A Retrospective Study from a Single Center in China to Develop a Nomogram to Predict One-Year Mortality in Patients with End-Stage Renal Disease Who Are Receiving Hemodialysis

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Background: The prognosis of end-stage renal disease (ESRD) patients receiving hemodialysis (HD) remains poor. This retrospective study from a single center in China aimed to develop a nomogram to predict one-year mortality in patients with ESRD on HD.

Material/Methods: We enrolled 299 ethnic Han Chinese ESRD patients undergoing HD at the Second Affiliated Hospital of Nantong University from April 29, 2011 to January 30, 2021. Univariate and multivariate Cox regression analyses were used to select the predictors incorporated in the prediction model to assess the one-year mortality for ESRD patients receiving HD. We used receiver operating characteristic curves, C-index, and calibration curves to evaluate the performance of the nomogram. The predictive performance of the nomogram was also verified in different subgroup populations.

Results: The median follow-up time was 23.30 months. The 299 ESRD patients receiving HD were divided into a death group (n=96) and a survival group (n=203), and the incidence of death was 32.11%. The main causes of death were cardiovascular disease, inflammation and cancer. A nomogram containing age, alkaline phosphatase, albumin, cystatin C, total bilirubin, and hypersensitive c-reactive protein was established. The performance of this nomogram was reflected by its moderate predictive ability, especially for patients who were male, had a primary disease of chronic glomerulonephritis, and had no history of comorbidities.

Conclusions: We developed and validated an easy-to-use nomogram for predicting the one-year mortality of ESRD patients undergoing HD.

Keywords: Hemodialysis Solutions • Kidney Failure, Chronic • Mortality • Nomograms

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Background

End-stage renal disease (ESRD) is the terminal stage of various chronic kidney diseases. ESRD is usually diagnosed when glomerular filtration rate (GFR) drops below 15 mL/min/1.73 m² and is a prevalent worldwide public health problem [1,2]. Due to the growing number of patients with diabetes mellitus, hypertension, and chronic kidney disease, the prevalence of ESRD is increasing in recent years [3,4].

Previous research has shown that hemodialysis (HD), peritoneal dialysis, and transplantation are the main treatments for ESRD, and can significantly prolong the survival time of patients [5]. In particular, HD has made great progress in the treatment of ESRD and is one of the most widely used renal replacement therapies for patients with ESRD in different countries and regions [6]. As reported by United States Renal Data System, the mortality rate for patients receiving HD is 159.3 per 1000 persons [6]. China’s annual report on kidney disease shows that mortality of HD patients reached 12.5%, which imposed a substantial burden for patients and the health care system [7]. The main causes of death for patients on HD in China are cardiovascular events (40.0%), cerebrovascular events (35.9%), and infections (9.9%) [7]. Some demographic characteristics and biochemical indicators of liver and kidney function related to the risk of death in ESRD patients receiving HD were extensively proposed, such as age [8], alkaline phosphatase (AKP) [9], albumin (ALB) [9], and uric acid (UA) concentrations [10]. However, the establishment of an effective prediction model by combing multiple prognostic factors could play an important role in clinical risk assessment and individual patient’s treatment [11]. There have been few studies based on the biochemical indicators of liver and kidney function needed to construct a prediction model associated with the risk of ESRD patients receiving HD [11-14].

Recently, nomograms have been widely used in oncology as an easy-to-use prediction tool, promoting personalized medicine and making it easier for clinicians to predict patient prognosis [15]. Therefore, this retrospective study from a single center in China aimed to develop a nomogram to predict one-year mortality in patients with ESRD who are receiving HD.

Material and Methods

Study Design and Population

This retrospective cohort study included 355 ethnic Han Chinese ESRD patients receiving HD at the Second Affiliated Hospital of Nantong University from April 29, 2011 to January 30, 2021. The median follow-up time was 23.30 months. During the follow-up period, the lost-to-follow-up rate was “5.97%” (n=19).

We only included ESRD patients who were ≥18 years of age, met the standard of chronic kidney disease proposed by Kidney Disease Improving Global Outcomes (KDIGO) of the United States in 2012, and needed to receive continuous HD for at least 90 days. Enrolled patients had to have baseline information, biochemical information, and prognostic data. The exclusion criteria were: (1) history of kidney transplantation (n=17); (2) withdrew from HD or received peritoneal dialysis (n=12); (3) died within 3 months after HD (they were considered as non-HD-related deaths, n=8); and (4) patients who were lost to follow-up (n=19). All patients were strictly selected according to inclusion and exclusion criteria. Moreover, the project leader developed a training program for every participant to ensure that they understood and were familiar with the clinical protocol before the clinical study. Ultimately, 299 patients were enrolled in this analysis. This study was approved by the Research Ethics Board of the Second Affiliated Hospital of Nantong University (approval number 2020KT031) and it was conducted in accordance with the Helsinki Declaration and China’s regulations on clinical research.

Data Collection

Before HD, demographic and clinical characteristics of all patients were retrospectively recorded, including age, sex, body mass index (BMI), comorbidities (e.g., hypertension, diabetes, hyperlipidemia, CVD, cancer); primary diseases (e.g., chronic glomerulonephritis, diabetic nephropathy, hypertensive nephropathy, polycystic kidney) and “other” (systemic lupus erythematosus, gouty nephropathy, obstructive nephropathy, antineutrophil cytoplasmic antibody (ANCA)-associated systemic vasculitis). Medication history included hypotensive drugs, hypoglycemic drugs, angiotensin-converting enzyme inhibitors (ACEI) or angiotensin-receptor blocker (ARBs), β-receptor antagonists, statins, antiplatelet drugs, diuretics, UA reduction medication, and aldosterone receptor antagonist. Biochemical indicators included white blood cell (WBC, 10⁹/L), hemoglobin (g/L), platelets (PLT, 10⁹/L), lymphocyte (10⁹/L), platelet/lymphocyte ratio (PLR), AKP (U/L), glutamyl transpeptidase (GGT, U/L), ALB (g/L), total bilirubin (TBIL, μmol/L), total bile acid (TBA, μmol/L), UA (μg/mL), β₂-microglobulin (μmol/L), creatinine (Cr, μmol/L), cystatin C (CysC, mg/L), estimated glomerular filtration rate (eGFR, mL/(min·1.73 m²)), total cholesterol (TC, mmol/L), triglyceride (TG, mmol/L), high-density lipoprotein cholesterol (HDL, mmol/L), low-density lipoprotein cholesterol (LDL, mmol/L), apolipoprotein A (APOA, mmol/L), apolipoprotein B (APOB, mmol/L), lipoprotein α (Lpα, mg/L), troponin I (TnI, pg/mL), brain natriuretic peptide (BNP), hypersensitive C-reactive protein (hs-CRP, mg/L), thyroid-stimulating hormone (TSH, mIU/L), glucose (GLU, mmol/L), lactic dehydrogenase (LDH, U/L), α-hydroxybutyric dehydrogenase (α-HBDH, U/L), creatine kinase (CK, U/L), creatine kinase-MB (CK-MB, U/L), serum potassium (mmol/L), serum phosphorus (mmol/L), and...
**Table 1.** Possible factors related to the mortality of end-stage renal disease patients receiving hemodialysis as shown by univariate Cox regression analysis.

