

# Correlation Model Construction and Validation of Coronary Artery Stenosis Degree Based on TCM Syndromes and Coronary Heart Disease-Related Parameters

Ge Liu, Junru Zhang\*, Yang Wang, Cong Wang

Shaanxi University of Chinese Medicine, Xianyang 712046, Shaanxi, China

\*Correspondence Author

**Abstract:** **Objective:** To investigate the relationship between coronary heart disease (CHD)-related indicators and the degree of coronary artery stenosis in patients based on traditional Chinese medicine (TCM) syndromes, and to provide a reference for clinicians to predict the severity of coronary artery lesions in CHD patients. **Methods:** Clinical data of 277 hospitalized patients diagnosed with CHD who underwent coronary angiography (CAG) in the Department of Cardiology, Shaanxi Provincial Hospital of Traditional Chinese Medicine, from June 2023 to June 2025 were collected, including 163 males and 114 females. The patients were divided into the severe CHD group (Gensini score  $\geq 32$  points,  $n=69$ ) and the mild CHD group (Gensini score  $< 32$  points,  $n=208$ ) according to the Gensini score. General information including gender, age, underlying disease history, smoking history, and multiple laboratory indicators of the patients were collected. Univariate analysis was first used to screen the influencing factors of CHD severity; the Least Absolute Shrinkage and Selection Operator (LASSO) algorithm was applied to correct factor collinearity and screen the optimal matching factors. These factors were then included in the multivariate forward stepwise logistic regression analysis to identify independent influencing factors and draw a nomogram. Finally, the receiver operating characteristic (ROC) curve, calibration curve, and clinical decision curve were used to verify the discrimination, accuracy, and clinical application efficacy of the model. **Results:** 1) Univariate analysis showed that there were statistically significant differences in the levels of lymphocyte (LYM), cardiac troponin (cTn), high-density lipoprotein (HDL), and lipoprotein a (Lp(a)) between the two groups ( $P < 0.05$ ). 2) LASSO regression and multivariate logistic regression identified 9 independent influencing factors for coronary artery stenosis, including smoking, diabetes mellitus,  $\ln(cTn)$ , HDL, Lp(a), uric acid, cystatin C, blood stasis syndrome, and neutrophil-to-lymphocyte ratio (NLR) ( $P < 0.05$ ). Among them, HDL was an independent negatively correlated factor, and the others were positively correlated factors. 3) The ROC curve showed that the area under the curve (AUC) of the model group was 0.760 (95% CI: 0.713, 0.806) and that of the validation group was 0.745 (95% CI: 0.714, 0.776), indicating good discrimination of the model. 4) The clinical decision curve and clinical impact curve showed that the model achieved the maximum clinical net benefit when the threshold probability was 0.12-0.76 in the model group and 0.18-0.57 in the validation group. **Conclusion:** 1) Smoking, diabetes mellitus,  $\ln(cTn)$ , HDL, Lp(a), uric acid, cystatin C, blood stasis syndrome, and NLR are independent risk factors for the degree of coronary artery stenosis in CHD patients. 2) Combined detection of serum levels of  $\ln(cTn)$ , HDL, Lp(a), uric acid, and cystatin C has reference value for predicting the degree of coronary artery stenosis in CHD patients.

**Keywords:** Coronary heart disease, Coronary artery stenosis degree, Lipoprotein a, Cystatin C, Uric acid, Prediction model, Traditional Chinese Medicine Syndromes.

## 1. Introduction

Coronary atherosclerotic heart disease (CHD) is a cardiac disease caused by the formation of atherosclerotic plaques in the coronary artery walls due to multiple factors, which leads to stenosis or occlusion of the vascular lumen and induces myocardial hypoxia, ischemia and even necrosis. In recent years, with the improvement of residents' living standards, the increase of unhealthy living habits, and the acceleration of population aging and urbanization, the risk factors for CHD have been continuously increasing, and its morbidity and mortality have risen year by year. CHD has become one of the three leading causes of death from cardiovascular diseases in China[1].

