Clinical Analysis of Pregnancy Complicated by Severe Pneumonia: Postprint

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Abstract

Objective To investigate the clinical and laboratory examination characteristics of pregnancy complicated by severe pneumonia.

Methods A retrospective analysis was conducted on 18 pregnant patients with pneumonia admitted to our department from March 2013 to October 2016, including 9 cases without tracheal intubation and 9 cases of severe pneumonia requiring tracheal intubation. Clinical symptoms, signs, admission biochemical and infection indicators, length of hospital stay, and maternal and fetal outcomes were analyzed.

Results There was no statistically significant difference in the number of pregnancies between the two groups, but the difference in the number of deliveries was statistically significant (1.7±1.1 vs. 0.7±0.7, P=0.038), with patients having a higher number of successful deliveries having lower intubation rates; intubated patients had lower gestational age, but the difference between the two groups was not statistically significant (27.6±6.9 weeks vs. 33.1±5.1 weeks, P=0.078); pneumonia patients had low hemoglobin and serum albumin levels, but the difference between the intubated and non-intubated groups was not statistically significant (P>0.05); the ICU length of stay was 11.6±8.7 days in the intubated group and 2.8±1.6 days in the non-intubated group, with a statistically significant difference between the two groups (P<0.05); there were no maternal deaths in the non-intubated group, while there were 2 deaths in the intubated group (2/9).

Conclusion A higher number of pregnancy failures is associated with a higher intubation rate after pneumonia infection. Pneumonia infection during the second trimester may be associated with more severe disease. Pneumonia patients with low hemoglobin and albumin levels may have a higher risk of intubation. Pregnant patients with pneumonia requiring tracheal intubation have longer ICU stays and higher mortality rates.

Full Text

Clinical Analysis of Severe Pneumonia During Pregnancy

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Abstract

Objective: To investigate the clinical and laboratory characteristics of pregnant patients with severe pneumonia.
Methods: Eighteen cases of pneumonia in pregnant women admitted to our department from March 2013 to October 2016 were retrospectively analyzed. Nine patients received tracheal intubation, while the other nine did not. Clinical manifestations, biochemical and infection indicators at admission, hospital stay duration, and maternal and fetal outcomes were analyzed.
Results: There was no significant difference in the number of pregnancies between the two groups, but the number of deliveries was significantly different (1.7±1.1 vs. 0.7±0.7, P=0.038). Patients with more successful deliveries had a lower intubation rate. The intubated group had fewer gestational weeks, though the difference was not statistically significant (27.6±6.9 weeks vs. 33.1±5.1 weeks, P=0.078). Patients with pneumonia had low hemoglobin and serum albumin levels, but there was no significant difference between the intubated and non-intubated groups (P>0.05). ICU stay was significantly longer in the intubated group (11.6±8.7 days vs. 2.8±1.6 days, P<0.05). No maternal deaths occurred in the non-intubated group, while two deaths occurred in the intubated group (2/9).
Conclusion: A higher number of pregnancy failures is associated with higher intubation rates after pneumonia infection. Pneumonia in the second trimester may be more severe. Pneumonia patients with low hemoglobin and albumin levels may be at higher risk for intubation. Pregnant women with pneumonia requiring tracheal intubation have longer ICU stays and higher mortality rates.

Keywords: pregnancy; severe pneumonia; tracheal intubation

Introduction

Physiological changes in respiration during pregnancy, particularly in the middle and late stages when the fetus enlarges significantly, cause elevation of the diaphragm and decreased functional residual capacity, increasing the risk of pneumonia in pregnant women[1]. Speculative data suggest that as pregnancy progresses, the pathophysiological changes of many acute and chronic lung dis-

eases intensify, and pregnant women cannot tolerate the significant reduction in gas exchange caused by pneumonia[2]. Some studies have suggested that anemia may be one of the high-risk factors for pregnant women developing pneumonia[3]. Pregnancy complicated by severe pneumonia is a critical condition with difficult treatment and high maternal and infant mortality rates. Currently, there are few reports on the risk factors for severe pneumonia during pregnancy requiring tracheal intubation and ventilatory support. This study retrospectively analyzed cases of pregnancy complicated by pneumonia to examine the clinical and laboratory characteristics of severe pneumonia during pregnancy and to explore the risk factors for ventilator assistance, providing clinical evidence for the prevention and management of pneumonia during pregnancy.

