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Assessment of Cognitive Function in the Elderly and Analysis of Its Influencing Factors

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Abstract

Objective: Taking elderly people aged 60 and above in Ma'anshan City, Anhui Province as the research subjects, to conduct cognitive function assessment and analyze its influencing factors, so as to provide empirical evidence for formulating targeted intervention measures to protect cognitive function and delay the progression of cognitive impairment in the elderly. Methods: A total of 200 permanent residents aged 60 and above from 8 community health service centers in Jihu District, Yushan District and Bowang District of Ma'anshan City were randomly selected as research subjects by simple random sampling method from January 2025 to June 2025. This was an exploratory study without formal sample size calculation. The Mini-Mental State Examination (MMSE) was used to assess the cognitive function of the elderly from six dimensions: orientation, memory, attention, calculation ability, recall ability and language ability. Meanwhile, information such as general basic data, living habits, mental and psychological status and disease conditions of the research subjects was collected to explore the correlation between various factors and the cognitive function of the elderly. Results: Among 200 elderly individuals, 74 had abnormal cognitive function, with an abnormal incidence rate of 37%. Univariate analysis showed that age, educational level, living status, physical activity, balanced diet, social activities, mental and psychological status, and comorbidity with hypertension, diabetes mellitus, or cerebrovascular disease were all associated with abnormal cognitive function in the elderly (all $P < 0.05$). Gender, monthly household income, smoking history, drinking history, and comorbidity with other chronic diseases showed no significant correlation with abnormal cognitive function (all $P > 0.05$). Multivariate Logistic regression analysis revealed that age ≥ 80 years (dummy variable, reference: 60 - 69 years), primary school education or below (dummy variable, reference: junior college or above), living alone, lack of regular exercise, insufficient social activities, presence of mental and psychological problems such as insomnia, anxiety or depression, and comorbidity with hypertension, diabetes mellitus or cerebro-

vascular disease were independent risk factors for abnormal cognitive function in the elderly (all $P < 0.05$), while a balanced diet was a protective factor for cognitive function ($P < 0.05$). Conclusion: The incidence of abnormal cognitive function among people aged 60 years and above in Ma'anshan City is relatively high. Their cognitive function is affected by multiple factors including age, educational level, living status, lifestyle habits, mental and psychological status, and underlying diseases. Clinically, personalized intervention measures can be formulated accordingly to protect the cognitive function of the elderly and reduce the risk of cognitive impairment.

Keywords

The Elderly, Cognitive Function, Mini-Mental State Examination, Influencing Factors, Intervention Measures

1. Introduction

Population aging is an important feature of China's current social development. As the size of the elderly population aged 60 and above continues to expand, the incidence of cognitive dysfunction among the elderly is also showing a year-on-year upward trend. Cognitive function is the core ability for the elderly to maintain normal life and achieve social participation, covering multiple dimensions such as orientation, memory, attention, and computing power. Its impairment degree directly affects the quality of life of the elderly. Severe cognitive dysfunction (such as dementia) will not only lead to the loss of self-care ability of the elderly, but also impose a heavy care burden on families, while intensifying the pressure on social elderly care services [1].

At present, China's attention to the cognitive function of the elderly is mostly focused on the stage of clinical diagnosis and treatment, while there is still a lack of early cognitive function screening and risk factor identification at the community level. Most elderly people seek medical attention only after obvious symptoms of cognitive impairment appear, missing the optimal time for early intervention [2]. As an important node city in the Wanjiang City Belt, Ma'anshan City features a prominent aging population. However, there has been no systematic research on the overall status of cognitive function and its related influencing factors among the elderly in its jurisdiction.

The Mini-Mental State Examination (MMSE) has become a commonly used tool for screening cognitive function among community-dwelling older adults due to its simple operation and comprehensive assessment dimensions [3]. This study took permanent residents aged 60 years and above in Ma'anshan City as research subjects to conduct cognitive function assessments. Meanwhile, it comprehensively collected information including general demographics, living habits, mental and psychological status, and disease conditions, and analyzed the main influencing factors of cognitive function in older adults. The purpose is to identify

the key populations and critical links for protecting cognitive function among older adults in this region, so as to provide a reference for formulating scientific and feasible community-based cognitive function intervention measures.

2. Method

2.1. Research Subjects

2.1.1. Inclusion Criteria

1) Permanent residents aged ≥ 60 years who have lived in Ma'anshan City for at least 1 year;

2) Clear consciousness, able to communicate normally, and cooperate in completing scale assessments and questionnaire surveys;

3) Voluntarily participate in this study and sign an informed consent form.