Coronary angiography (CAG) is the gold standard for diagnosing CHD, which can directly display the location of stenotic lesions and evaluate the degree of stenosis. However, this method has disadvantages such as high cost, high requirements for equipment and technology, and the need for hospitalization. In addition, it is invasive and radioactive, which is difficult for some patients to accept, thus restricting its popularization and application in primary medical

institutions. Therefore, it is urgent to find non-invasive, simple and easy-to-operate predictive indicators for CHD to quickly identify and screen CHD patients, estimate the degree of coronary angiographic stenosis in suspected patients, and achieve early diagnosis, early prevention and early treatment.

This study combines TCM syndromes with CHD risk factors to construct a risk prediction model for the degree of coronary artery stenosis, aiming to provide a simple reference tool for the early identification and screening of suspected CHD patients. The nomogram was used to quantify the probability of coronary artery stenosis in suspected CHD patients, and the AUC of ROC curve, sensitivity, specificity and calibration were used to evaluate the model performance, so as to improve the operability and efficacy of the model in clinical application. This study provides a basis for a comprehensive assessment of CHD risk factors, the adoption of active intervention measures, and the formulation of individualized medical plans.

## 2. Materials and Methods

### 2.1 General Information

Clinical data of 277 eligible CHD inpatients aged 35 to 85 years (163 males and 114 females) in the Department of Cardiology, Shaanxi Provincial Hospital of Traditional Chinese Medicine, from June 2023 to June 2025 were collected. The patients were divided into the severe CHD group (Gensini score  $\geq 32$  points,  $n=69$ ) and the mild CHD group (Gensini score  $< 32$  points,  $n=208$ ) according to the Gensini score of coronary angiography. Patients with severe hepatic and renal insufficiency, tumor diseases, hematological system diseases, secondary hypertension, and autoimmune diseases were excluded.

## 2.2 Inclusion and Exclusion Criteria

### 2.2.1 Inclusion Criteria

- (1) Definite diagnosis of CHD by coronary angiography with TCM syndromes;
- (2) Aged 18 to 90 years old;
- (3) Complete relevant clinical baseline data.

Patients meeting all the above 3 criteria were included in this study.

### 2.2.2 Exclusion Criteria

- (1) Patients with severe cardiac insufficiency, primary/secondary cardiomyopathy, valvular heart disease, and severe heart failure;
- (2) Patients with hepatic and renal insufficiency, abnormal thyroid function, tumors, and immune system-related diseases;
- (3) Patients with mental diseases or consciousness disorders;
- (4) Patients participating in other clinical studies or with incomplete clinical data.

Patients meeting any of the above criteria were excluded.

## 2.3 Data Collection

### 2.3.1 General Clinical Data

Basic information including gender, age, blood pressure, blood lipid, smoking history, drinking history, and TCM syndromes of the patients were collected.

### 2.3.2 Imaging Data

The main data were the results of coronary computed tomography angiography (CCTA) or CAG. The positive criterion of CAG was that the internal diameter stenosis of at least one major coronary artery or its branches was  $\geq 50\%$ [2]. The major coronary arteries included the left main coronary artery, left circumflex artery, left anterior descending artery and right coronary artery; the major branches included the diagonal branch, posterior descending branch, obtuse marginal branch, posterior left ventricular branch and acute marginal branch.

### 2.3.3 Laboratory Data

Four categories of indicators were included: (1) Routine blood test indicators: white blood cell count (WBC), lymphocyte count (LYM), monocyte count (MONO), neutrophil count (NEUT), neutrophil-to-lymphocyte ratio (NLR), monocyte-to-lymphocyte ratio (MLR); (2) Biochemical indicators: alanine aminotransferase (ALT), serum total bilirubin (TBIL), serum  $\gamma$ -glutamyl transferase ( $\gamma$ -GT), uric acid (UA); (3) Blood lipid indicators: triglyceride (TG), total cholesterol (TC), high-density lipoprotein cholesterol (HDL-C), low-density lipoprotein cholesterol (LDL-C), lipoprotein (a) (Lp(a)), apolipoprotein A1 (ApoA1), apolipoprotein B (ApoB); (4) Myocardial enzyme and inflammatory indicators: creatine kinase (CK), lactate dehydrogenase (LDH), high-sensitivity C-reactive protein (hs-CRP), cystatin C (CysC).

