Article

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Spectrum of Diseases, Risk Factors, and Prognostic Analysis of Critically Ill Obstetric Patients Transferred to the Obstetric Critical Care Unit: A Retrospective Cohort Study

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Background: Although critically ill pregnant women received specialized management in the Obstetric Critical Care Unit (OCCU), the disease spectrum and prognostic determinants still need to be further explored to optimize the early warning system. This study aims to systematically analyze the disease spectrum and identify risk factors for unfavorable prognosis in critically ill obstetric patients transferred to the OCCU.

Methods: A retrospective cohort study was conducted on 313 obstetric patients admitted to OCCU from 2015 to 2025. According to the prognosis (favorable, n = 222; unfavorable, n = 91), the patients were divided into two groups. The variables were screened using Least Absolute Shrinkage and Selection Operator (LASSO) regression and the independent risk factors were analyzed using multivariate logistic regression.

Results: Main transfer causes were postpartum hemorrhage (34.82%) and preeclampsia/eclampsia (21.73%). Independent risk factors for unfavorable prognosis included older age, lower gestational age, pre-existing heart disease, diabetes, hypertension, placental abruption, higher Acute Physiology and Chronic Health Evaluation II (APACHE II)/Sequential Organ Failure Assessment (SOFA) scores, and elevated D-dimer, Scr, and C-reactive Protein (CRP) levels (all $p < 0.05$). The integrated prediction model achieved an area under the curve (AUC) of 0.866 (95% CI: 0.819–0.913).

Conclusion: Specific comorbidities, disease severity scores and biomarkers are key prognostic factors. The model shows strong early warning and predictive capabilities.

Keywords: critical obstetric illness; obstetric critical care unit; disease spectrum; risk factors; prognosis; retrospective cohort study

Introduction

Maternal health is the key issue in global public health and an important indicator measuring the medical level and social development of a country or region [1]. Although the global maternal mortality rate has dropped by 44% in the past 30 years, obstetric critical illness is still the biggest threat to maternal and fetal safety [2]. According to the World Health Organization (WHO), approximately 830 women die each day worldwide from complications related to pregnancy or childbirth, with 99% of these maternal deaths occurring in developing countries. The increasing incidence of maternal near miss events (MNM), caused by advanced maternal age and metabolic disorders, further highlights the urgent need for prevention, control and treatment of critical obstetric diseases [3]. The Obstetric Critical Care Unit (OCCU), as a medical unit in the hospital, plays an irreplaceable role in the management of obstetric critical illness [4]. Obstetric referral is an important index to measure the severity of maternal illness and medical quality [5]. The existing research shows that the admission rate of OCCU varies from different regions and institutions, which not only reflects the difference in disease spectrum, but also reflects the potential factors related to the baseline health status of pregnant women, the quality of prenatal care, and the efficiency of the identification and referral system [6,7]. In-depth analysis of the disease composition of critically ill obstetric patients transferred to the OCCU, identification of relevant risk factors, and evaluation of their clinical prognosis are of great significance for optimizing early warning, clinical intervention, and resource allocation of critically ill pregnant women [8]. In recent years, scholars at home and abroad have conducted numerous studies on obstetric critical illness. However, the distribution of disease spectrum varies across regions and healthcare settings, and further research is needed to better define the specific risk and prognostic factors among patients transferred to the OCCU [9,10]. Based on this, this study used a retrospective cohort design to collect the clinical data of critically ill obstetric patients transferred to the OCCU. This study aims to systematically analyze the composition of the disease spec-

trum and explore the risk factors affecting the prognosis of patients, thereby providing data-driven support and clinical evidence for improving the outcomes in obstetric critical care and enhancing the prognosis of pregnant women and fetuses.

Methods

Study Subjects

The clinical data of all patients transferred to OCCU from January 2015 to June 2025 in Ruian Maternity and Child Care Hospital were retrospectively collected. Institutional protocols for obstetric critical care remained largely unchanged during the study period, with no major shifts in referral criteria or treatment guidelines. Inclusion criteria: ① Age ≥18 years; ② Patients during pregnancy, childbirth or the puerperium (within 42 days after delivery); ③ Critical illness caused by obstetric complications or complications, meeting OCCU admission criteria and requiring transfer to the OCCU; ④ Availability of complete and traceable clinical records. Exclusion criteria: ① Obstetric patients transferred to the OCCU for non-obstetric reasons; ② Clinical records with severe missing data; ③ Patients who are discharged against medical advice or transferred to another hospital within 24 hours of OCCU admission, rendering the prognosis follow-up impossible. A total of 313 obstetric OCCU patients were included in this study. All study procedures complied with the ethical standards of the Declaration of Helsinki and were approved by the Ethics Committee of Ruian Maternity and Child Care Hospital (Approval No.: 2026-04). Informed consent of the patient has been obtained