2.1.2. Exclusion Criteria

1) Those with severe mental illness, disturbance of consciousness, aphasia, etc., who are unable to cooperate with the assessment;

2) Those with end-stage diseases such as advanced malignant tumor and severe hepatic and renal failure;

3) Those with a recent history of brain trauma or acute cerebrovascular disease attack;

4) Those whose assessment results are affected by severe hearing or visual impairment.

2.2. Research Methods

2.2.1. Cognitive Function Assessment

The Mini-Mental State Examination (MMSE) was used to assess the cognitive function of all study subjects. The assessment covered six core dimensions: 1) orientation (temporal and spatial orientation); 2) memory (immediate memory); 3) attention and calculation (subtraction calculation, sustained attention); 4) recall ability (delayed recall); 5) language ability (naming, repetition, comprehension, writing). The total score of the scale was 30 points.

The scores were adjusted only according to educational level to determine cognitive function status: for those with primary school education or below, a score ≥ 17 was normal and <17 was abnormal; for those with secondary school education, a score ≥ 20 was normal and <20 was abnormal; for those with junior college education or above, a score ≥ 24 was normal and <24 was abnormal.

The assessment was conducted by uniformly trained medical staff through face-to-face interviews to ensure the consistency and accuracy of the assessment results.

2.2.2. Collection of Data on Influencing Factors

General basic information: age (60 - 69 years old, 70 - 79 years old, ≥80 years old), gender (male, female), educational background (primary school or below, middle school, junior college or above), monthly household income (<3000 yuan, 3000 - 5999 yuan, ≥6000 yuan), living status (living alone, living with family members);

Living habits: smoking history (yes, no), drinking history (yes, no), physical activity (irregular exercise, regular exercise ≥ 3 times a week with each session ≥ 30 minutes), balanced diet (yes: daily intake of ≥3 types of grains, ≥5 types of vegetables and fruits, and regular high-quality protein; no: failure to meet the above standards for a long time), social activities (abundant: ≥4 times/month of community/family social activities; insufficient: <4 times/month or no social activities);

Mental and psychological status: yes: self-reported persistent insomnia, anxiety or depression for more than 2 weeks; no: no above symptoms, judged by investigators based on the self-reports of the research subjects;

Medical conditions: Clinically confirmed comorbidities including hypertension, diabetes, coronary heart disease, cerebrovascular diseases and other chronic diseases.

2.3. Data Analysis

All research data were organized using Excel, and statistical analysis was performed with SPSS 27.0. Measurement data were presented as ($\overline{x} \pm s$), and the t-test was used for comparison between groups; enumeration data were expressed as n (%), and the chi-square test was adopted for inter-group comparison. Multivariate Logistic regression analysis was employed to explore the independent risk factors for abnormal cognitive function in the elderly, with $\alpha = 0.05$ as the test level.

3. Results

3.1. Overall Cognitive Function Status

Among 200 subjects, 126 (63%) had normal cognitive function and 74 (37%) had abnormal cognitive function. The normal rate showed a gradual decline with increasing age: 82.26% (51/62) in 60 - 69 years old, 60.98% (50/82) in 70 - 79 years old, and 44.64% (25/56) in ≥80 years old.

3.2. Univariate Analysis of Cognitive Function

Subjects were divided into normal group (n = 126) and abnormal group (n = 74). The results showed that age, educational level, living status, physical exercise, balanced diet, social activities, mental psychological problems, and comorbidity with hypertension, diabetes and cerebrovascular disease were all associated with abnormal cognitive function (all P < 0.05); other factors showed no significant correlation (all P > 0.05). See Table 1.

Table 1. Univariate analysis of cognitive impairment in the elderly (n(%)).

Influencing factors	group	normal group (n = 126)	Abnormal group (n = 74)	χ^2	P
Gender	Male	65 (62.50)	39 (37.50)	0.102	>0.05
	Female	61 (63.54)	35 (36.46)		
Age	60 - 69 years old	51 (82.26)	11 (17.74)	18.392	<0.001