| Variables                      | β    | S.E.  | χ²  | HR (95% CI)     | P    |
|--------------------------------|------|-------|-----|-----------------|------|
| Age                            | 0.050| 0.009 | 33.187 | 1.05 (1.03-1.07) | <0.001|
| Sex                            |      |       |       |                 |      |
| Male                           |      |       |       |                 |      |
| Female                         | -0.154| 0.209 | 0.545 | 0.86 (0.57-1.29) | 0.460|
| BMI                            | -0.041| 0.028 | 2.190 | 0.96 (0.91-1.01) | 0.139|
| Primary diseases               |      |       |       |                 |      |
| Polycystic kidney              |      |       |       |                 |      |
| Hypertensive nephropathy       | -0.042| 0.413 | 0.010 | 0.96 (0.43-2.15) | 0.919|
| Chronic glomerulonephritis     | -0.841| 0.413 | 4.137 | 0.43 (0.19-0.97) | 0.042|
| Diabetic nephropathy           | 0.208| 0.375 | 0.307 | 1.23 (0.59-2.57) | 0.579|
| Other*                         | 0.865| 0.429 | 4.059 | 2.37 (1.02-5.51) | 0.044|
| Hypertension (Yes)             | 0.216| 0.340 | 0.403 | 1.24 (0.64-2.41) | 0.526|
| Type of diabetes               |      |       |       |                 |      |
| Normal                         |      |       |       |                 |      |
| Type I                         | -0.204| 1.013 | 0.040 | 0.82 (0.11-5.94) | 0.841|
| Type II                        | 0.518| 0.207 | 6.247 | 1.68 (1.12-2.52) | 0.012|
| Hyperlipidemia (Yes)           | -0.156| 0.461 | 0.114 | 0.86 (0.35-2.11) | 0.735|
| Myocardial infarction or revascularization (Yes) | -0.174| 0.460 | 0.143 | 0.84 (0.34-2.07) | 0.705|
| Congestive heart failure (Yes) | 0.674| 0.233 | 8.400 | 1.96 (1.24-3.09) | 0.004|
| Stroke                         | -0.064| 0.587 | 0.012 | 0.94 (0.30-2.97) | 0.913|
| Peripheral vascular disease (Yes) | 0.778 | 0.718 | 1.175 | 2.18 (0.53-8.88) | 0.278|
| Other cardiovascular diseases (Yes) | 0.925 | 0.423 | 4.783 | 2.52 (1.10-5.78) | 0.029|
| History of cancer (Yes)        | 0.591| 0.393 | 2.254 | 1.81 (0.83-3.90) | 0.133|
| Hypotensive drugs (Yes)        | 0.043| 0.294 | 0.021 | 1.04 (0.59-1.86) | 0.884|
| Hypoglycemic drugs (Yes)       | 0.497| 0.206 | 5.820 | 1.64 (1.10-2.64) | 0.016|
| ACEI or ARBs (Yes)             | -0.517| 0.511 | 1.023 | 0.60 (0.22-1.62) | 0.312|
| β-receptor antagonists (Yes)   | -0.221| 0.217 | 1.036 | 0.80 (0.52-1.23) | 0.309|
| Statins (Yes)                  | 0.806| 0.237 | 11.589 | 2.24 (1.41-3.56) | <0.001|
| Antiplatelet drugs (Yes)       | 0.799| 0.226 | 12.536 | 2.22 (1.43-3.46) | <0.001|
| Diuretic (Yes)                 | 0.515| 0.240 | 4.598 | 1.67 (1.05-2.68) | 0.032|
| UA reduction medicine (Yes)    | 0.195| 0.423 | 0.213 | 1.22 (0.53-2.78) | 0.645|
| Aldosterone receptor antagonist (Yes) | 0.175 | 0.352 | 0.248 | 1.19 (0.60-2.38) | 0.618|
| Immunotherapy (Yes)            | -0.338| 0.461 | 0.538 | 0.71 (0.29-1.76) | 0.463|
| Oncotherapy (Yes)              | 0.591| 0.393 | 2.254 | 1.81 (0.83-3.90) | 0.133|
Table 1 continued. Possible factors related to the mortality of end-stage renal disease patients receiving hemodialysis as shown by univariate Cox regression analysis.