Data Collection

Data retrieved from the hospital's electronic medical record (EMR) system, obstetric delivery registration, laboratory information system (LIS) and follow-up database. Two researchers independently extracted the data and then cross-checked. Differences are resolved by a third-party obstetrician/intensive care specialist to ensure data accuracy. The information collected includes the following:

Baseline Characteristics: Age, gestational age, gravidity, parity, BMI, history of chronic diseases (hypertension, diabetes, heart disease), pregnancy complications (preeclampsia/eclampsia, placental abruption).

OCCU Admission Indicators: Reason for transfer (categorized by clinical diagnosis), Acute Physiology and Chronic Health Evaluation II (APACHE II)/ score and SOFA score upon admission, vital signs (blood pressure, heart rate, oxygen saturation).

OCCU Treatment Measures: Duration of mechanical ventilation, use of vasoactive drugs, volume of blood product transfusion.

Laboratory Indicators (Serum Biomarkers): Serum biomarker levels at OCCU admission, including: D-dimer, Prothrombin Time (PT), Activated Partial Thromboplastin Time (APTT), Fibrinogen (FIB); C-reactive Protein (CRP), Procalcitonin (PCT), Lactate; Troponin I (cTnI), Brain Natriuretic Peptide (BNP), Alanine Aminotransferase (ALT), Aspartate Aminotransferase (AST), Serum Creatinine (Scr), Blood Urea Nitrogen (BUN). All serum biomarkers were measured using a Cobas 8000 modular analyzer (Roche Diagnostics, Mannheim, Baden-Württemberg, Germany). D-dimer, PT, APTT, and FIB were assessed on a CS-5100 fully automated coagulation analyzer (Sysmex Corporation, Kobe, Hyogo, Japan). PCT was measured using an electrochemiluminescence immunoassay kit (Roche Diagnostics, Mannheim, Baden-Württemberg, Germany). cTnI and BNP were measured using a ADVIA Centaur XP immunoassay system (Siemens Healthineers, Erlangen, Bavaria, Germany). Lactate was measured using a GEM Premier 5000 blood gas and electrolyte analyzer (Instrumentation Laboratory, Bedford, MA, USA).

Prognostic Indicators: Maternal OCCU length of stay, total hospital length of stay; neonatal OCCU admission status, neonatal hospital length of stay.

Variable Definitions

Critical Obstetric Condition: Defined as a pregnancy-related condition posing a serious threat to maternal life, with reference to Danforth's Obstetrics and Gynecology [11].

Classification of Transfer Reasons (based on ICD-10 coding [12]): Postpartum Hemorrhage: Blood loss ≥500 mL (vaginal)/1000 mL (cesarean) within 24 hours of delivery, accompanied by shock or organ dysfunction. Preeclampsia/Eclampsia: Meeting the diagnostic criteria of the Guidelines for Diagnosis and Treatment of Hypertensive Disorders in Pregnancy (2020) [13], requiring OCCU monitoring. Amniotic Fluid Embolism: Acute pulmonary embolism, shock, triggered by amniotic fluid components entering the maternal circulation. Septic Shock: Shock resulting from pregnancy-related infection (e.g., chorioamnionitis). Others: ARDS, heart failure, DIC.

Unfavorable Prognosis: Based on the Guidelines for Clinical Practice in Critical Care Medicine [14], an unfavorable prognosis was defined as meeting any one of the following criteria: ① OCCU length of stay ≥72 hours; ② New or worsened organ dysfunction after OCCU admission: an increase in SOFA score by ≥2 points compared to admission, or a sustained score of ≥6 for over 48 hours; ③ Presence of chronic organ dysfunction (e.g., chronic renal insufficiency, heart failure, cognitive impairment) at the 6-month follow-up after discharge.

