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Comparison of Nomogram and Decision Tree Models for Risk Prediction of Mild Cognitive Impairment in Elderly Hospitalized Hypertensive

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Abstract: *Convenience sampling was adopted to enroll elderly hypertensive inpatients from the cardiovascular medicine department of a tertiary hospital in Shaanxi between November 2023 and June 2024; the incidence of mild cognitive impairment (MCI) was assessed via the Mini-Mental State Examination (MMSE), and relevant data were collected through multiple scales, with Logistic regression used to screen independent risk factors for MCI. A nomogram model was constructed and internally validated by the Bootstrap method, and its predictive performance was evaluated using indicators including the area under the curve (AUC), calibration curve and Brier score. Among the 368 enrolled patients, the incidence of MCI was 38.86%, with age, nutritional status, education level, hypertension duration and depression identified as independent influencing factors; the constructed nomogram model yielded an AUC of 0.868, a specificity of 0.840, a sensitivity of 0.785 and a Brier score of 0.138 after internal validation, while the decision tree model had an AUC of 0.860, a specificity of 0.911, a sensitivity of 0.720 and a Brier score of 0.131, both demonstrating favorable predictive performance, which indicates that age, nutritional status, education level, hypertension duration and depression exert impacts on MCI in elderly hypertensive inpatients, and the established nomogram and decision tree models possess satisfactory predictive efficacy.*

Keywords: *Elderly people; Hypertension; Mild cognitive impairment; Nomogram; Decision Tree; Prediction model*

1. Introduction

China's population aging is accelerating. By 2024, the elderly aged 60 and above reached 310 million, accounting for 22.0% of the total population, with those aged 65 and above at 220 million, making up 15.6%[1]. Hypertension, a prevalent chronic disease, affects over 245 million Chinese adults, with a 54.92% incidence rate among the elderly[2]. Mild cognitive impairment (MCI), involving memory, attention, and language decline, is common in this population[3]. Notably, hypertension and cognitive impairment frequently coexist[4]. Data from the China Health and Pension Tracing Survey (CHARLS) indicate a national MCI incidence of 20.05% among the elderly[5], with rates ranging from 21.3% to 53.8% in hypertensive elderly populations[6-7]. Existing research highlights a significant positive correlation between cognitive dysfunction in elderly hypertensive patients and adverse outcomes, including diabetes, coronary heart disease, stroke, hyponatremia, polypharmacy, and malnutrition[8]. Therefore, this study aimed to investigate the prevalence and influencing factors of MCI, and to develop and validate predictive models for MCI in elderly hypertensive inpatients.

2. Objects and Methods

2.1 Research Subjects

The study subjects were elderly hypertensive inpatients from a Grade A tertiary hospital in Shaanxi Province from November 2023 to June 2024 selected by convenience sampling. Inclusion criteria were age ≥65 years meeting the 2023 Chinese Hypertension Guidelines[9], clear consciousness with normal communication, and informed consent; exclusion criteria included hypertensive emergency[10], dementia or other mental disorders, sedative or psychotropic drug use, severe visual/hearing

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impairment, malignant tumor, long-term malnutrition or serious psychological problems. The sample size was calculated as 349 cases based on a cross-sectional formula with an MCI prevalence of 21.3% and an allowable error of 0.05, and finally set at 368 cases considering a 5% invalid questionnaire rate[11].

2.2 Method

1) MMSE scale for MCI is widely adopted as an important tool for cognitive function assessment in clinical practice and scientific research. The influence of different education levels on the test is considered when it is used. The correction criteria for educational level are adopted for judging cognitive dysfunction: illiteracy ≤ 17 points, primary school level ≤ 20 points, middle school level and above ≤ 24 points[12]. Cronbach's α coefficient of the Chinese scale is 0.83, and the correlation coefficient within the retest reliability group is 0.92, which has good reliability and validity[13].

