

Analysis of Risk Factors of Early-Onset Septicemia in Premature Infants

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Abstract: Objectives: To analyze the risk factors of early-onset septicemia in premature infants and to evaluate the significance of the risk factors in the early prognosis of premature infants. **Methods:** A total of 260 children with gestational age <34 weeks and birth weight <2000 grams diagnosed with early-onset septicemia admitted to the Neonatology Department of Dalian Municipal Woman and Children's Medical Center (Group) (Chunliu Maternity Department) from July 2015 to July 2021 were retrospectively analyzed. According to the early prognosis, the patients were divided into poor prognosis group (severe sequelae, death during treatment) and cure group (improved or cured and discharged from hospital). The general clinical conditions of the two groups were compared, and the risk factors for poor prognosis of premature early-onset septicemia were analyzed. **Results:** 1. There were statistically significant differences in gestational age, birth weight, premature rupture of membranes (>72h), maternal chorioamnionitis or group B hemolytic streptococcus (GBS) infection, and incidence of NEC (Bell stage II or above) between the two groups ($P<0.05$). 2. Chorioamnionitis and/or GBS infection are independent risk factors for poor early prognosis of premature infants with early-onset septicemia. **Conclusion:** Maternal chorioamnionitis or GBS infection may be associated with a poor prognosis for early-onset septicemia in premature infants.

Keywords: Premature Infants; Early-onset Septicemia; Mean Platelet Volume; Chorioamnionitis; GBS

Introduction

Premature infants refer to neonates with gestational age less than 37 weeks, with a global preterm incidence of 11.1%^[1]. The rate of preterm birth in China is about 6%. The rate of super preterm birth and very preterm birth are 0.5% and 9.0%, respectively^[2]. Premature infants have a high risk of death due to a variety of factors, with 60% of premature deaths occurring at gestational age of less than 32 weeks^[3]. Neonatal septicemia can be divided into early-onset septicemia and late-onset septicemia (72 hours after birth as the boundary). The more fiercely early-onset septicemia progresses, the smaller gestational age is, and the lower the birth weight is, the higher the case fatality rate will be.

1. Object of study

1.1 Object of study

Septicemia children with gestational age <34 weeks and birth weight <2000 g admitted to the neonatal department of our hospital from July 2015 to July 2021 were collected. Inclusion criteria: (1) Gestational age <34 weeks and birth weight <2000 g; (2) Clinical diagnosis and laboratory diagnosis of neonatal septicemia; diagnostic criteria refer to Practice of Neonatology^[4]. Exclusion criteria: (1) Giving up treatment within 72 hours of birth due to social factors; (2) There are serious congenital defects, such as complex congenital heart disease, inherited metabolic diseases, digestive tract malformation, chromosome abnormality, etc.

1.2 Collecting data

(1) General information: Gender, gestational age, birth weight, mode of delivery, premature rupture of membranes (single, >12h), chorioamnionitis and (or) GBS infection; (2) Related complications: Septic shock, disseminated intravascular coagulation, purulent meningitis, neonatal necrotizing enterocolitis (Bell stage II or above), and gastrointestinal perforation.

2. Statistical method

SPSS25.0 statistical software was used for data analysis. Measurement data conforming to normal distribution were represented by $\bar{x} \pm s$, and comparison between groups was performed by two-sample t test. Counting data were represented by frequency and rate (%), and comparison between groups was performed by chi-square test or Fisher's exact probability test. Risk factors for complications were analyzed by logistic regression. $P < 0.05$ was considered statistically significant.

3. Results

3.1 Comparison of two groups of general data

A total of 260 children with gestational age <34 weeks and body weight <2000 grams developed early-onset neonatal septicemia, 35 cases were excluded, and a total of 210 cases were included in the study, which were divided into the poor prognosis group (85 cases) and the cured group (125 cases). There were statistically significant differences in gestational age, birth weight, premature rupture of membranes (>72h), maternal chorioamnionitis and/or GBS infection between the two groups ($P < 0.05$). The incidence of NEC (Bell stage II or above) in the poor prognosis group was significantly higher than that in the cured group, and the difference was statistically significant ($P < 0.01$). (See **Table 1**)