| Variables          | β     | S.E. | χ²  | HR (95% CI)          | P     |
|--------------------|-------|------|-----|----------------------|-------|
| WBC                | 0.033 | 0.014| 5.579| 1.03 (1.01-1.06)    | 0.018 |
| Hemoglobin         | 0.010 | 0.005| 3.937| 1.01 (1.01-1.02)    | 0.047 |
| PLT                | 0.001 | 0.001| 0.984| 1.01 (1.01-1.01)    | 0.321 |
| Lymphocyte         | 0.030 | 0.186| 0.025| 1.03 (0.71-1.48)    | 0.873 |
| PLR                | 0.002 | 0.001| 4.293| 1.01 (1.01-1.01)    | 0.038 |
| AKP                | 0.005 | 0.001| 13.146| 1.01 (1.01-1.01) <0.001 |
| GGT                | 0.002 | 0.001| 9.462| 1.01 (1.01-1.01)    | 0.002 |
| ALB                | -0.062| 0.019| 10.733| 0.94 (0.91-0.98)    | 0.001 |
| TBIL               | 0.014 | 0.004| 15.471| 1.01 (1.01-1.02) <0.001 |
| TBA                | 0.027 | 0.010| 6.885| 1.03 (1.01-1.05)    | 0.009 |
| UA                 | 0.001 | 0.001| 0.629| 1.01 (1.01-1.01)    | 0.428 |
| β₂ microglobulin   | -0.014| 0.010| 1.937| 0.99 (0.97-1.01)    | 0.164 |
| Cr                 | -0.002| 0.000| 12.450| 0.99 (0.99-0.99)    | <0.001 |
| CysC               | -0.172| 0.072| 5.682| 0.84 (0.73-0.97)    | 0.017 |
| eGFR               | 0.135 | 0.036| 14.184| 1.14 (1.07-1.23) <0.001 |
| TC                 | -0.135| 0.091| 2.204| 0.87 (0.73-1.04)    | 0.138 |
| TG                 | 0.034 | 0.076| 0.193| 1.03 (0.89-1.20)    | 0.661 |
| HDL                | -0.553| 0.340| 2.654| 0.57 (0.30-1.12)    | 0.103 |
| LDL                | -0.228| 0.122| 3.464| 0.80 (0.63-1.01)    | 0.063 |
| APOA               | -1.162| 0.429| 7.339| 0.31 (0.14-0.73)    | 0.007 |
| APOB               | -0.348| 0.385| 0.816| 0.71 (0.33-1.50)    | 0.366 |
| LIPα               | -0.000| 0.000| 0.527| 0.99 (0.99-0.99)    | 0.468 |
| TnI                | 0.112 | 0.064| 3.066| 1.12 (0.99-1.27)    | 0.080 |
| BNP                | 0.000 | 0.000| 1.387| 1.01 (1.01-1.01)    | 0.239 |
| Hs-CRP             | 0.007 | 0.002| 9.319| 1.01 (1.01-1.01)    | 0.002 |
| TSH                | 0.033 | 0.048| 0.469| 1.03 (0.94-1.14)    | 0.494 |
| GLU                | 0.030 | 0.046| 0.434| 1.03 (0.94-1.13)    | 0.510 |
| LDH                | 0.000 | 0.000| 2.738| 1.01 (1.01-1.01)    | 0.098 |
| α-HBDH             | 0.001 | 0.001| 2.901| 1.01 (1.01-1.01)    | 0.089 |
| CK                 | -0.000| 0.000| 0.736| 0.99 (0.99-0.99)    | 0.391 |
| CK-MB              | 0.013 | 0.009| 2.383| 1.01 (1.01-1.03)    | 0.123 |
| Serum potassium    | 0.159 | 0.109| 2.117| 1.17 (0.95-1.45)    | 0.146 |
| Serum phosphorus   | -0.145| 0.138| 1.116| 0.86 (0.66-1.13)    | 0.291 |
| Serum calcium      | -0.271| 0.399| 0.462| 0.76 (0.35-1.67)    | 0.497 |
serum calcium (mmol/L). Echocardiogram indexes also were collected after hemodialysis, including end-diastolic ventricular septal thickness (IVST), left ventricular end-diastolic diameter (LVEDD), left ventricular end-systolic diameter (LVESD), body surface area, left ventricular posterior wall thickness (LVPWT), and left ventricular mass index (LVML). In this study, eGFR was calculated using the formula:

\[ \text{eGFR} \left[ \text{mL/(min·1.73 m}^2\right] = 175 \times (\text{serum creatinine})^{-1.154} \times (\text{age})^{-0.203} \times 0.79 \] (female).

**Statistical Analysis**

Kolmogorov-Smirnov analysis was used to conduct normality testing of quantitative data. Normally distributed measurement data are expressed as mean±standard deviation (mean±SD), and comparisons between groups used the independent-samples t test. Non-normally distributed data are expressed as median and interquartile range (M [Q1, Q3]), and comparisons between groups was performed by Mann-Whitney U test. The enumeration data are expressed as number of cases and composition ratio N (%). The chi-squared or Fisher’s exact test was used for comparisons between 2 groups, and multiple groups were assessed using the chi-squared test.

### Table 1 continued.

| Variables | β    | S.E.  | χ²   | HR (95% CI)          | P   |
|-----------|------|-------|------|----------------------|-----|
| IVST      | -0.006 | 0.054 | 0.011 | 0.99 (0.89-1.11)     | 0.917 |
| LVEDD     | -0.020 | 0.020 | 0.970 | 0.98 (0.94-1.02)     | 0.325 |
| LVESD     | -0.010 | 0.018 | 0.294 | 0.99 (0.96-1.03)     | 0.587 |
| LVPWT     | -0.054 | 0.063 | 0.733 | 0.95 (0.84-1.07)     | 0.392 |
| LVMW      | -0.002 | 0.001 | 1.200 | 0.99 (0.99-0.99)     | 0.273 |
| Body surface area | -0.766 | 0.529 | 2.095 | 0.46 (0.16-1.31)     | 0.148 |
| LVML      | -0.001 | 0.003 | 0.236 | 0.99 (0.99-0.99)     | 0.627 |

BMI – body mass index; other* – included systemic lupus erythematosus, gouty nephropathy, obstructive nephropathy, ANCA-associated systemic vasculitis; WBC – white blood cell; PLT – platelets; PLR – platelet/lymphocyte ratio; AKP – alkaline phosphatase; GGT – glutamyl transpeptidase; ALB – albumin; TBL – total bilirubin; TBA – total bile acid; UA – uric acid; Cr – creatinine; CysC – cystatin C; eGFR – estimated glomerular filtration rate; TC – total cholesterol; TG – triglyceride; HDL – high-density lipoprotein cholesterol; LDL – low-density lipoprotein cholesterol; APOA – apolipoprotein A; APOB – apolipoprotein B; LIPx – lipoprotein a; TnI – troponin I; BNP – brain natriuretic peptide; Hs-CRP – hypersensitive c-reactive protein; TSH – thyroid-stimulating hormone; GLU – glucose; LDH – lactic dehydrogenase; α-HBDH – α-hydroxybutyric dehydrogenase; CK – creatine kinase; CK-MB – creatine kinase-MB; ACEI – angiotensin-converting enzyme inhibitors; ARBs – angiotensin-receptor blockers; IVST – end-diastolic ventricular septal thickness; LVEDD – left ventricular end-diastolic diameter; LVESD – left ventricular end-systolic diameter; LVPWT – left ventricular posterior wall thickness; LVML – left ventricular mass index; HR – hazard ratio; CI – confidence interval.