2) Data collection (1) The general data questionnaire covers demographic, sociological and disease-related data. Population sociological data involves gender, age, height, weight, marital status, education level, living arrangement, individual average monthly income and pre-retirement occupation; disease-related data includes the number of medications taken, multimorbidity, one-year fall history, hypertension duration and hypertension classification.(2) The mini-nutrition assessment scale assesses nutritional status from six dimensions: dietary intake, weight change, activity ability, disease/psychological stress, mental state, and BMI/calf circumference. Malnutrition is defined as 0-7 points, malnutrition risk as 8-11 points, and normal nutritional status as ≥12 points[14]. Studies confirm MNA-SF performs well in nutritional screening for elderly patients, with 78.93% sensitivity and 83.59% specificity in screening chronically ill elderly inpatients[15].(3) The Pittsburgh Sleep Quality Index comprehensively reflects subjects' sleep status in the past month via seven core dimensions: sleep efficiency, sleep disturbance, sleep duration, subjective sleep quality, sleeping pill use, sleep onset latency and daytime dysfunction. The total score is 21 points, and a score >7 indicates sleep disorders[16]. The scale has 0.87 internal consistency, 90.20% specificity and 98.30% sensitivity [17].(4) The International Physical Activity Questionnaire, divided into long and short forms, is adopted to evaluate individual physical activity level, with the short form used in this study[18]. Physical activity is graded by total volume: low level<600 METs-min/W), moderate level (600-1500 METs-min/W), high level (>1500 METs-min/W)[19]. IPAQ has a test-retest reliability coefficient of 0.71-0.93 and a 0.30 correlation coefficient with accelerometer measurements, showing high validity and reliability[20].(5) The Social Support Rating Scale, containing 10 items, is used to assess individual social support level and divided into three dimensions: subjective support, objective support and support utilization[21]. Liu Jiwen's research verified its reliability and validity, with Cronbach's α coefficients of 0.90, 0.85 and 0.83 for the three dimensions respectively[22].(6) The Patient Health Questionnaire-9 includes 9 items covering depression, anhedonia, sleep problems and fatigue, classifying depressive symptoms into four levels: 0-4 points (normal), 5-9 points (mild), 10-14 points (moderate) and ≥15 points (severe)[23]. Its Cronbach's α coefficient is 0.833, indicating favorable internal consistency reliability[24].

3) Statistical Methods Statistical analysis was performed using SPSS 26.0 and RStudio 4.0.2. Count data were expressed as frequency and percentage; normally distributed measurement data as mean±standard deviation ($\bar{x} \pm S$), non-normal data as median (quartile) M(P25, P75). With MCI as dependent variable and potential factors as independent variables, univariate and Logistic regression analyses were conducted. Chi-square test, independent-samples t-test and Mann-Whitney U test were used for group comparisons accordingly. The significance level was set at P=0.05. ROC and calibration curves were plotted with RStudio 4.0.2 to calculate accuracy and evaluate model performance.

3. Results

3.1 Incidence of MCI

A total of 368 subjects were enrolled in the study, among which 143 elderly hospitalized patients with hypertension had MCI, and the incidence rate was 38.86 %.

3.2 Analysis of influencing factors of MCI in elderly hospitalized hypertensive patients

3.2.1 Univariate analysis of MCI in elderly hospitalized hypertensive patients

The analysis of the collected data showed that there were significant differences between the

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cognitive impairment group and the non-cognitive impairment group in age, marital status, educational level, type of work before retirement, average monthly income of individuals, living arrangement, nutritional status, presence or absence of sleep disorders, physical activity level, social support level, depression, multimorbidity, hypertension duration, classification of hypertension and history of falls, and the differences were statistically significant ($P < 0.05$); The differences in gender and polypharmacy were not statistically significant ($P > 0.05$), as shown in Table 1.