Statistical Analysis

SPSS software (version 26.0; IBM Corporation, Armonk, NY, USA) and R software (version 4.2.1; R Foundation for Statistical Computing, Vienna, Austria) were used

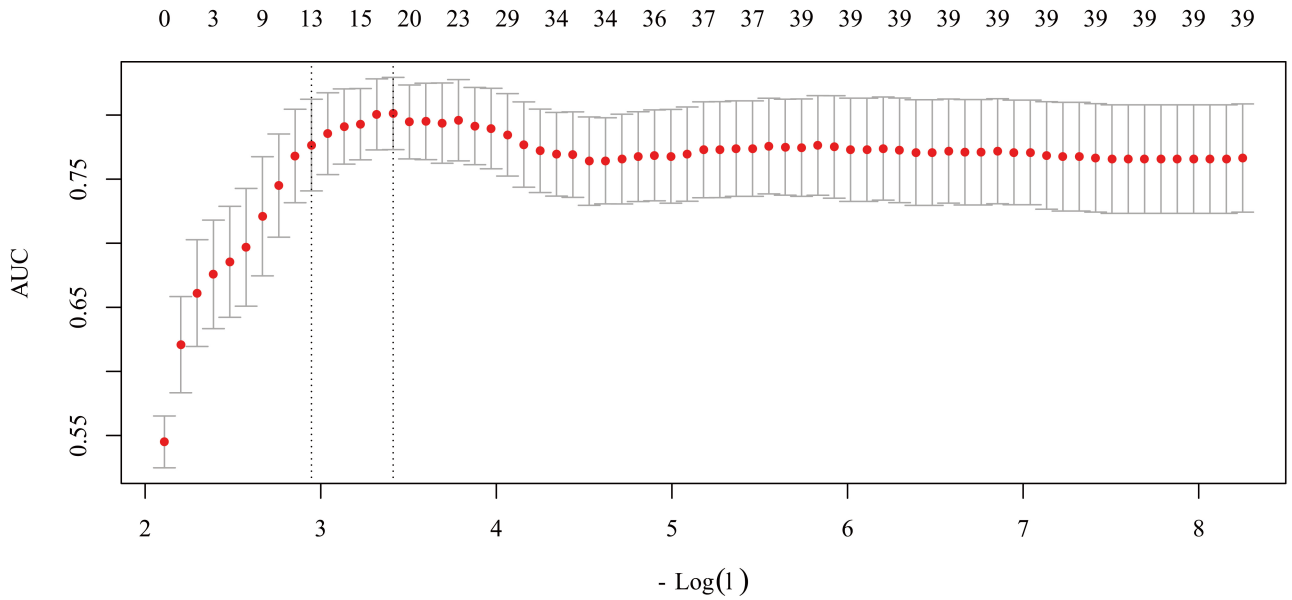

Fig. 1. Coefficient path of LASSO regression results.