### Table 2.

Factors related to mortality of end-stage renal disease patients with hemodialysis by multivariate Cox regression analysis.

| Variables | β    | S.E.  | χ²   | HR (95% CI)          | P   |
|-----------|------|-------|------|----------------------|-----|
| Age       | 0.051 | 0.009 | 31.597 | <0.001               | 1.05 (1.03-1.07) |
| AKP       | 0.003 | 0.001 | 6.106 | 0.013                | 1.01 (1.01-1.01) |
| ALB       | -0.049 | 0.020 | 6.158 | 0.013                | 0.95 (0.92-0.99) |
| TBL       | 0.011 | 0.004 | 9.153 | 0.002                | 1.01 (1.01-1.02) |
| CysC      | -0.192 | 0.085 | 4.053 | 0.042                | 0.89 (0.70-0.98) |
| Hs-CRP    | 0.006 | 0.003 | 5.877 | 0.015                | 1.01 (1.00-1.01) |

AKP – alkaline phosphatase; ALB – albumin; TBL – total bilirubin; CysC – cystatin C; Hs-CRP – hypersensitive c-reactive protein; HR – hazard ratio; CI – confidence interval.
We used univariate Cox regression to screen out statistically significant variables (variables with $P < 0.05$ were considered as statistically significant), which were included in multivariate Cox regression analysis for further backward elimination regression and selection of independent predictors. These predictors were incorporated in the prediction model to construct a nomogram for assessing the one-year risk of mortality for ESRD patients receiving HD. Then, the area under the receiver operating characteristic (ROC) curve (AUC), C-index, and calibration curves were used to evaluate the performance of the nomogram. The predictive performance of the nomogram was also verified in different subgroup populations. Hazard ratio (HR) and 95% confidence interval (CI) were calculated. Two-tailed tests were utilized for all analyses. All statistical analyses were performed using SAS 9.4. With respect to missing data of the variables, random forest method was used to fill in. Sensitivity analysis of missing data before and after interpolation is shown in Supplementary Table 1. R 4.0.3 software was used to draw the nomogram, ROC curves, and calibration curves. Python 3.8 software was used to interpolate the missing data.

**Figure 1.** Nomogram predicting one-year mortality for end-stage renal disease patients with hemodialysis. R software (version 4.0.3, Institute for Statistics and Mathematics, Vienna, Austria) was used for figure creation.

**Figure 2.** The receiver operating characteristic curves of predictive nomogram. R software (version 4.0.3, Institute for Statistics and Mathematics, Vienna, Austria) was used for figure creation.
Results

Baseline Characteristics

299 ESRD patients receiving HD were divided into a death group (n=96) and a survival group (n=203) based on whether death occurred by the end of follow-up. The causes of death included cardiovascular disease (CVD, n=65), inflammation (n=19), cancer (n=2), and “other” (eg, cerebral hemorrhage, gastrointestinal bleeding, liver failure, fracture, self-harm). The incidence of death was 32.11% in the study. As displayed in Supplementary Table 2, the mean age was 60.74±15.21 years old, and there were 174 (58.19%) males and 125 (41.81%) females. The primary diseases of patients were classified as chronic glomerulonephritis (36.12%), diabetic nephropathy (32.11%), hypertensive nephropathy (14.72%), and polycystic kidney (7.36%). In addition, the characteristics of the death group and survival group are compared in Supplemental Table 2. The results showed that mean age, AKP, TBIL, and hs-CRP levels in the death group were higher than in the survival group (P<0.05). The ALB level of the death group was lower than in the survival group (31.79±5.88 g/L vs 33.21±5.20 g/L, t=2.10, P=0.036). Detailed baseline characteristics are given in Supplementary Table 2.

Results of Selection of Predictors

We performed univariate Cox regression analysis of the factors related to mortality in ESRD patients receiving HD. Table 1 indicates that age, primary diseases, type II diabetes, congestive heart failure, WBC, hemoglobin, PLR, GGT, AKP, ALB, TBIL, TBA, Cr, CysC, eGFR, LDL, APOA, hs-CRP, and medication history (hypoglycemic drugs, statins, antiplatelet drugs, diuretic) were significantly associated with mortality of ESRD patients receiving HD (P<0.05). After performing backward elimination method in multivariate Cox regression analysis, 6 predictors were selected into the final prediction model: age (HR=1.05, 95% CI: 1.03-1.07), AKP (HR=1.01, 95% CI: 1.01-1.01), ALB (HR=0.95, 95% CI: 0.92-0.99), TBIL (HR=1.01, 95% CI: 1.01-1.02), CysC (HR=0.83, 95% CI: 0.70-0.98), and hs-CRP (HR=1.01, 95% CI: 1.00-1.01) (Table 2). Then, we plotted a nomogram based on these 6 predictors to predict the one-year mortality for ESRD patients receiving HD (Figure 1). We used the online prediction system available at: https://ywb456123pred.shinyapps.io/dynnomapp/.

Performance of the Established Nomogram

According to ROC analysis, the AUC value in predicting one-year mortality for ESRD patients receiving HD was 0.715 (Figure 2). The nomogram appeared to be a good fit of the predicted probabilities based on calibration curves analysis (Figure 3). These findings suggest that the developed nomogram has good predictive value. Additionally, we also verified the predictive performance of the nomogram in different subgroup populations (Table 3). We found that the nomogram has a better predictive ability for patients who are male (C-index=0.733, 95% CI: 0.668-0.798), had a primary disease of chronic glomerulonephritis (C-index=0.839, 95% CI: 0.753-0.925), had no history of comorbidities such as hypertension (C-index=0.898, 95% CI: 0.822-0.974), diabetes (C-index=0.775, 95% CI: 0.702-0.848), hyperlipidemia (C-index=0.730, 95% CI: 0.673-0.787), or stroke (C-index=0.773, 95% CI: 0.718-0.828).

Discussion

Multivariate Cox regression analysis revealed that age, higher levels of AKP, TBIL, and hs-CRP, and lower levels of ALB and CysC were associated with increased mortality for ESRD patients receiving HD. Based on these predictors, a nomogram for prediction of one-year mortality for ESRD patients receiving HD was constructed, with an AUC of 0.715. Furthermore, subgroup differences in the performance of the nomogram were assessed in different subgroups. These findings suggest that the developed nomogram has good predictive value.
Table 3. The predictive ability of nomogram for different subgroup population.