Table 1 Univariate analysis of MCI in elderly hospitalized hypertensive patients

Variable	Category	MCI group	Non-MCI group	χ^2/Z	P
Gender	Male	60(41.96)	113(50.22)	2.397(1)	0.122
	Female	83(58.04)	112(49.78)		
Age M(P25, P75)		79(75, 82)	70(68, 76)	-10.021(2)	<0.001
Marital status	Married	65(45.45)	184(81.78)	52.722(1)	<0.001
	Widowed/divorced	78(54.55)	41(18.22)		
Educational level	Illiterate	9(6.29)	45(20.00)	24.640(1)	<0.001
	Primary school	51(35.66)	99(44.00)		
	Middle school/technical secondary school	49(34.27)	57(25.33).		
	Junior college or above	34(23.78)	24(10.67)		
Pre-retireme-nt occupation	Manual labor	56(39.16)	69(30.67)	6.750(1)	0.034
	Mental labor	34(23.78)	82(36.44)		
	Mixed	53(37.06)	74(32.89)		
Average monthly personal income M (P , P_{75})		2000 (800, 4000)	3200(2000, 5000)	-3.401(2)	0.001
Living arrangement	Living with spouse	65(45.45)	178(79.11)	47.949(1)	<0.001
	Living with children	36(25.17)	20(8.89)		
	Living alone	29(20.28)	24(10.67)		
	Others	13(9.09)	3(1.33)		
Nutritional status	Normal	24(16.78)	108(48.00)	37.044(1)	<0.001
	At risk of malnutrition	94(65.73)	92(40.89)		
	Malnutrition	25(17.48)	25(11.11)		
Sleep disturbance	No	100(69.93)	142(63.11)	21.261(1)	<0.001
	Yes	43(30.07)	83(36.89)		
Physical	Low	51(35.66)	59(26.22)	70.145(1)	<0.001

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activity	Moderate	61(42.66)	99(44.00)		
	High	31(21.68)	67(29.78)		
Social support	Low	24(16.78)	53(23.56)	20.849(1)	<0.001
	Moderate	100(69.93)	115(51.11)		
	High	19(13.29)	57(25.33)		
Depression	No	12(8.39)	82(36.44)	52.654(1)	<0.001
	Mild	76(53.15)	112(49.78)		
	Moderate	43(30.07)	19(8.44)		
	Severe	12(8.39)	12(5.33)		
Multimorbidity	No	18(12.59)	79(35.11)	22.851(1)	<0.001
	Yes	125(87.41)	146(64.89)		
Polypharmacy	No	96(67.13)	166(73.78)	1.883(1)	0.170
	Yes	47(32.87)	59(26.22)		
Hypertension duration		20(10, 22)	10(6, 16)	-7.040(2)	<0.001
Hypertension grade	1	1(0.70)	12(5.33)	11.765(1)	0.003
	2	51(35.66)	105(46.67)		
	3	91(63.64)	108(48.00)		
History of falls	No	113(79.02)	205(91.11)	23.333(1)	<0.001
	Yes	30(20.98)	20(8.89)		

Note:(1)χ^2 test;(2) Mann-Whitney U test

3.2.2 Collinearity Diagnostics

Collinearity diagnosis was performed for significant variables in univariate analysis, and the results showed that the tolerance of variables was > 0.1 and the variance expansion factor was < 10, indicating that there was no multicollinearity, as shown in Table 2.

Table 2 Collinearity Diagnostic Results

Variable	Tolerance	Variance Inflation Factor
Age	0.412	2.429
Marital status	0.190	5.254
Educational level	0.623	1.604
Pre-retirement occupation	0.729	1.371
Average monthly personal income	0.596	1.678
Living arrangement	0.208	4.801

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Nutritional status	0.859	1.164
Sleep disturbance	0.789	1.267
Physical activity level	0.507	1.973
Social support	0.889	1.131
Depression	0.857	1.167
Multimorbidity	0.872	1.147
Hypertension duration	0.883	1.200
Hypertension grade	0.886	1.129
History of falls	0.883	1.133

3.2.3 Multivariate analysis of MCI in elderly hospitalized hypertensive patients

In this study, MCI was taken as the dependent variable, and variables with significant differences and no multicollinearity in univariate analysis were used as independent variables (assignment shown in Table 3). Binary Logistic regression with forward stepwise selection indicated that age, nutritional status, education level, hypertension duration and depression were independent influencing factors (Table 4).