## 2.4 Statistical Methods

Excel software was used to sort out and input all data, and SPSS 26.00 and R version 4.2 were used for statistical analysis and visualization, with  $P < 0.05$  considered statistically significant.

Normality and homogeneity of variance tests were first performed on the data. Measurement data with normal distribution were expressed as mean  $\pm$  standard deviation ( $\bar{X} \pm s$ ), and measurement data with non-normal distribution were expressed as median (25th percentile, 75th percentile) (M (P25, P75)). Count data were expressed as number and percentage (n%). Univariate analysis was first used to screen the influencing factors of CHD severity, and then LASSO regression was applied to correct collinear factors and screen the optimal matching factors of the model. The screened factors were included in the multivariate forward stepwise logistic regression to identify the independent influencing factors of coronary artery stenosis in CHD and draw a nomogram.

Patients were randomly divided into a training set and a validation set at a ratio of 7:3 using R software. The training set was used for model construction and efficacy evaluation, and the validation set was used for internal model validation. Based on the influencing factors screened from the training set, univariate and multivariate logistic regression analyses were used to identify the independent risk factors of CHD. Variables with statistical significance were included in the regression model to draw a nomogram for quantifying the risk probability of coronary artery stenosis. The validation set was used for internal validation; the Hosmer-Lemeshow (H-L) test and calibration curve were used to evaluate the predictive effect of the model, and the ROC curve and AUC were calculated to judge the discrimination ability of the model.

## 3. Results

### 3.1 Univariate Analysis of Coronary Artery Stenosis Degree in CHD Patients

Comparison of clinical and laboratory indicators between the low-score group (mild CHD) and the high-score group (severe CHD) showed that there were statistically significant

differences in the levels of LYM, cTn, HDL and Lp(a) between the two groups ( $P < 0.05$ ); while there were no significant statistical differences in age, gender, smoking history, hypertension history, diabetes history, WBC, MONO and other indicators between the two groups ( $P > 0.05$ ), as shown in Table 1.