| Population                        | n (%) | C-index | S. E | 95% CI      |
|-----------------------------------|-------|---------|------|-------------|
| Total                             | 299 (100.00) | 0.729 | 0.028 | 0.674-0.784 |
| Sex                               |       |         |      |             |
| Male                              | 174 (58.19) | 0.733 | 0.033 | 0.668-0.798 |
| Female                            | 125 (41.81) | 0.718 | 0.052 | 0.616-0.820 |
| Primary diseases                  |       |         |      |             |
| Chronic glomerulonephritis        | 108 (36.12) | 0.839 | 0.044 | 0.753-0.925 |
| Diabetic nephropathy              | 96 (32.11) | 0.617 | 0.059 | 0.501-0.733 |
| Hypertensive nephropathy          | 44 (14.72) | 0.749 | 0.077 | 0.598-0.900 |
| Polycystic kidney                 | 22 (7.36) | 0.713 | 0.092 | 0.533-0.893 |
| Other*                            | 29 (9.70) | 0.784 | 0.065 | 0.657-0.911 |
| Hypertension                      |       |         |      |             |
| No                                | 25 (8.36) | 0.898 | 0.039 | 0.822-0.974 |
| Yes                               | 274 (91.64) | 0.701 | 0.032 | 0.638-0.764 |
| Type of diabetes                  |       |         |      |             |
| Normal                            | 162 (54.18) | 0.775 | 0.037 | 0.702-0.848 |
| Type I                            | 4 (1.34) | –       |  |              |
| Type II                           | 133 (44.48) | 0.678 | 0.046 | 0.588-0.768 |
| Hyperlipidemia                    |       |         |      |             |
| No                                | 280 (93.65) | 0.730 | 0.029 | 0.673-0.787 |
| Yes                               | 19 (6.35) | 0.676 | 0.113 | 0.455-0.897 |
| Myocardial infarction or revascularization |  |       |      |             |
| No                                | 281 (93.98) | 0.726 | 0.029 | 0.669-0.783 |
| Yes                               | 18 (6.02) | 0.778 | 0.117 | 0.549-1.007 |
| Congestive heart failure          |       |         |      |             |
| No                                | 239 (79.93) | 0.719 | 0.031 | 0.658-0.780 |
| Yes                               | 60 (20.07) | 0.745 | 0.057 | 0.633-0.857 |
| Stroke                            |       |         |      |             |
| No                                | 286 (95.65) | 0.773 | 0.028 | 0.718-0.828 |
| Yes                               | 13 (4.35) | 0.706 | 0.154 | 0.404-1.008 |
| Peripheral vascular disease       |       |         |      |             |
| No                                | 295 (98.66) | 0.731 | 0.029 | 0.674-0.788 |
| Yes                               | 4 (1.34) | –       |  |              |
| Other cardiovascular diseases      |       |         |      |             |
| No                                | 288 (96.32) | 0.729 | 0.029 | 0.672-0.786 |
| Yes                               | 11 (3.68) | 0.792 | 0.091 | 0.614-0.970 |
| History of cancer                 |       |         |      |             |
| No                                | 285 (95.32) | 0.724 | 0.029 | 0.667-0.781 |
| Yes                               | 14 (4.68) | 0.796 | 0.089 | 0.622-0.970 |

Other* – included systemic lupus erythematosus, gouty nephropathy, obstructive nephropathy, ANCA-associated systemic vasculitis; CI – confidence interval.
analysis also showed that the nomogram had good predictive ability for patients who are male (C-index=0.733), have a primary disease of chronic glomerulonephritis (C-index=0.839), and had no history of comorbidities.

Age, as an important demographic feature, was identified as a risk factor with respect to the one-year mortality of ESRD patients with undergoing HD in this study, suggested that elderly patients have higher mortality than younger patients. It was not surprising that death increases with advancing age. After HD treatment, elderly patients were prone to suffer the serious complications, cognitive dysfunction and the decreased quality of life, which caused an increased mortality [8,16,17]. Hence, we should give more attention to elderly patients with HD. Furthermore, our study also found that higher levels of AKP, TBIL, hs-CRP and lower levels of ALB, CysC were associated with increased risk of mortality for ESRD patients receiving HD, which were consistent with previous studies [18-22]. In our study, the lower level of CysC were related to an increased risk of death, and a possible explanation was that the lower levels of CysC reduce the body’s resistance to bacterial and viral infections, potentially increasing inflammatory stimulation of ESRD patients receiving HD [23,24]. Also, both AKP and TBIL levels might be positively associated with patients’ risk of death. In the study of Fan, et al, they pointed out that a higher serum AKP levels was an independent risk factor for all-cause mortality of patients receiving HD, which was associated with vascular calcification and inflammation [20]. Similarly, Su, et al, also proposed that a high TBIL level was associated with mortality among uremia patients undergoing long-term HD [21]. However, some studies have also shown that bilirubin has antioxidant properties and might be negatively correlated with the mortality for HD patients [25,26], which was inconsistent with our results. The possible reason was considered as the population selection. In the future, more prospective studies will investigate this relationship.

Importantly, compared with previous studies [11-13], we developed a simple-to-use prognostic nomogram containing 6 factors that were easily accessible in actual clinical application, which predicted the one-year mortality of ESRD patients with HD in China. And this nomogram was helpful to identify the patients with a high mortality, which may help clinicians develop individualized treatment regimens and improve timely implement interventions. In recent years, some prediction models have been proposed in the prognosis of diseases. For example, Siddiqa M, et al, developed and externally validated prediction model for the survival of HD patients in Pakistan, however, they selected chronic kidney disease patients [11]. Fukuma, et al, developed a risk prediction model for predicting loss of physical function among elderly HD patients [12]. Schamroth Pravda, et al, reported the CHA2DS2-VASc (congestive heart failure, hypertension, age >75 years, diabetes, prior stroke, vascular disease, age 65-74 years, and sex [female] category) score was strongly related to adverse outcomes for ESRD patients within the first year of HD [13]. However, these studies only considered chronic kidney disease patients with HD, or elderly hemodialysis patients. Still, to date, few studies focused on the biochemical indicators of liver and kidney function to construct a prediction model associated with one-year mortality for ESRD patients receiving HD in China. Our nomogram was established based on age and levels of 5 commonly biochemical indicators, suggesting the practicality and convenience. Additionally, it should be noted that the developed nomogram was also validated in different subgroup population in this study, and it seems that the established nomogram may be more suitable for patients who was male, had a primary disease of chronic glomerulonephritis, had not the history of comorbidities.

However, the limitations of our study cannot be ignored. Firstly, this was a single center in China with a relatively small sample size, which limits the applicability of the nomogram to other populations. Secondly, the information about nutritional status, living conditions, infections, poorly controlled secondary hyperparathyroidism cognitive impairment and sarcopenia of patients might be associated with mortality among ESRD patients on HD, were not recorded in the study. Thirdly, although the findings showed that the nomogram may have a good predictive performance, internal and external validation was absent due to the limited sample size. Thus, the results should be prudently interpreted. More large-sample cohort studies will further evaluate the predictive value of the developed nomogram in the future. Lastly, this nomogram by using traditional Cox regression was developed to assess one-year mortality among ESRD patients receiving HD. In the future, we will consider to adopt the machine learning method to simplify the prediction model and improving the predictive ability.

Conclusions

In conclusion, this study showed that age, higher levels of AKP, TBIL, hs-CRP and lower levels of ALB, CysC were associated with increased mortality for ESRD patients receiving HD, which were consistent with previous studies. It is important that we developed an easy-to-use nomogram for predicting the one-year mortality for ESRD patients receiving HD. The developed nomogram is a simple tool to identify patients with a high mortality, which may help clinicians develop individualized treatment regimens and improve the prognosis of patients, but validation is needed by more large-sample cohort studies in the future.