Table 3 Variable assignment table

Variable	Assignment description
MCI	0 = No, 1 = Yes
Marital status	0 = Married, 1 = Widowed/Unmarried/Divorced
Educational level	0 = Junior college or above, 1 = Middle school/technical secondary school, 2 = Primary school, 3 = Illiterate
Living arrangement	0 = Living with spouse, 1 = Living with children, 2 = Living alone, 3 = Others
Nutritional status	0 = Normal, 1 = At risk of malnutrition, 2 = Malnutrition
Sleep disturbance	0 = No, 1 = Yes
Physical activity level	0 = High, 1 = Moderate, 2 = Low
Social support	0 = High, 1 = Moderate, 2 = Low
Depression	0 = No, 1 = Mild, 2 = Moderate, 3 = Severe
Multimorbidity	0 = No, 1 = Yes
History of falls	0 = No, 1 = Yes
Hypertension grade	0 = Grade 1, 1 = Grade 2, 2 = Grade 3
Age	Entered as a continuous variable

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Variable	Assignment description
Average monthly personal income	Entered as a continuous variable
Hypertension duration	Entered as a continuous variable

Table 4 Results of Logistic Regression Analysis on the Influencing Factors of MCI

Variable	Category	β	SE	Wald	Exp(B)	95% CI	P
Age	-	0.194	0.029	43.494	1.214	1.146–1.286	<0.001
Nutritional status	Normal	-	-	7.518	-	-	0.023
	At risk of malnutrition	0.493	0.340	2.100	1.637	0.840–3.188	0.147
	Malnutrition	1.357	0.497	7.443	3.883	1.465–10.290	0.006
Educational level	Reference: Junior college or above	-	-	14.705	-	-	0.002
	Middle school/technical secondary school	1.491	0.511	8.520	4.443	1.632–12.095	0.004
	Primary school	1.618	0.423	14.630	5.044	2.200–11.556	<0.001
	Illiterate	1.728	0.778	4.933	5.633	1.225–25.855	0.026
Hypertension duration	-	0.077	0.017	21.200	1.080	1.045–1.117	<0.001
Depression	No depression	-	-	15.600	-	-	0.001
	Mild	1.027	0.408	6.333	2.793	1.255–6.214	0.012
	Moderate	2.028	0.524	14.953	7.596	2.718–21.227	<0.001
	Severe	2.087	0.635	10.800	8.056	2.322–27.939	<0.001
Constant	-	-19.123	2.353	66.060	-	-	-

3.3 Model establishment and verification

3.3.1 Model establishment

(1) Nomogram model: Based on the results of Logistic regression analysis, the regression equation is constructed as follows: Logit (P) = -19.123 + 0.194×age + 1.357×malnutrition + 1.491×middle school or technical secondary school + 1.618 primary school + 1.728×illiteracy + 0.077× hypertension duration + 1.027×mild depression + 2.028×moderate depression + 2.087×severe depression, and nomogram is drawn, as shown in Figure 1.

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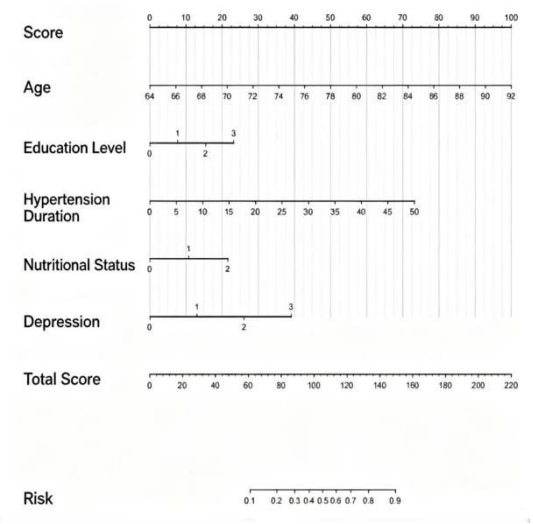