**Table 1:** Comparison of data between patients with mild and severe CHD in the training set

Characteristic	Overall N = 194 <sup>1</sup>	Mild CHD N = 144 <sup>1</sup>	Severe CHD N = 50 <sup>1</sup>	p-value <sup>2</sup>
age	65.5 (60, 72)	66 (60, 72.5)	65 (60, 72)	0.979
sex				0.528
Male	109(56.2)	79(54.9)	30(60.0)	
Female	85(43.8)	65(45.1)	20(40.0)	
smoke	65(33.5)	46(31.9)	19(38.0)	0.434
Hypertension	131(67.5)	97(67.4)	34(68.0)	0.934
Hypertension classification				0.777
0	63(32.5)	47(32.6)	16(32.0)	
1	17(8.8)	11(7.6)	6(12.0)	
2	40(20.6)	31(21.5)	9(18.0)	
3	74(38.1)	55(38.2)	19(38.0)	
Diabetes	51(26.3)	36(25.0)	15(30.0)	0.489
WBC	5.4 (4.6, 6.4)	5.4 (4.6, 6.5)	5.5 (4.6, 6.2)	0.986
Lymphocyte	1.5 (1.2, 1.7)	1.5 (1.2, 1.7)	1.3 (1.0, 1.7)	<b>0.026</b>
Monocyte	0.3 (0.3, 0.4)	0.3 (0.3, 0.4)	0.3 (0.3, 0.4)	0.654
Neutrophil	3.5 (2.7, 4.4)	3.5 (2.7, 4.4)	3.6 (2.8, 4.7)	0.530
CRP	0.7 (0.3, 1.9)	0.7 (0.3, 2.0)	0.8 (0.4, 1.5)	0.986
Total Bilirubin	11.8 (9.5, 15.7)	11.7 (9.6, 15.4)	13.8 (9.4, 16.6)	0.338
Alanine	20.0 (15.0, 28.0)	20.0 (15.0, 29.5)	19.0 (16.0, 24.0)	0.389
Glutamic acid	21.0 (15.0, 31.0)	21.0 (15.0, 32.0)	21.0 (17.0, 31.0)	0.853
cTn	3.5 (1.7, 7.2)	2.8 (1.6, 5.3)	5.9 (2.2, 22.1)	<b>0.001</b>
CKMB	0.8 (0.5, 1.3)	0.8 (0.5, 1.3)	0.8 (0.6, 1.3)	0.456
Glucose	5.3 (4.8, 5.9)	5.4 (4.8, 6.0)	5.3 (4.7, 5.7)	0.529
Total Cholesterol	3.7 (3.1, 4.5)	3.8 (3.1, 4.6)	3.5 (3.1, 4.4)	0.203
Triglyceride	1.3 (0.9, 1.8)	1.3 (0.9, 1.8)	1.3 (0.9, 1.9)	0.970
HDL	1.2 (1.0, 1.5)	1.2 (1.0, 1.5)	1.2 (0.9, 1.3)	<b>0.026</b>
LDL	2.0 (1.6, 2.6)	2.1 (1.6, 2.6)	1.9 (1.7, 2.5)	0.508
APOA	1.4 (1.3, 1.6)	1.4 (1.3, 1.6)	1.3 (1.2, 1.6)	0.129
APOB	0.7 (0.6, 0.8)	0.7 (0.6, 0.8)	0.7 (0.6, 0.8)	0.944
Lpa	224.0 (107.0, 417.0)	215.0 (91.5, 354.5)	282.5 (137.0, 502.0)	<b>0.040</b>
LDH	175.5 (154.0, 196.0)	176.0 (150.0, 200.5)	171.0 (156.0, 187.0)	0.163
CK	87.0 (66.0, 116.0)	85.0 (66.5, 113.0)	97.0 (64.0, 124.0)	0.403
Cr	60.7 (50.3, 72.3)	59.3 (50.2, 70.8)	66.0 (51.1, 77.3)	0.112
UA	321.0 (272.0, 386.0)	310.0 (266.5, 381.5)	345.0 (286.0, 392.0)	0.076
Cystatin C	1.0 (0.9, 1.1)	1.0 (0.9, 1.1)	1.0 (0.9, 1.1)	0.185
Phlegm stasis	154(79.4)	117(81.3)	37(74.0)	0.275
Intermingling	39(20.1)	26(18.1)	13(26.0)	0.227
Blood stasis	18 (10, 32)	13.8 (7, 20)	50 (38, 72)	<0.001
Gensini score	8.6 (8.2, 9.0)	8.6 (8.2, 9.0)	8.5 (8.3, 9.0)	0.922
TyG	6.8 (2.4, 15.8)	6.7 (2.3, 16.5)	6.8 (3.0, 14.7)	0.957
CTI	2.4 (1.9, 3.3)	2.3 (1.8, 3.1)	2.6 (2.0, 3.9)	0.084
NLR	0.2 (0.2, 0.3)	0.2 (0.2, 0.3)	0.3 (0.2, 0.3)	0.240

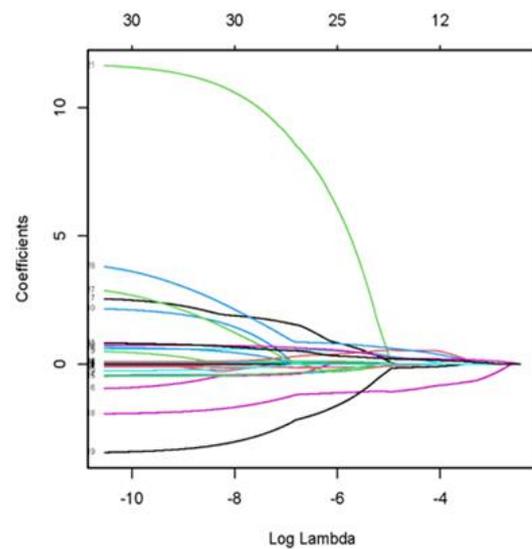
<sup>1</sup>Median (Q1, Q3); n(%)

<sup>2</sup>Wilcoxon rank sum test; Pearson's Chi-squared test; Fisher's exact test