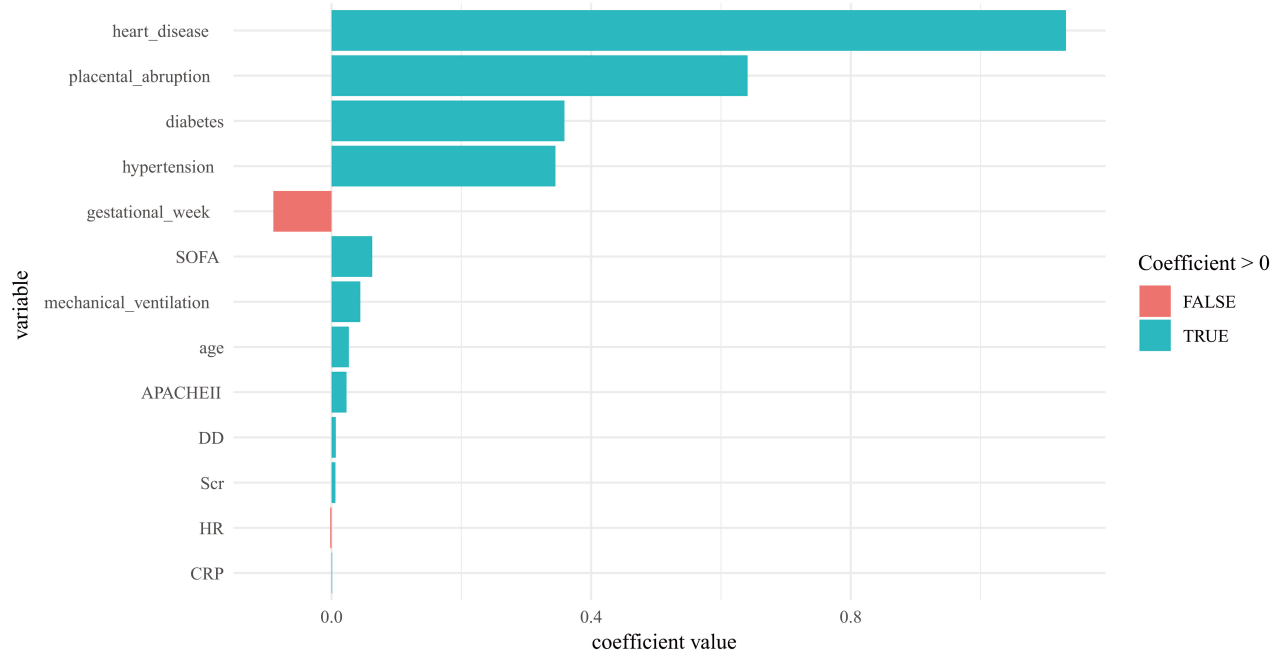

Fig. 2. Coefficient selection in LASSO regression (feature values). Note: APACHE II, Acute Physiology and Chronic Health Evaluation II; SOFA, Sequential Organ Failure Assessment; CRP, C-reactive protein; D-D, D-dimer; Scr, serum creatinine; HR, heart rate.

for statistical analysis. For missing data handling, variables with a missing proportion of less than 5% were interpolated using the median for continuous data and the mode for categorical data; Variables with a missing proportion of 5% to 20% were imputed using multiple imputation (MICE) with 5 iterations; Variables with a missing proportion greater than 20% were excluded from the statistical analysis. For continuous data with normal distribution, the value is expressed as the mean standard deviation ($\bar{x} \pm s$); For data with non-normal distribution, use the median (P25, P75). The *T*-test or the Mann-Whitney U test was used to evaluate the differences between groups. The categorical data are expressed in n (%), and the differences were analyzed by the Chi-square test or Fisher's exact test.

LASSO (Minimum Absolute Shrinkage and Selection Operator) regression ($\alpha = 1$) was used to further screen the variables with $p < 0.1$ in univariate analysis for dimensionality reduction. The optimal λ value is determined by 10 times cross-validation (λ corresponds to the minimum cross-validation error), and the variables with non-

Table 1. Baseline characteristics of the 313 patients.

Indicator	Favorable prognosis group (n = 222)	Unfavorable prognosis group (n = 91)	$t/Z/\chi^2$ value	p value
Age (years)	29.14 ± 4.68	31.58 ± 4.83	4.152	<0.001
Gestational age (weeks)	37.96 ± 3.02	36.26 ± 3.31	4.403	<0.001
Pregnancy times (times)	3 (2, 4)	3 (2, 4)	1.270	0.204
Delivery times (times)	1 (1, 2)	1 (0, 2)	0.643	0.520
BMI (kg/m^2)	24.80 ± 4.50	25.85 ± 4.44	1.877	0.062
Past medical history				
Hypertension [n (%)]	6 (2.70)	9 (9.89)	7.308	0.007
Diabetes [n (%)]	6 (2.70)	8 (8.79)	5.600	0.018
Heart disease [n (%)]	1 (0.45)	9 (9.89)	-	<0.001
Other chronic diseases [n (%)]	19 (8.56)	10 (10.99)	0.454	0.501
Complications				
Eclampsia [n (%)]	47 (21.17)	20 (21.98)	0.025	0.874
Placental abruption [n (%)]	14 (6.31)	14 (15.38)	6.530	0.011
Placenta previa [n (%)]	13 (5.86)	5 (5.49)	0.016	0.901
Other complications [n (%)]	46 (20.72)	11 (12.09)	3.229	0.072
APACHE II rating	18.84 ± 4.86	21.03 ± 6.09	3.055	0.003
SOFA rating	8.63 ± 2.83	10.08 ± 3.26	3.712	<0.001
Systolic blood pressure	110.82 ± 15.01	108.22 ± 15.87	1.366	0.173
Diastolic pressure	69.57 ± 9.05	70.70 ± 9.69	0.988	0.324
Heart rate	100.59 ± 23.70	91.69 ± 21.61	3.093	0.002
SpO_2	92.82 ± 4.65	93.02 ± 4.32	0.364	0.716

Note: BMI, body mass index; APACHE II, Acute Physiology and Chronic Health Evaluation II; SOFA, Sequential Organ Failure Assessment; SpO_2, peripheral oxygen saturation. - indicates Fisher's test.

zero coefficients are retained. Then, the variables selected by LASSO were input into the binary logistic regression model (using the backward Wald method) to determine the independent risk factors for poor prognosis. The significance level (α) was set to 0.05, and a $p < 0.05$ was statistically significant.

Results

Baseline Characteristics of the Patients

Among the 313 patients, 222 cases were in the favorable prognosis group and 91 cases were in the unfavorable prognosis group. The unfavorable prognosis group was older and had a smaller gestational age. This group also had a higher proportion of patients with a history of hypertension, diabetes, heart disease, and a higher incidence of placental abruption. The APACHE II and SOFA scores at OCCU admission were significantly higher in the unfavorable prognosis group compared with the favorable prognosis group ($p = 0.003$, $p < 0.001$). Details are shown in Table 1.