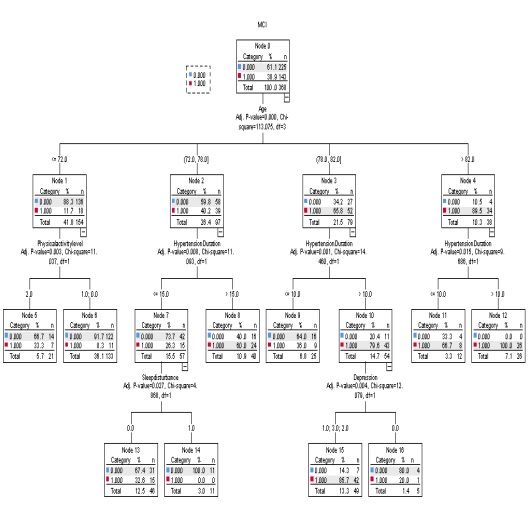


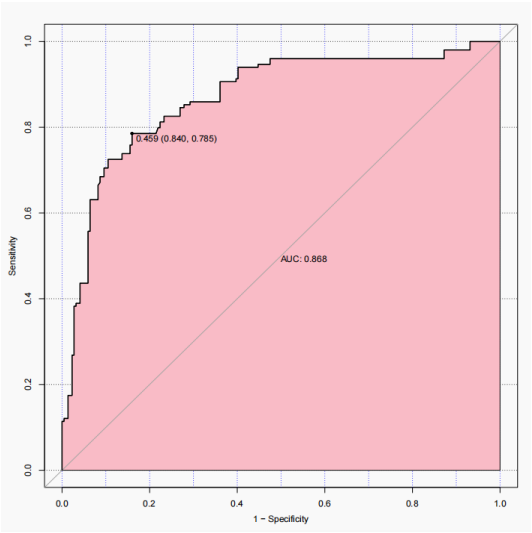
Fig. 1 Nomogram model for MCI risk prediction Fig. 2 Decision tree modelfor MCI risk prediction

Establishment of decision tree model: The output pruned decision tree model includes 17 nodes, including 1 root node, 6 internal nodes and leaves 10 nodes. Each box includes three columns, the first column is outcome variable, the second column is proportion of such outcomes, and the third column is number of samples with such outcomes, as shown in Figure 2.

3.3.2 Model Verification

(1) Discrimination: the internal verification was carried out through 1000 times of bootstrap resampling. After verification, the nomogram AUC 0.868, 95 % CI: 0.838 ~ 0.911, model truncation value 0.459, specificity 0.840, sensitivity 0.785 (see Figure 3-1); Decision tree model AUC0.860, 95 % CI: 0.819 ~ 0.900, model truncation value 0.535, specificity 0.911, sensitivity 0.720 (see Figure 3-2).

(2) Calibration degree: draw calibration curves respectively, and the Brier score result of nomogram shows that Brier score= 0.138, and the calibration curve is close to the ideal standard curve, indicating that the calibration degree of the nomogram model is good, as shown in Figure 4-1; The decision tree model Brier score was 0.131, and the calibration curve is close to the ideal standard curve, indicating that the calibration degree of the model is good, as shown in Figure 4-2.



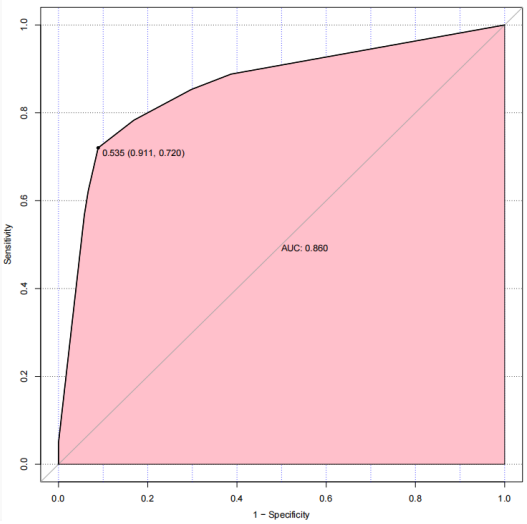


Fig.3-1 ROC Curve - Nomogram Model *Fig.3-2 ROC Curve - Decision Tree Model*

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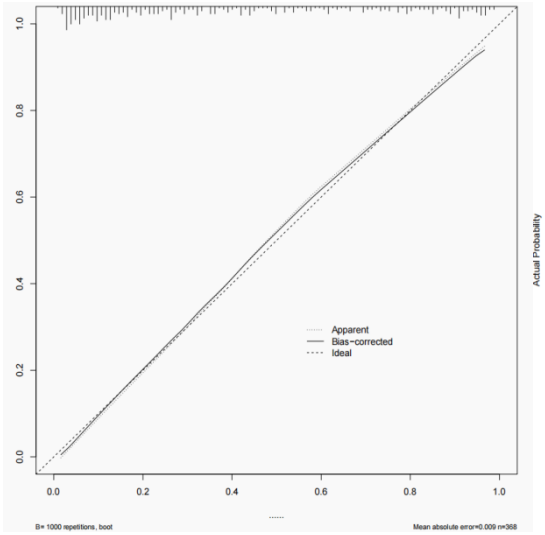

