADL and IADL consist of 14 items, and the performance of each activity is rated as performed with independence (score of 1), partial dependence (score of 2), or complete dependence (score of 3). Cognitive function was measured with the Mini Mental State Examination (MMSE) scale with 11 items; possible scores ranging from 0 to 30. Participants were stratified by educational level to determine thresholds for cognitive function. The thresholds for those who were illiterate, or attended at most primary school, middle school, or university were ≤ 17, 17-20, 21-22, and 23-24, respectively. Participants who scored below the threshold value for their education group were recorded as cognitive dysfunction [10].

Data collection

The assessments were completed by trained staff using standard survey instruments. During person-to-person interviews, data were collected regarding demographic characteristics, living conditions, health conditions, and via the CES-D. Exclusion criteria were secondary hypertension, dementia, or inability to answer the questions.

### Table 1. Effect of demographic characteristics on the depression symptoms associated with hypertension

<table>
<thead>
<tr>
<th>Gender</th>
<th>Total</th>
<th>Depression symptoms (%)</th>
<th>$\chi^2$</th>
<th>$P$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>502</td>
<td>67 (13.3)</td>
<td>1.907</td>
<td>0.167</td>
</tr>
<tr>
<td>Female</td>
<td>562</td>
<td>92 (16.4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age (y)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 75</td>
<td>570</td>
<td>78 (13.7)</td>
<td>2.192</td>
<td>0.139</td>
</tr>
<tr>
<td>≥ 75</td>
<td>477</td>
<td>81 (17.0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Area</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rural</td>
<td>569</td>
<td>123 (21.6)</td>
<td>42.850</td>
<td>0.000</td>
</tr>
<tr>
<td>Urban</td>
<td>495</td>
<td>36 (7.3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Literacy</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Illiterate</td>
<td>457</td>
<td>91 (19.9)</td>
<td>34.629</td>
<td>0.000</td>
</tr>
<tr>
<td>Literate</td>
<td>607</td>
<td>68 (11.2)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The sample population consisted of 1847 elderly people aged ≥ 60 years in Beijing in 2004, sampling from an urban district, a suburb, and the country (mountain). Of the 1847, 1826 had blood pressure measurements of whom 1133 (62.0%) were hypertensive. Among the hypertensive individuals 1064 (93.9%) were screened with the Center for Epidemiologic Studies-Depression (CES-D) screening test [8]. There were 502 (47.2%) men and 562 (52.8%) women, with an age range of 60-100 (74.2 ± 7.0) years. The participants lived in an urban district (495, 46.5%), in suburbs (290, 27.3%) and in the country (mountain; 279, 26.2%). In this study, we combined those living in the suburbs and country, and classified the group as rural (569, 53.5%).

The measurement of blood pressure was performed after 5 min of rest. Systolic and diastolic blood pressures were Korotkoff I and V, respectively, and an average was taken of the two values.

The definition of hypertension was systolic blood pressure ≥ 140 mmHg or diastolic blood pressure ≥ 90 mmHg. Individuals were screened for a definite diagnosis of hypertension whether or not they were receiving antihypertensive drugs.
Risk factors for depression among elderly hypertension

Table 2. Effect of social-psychology factors on the depression symptoms associated with hypertension

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Depression symptoms (%)</th>
<th>$\chi^2$</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marriage</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>699</td>
<td>87 (12.4)</td>
<td>9.997</td>
<td>0.002</td>
</tr>
<tr>
<td>Not married</td>
<td>365</td>
<td>72 (19.7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Occupation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White-collar</td>
<td>265</td>
<td>20 (7.5)</td>
<td>33.945</td>
<td>0.000</td>
</tr>
<tr>
<td>Physical labor</td>
<td>328</td>
<td>36 (11.0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monthly income (US$)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 90</td>
<td>529</td>
<td>116 (21.9)</td>
<td>41.619</td>
<td>0.000</td>
</tr>
<tr>
<td>90-180</td>
<td>254</td>
<td>25 (9.8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; 180</td>
<td>281</td>
<td>18 (6.4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Significant life event</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>601</td>
<td>52 (8.7)</td>
<td>43.221</td>
<td>0.000</td>
</tr>
<tr>
<td>Yes</td>
<td>462</td>
<td>107 (23.2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sleep quality</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Well</td>
<td>767</td>
<td>67 (8.7)</td>
<td>83.322</td>
<td>0.000</td>
</tr>
<tr>
<td>Not well</td>
<td>297</td>
<td>92 (31.0)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Evaluation of depression

The CES-D scale was used to assess depression symptoms [11]. The CES-D is a 20-item self-report rating scale designed to measure current levels of depression symptoms. It is widely used and is a reliable and valid instrument. Scores range from 0 to 60; higher scores indicate more depression symptoms. Scores $\geq$ 16 are generally consistent with depression of clinically depressed patients [11, 12].