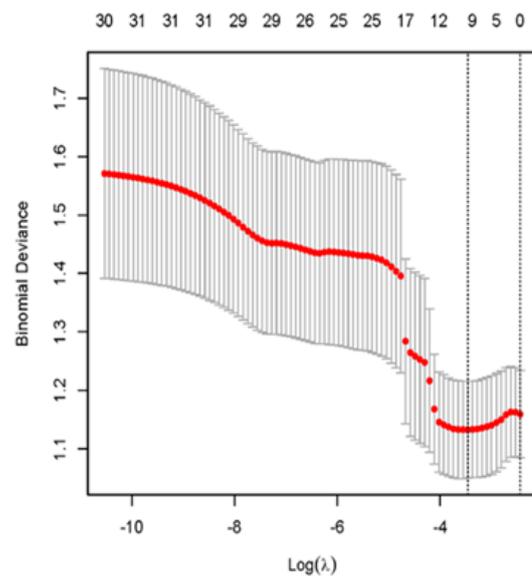
### 3.2 Multivariate Analysis of Coronary Artery Stenosis Degree in CHD Patients

LASSO regression analysis was performed on the indicators with statistical significance in univariate analysis and potential related indicators. The optimal  $\lambda$  value was determined by the LASSO regularization variable screening path diagram and 10-fold cross-validation to screen the optimal matching factors. These factors were included in the multivariate logistic regression analysis, and finally 9 independent influencing factors for coronary artery stenosis in CHD were identified, including smoking, diabetes mellitus, ln(cTn), HDL, Lp(a), uric acid, cystatin C, blood stasis syndrome and NLR ( $P < 0.05$ ). Among them, HDL was an

independent protective factor (negative correlation), and the other 8 factors were risk factors (positive correlation), as shown in Figure 1 and Figure 2.



**Figure 1:** LASSO regularization variable screening path diagram (Each color curve represents the change trajectory of the coefficient of each variable with the change of  $\lambda$ . With the increase of regularization degree, the coefficients of more variables are compressed to 0).

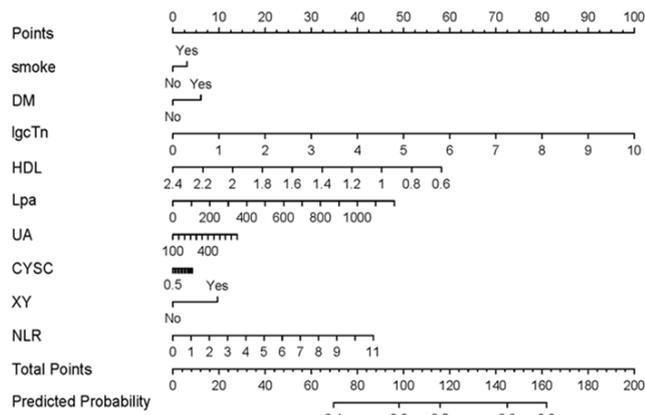


**Figure 2:** Determination of the optimal  $\lambda$  by 10-fold cross-validation, and the final number of variables is determined accordingly. The number of variables included in the final model is determined according to the  $\lambda$  value corresponding to the minimum deviation (the variables corresponding to the first dotted line in the figure).

### 3.3 Construction of a Nomogram for the Prediction Model of Coronary Artery Stenosis Degree in CHD Patients

Based on the 9 screened independent influencing factors, a nomogram model for the risk degree of coronary artery stenosis in CHD was drawn. In clinical application, clinicians can obtain the single score of each indicator according to the specific conditions of patients' smoking history, diabetes history, ln(cTn), HDL, Lp(a), uric acid, cystatin C, blood stasis syndrome and NLR from the nomogram, sum all single scores to get the total score, and then query the corresponding risk probability of coronary artery stenosis according to the

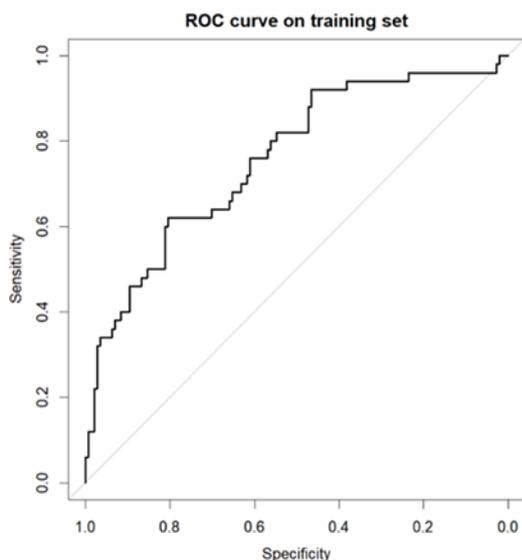
total score, as shown in Figure 3.