Fig.4-1 Nomogram Model Internal Validation Calibration Curve

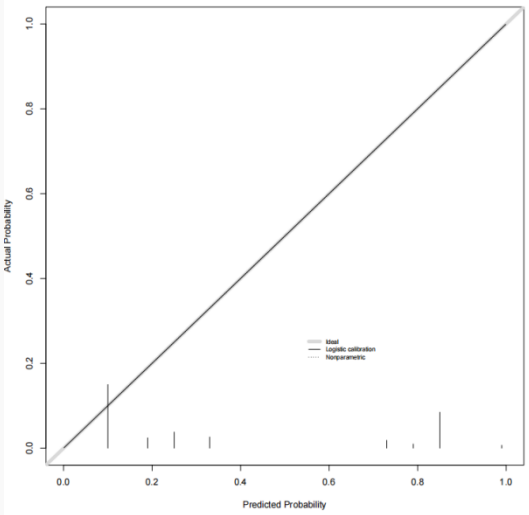

Fig.4-2 Decision Tree Model Internal Validation Calibration Curve

3.3.3 Comparison of the Performance of Nomogram and Decision Tree Models

Compared with the decision tree model, the nomogram model showed higher AUC and sensitivity, while the decision tree model had higher specificity and a lower Brier score.

Table 5 Model performance comparison

Model	AUC	Specificity	Sensitivity	Brier score
Nomogram model	0.868	0.840	0.785	0.138
Decision tree model	0.860	0.911	0.720	0.131

4. Discussion

4.1 Incidence of MCI in elderly hospitalized hypertensive patients

This study included 368 subjects, of whom 143 elderly hospitalized hypertensive patients had MCI, with an incidence of 38.86%. The high incidence may be related to cerebrovascular injury and dysfunction caused by long-term hypertension[25], imbalance of the brain renin-angiotensin system leading to oxidative stress and hippocampal damage[26], as well as white matter lesions and demyelination due to chronic hypoperfusion, which further reduce the efficiency of neural networks and cause cognitive impairment[27].

4.2 Influencing factors of MCI in elderly hospitalized hypertensive patients

Age is an important risk factor for cognitive impairment. In hypertensive patients, older age is accompanied by a longer disease course and more serious cumulative cerebrovascular damage, which superimposes with age-related brain degeneration such as neuronal loss and cerebral atrophy, thus significantly accelerating cognitive decline[28]. Education level represents cognitive reserve; higher education provides a more efficient neural network and stronger compensatory capacity against hypertensive brain injury, thereby delaying the occurrence of cognitive symptoms, while low education is associated with weaker cognitive reserve and more obvious dysfunction[29]. A longer duration of hypertension leads to more severe cerebral arteriolosclerosis and white matter lesions, and such irreversible structural damage markedly increases the risk of cognitive impairment[30]. Malnutrition weakens antioxidant and anti-inflammatory abilities and fails to provide sufficient nutrients for neuronal repair, thereby exacerbating cognitive damage[31]. In addition, depression and cognitive impairment form a bidirectional vicious cycle: chronic stress and HPA axis hyperactivity damage the hippocampus and impair cognition directly, while reduced medication compliance due to depression worsens blood pressure control and further accelerates cognitive decline[32].

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4.3 Performance of the model

In this study, logistic regression analysis identified age, education level, hypertension duration, nutritional status and depression as independent influencing factors of cognitive impairment in elderly hypertensive inpatients. Nomogram and decision tree prediction models were constructed based on these variables. Internal validation showed that both models exhibited favorable discrimination, calibration and predictive performance. The AUC was used as the core indicator of model discrimination, reflecting its overall sensitivity and specificity at various thresholds. The high AUC and satisfactory predictive performance in this study may be attributed to the inclusion of comprehensive multidimensional variables, including sociodemographic characteristics, lifestyle, psychological status and disease-related factors, as well as some rarely reported indicators such as physical activity, social support, monthly income, medication compliance, fall history and number of medications, leading to a more complete variable system and improved accuracy in predicting cognitive impairment risk in elderly hospitalized hypertensive patients.