Distribution of Disease Spectrum

The primary reason for OCCU transfer was postpartum hemorrhage (34.82%), followed by preeclampsia/eclampsia (21.73%). The proportion of postpartum hemorrhage was significantly higher in the unfavorable prognosis group compared with the favorable prognosis group ($p = 0.015$). Details are shown in Table 2.

Serum Biomarker Levels

Serum levels of CRP, D-dimer, BNP, and Scr were significantly higher in the unfavorable prognosis group compared with the favorable prognosis group ($p < 0.01$). Details are shown in Table 3.

Treatment and Prognostic Indicators for Critically Ill Obstetric Patients Transferred to the OCCU

The unfavorable prognosis group had a significantly longer OCCU length of stay and total hospital length of stay than the favorable prognosis group, and exhibited significantly higher Neonatal ICU (NICU) admission rate and longer neonatal hospital length of stay ($p < 0.05$). Details are shown in Table 4.

Screening of Risk Factors Affecting the Prognosis of Critically Ill Obstetric Patients

The results of the LASSO regression indicated that 13 variables with non-zero coefficients were significantly associated with an unfavorable prognosis. These variables were age, gestational week, hypertension, diabetes, heart disease, placental abruption, APACHE II score, SOFA score, heart rate (HR), CRP, D-dimer, Scr, and mechanical ventilation. Details are shown in Figs. 1,2.

Table 2. Distribution of disease spectrum for OCCU transfer [n (%)].

Indicator	Total (n = 313)	Favorable prognosis group (n = 222)	Unfavorable prognosis group (n = 91)	χ^2 value	p value
Postpartum hemorrhage	109	68 (30.63)	41 (45.05)	5.917	0.015
Preeclampsia	51	41 (18.47)	10 (10.99)	2.647	0.104
Septic shock	34	28 (12.61)	6 (6.59)	2.415	0.120
Eclampsia	17	13 (5.86)	4 (4.40)	-	0.617
ARDS	16	14 (6.31)	2 (2.20)	-	0.143
DIC	18	12 (5.41)	6 (6.59)	0.168	0.682
Acute kidney injury	18	13 (5.86)	5 (5.49)	0.016	0.901
Heart failure	12	7 (3.15)	5 (5.49)	0.960	0.327
Amniotic fluid embolism	10	7 (3.15)	3 (3.30)	-	0.865
Other	28	19 (8.56)	9 (9.89)	0.140	0.708

Note: ARDS, acute respiratory distress syndrome; DIC, disseminated intravascular coagulation. - indicates Fisher's test.

Multivariate Logistic Regression Analysis of Factors Affecting the Prognosis of Critically Ill Obstetric Patients

The 13 variables identified by LASSO regression were included in the multivariate analysis. After backward stepwise elimination, mechanical ventilation was excluded from the final model due to a lack of statistical significance ($p > 0.05$). The results showed that increased age, decreased gestational age, a history of hypertension, diabetes, or heart disease, placental abruption, elevated APACHE II/SOFA scores at admission, and elevated levels of D-dimer, Scr, and CRP were independent risk factors for an unfavorable prognosis. A lower heart rate (HR) was identified as a protective factor. Variance inflation factor analysis showed that there was no significant collinearity among the indices in the model (VIF <5). Details are shown in Table 5.

ROC Curve Analysis

The multivariate Logistic regression model constructed from the 12 risk factors demonstrated a high predictive value for critically ill obstetric patients. The area under the curve (AUC) was 0.866 (95% CI: 0.819–0.913). The Youden index is 0.614, and the optimal cutoff value for the model is 0.248. The sensitivity and specificity were 83.5% and 77.9%, respectively. Details are shown in Fig. 3.

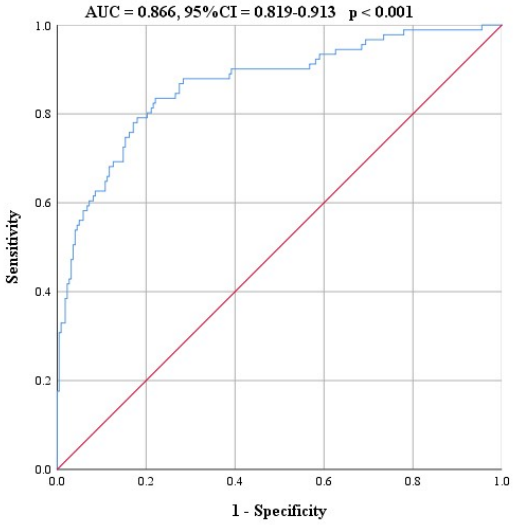

Fig. 3. ROC curve for the model's prediction of prognosis in critically ill obstetric patients. Note: ROC, receiver operating characteristic; AUC, area under the curve.