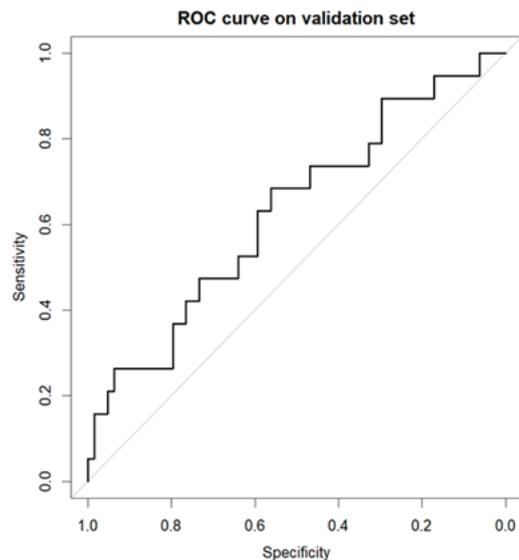
**Figure 3:** A patient with smoking history (2.6 points), HDL 0.8 (51.8 points), Lp(a) 1000 (40.9 points), NLR 2 (8.8 points) and blood stasis syndrome (11.9 points) had a total score of 116 points. The probability of abnormal coronary angiography results was about 50% according to the nomogram. This nomogram realizes the quantitative assessment of the risk of coronary artery stenosis in CHD and provides an intuitive tool for clinical individualized prediction

**3.4 Evaluation of Discrimination and Calibration of the Risk Prediction Model for Coronary Artery Stenosis in CHD**

The ROC curve was used to evaluate the discrimination of the model. The results showed that the AUC of the model group was 0.760 (95% CI: 0.713, 0.806) and that of the validation group was 0.745 (95% CI: 0.714, 0.776), suggesting that the prediction model had good discrimination ability for mild and severe coronary artery stenosis in CHD. The results of the calibration curve and H-L test showed that the consistency between the predicted value and the actual observed value of the model was good, the calibration was ideal, and there was no significant prediction bias, as shown in Figure 4 and Figure 5.



**Figure 4**

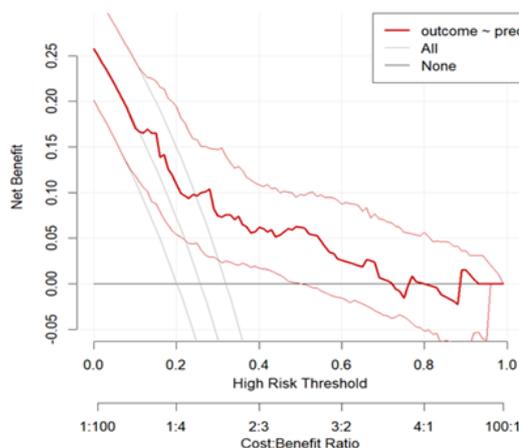


**Figure 5**

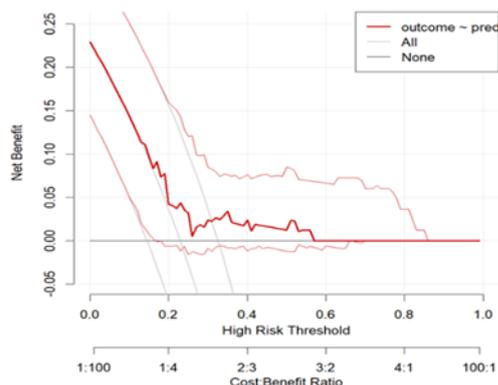
**Figure 4 and Figure 5:** ROC curves of the prediction model for coronary artery stenosis in CHD patients in the model group and validation group, respectively. The abscissa is specificity and the ordinate is sensitivity; the black solid line is the bias correction line, and the black dotted line is the ideal reference line