Table 1. Comparison of clinical situation of two groups of premature infants

| Statistical items | Poor prognosis group (n = 85) | Cure group (n = 125) | Statistic ($\chi^2/t/F$) | P |
|----------------------------------------|----------------------------------|-------------------------|----------------------------|-------|
| Male | 40 (47.1) | 60 (48.0) | 0.071 | 0.813 |
| Gestational age (week) | 29.75 \pm 1.38 | 30.62 \pm 1.43 | 0.956 | 0.006 |
| Birth weight (g) | 1403.42 \pm 353.74 | 1557.72 \pm 313.42 | 5.432 | 0.042 |
| Premature rupture of membranes (>72h) | 42 (49.4) | 32 (25.6) | 9.928 | 0.004 |
| Chorioamnionitis and/or GBS infection | 46 (54.1) | 28 (22.4) | 8.422 | 0.001 |
| Septic shock | 17 (21.2) | 19 (15.2) | 1.233 | 0.267 |
| Disseminated intravascular coagulation | 11 (12.94) | 11 (8.8) | 1.523 | 0.121 |
| Purulent meningitis | 26 (30.6) | 37 (29.6) | 4.902 | 0.050 |
| NEC (Bell stage II or above) | 9 (11.2) | 5 (4.0) | 4.030 | 0.023 |
| Gastrointestinal perforation | 7 (8.8) | 7 (5.6) | 0.761 | 0.383 |

3.2 Logistic regression analysis of factors influencing early prognosis of premature infants

The results showed that premature rupture of membranes (>72h), chorioamnionitis and/or GBS infection were independent risk factors for early prognosis of premature infants with early-onset septicemia. (See **Table 2**)

Table 2. Logistic regression analysis of factors influencing early prognosis

| Relevant factors | β | Wald | P | OR | 95% CI |
|---------------------------------------|---------|-------|-------|-------|-------------|
| Gestational age (week) | 0.180 | 2.092 | 0.148 | 1.198 | 0.938-1.529 |
| Birth weight (g) | 0.001 | 1.162 | 0.281 | 1.001 | 1.000-1.002 |
| Premature rupture of membranes (>72h) | 0.864 | 6.518 | 0.011 | 2.372 | 1.222-4.604 |
| NEC (Bell stage II or above) | 0.926 | 1.914 | 0.166 | 2.524 | 0.680-9.373 |
| Chorioamnionitis and/or GBS infection | -0.574 | 4.481 | 0.034 | 0.563 | 0.331-0.958 |

Discussion

Neonatal septicemia is a serious systemic infectious disease in the neonatal period, with an incidence of 3.1/1000 live births [4]. Its pathogenic bacteria including bacteria and fungi enter into the newborn blood circulation, and in which they grow and reproduce, producing toxins to cause systemic inflammatory responses. Although the increased awareness of neonatal septicemia has significantly reduced its morbidity and mortality, the incidence of early septicemia in premature infants is still 15%, and the fatality rate is as high as 50%. The key risk factors are preterm birth, low birth weight, premature rupture of membranes, chorioamnionitis, and colonization and infection of streptococcus agalactiae (GBS) in the urinary and reproductive tracts. Premature rupture of membranes or prolonged rupture of membranes is an important factor leading to intrauterine infection, and the longer the interval between rupture of membranes and the normal expected rupture of membranes is, the greater the risk of maternal uterus infection and the higher the possibility of fetal sepsis after birth will be.

Maternal chorioamnionitis or GBS infection may be associated with a poor prognosis for early-onset septicemia in premature infants, providing an early judgment of the prognosis of septicemia in premature infants.

References

- [1] Dundar B, Dincez Cakmak B, Ozgen G, et al. Platelet indices in preterm premature rupture of membranes and their relation with adverse neonatal outcomes. *J Obstet Gynaecol Res* 2018; 44(1): 67–73.
- [2] Kozharskaya O, Ostrovskaya O, Vlasova M, et al. Intrauterine infection within the causes of perinatal mortality. *Bulletin physiology and pathology of respiration* 2020; 76: 54–61.
- [3] Fridman I, Kharit S, Vasiliev V, et al. Practical recommendations for vaccination of patients with intrauterine infection. *Journal Infectology* 2020; 12(2): 151–155.
- [4] Shao X, Ye H, Qiu X (editors). *Practice of Neonatology*. 5th ed. Beijing: People's Medical Publishing House Co., Ltd.; 2019. p. 512–513.