Continued

	70 - 79 years old	50 (60.98)	32 (39.02)		
	≥80 years old	25 (44.64)	31 (55.36)		
Educational background	Primary school and below	39 (40.63)	57 (59.37)	34.089	<0.001
	Middle school	59 (78.67)	16 (21.33)		
	College diploma or above	28 (96.55)	1 (3.45)		
Monthly household income	<3000¥	45 (60.00)	30 (40.00)	0.586	>0.05
	3000 - 5999¥	52 (65.00)	28 (35.00)		
	≥6000¥	29 (65.91)	16 (34.09)		
Living conditions	Live with family	105 (72.92)	39 (27.08)	12.841	<0.001
	living alone	21 (38.18)	35 (61.82)		
Smoking history	Yes	58 (62.37)	35 (37.63)	0.065	>0.05
	No	68 (63.55)	39 (36.45)		
Drinking history	Yes	52 (61.18)	33 (38.82)	0.217	>0.05
	No	74 (64.35)	41 (35.65)		
Exercise status	Regular exercise	89 (76.07)	28 (23.93)	14.562	<0.001
	Irregular exercise	37 (42.05)	46 (57.95)		
Balanced diet	Yes	98 (79.03)	26 (20.97)	16.835	<0.001
	No	28 (40.00)	42 (60.00)		
Social activities	Abundant	92 (78.62)	25 (21.38)	18.026	<0.001
	Insufficient	34 (39.08)	49 (60.92)		
mental and psychological problems	No	101 (79.37)	26 (20.63)	22.589	<0.001
	Yes	25 (34.25)	48 (65.75)		
Hypertension	No	82 (75.00)	27 (25.00)	10.826	0.001
	Yes	44 (47.83)	47 (52.17)		
Diabetes mellitus	No	86 (74.39)	29 (25.61)	9.964	0.002
	Yes	40 (47.62)	45 (52.38)		
Cerebrovascular disease	No	93 (78.81)	25 (21.19)	16.152	<0.001
	Yes	33 (40.24)	49 (59.76)		
Comorbidity with other chronic diseases	Yes	70 (64.81)	38 (35.19)	0.328	>0.05
	No	56 (61.54)	36 (38.46)		

3.3. Multivariate Logistic Regression Analysis of Abnormal Cognitive Function

Taking the cognitive function status of the elderly as the dependent variable (normal = 0, abnormal = 1), variables with $P < 0.05$ in the univariate analysis were assigned as independent variables (variable assignment see Table 2) and included in the multivariate Logistic regression model for analysis. The model was built with dummy variable coding for age and educational level, with collinearity diagnosis and model fit test completed in advance. The results showed that age ≥ 80

years, primary school education or below, living alone, irregular exercise, insufficient social activities, mental psychological problems, and comorbidity with hypertension, diabetes or cerebrovascular disease were independent risk factors for abnormal cognitive function (all $P < 0.05$); balanced diet was a protective factor against abnormal cognitive function ($P < 0.05$). See Table 3.

Table 2. Independent variable assignment table.

Independent variable	Assignment situation
Age (dummy variable)	60 - 69 = 0，70 - 79 = 1，≥80 = 2
Educational background	College diploma or above = 0 (reference group), Middle school = 1, Primary school or below = 2
Living conditions	Living with family = 0 (reference group), Living alone = 1
Physical activity	Regular exercise = 0 (reference group), Irregular exercise = 1
Balanced diet	Yes = 1, No = 0
Social activities	Abundant = 0 (reference group), Insufficient = 1
Mental and psychological problems	None = 0 (reference group), Yes = 1
Hypertension	None = 0 (reference group), Yes = 1
Diabetes	None = 0 (reference group), Yes = 1
Cerebrovascular diseases	None = 0 (reference group), Yes = 1

Table 3. Multivariate logistic regression analysis of cognitive impairment in the elderly.

Independent variable	β	SE	Wald	OR	95%CI	P
Age ≥ 80 (vs 60 - 69 years old)	1.852	0.426	18.963	6.375	2.589 - 15.692	<0.001
Primary school education or below (vs junior college or above)	1.926	0.458	17.782	6.872	2.598 - 18.165	<0.001
Living alone (vs living with family)	1.205	0.389	9.458	3.338	1.426 - 7.825	0.002
Irregular exercise (vs regular exercise)	1.058	0.367	8.264	2.882	1.315 - 6.321	0.004
Insufficient social activities (vs abundant social activities)	1.126	0.379	8.895	3.085	1.386 - 6.882	0.003
Mental psychological problems (vs none)	1.352	0.405	11.256	3.868	1.659 - 8.996	0.002
Balanced diet (vs unbalanced diet)	−0.985	0.356	7.689	0.373	0.175 - 0.795	0.005
Hypertension (vs no hypertension)	0.926	0.364	6.458	2.525	1.168 - 5.469	0.011
Diabetes mellitus (vs no diabetes)	0.895	0.359	6.287	2.448	1.142 - 5.245	0.020
Cerebrovascular disease (vs no cerebrovascular disease)	1.526	0.418	13.159	4.598	1.906 - 11.098	<0.001

4. Discussion

This study found that the incidence of abnormal cognitive function in the elderly aged 60 and above in Ma'anshan City was 37%, and the normal cognitive function rate decreased significantly with age, which was consistent with the results of most domestic community-based studies [4]-[6], indicating that cognitive impairment has become an important issue in local community elderly health management, and the elderly over 80 years old are the key protection population.