Ethics Statement

This study has been approved by the Ethics Committee of Shaanxi Provincial People's Hospital, Ethics No. 2024 R138.Written informed consent was obtained from all participants.

References

[1] National Bureau of Statistics. 2024 Statistical Bulletin on National Economic and Social Development [EB/OL]. (2025 - 02 - 28) [2025 - 03 - 01]. http://www.stats.gov.cn/sj/tjgb/ndtjgb/ .
[2] Liu Mingbo, He Xinye, Yang Xiaohong, et al. Interpretation of key points in China Report on Cardiovascular Health and Disease 2023 [J]. Chinese General Practice, 2025, 28 (01): 20-38.
[3] P é rez Palmer N, Trejo Ortega B, Joshi P. Cognitive immunity in respiratory diseases: Epidemiology, tuberculosis, and treatment [J]. Psychiatr Clin North Am. 2022 Dec; 45 (4): 639-661.
[4] Guzmán L O ,Aguilar R V Y ,Raygoza P N , et al.Relationship between Hypertension and Cognitive Impairment in Older Adults: A Cross-Sectional Study[J].Journal of Advances in Medicine and Medical Research,2025,37(11):278-287.
[5] Shi Zhengli, Zhu Zhengjie, Zhang Hao, et al. The prevalence and influencing factors of cognitive impairment in the elderly in China: based on CHARLS data [J]. Chinese Journal of Gerontology, 2025 (06): 1511 - 1514.
[6] Wang Biqing, Zhang Ping, Yang Hongxia, et al. A meta-analysis of the prevalence and development trend of MCI in elderly patients with hypertension in China [J]. Chinese General Practice, 2025,45, 28 (17): 2186 - 2192.
[7] Chen Ling, Yang Lianzhao, Lu Jingyu, et al. Study on the status and influencing factors of mild cognitive impairment in elderly patients with hypertension in Nanning [J]. China Nursing Education, 2022, 19 (06): 566-571.
[8] Zhao Can, Liu Shanshan, Li Jingbing, et al. Risk factors of cognitive impairment and its relationship with poor prognosis in elderly patients with hypertension and weakness [J]. Journal of Cardiovascular Rehabilitation Medicine, 2024, 33 (04): 391-394.
[9] Hypertension Branch of Chinese Society of Geriatrics, Beijing Association for Prevention and Treatment of Hypertension, National Center for Clinical Medical Research on Diseases in the Elderly, et al. Guidelines for the Management of Hypertension in the Elderly in China 2023 [J]. Chinese Journal of Hypertension, 2023, 31 (06): 508-538.
[10] Chinese College of Emergency Medicine Education, Beijing Key Laboratory of Cardiopulmonary and Brain Resuscitation, Clinical Research Center of Emergency Medicine, Beijing Chaoyang Hospital Affiliated to Capital Medical University, et al. Chinese Standard for Diagnosis and Treatment of Hypertensive Emergencies [J]. Chinese Journal of Emergency Medicine, 2020, 29 (09): 1154 - 2023.
[11] Fang Jigan. Health Statistics [M]. Beijing: People's Health Publishing House, 2012: 399-400.
[12] Folstein MF, Folstein SE, McHugh PR ." Mini-mental state": a diagnostic method for treating the underlying state of patients for the clinician [J]. J Psychiatr Res, 1975,12 (3): 189-198.
[13] Zhou Xiaoxuan. A preliminary study on the reliability and validity of Chinese version of Mini-Mental in stroke patients [D]. Fuzhou: Fujian University of Traditional Chinese Medicine, 2016.
[14] Rubenstein LZ, Harker JO, Salv à A, et al. Screening for undernutrition in the practice of general nutrition: taking the short-form mini-nutritional assessment (MNA-SF) [J]. J Gerontol A Biol Sci Med Sci, 2001,56 (6): M366-M372.
[15] Zhang Yan, Wang Lixian, Lv Xiaohua, et al. Application of the mini nutrition assessment brief table in nutritional screening for elderly patients with chronic diseases [J]. Chinese Journal of