Declaration of Figures’ Authenticity

All figures submitted have been created by the authors who confirm that the images are original with no duplication and have not been previously published in whole or in part.
## Supplementary Table 1. Sensitivity analysis of missing data before and after interpolation.

| Variables              | Ratio of missing values (%) | Before the interpolation | After the interpolation | Statistics | P     |
|------------------------|-----------------------------|--------------------------|-------------------------|------------|-------|
| BMI                    | 2.34%                       | 24.02±3.74               | 24.03±3.77              | t=0.04     | 0.972 |
| TBA                    | 0.33%                       | 2.30 (1.40, 4.50)        | 2.30 (1.40, 4.50)       | Z=-0.065   | 0.948 |
| LVEDD                  | 0.67%                       | 52.95±5.13               | 52.94±5.12              | t=0.01     | 0.994 |
| LVESD                  | 0.67%                       | 35.20±5.56               | 35.21±5.55              | t=0.02     | 0.985 |
| LVPWT                  | 0.67%                       | 11.34±1.64               | 11.33±1.64              | t=0.07     | 0.947 |
| IVST                   | 0.67%                       | 12.18±1.80               | 12.17±1.80              | t=0.03     | 0.939 |
| LVMW                   | 0.67%                       | 253.73±70.22             | 253.49±70.05            | t=0.04     | 0.966 |
| Body surface area      | 2.34%                       | 1.69±0.19                | 1.69±0.19               | t=0.05     | 0.964 |
| LVML                   | 3.01%                       | 150.55±37.94             | 150.34±37.62            | t=0.07     | 0.948 |
| TG                     | 1.00%                       | 1.32 (0.87, 1.89)        | 1.32 (0.86, 1.89)       | Z=0.084    | 0.933 |
| HDL                    | 1.00%                       | 1.04±0.30                | 1.04±0.30               | t=0.02     | 0.981 |
| LDL                    | 1.00%                       | 2.24 (1.68, 2.92)        | 2.25 (1.68, 2.93)       | Z=0.068    | 0.946 |
| APOA                   | 1.00%                       | 0.98±0.25                | 0.98±0.26               | t=0.09     | 0.926 |
| APOB                   | 1.00%                       | 0.82 (0.65, 1.02)        | 0.83 (0.65, 1.02)       | Z=0.140    | 0.888 |
| TC                     | 1.00%                       | 4.08±1.24                | 4.09±1.24               | t=0.08     | 0.935 |
| LIPx                   | 1.34%                       | 297.00 (158.00, 573.00)   | 301.00 (158.00, 591.00)  | Z=-0.122   | 0.903 |
| BNP                    | 7.36%                       | 12507.00 (4367.00, 35000.00) | 12235.00 (4367.00, 35000.00) | Z=0.234    | 0.815 |
| Hs-CRP                 | 2.34%                       | 9.09 (1.93, 27.18)       | 9.03 (1.93, 28.00)      | Z=0.005    | 0.996 |
| β, microglobulin       | 3.68%                       | 16.60 (11.95, 22.60)     | 16.40 (11.90, 22.50)    | Z=0.158    | 0.874 |
| Serum phosphorus       | 3.68%                       | 1.86 (1.54, 2.20)        | 1.85 (1.53, 2.20)       | Z=0.189    | 0.850 |
| TSH                    | 6.69%                       | 2.23 (1.26, 3.70)        | 2.18 (1.26, 3.65)       | Z=0.112    | 0.911 |
| TnI                    | 1.34%                       | 0.02 (0.01, 0.06)        | 0.02 (0.01, 0.06)       | Z=0.092    | 0.927 |

TBA – total bile acid; LVEDD – left ventricular end-diastolic diameter; LVESD – left ventricular end-systolic diameter; LVPWT – left ventricular posterior wall thickness; IVST – end-diastolic ventricular septal thickness; LVML – left ventricular mass index; TG – triglyceride; HDL – high-density lipoprotein cholesterol; LDL – low-density lipoprotein cholesterol; APOA – apolipoprotein A1; APOB – apolipoprotein B; TC – total cholesterol; LIPx – lipoprotein α; BNP – brain natriuretic peptide; Hs-CRP – hypersensitive C-reactive protein; TSH – thyroid-stimulating hormone; TnI – troponin I.
## Supplementary Table 2. Baseline characteristics of all patients.

| Variables                              | Total (n=299) | Survival (n=203) | Death (n=96) | Statistics | P      |
|----------------------------------------|---------------|------------------|--------------|------------|--------|
| Age, years, Mean±SD                    | 60.74±15.21   | 57.13±15.43      | 68.36±11.54  | t=-7.02    | <0.001 |
| Age, years, n (%)                      |               |                  |              |            |        |
| <60                                    | 124 (41.47)   | 105 (51.72)      | 19 (19.79)   |            |        |
| 60-70                                   | 74 (24.75)    | 46 (22.66)       | 28 (29.17)   |            |        |
| 70-80                                   | 78 (26.09)    | 43 (21.18)       | 35 (36.46)   |            |        |
| 80-90                                   | 23 (7.69)     | 9 (4.43)         | 14 (14.58)   |            |        |
| Gender, n (%)                           |               |                  |              |            |        |
| Male                                    | 174 (58.19)   | 118 (58.13)      | 56 (58.33)   |            |        |
| Female                                  | 125 (41.81)   | 85 (41.87)       | 40 (41.67)   |            |        |
| BMI, Mean±SD                            | 24.03±3.77    | 24.28±3.62       | 23.49±4.05   | t=1.70     | 0.091  |
| Primary diseases, n (%)                 |               |                  |              |            |        |
| Chronic glomerulonephritis              | 108 (36.12)   | 91 (44.83)       | 17 (17.71)   |            |        |
| Diabetic nephropathy                    | 96 (32.11)    | 58 (28.57)       | 38 (39.58)   |            |        |
| Hypertensive nephropathy                | 44 (14.72)    | 27 (13.30)       | 17 (17.71)   |            |        |
| Polycystic kidney                       | 22 (7.36)     | 13 (6.40)        | 9 (9.38)     |            |        |
| Hypertension (Yes), n (%)               | 274 (91.64)   | 188 (92.61)      | 86 (89.58)   | χ²=0.780   | 0.377  |
| Type of diabetes, n (%)                 |               |                  |              |            |        |
| Normal                                  | 162 (54.18)   | 119 (58.62)      | 43 (44.79)   |            |        |
| Type I                                  | 4 (1.34)      | 3 (1.48)         | 1 (1.04)     |            |        |
| Type II                                 | 133 (44.48)   | 81 (39.90)       | 52 (54.17)   |            |        |
| Hyperlipidemia (Yes), n (%)             | 19 (6.35)     | 14 (6.90)        | 5 (5.21)     | χ²=0.312   | 0.576  |
| Myocardial infarction or revascularization (Yes), n (%) | 18 (6.02) | 13 (6.40) | 5 (5.21) | χ²=0.165 | 0.685 |
| Congestive heart failure (Yes), n (%)   | 60 (20.07)    | 33 (16.26)       | 27 (28.13)   | χ²=5.724   | 0.017  |
| Stroke (Yes), n (%)                     | 13 (4.35)     | 10 (4.93)        | 3 (3.13)     |            |        |
| Peripheral vascular disease (Yes), n (%)| 4 (1.34)      | 2 (0.99)         | 2 (2.08)     |            |        |
| Other cardiovascular diseases (Yes), n (%)| 11 (3.68) | 5 (2.46) | 6 (6.25) |            |        |
| History of cancer (Yes), n (%)          | 14 (4.68)     | 7 (3.45)         | 7 (7.29)     |            |        |
| Hypotensive drugs (Yes), n (%)          | 267 (89.30)   | 185 (91.13)      | 82 (85.42)   | χ²=2.229   | 0.135  |
| Hypoglycemic drugs (Yes), n (%)         | 137 (45.82)   | 84 (41.38)       | 53 (55.21)   | χ²=5.021   | 0.025  |
| ACEI or ARBs (Yes), n (%)               | 19 (6.35)     | 15 (7.39)        | 4 (4.17)     | χ²=1.137   | 0.286  |
| β-receptor antagonists (Yes), n (%)     | 115 (38.46)   | 83 (40.89)       | 32 (33.33)   | χ²=1.571   | 0.210  |
Supplementary Table 2 continued. Baseline characteristics of all patients.