Discussion

The composite definition of unfavorable prognosis was adopted based on the 'near-miss' methodology advocated by the World Health Organization (WHO) and the Maternal Near-Miss (MNM) criteria. In critical obstetric care, maternal mortality is fortunately low, which limits the statistical power of studies solely on death. A composite endpoint encompassing prolonged ICU stay (reflecting treatment intensity), acute organ dysfunction (reflecting disease severity), and long-term morbidity (reflecting quality of life) provides a more comprehensive assessment of severe maternal outcomes. This approach enhances the statistical power to identify risk factors while capturing the full spectrum of morbidity associated with critical illness in pregnancy. This study demonstrates that postpartum hemorrhage (34.82%) and preeclampsia/eclampsia (21.73%) are the two primary causes of obstetric patient transfer to the OCCU, collectively accounting for over 60% of cases. This distribution aligns with findings reported in previous studies [15,16]. This model emphasizes the importance of centralized prevention, control and effective management of these two situations. It is noteworthy that in the poor prognosis group, the proportion of postpartum hemorrhage is significantly higher than that in the good prognosis group,

Table 3. Comparison of serum biomarker levels between the two groups.

Indicator	Favorable prognosis group (n = 222)	Unfavorable prognosis group (n = 91)	*t*/Z value	*p* value
CRP_mg/L	27.30 (19.26, 168.07)	130.90 (62.38, 234.82)	4.992	<0.001
PCT_ng/mL	1.84 (0.57, 2.95)	1.85 (0.76, 6.51)	1.237	0.216
Lactic acid_mmol/L	1.92 (1.18, 3.78)	2.09 (1.28, 4.29)	1.736	0.083
D-D_mg/L (FEU)	1.99 (1.28, 3.80)	3.71 (1.94, 7.37)	4.164	<0.001
PT_s	13.20 ± 1.82	12.92 ± 1.84	1.207	0.229
APTT_s	34.45 ± 4.70	35.29 ± 5.57	1.368	0.172
FIB_g/L	3.80 (2.60, 4.70)	3.60 (2.30, 4.70)	0.863	0.388
cTnI_ng/mL	0.06 (0.01, 0.25)	0.06 (0.02, 0.28)	0.221	0.825
BNP_pg/mL	161.89 (33.96, 391.44)	223.25 (89.21, 599.53)	3.753	<0.001
ALT_U/L	20 (11, 35.25)	17 (9, 32)	1.417	0.156
AST_U/L	19 (12, 31.25)	21 (11, 31)	0.363	0.716
Scr_μmol/L	40 (32, 59)	53 (36, 78)	3.189	0.001
BUN_mmol/L	4.35 (2.40, 7.33)	4.40 (2.90, 7.50)	0.486	0.627
Blood glucose_mmol/L	6.12 ± 1.91	6.24 ± 1.72	0.491	0.623
Blood potassium_mmol/L	4.00 ± 0.53	4.05 ± 0.44	0.911	0.363
Blood sodium_mmol/L	137.87 ± 4.88	138.00 ± 4.97	0.214	0.831
Blood calcium_mmol/L	2.20 ± 0.20	2.17 ± 0.19	1.224	0.222

Note: CRP, C-reactive protein; PCT, procalcitonin; D-D, D-dimer; PT, prothrombin time; APTT, activated partial thromboplastin time; FIB, fibrinogen; cTnI, cardiac troponin I; BNP, brain natriuretic peptide; ALT, alanine aminotransferase; AST, aspartate aminotransferase; Scr, serum creatinine; BUN, blood urea nitrogen.

Table 4. Comparison of OCCU treatment and prognostic indicators between the two groups.

Indicator	Favorable prognosis group (n = 222)	Unfavorable prognosis group (n = 91)	Z/χ^2 value	*p* value
Mechanical ventilation [n (%)]	67 (30.18)	37 (40.66)	3.195	0.074
Vasoactive drug usage [n (%)]	92 (41.44)	34 (37.36)	0.446	0.504
Red blood cell transfusion volume (U)	1 (0, 6)	0 (0, 6)	0.246	0.805
Plasma infusion volume (mL)	318 (0, 1158.50)	0 (0, 811)	1.661	0.097
OCCU length of stay (h)	32 (15.75, 56)	44 (33, 99)	4.796	<0.001
Total length of hospital stay (d)	10 (7, 14)	12 (10, 14)	2.591	0.010
NICU Transfer [n (%)]	96 (43.24)	64 (70.33)	18.951	<0.001
Newborns' hospitalization time (d)	7 (5, 11)	9 (7, 20)	3.633	<0.001