**3.5 Evaluation of Clinical Application Efficacy of the CHD Risk Prediction Model**

The clinical decision curve and clinical impact curve were used to evaluate the clinical application value of the model. The results showed that the model achieved the maximum clinical net benefit when the threshold probability was in the range of 0.12-0.76 in the model group and 0.18-0.57 in the validation group. Within this threshold probability range, the number of patients with coronary artery stenosis predicted by the model was more than the actual number of patients with the disease, and the loss-benefit ratio was always less than 1, indicating that clinical intervention using this model can provide effective reference for clinicians, reduce ineffective intervention, and has good clinical application efficacy and practical application value, as shown in Figure 6 and Figure 7.



**Figure 6**



**Figure 7**

**Figure 6 and Figure 7:** Clinical decision curves of the model group and validation group, respectively. The abscissa is the threshold probability and the ordinate is the net profit value. The dotted line represents clinical intervention for all patients, the dot-dash line represents no clinical intervention for all patients, and the solid line represents the model group and validation group, respectively

#### 4. Discussion

With the socio-economic development of China, the unhealthy lifestyle of residents has intensified, and the incidence of cardiovascular and cerebrovascular diseases has continued to rise. Cardiovascular diseases have become the leading cause of death among urban and rural residents in China [3], bringing a heavy economic burden to society and families. A number of studies [4-5] have shown that hypertension, obesity, smoking, hypercholesterolemia and other factors are related risk factors for the onset of CHD. This study screened 9 independent influencing factors for coronary artery stenosis in CHD, and combined TCM syndromes with modern medical indicators, providing a new integrated traditional Chinese and Western medicine idea for CHD risk prediction. The mechanism of action and clinical significance of each factor are analyzed as follows:

(1) Smoking: It is an important risk factor for cardiovascular diseases. Compared with non-smokers, mild smoking also increases the incidence of CHD, and the incidence is positively correlated with the amount of smoking. More than 75% of patients with early-onset CHD are smokers [6]. Smoking can cause a transient increase in blood pressure, accelerated heart rate, increased myocardial oxygen consumption, and induce insufficient myocardial blood supply and oxygen supply; at the same time, it enhances platelet aggregation, reduces the sensitivity of platelet aggregation inhibitors, and promotes the formation of atherosclerosis through multiple pathways, which is an independent risk factor for CHD.

(2) Diabetes mellitus: It is an important risk factor for CHD. The probability of developing CHD in diabetic patients is nearly twice that in non-diabetic patients [7]. The pathogenic mechanism of CHD complicated with diabetes mellitus is complex, which may be related to insulin resistance, oxidative stress and chronic inflammatory response. Therefore, comprehensive treatment of cardiovascular risk factors in diabetic patients is a key measure to reduce cardiovascular events.

(3) In(cTn): Cardiac troponin is a specific protein of cardiomyocytes. When cardiomyocytes are damaged, a large amount of cTnI in the cytoplasm is released into the blood, and its serum level is closely related to the degree of myocardial damage. cTn rises 3~6 hours after myocardial damage [8], reaches the peak at 10~24 hours, and can last for 7~10 days, with extremely high specificity and sensitivity. It is an ideal marker for early detection of myocardial damage, and its level is significantly positively correlated with the degree of coronary vascular lesions.

(4) HDL-C: As an independent protective factor, it can transport cholesterol in peripheral tissues, promote cholesterol metabolism and excrete it from the body through bile. A number of studies [9-10] have confirmed that the content of HDL-C is significantly negatively correlated with the degree of arterial lumen stenosis. Therefore, maintaining the level of HDL-C has a positive significance for reducing cholesterol deposition in the vascular wall and delaying atherosclerosis.

