Logistic Regression Analysis on the Correlation between Physical Diseases and Life Events and Depression in the Elderly

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Abstract [**Objectives**] This study was conducted to explore the effects of physical diseases and life events on depression among urban elderly people. [**Methods**] Five hundred urban elderly people in Shiyan City were selected using a convenient sampling method to investigate and diagnose depression using the Geriatric Mental State Schedule and its accompanying computer diagnostic system. The Minimum Data Set (MDS) and related factor survey form were used to investigate physical diseases and life events, and statistical analysis was conducted using methods such as logistic regression analysis and factor analysis. [**Results**] The prevalence rates of angina, stroke, or partial paralysis, migraine, vision problems, hyperthyroidism or hypothyroidism, as well as the number of physical diseases were significantly higher in elderly depression patients than in objects free of depression. Stroke or partial paralysis [OR (95% *CI*) = 6.389 (1.684, 24.237)], emotional trauma events [OR (95% *CI*) = 1.438 (1.069, 1.934)] and adverse health and economic events [OR (95% *CI*) = 1.652 (1.099, 2.483)] were risk factors for late life depression (LLD). [**Conclusions**] Some physical diseases and life events may affect the onset process of depression in urban elderly people, and various measures need to be taken to reduce the risk of physical diseases and life events on depression.

Key words Urban elderly, Physical diseases, Life event, Depression

1 Introduction

Late life depression (LLD) is one of the most common mental disorders in the elderly, which mainly affects the physical and mental health of elderly patients. It is characterized by high incidence rate, high suicide rate, high recurrence rate and low recognition rate. With the arrival of aging population in China, the incidence rate of LLD has significantly increased, bringing serious burden to families and society. This issue is gradually attracting people's attention. At present, the research results on its pathogenesis and influencing factors are still not unified. Some studies have pointed out that depression patients are more common among elderly patients with at least two kinds of somatic diseases, and the incidence rate of depression after cardiovascular events is as high as 15% to 30%[1-2]. According to the age-disease interaction hypothesis of LLD, under the additional promotion of genetic factors, environmental and biochemical factors may be sufficient to cause bodily malfunction, leading to depression[3]. Therefore, in this study, a survey was conducted on physical diseases and life events with depression among urban elderly people, hoping to further understand the impact of these factors on depression and provide effective practical guidance for reducing the risk of elderly depression.

2 Objects and methods

2.1 Research objects From October 2019 to December 2022, a total of 500 elderly people aged 60 and above were surveyed in urban communities of Shiyan City, Hubei Province. Adopting a convenient sampling method, three larger communities with a proportion of elderly population (12.7%) similar to Shiyan City's were selected. On the basis of informed consent, the elderly aged 60 and above who had registered in the communities and had lived continuously for more than 6 months were investigated at home, excluding those who had organic mental disorders or hearing, speech and understanding disorders and could not complete the survey. Among the 560 elderly people selected in the survey, 26 refused to participate in the survey, 6 were unable because of hearing, speech and understanding impairment, and 27 did not complete all items. After deleting a duplicate questionnaire, 500 valid questionnaires were obtained, with an effective response rate of 89.29%.

2.2 Measurement tools

2.2.1 Survey tools. (i) Geriatric Mental State Schedule (GMS): The Geriatric Mental State Schedule (GMS) from the Institute of Psychiatry at the University of Liverpool in the United Kingdom (Simplified Chinese version of the Community Version 3) was used as the main survey tool. This Schedule was designed by Professor Copeland in 1976 and is currently the most widely used tool for international communication. Its items reflect the main symptoms of mental illness and neurosis among elderly people in the community[4]. (ii) Minimum Data Set (MDS) and related factor survey form: The MDS and related factor survey form for the health status of the elderly was developed by Anhui Medical University based on the baseline survey according to the Minimum Data Set questionnaire used by the Institute of Psychiatry at the University of Liverpool[5].

2.2.2 Diagnostic tools. LLD was diagnosed using a computer diagnostic system (AGECAT) that is compatible with GMS as a diagnostic tool. The contents of GMS forms were input into the AGECAT diagnostic software, and the system could automatically provide diagnostic results. The report results were divided into five levels, with 0 indicating that the subjects are completely normal, 1 - 2 levels indicating suspicious cases, and 3 - 4 levels indicating cases. Based on the results of this report, whether the elderly suffer from depression and its severity could be determined. A large

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number of foreign studies have shown that GMS-AGECAT has good reliability and validity[6]. GMS-AGECAT has been introduced into China and has completed localization and preliminary testing. An example of comparing it with the ICD-10 clinical diagnostic standard showed that the sensitivity and specificity of diagnosed depression and objects free of depression were 96.7%, 100%, and the diagnostic consistency kappa was 0.97.

2.3 Survey methods (i) Relevant experts were uniformly organized to design and demonstrate the survey plan, and pre-survey and subsequent modifications were carried out. (ii) Medical undergraduates and postgraduates were strictly selected to conduct face-to-face survey by combining household survey with centralized survey. (iii) Investigators were strictly trained to unify the scope and standards of survey, while trying to avoid using professional terminology. (iv) An expert technical group and leadership group were established to oversee the quality of the investigation work, collect questionnaires on the spot, and ensure a 5% review rate for daily questionnaires collected.