Age and educational level are the most significant independent risk factors. The risk of abnormal cognitive function in the elderly ≥ 80 years old is 6 times that of the 60 - 69 years old group, which is due to physiological brain atrophy, neuronal reduction and cholinergic system decline with age, and the high incidence of underlying diseases further exacerbates cognitive impairment. The risk of primary school education or below is 6.8 times that of junior college or above, because high education forms a "cognitive reserve" through long-term learning and thinking activities, which can resist brain tissue damage and delay cognitive decline [7] [8].

Living status and lifestyle are closely related to cognitive function. Living alone leads to insufficient brain stimulation and increased mental psychological problems, which superimposes cognitive decline. Regular exercise promotes cerebral blood circulation and neuronal metabolism, and abundant social activities maintain cognitive activity; insufficient exercise and social interaction lead to brain function degeneration. Balanced diet provides nutrients such as high-quality protein, B vitamins and folic acid for brain metabolism and neurotransmitter synthesis, which is a protective factor for cognitive function. This study found no significant correlation between smoking, drinking and cognitive function, which may be related to the mild smoking and drinking habits of the sample and the limited sample size, and needs further verification with expanded samples [9] [10].

Mental psychological problems are important influencing factors for cognitive function. Insomnia, anxiety and depression lead to insufficient brain rest, impaired neuronal repair and abnormal neurotransmitter secretion, and also reduce the willingness of the elderly to participate in exercise and social activities, forming a vicious cycle of "low mood-reduced activity-cognitive decline" that exacerbates cognitive impairment [11].

Hypertension, diabetes and cerebrovascular disease are important risk factors for abnormal cognitive function. Poor long-term control of hypertension causes chronic cerebral ischemia and hypoxia; diabetes induces microangiopathy and oxidative stress damage to neurons; cerebrovascular disease directly damages brain tissue, and even mild lesions can cause occult cognitive damage, which gradually manifests and triggers cognitive abnormalities [12].

This study has limitations: the sample is only from urban communities of Ma'anshan City with a limited size; the cross-sectional design cannot analyze the dynamic relationship between factors and cognitive function; no stratified analysis of the severity of cognitive dysfunction was conducted. Future research can expand the sample to cover urban and rural areas of Ma'anshan City, conduct prospective cohort studies to explore the long-term mechanism of various factors on cognitive function, and use more refined assessment tools, such as MoCA for stratified analysis to formulate targeted intervention programs.

Based on the research results, multi-dimensional targeted interventions can be formulated for the identified risk factors: first, strengthen cognitive function screening for key populations such as the elderly ≥ 80 years old, those with primary school education or below and living alone; second, guide the elderly to develop

healthy living habits through community health education, and organize cultural and sports activities to enrich their social life; third, establish community psychological counseling service stations to provide professional intervention for the elderly with mental psychological problems; fourth, establish chronic disease management files, standardize the diagnosis and treatment of hypertension, diabetes and cerebrovascular disease, and reduce secondary cognitive damage [13].

5. Conclusions

The incidence of abnormal cognitive function among elderly people aged 60 and above in Ma'anshan City is relatively high, and the rate of normal cognitive function shows a significant downward trend with age. Their cognitive function is jointly affected by multiple factors including age, educational level, living status, living habits, mental psychological status and underlying diseases.

In clinical and community elderly health management, personalized comprehensive intervention measures should be formulated for the above influencing factors: strengthen cognitive function screening for key populations, guide the elderly to form healthy living habits such as regular exercise, balanced diet and abundant social interaction, pay attention to mental psychological health intervention, and standardize the management of hypertension, diabetes and cerebrovascular disease. Through multi-dimensional interventions, the cognitive function of the elderly can be protected, the progression of cognitive impairment can be delayed, and the incidence of dementia can be reduced, thereby improving the quality of life of the elderly and alleviating the care burden of families and society.

Ethical Statement

This research was conducted by recruiting adult participants voluntarily. All of them agreed to have their real data measured and reported during the study. This research does not involve experimental medical treatment, invasive procedures, or drug intervention. Participants have been informed of the detailed process and purpose of this research, and have agreed to use their anonymized data for research and publication purposes. All records have deleted personal identification information, and participants are only referred to as "Participant 1" (P1) and "Participant 2" (P2)… to maintain their confidentiality and privacy rights. Since this research involves non-invasive research operations and voluntary participation of the participants, the relevant procedures comply with the ethical standards followed by recognized low-risk observational studies.

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Conflicts of Interest

There is no conflict of interest in this study.

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