| Variables                                  | Total (n=299) | Survival (n=203) | Death (n=96) | Statistics |
|--------------------------------------------|---------------|------------------|--------------|------------|
| Statins (Yes), n (%)                       | 53 (17.73)    | 28 (13.79)       | 25 (26.04)   | $\chi^2=6.705$  | 0.010      |
| Antiplatelet drugs (Yes), n (%)            | 56 (18.73)    | 27 (13.30)       | 29 (30.21)   | $\chi^2=12.241$ | <0.001     |
| Diuretic (Yes), n (%)                      | 196 (65.55)   | 123 (60.59)      | 73 (76.04)   | $\chi^2=6.890$  | 0.009      |
| UA reduction medicine (Yes), n (%)         | 18 (6.02)     | 12 (5.91)        | 6 (6.25)     | $\chi^2=0.013$  | 0.908      |
| Aldosterone receptor antagonist (Yes), n (%)| 27 (9.03)     | 18 (8.87)        | 9 (9.38)     | $\chi^2=0.020$  | 0.886      |
| Immunootherapy (Yes), n (%)                | 26 (8.70)     | 21 (10.34)       | 5 (5.21)     | $\chi^2=2.166$  | 0.141      |
| Oncotherapy (Yes), n (%)                   | 14 (4.68)     | 7 (3.45)         | 7 (7.29)     | –           | 0.152      |
| WBC*10/L, M (Q1, Q3)                       | 6.50 (5.10, 8.80) | 6.30 (5.10, 8.40) | 6.90 (5.05, 9.30) | Z=0.994 | 0.320 |
| Hemoglobin, g/L, Mean±SD                   | 80.33±19.29   | 78.13±18.22      | 84.98±20.73  | t=-2.90     | 0.004      |
| PLT*10/L, M (Q1, Q3)                       | 158.00 (116.00, 217.00) | 156.00 (115.00, 213.00) | 166.50 (117.00, 232.50) | Z=0.741 | 0.459 |
| Lymphocyte*10/L, M (Q1, Q3)                | 1.00 (0.70, 1.30) | 1.00 (0.70, 1.30) | 0.90 (0.65, 1.35) | Z=-1.146 | 0.252 |
| PLR, M (Q1, Q3)                            | 165.29 (118.42, 230.00) | 165.29 (118.89, 225.00) | 164.64 (116.35, 259.34) | Z=0.967 | 0.333 |
| AKP, M (Q1, Q3)                            | 66.00 (51.00, 88.00) | 62.00 (49.00, 82.00) | 76.00 (57.50, 106.00) | Z=3.820  | <0.001    |
| GGT, U/L, M (Q1, Q3)                       | 25.00 (15.00, 40.00) | 24.00 (15.00, 35.00) | 29.00 (16.00, 66.00) | Z=2.378  | 0.017      |
| ALB, g/L, Mean±SD                          | 32.75±5.45    | 33.21±5.20       | 31.79±5.88   | t=2.10      | 0.036      |
| TBIL, μmol/L, M (Q1, Q3)                   | 5.10 (3.70, 6.30) | 4.90 (3.60, 6.10) | 5.60 (4.05, 6.80) | Z=2.460  | 0.014      |
| TBA, μmol/L, M (Q1, Q3)                    | 2.30 (1.40, 4.50) | 2.40 (1.40, 4.50) | 2.20 (1.40, 4.55) | Z=0.274  | 0.784      |
| UA, μg/mL, M (Q1, Q3)                      | 495.00 (415.00, 585.00) | 495.00 (416.00, 577.00) | 501.25 (408.00, 605.50) | Z=0.557  | 0.577      |
| β2 microglobulin, μmol/L, M (Q1, Q3)       | 16.40 (11.90, 22.50) | 15.30 (11.40, 21.30) | 17.60 (12.95, 23.35) | Z=2.388  | 0.017      |
| Cr, μmol/L, M (Q1, Q3)                     | 754.00 (605.00, 950.00) | 795.00 (643.00, 979.00) | 679.00 (541.50, 870.00) | Z=4.141  | <0.001    |
| CysC, mg/L, Mean±SD                        | 5.31±1.45     | 5.36±1.48        | 5.21±1.40    | t=0.86      | 0.389      |
| eGFR, ml/(min·1.73 m2), M (Q1, Q3)         | 5.33 (4.04, 7.05) | 5.11 (3.85, 6.64) | 5.93 (4.54, 7.75) | Z=3.386  | <0.001    |
| TC, mmol/L, Mean±SD                        | 4.09±1.24     | 4.10±1.24        | 4.06±1.24    | t=0.24      | 0.808      |
| TG, mmol/L, M (Q1, Q3)                     | 1.32 (0.86, 1.89) | 1.32 (0.89, 1.89) | 1.30 (0.84, 1.92) | Z=0.287  | 0.774      |
| HDL, mmol/L, Mean±SD                       | 1.04±0.30     | 1.06±0.29        | 1.00±0.31    | t=1.54      | 0.124      |
| LDL, mmol/L, M (Q1, Q3)                    | 2.25 (1.68, 2.93) | 2.31 (1.74, 2.95) | 1.94 (1.59, 2.76) | Z=2.305  | 0.021      |
| APOA, mmol/L, Mean±SD                      | 0.98±0.26     | 0.99±0.25        | 0.95±0.28    | t=1.15      | 0.249      |
### Supplementary Table 2 continued. Baseline characteristics of all patients.