2.4 Statistics Epidata 3.1 was used for double entry of MDS and related factor survey form data on the health status of the elderly, and for consistency validation. The GMS questionnaire data were input into the supporting software AGECAT for analysis to obtain the diagnostic results of LLD, and a SPSS database for the diagnostic results was established. The SPSS 19.0 software package was used for analysis, and the comparison of counting data was conducted using chi-square test. With depression patients (yes or no) as dependent variables, and influencing factors of social demographic and physical disease characteristics as independent variables, Mann-Whitney U tests were carried out to compare the mean of the two populations, and factor analysis was conducted to analyze the effects of life events. Logistic regression analysis of multi-class data was also introduced.

3 Results and analysis

3.1 Relationships of the prevalence of LLD in cities with social demographic characteristics and physical diseases Among the 500 elderly people in urban communities, there were 15 patients with depression, with a prevalence rate of 3%. It was found by comparing the social demographic characteristics and physical disease characteristics in unban LLD patients with objects free of depression through chi-square tests that there were statistically significant differences in the prevalence of depression among elderly people with different self-assessed health status and economic satisfaction; and the prevalence rates of angina, stroke, or partial paralysis, migraine and vision problems were significantly higher in patients with depression than in objects free of depression. Under the condition of adjusting social demographic variables, with depression as the dependent variable and four diseases with significant differences in prevalence in single factor analysis as independent variables, logistic regression analysis was conducted, showing that stroke or partial paralysis were risk factors for LLD in cities [OR (95% *CI*) = 6.389 (1.684, 24.237)], $P = 0.006$.

3.2 Relationship between depression and life events in urban elderly people

3.2.1 Factor analysis of life events. Factor analysis was conducted to reduce the dimensionality of eight items of life events, and the statistical value of KMO was 0.606. The results of Bartlett's test of sphericity showed $P = 0.000$, indicating that the variables were suitable for factor analysis. The principal component analysis method extracted three common factors with eigenvalues greater than 1, and after orthogonal rotation, they explained a total of 55.28% of the total variance. Common factor 1 had a high load factor of enduring fear or pain for a long time, having experienced fear or terror (such as an accident, fire, *etc.*), and having important things lost or stolen, mainly reflecting fear or pain. The load factor of unpleasant events with close friends, neighbors, and loved ones, serious events that make them sad, and the death of close individuals in common factor 2 was relatively high, mainly reflecting emotional trauma events. The load factor of significant changes in health status and severe economic difficulties in common factor 3 was relatively large, mainly reflecting adverse events in the health economy.

3.2.2 Effects of life events on depression among urban elderly people. Under the condition of adjusting social demographic variables, with depression as the dependent variable and three types of life events as independent variables, logistic regression analysis was conducted. The results showed that urban elderly people who had experienced emotional trauma events were 1.438 times more likely to suffer from depression than those who had not experienced such events [OR (95% *CI*) = 1.438 (1.069, 1.934)], $P = 0.016$, and urban elderly people who had experienced health and economic adverse events were 1.652 times more likely to suffer from depression than those who had not experienced such events [OR (95% *CI*) = 1.652 (1.099, 2.483)], $P = 0.016$.

4 Discussion

The analysis results of this survey indicate that physical diseases and life events are closely correlated with LLD. Stroke or partial paralysis is important risk factors. Research has shown that the prevalence of LLD significantly increases with the number of chronic diseases[7]. Stroke, hearing impairment, cardiovascular disease and chronic lung diseases have been proven to be risk factors for LLD[8]. In this study, it was found that urban LLD patients had a larger number of physical diseases than objects free of depression, and their prevalence of angina, migraine, vision problems, stroke or partial paralysis, hyperthyroidism or hypothyroidism was higher than that of objects free of depression. The need for autonomy is one of the three basic psychological needs of human beings. Chronic diseases, pain, and related activity limitations mean that elderly people need to rely more on people around for daily life and activities, and such limitations can become an important threat to the need for autonomy. Such condition will seriously affect the quality of life of patients with physical diseases and is closely related to the occurrence of depression. There is a negative correlation between stroke patients' daily living ability and quality of life and post-stroke depression levels. In addition, brain damage caused by stroke may have a direct impact on the pathological process of depression. It can be seen that the occurrence of depression in elderly patients with physical diseases is not

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only affected by physical diseases, but more importantly, it is related to the various social consequences of these diseases on the psychological impact of urban elderly people.

At present, the trend of population aging in China is constantly increasing. The society should really identify and solve the physical and mental problems of the elderly from the perspective of superiority theory and promote "active aging". We have found that in addition to physical diseases themselves, the prevalence of depression among urban elderly people is closely related to the long-term unmet psychological needs of the elderly, such as autonomy and relationship needs, due to physical diseases and life events. From the perspective of the new biological-psychological-social medical model, LLD is the result of the interaction of many factors such as biology, psychology, and social environment. The results of this study indicated that some physical diseases and life events may affect the onset process of LLD in cities. Hawkins' stress hypothesis theory[9] suggests that individuals with depression or a tendency towards depression tend to experience higher levels of life stress (such as life events that rely on personality traits and interpersonal relationships) compared with those without such "fragility", and the reverse relationship between physical illness and depression has also been confirmed by other studies. Therefore, it is necessary to consider the possibility of a bidirectional relationship between life events and physical diseases, and depression. Considering that this study is a cross-sectional study and cannot indicate the causal relationship between physical diseases and life events, and depression, further exploration of prospective research is needed, emphasizing the timely assessment after the occurrence of life events among urban elderly people and the early screening of physical diseases and depression.

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