ISSN 2706-6819 Vol.8, Issue 2: 25-34, DOI: 10.25236/IJFM.2026.080203

Multiple Organ Diseases in the Elderly, 2019, 18 (02): 107-111 .
[16] Buysse DJ, Reynolds CF, Monk TH, et al. The Pittsburgh sleep quality index: a new instrument for therapeutic practice and research [J]. Psychiatry Res, 1989,28 (2): 193-213.
[17] Liu XC, Tang MQ. Reliability and reliability of the Pittsburgh Sleep Quality Index [J]. Chin J Psychiatry, 1996,29 (2): 103-107.
[18] Craig CL, Marshall AL, Sjostrom M, et al. International Physical Activity Questionnaire: 12-country exercises and exercises [J]. Medicine and Science in Sports and Exercise, 2003,35 (8): 1381 - 1395.
[19] Fan Mengyu, Lu Jun and He Pingping. Methods for calculating physical activity levels in the International Physical Activity Questionnaire [J]. Chinese Journal of Epidemiology, 2014, 35 (8): 961-964.
[20] Qu Ningning, Li Keji. Study on reliability and validity of the Chinese version of the International Physical Activity Questionnaire [J]. Chinese Journal of Epidemiology, 2004, 25 (3): 265-268.
[21] Xiao Shuiyuan. The theoretical basis and research of the Social Support Rating Scale [J]. Journal of Clinical Psychiatry, 1994 (2): 98-100.
[22] Liu Jiwen, Li Fuye, Lian Yulong. Study on reliability and validity of Social Support Rating Scale [J]. Journal of Xinjiang Medical University, 2008 (01): 1-3.
[23] Spitzer R L, Kroenke K, Williams J B. Validation and Utility of a Self-report Version of PRIME-MD: the PHQ Primary Care Study. Primary Care Evaluation of Mental Disorders. Patient Health Questionnaire [J]. JAMA, 1999,282 (18): 2008 - 1744.
[24] Yan M, Xiao S, Hu M. Chinese translation and reliability and validity of some depression scales in China [J]. Chinese Journal of Mental Health, 2016, 30 (07): 501-505.
[25] Santiago et al. MM, Iadecola C, Carnevale D. Hypertension, Neuroprotective Dysfunction, and Cognitive Immediate ment. Hypertension 2023; 80 (1): 22-34.
[26] Zou Yun, Shao Linlin. Progress of function research on cerebral renin-angiotensin system in cognitive impairment of hypertension [J]. Chinese Journal of Hypertension, 2023, 31 (12): 1163 - 1173.
[27] Hainsworth AH, Markus HS, Schneider JA. Brain Disease Small Vessel Disease, Hypertension, and Vascular Contributions to Cognitive Impairment and Dementia. Hypertension 2024; 81 (1): 75-86.
[28] Zhang Xiaoming, Li Xinghui, Zhang Huijuan, et al. The prevalence of cognitive impairment and its influencing factors in Tibetan and Han Chinese patients with hypertension in southern Gansu: a cross-sectional survey [J]. Practical Journal of Cardio-cerebral Pulmonale, 2025, 33 (03): 39-44.
[29] Chen Ling, Yang Lianzhao, Lu Jingyu, et al. Study on the status and influencing factors of mild cognitive impairment in elderly patients with hypertension in Nanning [J]. China Nursing Education, 2022, 19 (06): 566-571.
[30] Tang Huaping. Current status and risk factors of cognitive impairment in elderly hospitalized patients with hypertension [J]. Journal of Clinic& Pathology, 2023, 43 (01): 92-99.
[31] Xu Q, Lu SR, Shi ZH, et al. Nutritional status of peripheral hypertensive patients and its relation to the survival of peripheral diseases. World J Psychiatry. 2025;15 (4): 103092. Published 2025 Apr 19.
[32] Jones A, Ali MU, Kenny M, et al. Modifying Risk Factors for Dementia and Mild Cognitive Impairment: An Umbrella Review and Meta-Analysis. Dement Geriatr Cogn Disord. 2024; 53 (2): 91-106.