(5) Lp(a): It is a macromolecular lipoprotein synthesized by the liver and rich in cholesterol. Its serum concentration is stable and not affected by smoking, lipid metabolism, age and other factors, which is an independent risk factor for CHD [11]. Lp(a) can promote the esterification of cholesterol by binding to sulfated glucose in the arterial wall through oxidative stress and promoting inflammatory response. At the same time, it blocks the combination of plasminogen and fibrin, promotes thrombosis, accelerates the process of coronary atherosclerosis, and can be used as an independent indicator to evaluate the degree of coronary artery stenosis [12].

(6) Uric acid (UA): It is the final product of purine metabolism, and its level is closely related to the incidence and severity of CHD. The level of serum UA in CHD patients is significantly increased, and the wider the lesion range and the more severe the condition, the higher the UA level [13]. Meta-analysis has confirmed that elevated UA increases the risk of CHD events and is an important risk factor for the progression of CHD [14].

(7) Cystatin C (Cys C): It is mainly filtered by the glomerulus and degraded in the proximal convoluted tubule. It is a sensitive indicator reflecting the glomerular filtration rate, and is less affected by gender, age, body weight and other factors. In recent years, studies have found that Cys C can promote the formation of atherosclerosis and increase the risk of cardiovascular events by participating in the inflammatory response and remodeling of vascular walls and affecting the synthesis and release of nitric oxide, and its level is positively correlated with the severity of CHD [15].

(8) NLR: The ratio of neutrophils to lymphocytes comprehensively reflects the degree of inflammatory response and the state of the immune system in the body. Neutrophils can promote coronary inflammatory response and the formation of atherosclerotic plaques by producing reactive oxygen species and releasing proteases, while lymphocytes are involved in immune regulation and inflammatory control [16]; a number of studies have shown that the level of NLR is closely related to the risk of CHD, the severity of lesions and adverse cardiovascular events, and can predict the onset of

CHD and the degree of coronary artery stenosis by reflecting the systemic inflammatory state [17-18].

(9) Blood stasis syndrome: CHD belongs to the categories of “chest impediment” and “heart pain” in TCM. Blood stasis is one of the core pathogenesis of its occurrence and development. The disease is based on yin-yang and qi-blood deficiency, and marked by blood stasis and phlegm turbidity. Its pathological mechanism is highly consistent with coronary atherosclerosis in modern medicine [19]. Blood stasis can lead to a hypercoagulable state of blood, damage vascular endothelium, promote platelet aggregation, aggravate the degree of coronary artery stenosis, and induce myocardial ischemia and hypoxia [20]; the severity of blood stasis syndrome is positively correlated with the incidence of restenosis after interventional therapy for CHD. However, blood circulation activating and stasis resolving intervention can significantly reduce the incidence of restenosis and angina pectoris recurrence by inhibiting intimal hyperplasia and improving vascular remodeling. Classic prescriptions such as Xuefu Zhuyu Decoction have also confirmed the clinical effectiveness of blood circulation activating and stasis resolving therapy [21].

This study found no independent correlation between TyG index, hypertension and coronary artery stenosis in CHD. The possible reasons include the limited sample size of the study, regional limitations, differences in gender ratio and living habits of the study subjects, etc. In the future, multi-center studies with expanded sample size are needed to further explore their correlation.

The nomogram prediction model constructed in this study still has certain limitations: first, the study subjects are all from a single medical institution (Shaanxi Provincial Hospital of Traditional Chinese Medicine), lacking multi-center data support and no external validation, so the applicability of the model needs to be further verified; second, this study is a retrospective study, limited by time, the scope of data collection is limited, the number of included variables is small, and some potential non-traditional risk factors are not discussed. In the future, the nomogram model can be optimized by expanding the sample size, carrying out multi-center studies, and including more independent variables to improve the accuracy and clinical applicability of the model.

## 5. Summary

In summary, smoking, diabetes mellitus, ln(cTn), HDL, Lp(a), uric acid, cystatin C, blood stasis syndrome and NLR screened in this study are independent influencing factors for the degree of coronary artery stenosis in CHD patients. The nomogram prediction model constructed based on these factors has good discrimination, calibration and clinical application efficacy, which can provide a simple and effective reference tool for clinicians to predict the severity of coronary artery lesions in CHD patients, and a basis for early diagnosis, early treatment and individualized intervention of CHD.

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