indicating that although the treatment technology of postpartum hemorrhage is relatively mature, once it develops into uncontrollable severe hemorrhage, it is still accompanied by a high risk of organ dysfunction and poor prognosis [17]. These findings underscore the importance of early identification, standardized treatment and timely referral of postpartum hemorrhage at primary medical institutions. Pre-eclampsia/eclampsia is another major contributor to OCCU admissions, mainly driven by severe hypertension, organ dysfunction (such as HELLP syndrome and acute kidney injury), or eclampsia convulsion, all of which need close monitoring and comprehensive treatment [18,19]. Other diseases, such as septic shock, amniotic fluid embolism, and ARDS, although less frequent, are usually sudden and life-threatening. They represent important direct causes of maternal death and require highly specialized, multidisciplinary management [20].

In this study, LASSO regression combined with multivariate Logistic regression was used to identify a series of independent risk factors significantly related to poor prognosis. The results indicate that chronic comorbidities and pregnancy complications are closely linked to maternal outcomes, consistent with the findings reported by Teshome HN *et al.* [21] from the Ethiopian region. Patients with a history of heart disease, diabetes and hypertension have a significantly increased risk of poor prognosis, indicating that pre-pregnancy health exhibits a far-reaching impact on pregnancy outcome. A history of heart disease, especially structural or functional disorder, impairs pregnant women's ability to tolerate hemodynamic changes during pregnancy, predisposing them to heart failure, which is the highest risk factor in this study [22]. Notably, the wide confidence interval for heart disease history reflects the small number of patients with this condition in our cohort, which may limit the precision of the estimate. Future multicenter studies with larger samples are needed to confirm the association between heart disease and poor prognosis in obstetric critical care. Diabetes and hypertension exacerbate critical con-

Table 5. Analysis of independent risk factors affecting the prognosis of critically ill obstetric patients.

Indicator	*b*	*SE*	*Wald* χ^2 value	*p* value	*OR*	95% CI	VIF
Medical history _ Heart disease	3.983	1.994	3.988	0.046	53.653	1.076–2674.37	1.051
Complications _ Placental abruption	1.855	0.521	12.661	<0.001	6.39	2.301–17.752	1.023
History _ diabetes	1.943	0.685	8.045	0.005	6.977	1.822–26.708	1.042
Medical history _ Hypertension	1.796	0.663	7.335	0.007	6.025	1.642–22.103	1.051
Gestational week	–0.158	0.054	8.549	0.003	0.854	0.769–0.949	1.053
SOFA Scores	0.186	0.053	12.231	<0.001	1.204	1.085–1.336	1.029
Age (years)	0.144	0.037	15.625	<0.001	1.155	1.076–1.241	1.064
APACHE II Scores	0.102	0.031	11.045	0.001	1.107	1.043–1.176	1.052
D-dimer	0.084	0.031	7.28	0.007	1.088	1.023–1.156	1.036
Scr	0.019	0.005	13.982	<0.001	1.019	1.009–1.029	1.029
Heart rate	–0.018	0.008	5.775	0.016	0.982	0.968–0.997	1.058
CRP	0.005	0.002	12.515	<0.001	1.005	1.002–1.008	1.036
Constant	–4.091	2.646	2.391	0.122	0.017	-	

ditions by accelerating vascular endothelial injury, increasing the risk of infection, and posing a greater burden on organs. Meta-analysis, including results of HABTE A [23], has shown that hypertension is an independent risk factor for neonatal death and is closely related to the poor prognosis of pregnant women. Placental abruption, as an acute complication, showed a strong association with an unfavorable prognosis (OR = 6.39). This is likely due to its frequent induction of severe postpartum hemorrhage, coagulopathy (DIC), and the high-stress state associated with emergency surgery [24]. The results of this study also showed that the increase in age and the decrease in gestational age were independent risk factors. Older pregnant women (≥35 years old) often have more chronic diseases, and the ability of organ compensation decreases. Lower gestational age may reflect the necessity of early termination of pregnancy due to maternal critical condition, or it may indicate that premature birth results from serious complications (such as severe preeclampsia or placental abruption). This shows that, due to the immature fetus, the severity of potential diseases is higher and the decision-making pressure is greater [25].