Statistical methods

All statistical analyses were performed using SPSS software for single factor analysis, and logistic analysis was done to explore the association between those factors and depression in hypertension. $P < 0.05$ was considered statistically significant.

Results

Factors associated with depression symptoms in hypertension: single factor analysis

Results of the single factor analysis of demographic characteristics revealed that elderly people with hypertension who lived in rural areas and were illiterate had a higher incidence of depression (Table 1). In addition, the influence of social-psychological factors including occupation, marital status, income, significant life events, and sleeping habits were analyzed (Table 2). Those individuals who did physical labor had a higher incidence of depression compared with the white-collar group. Those individuals who were not married had a higher incidence of depression. The results revealed that the higher the income, the lower the incidence of depression. Those individuals who had experienced a significant stressful life event had a higher incidence of depression. Those who had poor sleep habits also had a higher incidence of depression.

Analysis of the effect of somatic health factors on symptoms of depression in hypertension included course of hypertension, level of hypertension, functional status, and cognitive function (Table 3). The results showed that the course of hypertension had no effect on the incidence of depression, but incidence of depression tended to increase with blood pressure. Those who were illiterate or with worse functional status had a higher incidence of depression.

Factors associated with depression symptoms in hypertension: multiple factor analysis

With depression as the dependent variable and gender, age, area, literacy, occupation, marital status, income, significant stressful life event, sleep habits, course of hypertension, level of hypertension, functional status, and cognitive function as independent variables, logistic analysis showed that education, occupation, significant stressful life event, sleep habits, and functional status were the independent factors influencing depression in elderly hypertensive individuals (Table 4).

Discussion

Our data originated from a population-based cross-sectional epidemiological study performed with older subjects ($\geq$ 60 years), who lived at home in the general population of Beijing. Hypertension with no known specific cause (i.e., primary or essential hypertension) may be considered a single disease or the secondary result of any of a number of other diseases of various causes [13]. As blood pressure ranges quantitatively on a continuum from
Risk factors for depression among elderly hypertension

In the elderly, and enhances symptoms of depression.

The logistic regression analysis showed that literacy, life events, sleep quality, and functional status had independent effects on the incidence of depression symptoms in elderly patients with hypertension ($P = 0.023, 0.000, 0.000$ and $0.000$, respectively). This suggests a need for better health education, supportive care, a reduction in the negative effects of important life events, and improved sleep quality. The efficacy of hypertension drug therapy is influenced by symptoms of depression. A previous study found that depression can cause the regulation of the autonomic nervous system’s hypothalamic-pituitary-adrenal axis to dysfunction [20]. This can increase vascular tone and resistance to the control of blood pressure.

A study found that the typical profile of a person in need of blood pressure control was an aged patient on antidepressant treatment for depression [19]. However, some antihyperten-
Risk factors for depression among elderly hypertension

Prescriptive drugs have side effects that cause depression, leading some doctors to recommend the end of the use of beta-blockers to treat hypertension among older persons [21]. A verapamil SR strategy is a viable alternative to beta-blocker therapy for hypertensive patients, especially those at risk for depression [22]. Other studies found that the evidence regarding the association between beta-blockers and depression is inconclusive [23], so further studies on the influence of depression are needed.

Depression symptoms are closely associated with hypertension. They are a precipitating factor of hypertension, and hypertension can worsen symptoms of depression. Clinical doctors should note the greater potential of hypertensive elderly patients to experience symptoms of depression, educate their patients, and control precipitating factors, even while administering active antihypertensive medications and antidepressants to prevent disease progression and improve health-related quality of life. For hypertensive patients, early detection and treatment of symptoms of depression is an important component of the treatment and management of hypertension.

Our sample was restricted to community residents in Beijing, so our result is not representative of the overall Chinese population. Moreover, since the cross-sectional study cannot reflect the association between risk factors and outcomes, a follow-up study is needed.

Acknowledgements

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Disclosure of conflict of interest

None.

Address correspondence to: Dr. Zhe Tang, Department of Epidemiology and Social Medicine, Xuan Wu Hospital, Capital Medical University, Key Laboratory for Neurodegenerative Disease of Ministry of Education, Center of Alzheimer’s Disease, Beijing Institute for Brain Disorders, 45 Changchun Street, Xicheng District, Beijing 100053, China. Tel: 86-10-63162077; Fax: 86-10-63162077; E-mail: tangzhe@medmail.com.cn

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Risk factors for depression among elderly hypertension