| Variables                        | Total (n=299) | Survival (n=203) | Death (n=96) | Statistics | P    |
|----------------------------------|---------------|------------------|--------------|------------|------|
| APOB, mmol/L, M (Q₁, Q₃)        | 0.83 (0.65, 1.02) | 0.83 (0.66, 1.03) | 0.81 (0.65, 1.01) | Z=-0.517 | 0.605 |
| LIPa, mg/L, M (Q₁, Q₃)          | 301.00 (158.00, 591.00) | 301.00 (161.00, 548.00) | 298.00 (150.50, 634.50) | Z=0.169 | 0.866 |
| Tnl, pg/mL, M (Q₁, Q₃)          | 0.02 (0.01, 0.06) | 0.02 (0.01, 0.06) | 0.02 (0.01, 0.09) | Z=0.873 | 0.382 |
| BNP, M (Q₁, Q₃)                 | 12235.00 (4367.00, 35000.00) | 13696.00 (4613.00, 35000.00) | 16906.00 (4001.50, 35000.00) | Z=0.645 | 0.519 |
| Hs-CRP, mg/L, M (Q₁, Q₃)        | 9.03 (1.93, 28.00) | 6.88 (1.07, 18.09) | 14.25 (4.27, 44.31) | Z=3.887 | <0.001 |
| TSH, mIU/L, M (Q₁, Q₃)          | 2.18 (1.26, 3.65) | 2.09 (1.28, 3.73) | 2.24 (1.02, 3.64) | Z=0.133 | 0.895 |
| GLU, mmol/L, M (Q₁, Q₃)         | 5.14 (4.55, 6.42) | 5.15 (4.60, 5.93) | 5.12 (4.41, 6.90) | Z=0.293 | 0.770 |
| LDH, U/L, M (Q₁, Q₃)            | 257.00 (210.00, 316.00) | 257.00 (211.00, 320.00) | 256.00 (201.50, 310.00) | Z=0.431 | 0.667 |
| α-HBDH, U/L, M (Q₁, Q₃)         | 200.00 (166.00, 243.00) | 199.00 (166.00, 239.00) | 202.00 (165.50, 249.50) | Z=0.544 | 0.587 |
| CK, U/L, M (Q₁, Q₃)             | 115.00 (73.00, 196.00) | 117.00 (75.00, 210.00) | 114.00 (67.00, 172.50) | Z=1.199 | 0.230 |
| CK-MB, U/L, M (Q₁, Q₃)          | 10.00 (7.00, 13.00) | 10.00 (8.00, 14.00) | 9.50 (7.0, 13.00) | Z=0.998 | 0.319 |
| Serum potassium, mmol/L, Mean±SD | 4.64±0.86 | 4.60±0.80 | 4.72±0.96 | t=1.04 | 0.301 |
| Serum phosphorus, mmol/L, M (Q₁, Q₃) | 1.85 (1.53, 2.20) | 1.87 (1.60, 2.25) | 1.76 (1.40, 2.07) | Z=2.724 | 0.006 |
| Serum calcium, mmol/L, Mean±SD   | 1.98±0.26 | 1.98±0.27 | 1.98±0.23 | t=0.07 | 0.945 |
| IVST, Mean±SD                   | 12.17±1.80 | 12.20±1.93 | 12.11±1.49 | t=0.40 | 0.687 |
| LVEDD, Mean±SD                  | 52.94±5.12 | 53.00±4.96 | 52.83±5.47 | t=0.25 | 0.799 |
| LVESD, Mean±SD                  | 35.21±5.55 | 35.08±5.21 | 35.47±6.23 | t=0.52 | 0.600 |
| LVPWT, Mean±SD                  | 11.33±1.64 | 11.41±1.76 | 11.16±1.37 | t=1.35 | 0.177 |
| LVMW, Mean±SD                   | 253.49±70.05 | 256.01±74.59 | 248.15±59.34 | t=0.98 | 0.327 |
| Body surface area, Mean±SD      | 1.69±0.19 | 1.70±0.19 | 1.66±0.19 | t=1.84 | 0.066 |
| LVML, Mean±SD                   | 150.34±37.62 | 150.50±39.71 | 150.02±32.96 | t=0.11 | 0.913 |
| Time, M (Q₁, Q₃)                | 23.30 (12.37, 43.10) | 24.67 (13.00, 44.00) | 21.10 (11.90, 39.42) | Z=-1.187 | 0.235 |

BMI – body mass index; other* = included systemic lupus erythematosus, gouty nephropathy, obstructive nephropathy, ANCA-associated systemic vasculitis; WBC – white blood cell; PLT – platelets; PLT/lymphocyte ratio; AKP – alkaline phosphatase; GGT – glutamyl transpeptidase; ALB – albumin; TBL – total bilirubin; TBA – total bile acid; UA – uric acid; Cr – creatinine; CysC – cystatin C; eGFR – estimated glomerular filtration rate; TC – total cholesterol; TG – triglyceride; HDL – high-density lipoprotein cholesterol; LDL – low-density lipoprotein cholesterol; ApoA1 – apolipoprotein A1; ApoB – apolipoprotein B; Lp(a) – lipoprotein(a); TnI – troponin I; BNP – brain natriuretic peptide; Hs-CRP – hypersensitive C-reactive protein; TSH – thyroid-stimulating hormone; GLU – glucose; LDH – lactic dehydrogenase; α-HBDH – α-hydroxybutyric dehydrogenase; CK – creatine kinase; CK-MB – creatine kinase-MB; ACEI – angiotensin-converting enzyme inhibitors; ARBs – angiotensin-receptor blocker; IVST – end-diastolic ventricular septal thickness; LVEDD – left ventricular end-diastolic diameter; LVESD – left ventricular end-systolic diameter; LVPWT – left ventricular posterior wall thickness; LVML – left ventricular mass index.
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