The results of this study also indicate that the severity of the disease and organ function markers can predict the prognosis of patients. Higher APACHE II and SOFA scores at admission directly reflect the initial severity of the illness, as well as the extent and depth of organ dysfunction, serving as classic and reliable indicators for predicting outcomes [26]. In this study, the OR value of the SOFA score is 1.204, which emphasizes the importance of dynamic monitoring of organ function. As for serum biomarkers, the significant increase of D-dimer indicates excessive coagulation activation and fibrinolysis, which is usually observed in cases of amniotic fluid embolism, severe infection, or massive bleeding leading to pre-DIC or dominant DIC [27]. The increase of CRP reflects the level of systemic inflammatory response and is closely related to septic shock, severe tissue injury and other diseases. Elevated serum creatinine (SCR) directly indicates renal function damage, which is one of the common organ dysfunctions in critically ill patients and is related to the increase in mortality [28]. These laboratory parameters provide an objective basis for the early clinical identification of high-risk patients.

The study also found that a lower heart rate was a protective factor for a poor prognosis. One possible explanation is that, in critical situations, a relatively low heart rate may indicate better cardiac reserve function or compensatory tachycardia without extreme pressure. However, this result needs to be interpreted cautiously, as it may be affected by factors such as sample characteristics and drug intervention, which needs further investigation and confirmation.

The multivariate logistic regression model constructed in this study achieved an AUC of 0.866, indicating that the integration of demographic factors, medical history, disease severity scores, and key serum biomarkers provides good predictive value for the prognosis of critically ill obstetric patients. This finding is consistent with results from studies, such as that by EVSEN GA *et al.* [29]. The model presented herein can assist clinicians in early identification of high-risk individuals upon OCCU admission, thereby enabling more intensive monitoring and intervention. For instance, heightened vigilance for the potential development of multiple organ dysfunction is warranted for older patients who have a smaller gestational age and comorbid diabetes, are admitted for postpartum hemorrhage, and exhibit significantly elevated levels of D-dimer and CRP. Proactive multidisciplinary consultation from departments, such as hematology, nephrology, and cardiology, is recommended for these high-risk cases. The neonatal NICU transfer rate of pregnant women with poor prognosis increased significantly and the hospitalization time was prolonged, consistent with the previous research [30,31]. Maternal and neonatal outcomes are closely intertwined, as the mother's critical state often directly affects neonatal health through premature delivery, fetal distress or perinatal asphyxia. Therefore, the treatment of obstetric critical illness

must emphasize integrated management of mother and infant, with effective cooperation among OCCU, obstetrics, and neonatology teams [32,33].

This study has certain limitations. Firstly, for a single-center retrospective study, the generalization of conclusions may be limited, and the results are potentially subject to selection and information biases. Secondly, although the study included 313 cases, the sample size was insufficient to perform robust subgroup analysis for rare diseases, such as amniotic fluid embolism. Third, the definition of poor prognosis combined with hospitalization time, dynamic organ function changes, and long-term follow-up outcomes; however, the integrity of long-term follow-up may have been affected by loss of follow-up. Fourthly, serum markers were analyzed only at baseline upon OCCU transfer, and the relationship between their dynamic trajectory and prognosis needs further investigation.

Conclusion

In summary, postpartum hemorrhage and preeclampsia/eclampsia are the primary causes of OCCU admission among obstetric patients. Age, gestational age, chronic comorbidities (heart disease, diabetes, hypertension), placental abruption, high APACHE II/SOFA scores, and elevated levels of D-dimer, CRP, and Scr are independent risk factors for an unfavorable prognosis. The predictive model constructed based on these factors demonstrates strong clinical predictive performance. Future research should further validate this predictive model through multicenter, prospective cohorts and explore the integration of dynamically monitored serum biomarker trends into early warning systems, thereby providing more precise, individualized management and optimizing resource allocation in obstetric critical care.

Availability of Data and Materials

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Author Contributions

FX, XW—designed the study and carried them out; FX, XW, SW—contributed to the data collection; FX, XW—analyzed the data; FX, XW—interpreted the data; FX, XW, SW—drafted the manuscript for publication and revised the manuscript critically for important intellectual content. All authors gave final approval of the version to be published. All authors have participated sufficiently in the work to take public responsibility for appropriate portions of the content and agreed to be accountable for all aspects of the work in ensuring that questions related to its accuracy or integrity.

Ethics Approval and Consent to Participate

All study procedures complied with the ethical standards of the Declaration of Helsinki, and ethical approval was obtained from the Ethics Committee of Ruian Maternity and Child Care Hospital (Approval no. 2026-04). Written informed consent was obtained from legally authorized representatives for the publication of anonymized patient information in this article.

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Conflict of Interest

The authors declare no conflict of interest.

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