1. Materials and Methods

1.1 General Data A total of 18 pregnant patients with pneumonia admitted to our department from March 2013 to October 2016 were included, comprising 9 patients who did not undergo tracheal intubation and 9 who did. General patient information is presented in . After admission, all patients received anti-infective and expectorant treatments. Patients meeting the criteria for tracheal intubation received the procedure, and the delivery method was determined by the obstetrician.

1.2 Diagnostic Criteria for Pneumonia and Severe Pneumonia The diagnosis of pneumonia was based on the Chinese Guidelines for the Diagnosis and Treatment of Adult Community-Acquired Pneumonia (2016 Edition)[4]. The diagnostic criteria for severe pneumonia were based on the 2007 guidelines established by the American Thoracic Society/Infectious Diseases Society of America in the "Guidelines for the Management of Community-Acquired Pneumonia in Adults" [5]. Major criteria included: (1) need for invasive mechanical ventilation; and (2) septic shock requiring vasopressor agents. Minor criteria included: (1) respiratory rate >30 breaths/min; (2) oxygenation index (PaO2/FiO2) 250 mmHg; (3) multi-lobe infiltration; (4) confusion/disorientation; (5) uremia (BUN 20 mg/dL); (6) leukopenia (white blood cell count <4×10 /L); (7) thrombocytopenia (platelet count <100×10 /L); (8) hypothermia (core temperature <36°C); and (9) hypotension requiring aggressive fluid resuscitation. Severe pneumonia was diagnosed when a patient met one major criterion or three or more minor criteria.

1.3 Analysis Indicators Indicators analyzed included: blood routine tests at admission; biochemical indicators: B-type natriuretic peptide (BNP), procalcitonin, lactate, serum albumin, and creatinine; and obstetric-related indicators: number of pregnancies, number of deliveries, and gestational weeks.

1.4 Statistical Analysis SPSS 19.0 statistical software was used. For normally distributed and homoscedastic measurement data, intergroup mean comparisons were performed using t-tests. Measurement data were analyzed using unpaired t-tests. The chi-square test was used to compare differences in rates between two samples in a completely randomized design. $P<0.05$ was considered statistically significant.

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2. Results

2.1 Blood Routine Comparison White blood cell counts were elevated in both groups at admission, but the average increase was not significant, and there was no statistically significant difference between the two groups ($P>0.05$,).

2.2 Obstetric Data Comparison Both groups had a history of multiple pregnancies on average, with comparable numbers of pregnancies. However, there was a statistically significant difference in the number of successful deliveries ($P<0.05$,), suggesting that pregnant women with more frequent abortion/induced labor histories may develop more severe pneumonia after infection. Gestational age in both groups was >14 weeks, with the intubated group having lower gestational age than the non-intubated group, indicating that pneumonia is more likely to occur in the middle and late stages of pregnancy, and that pneumonia in the second trimester may be more severe.

2.3 Comparison of Biochemical Indicators Procalcitonin and lactate levels were higher in the intubated group than in the non-intubated group. However, there were no statistically significant differences in biochemical indicators (BNP, procalcitonin, lactate, serum albumin, creatinine) between the two groups ($P>0.05$,).

2.4 Maternal and Fetal Outcomes Total maternal deaths were two cases, both in the intubated group, with a mortality rate of 22.2% (2/9). Total fetal deaths were also two cases, both in the intubated group, with a mortality rate of 22.2% (2/9). There were 10 cesarean sections, 3 vaginal deliveries, and 5 patients discharged. Apgar scores at 1, 5, and 10 minutes postpartum were 6.4±3.9, 7.6±4.0, and 8.0±4.0, respectively. The average birth weight was 1780±984 g.

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3. Discussion

Pneumonia during pregnancy presents with various clinical symptoms, with cough and fever predominating in the early stage, followed by sputum production and dyspnea later on. Previous literature on pregnancy complicated by pneumonia reported cough as the most common symptom[3]. In this study,

fever was the most common pre-admission symptom, reaching 100%, which may be related to the more severe condition of patients admitted to the ICU, with half of the patients requiring mechanical ventilation via tracheal intubation. Both groups of patients had a history of multiple pregnancies on average, and the number of pregnancies was comparable between groups. However, there was a statistically significant difference in the number of successful deliveries. Vital signs monitoring after admission showed that patients in the intubated group had higher respiratory rates and more obvious dyspnea. However, symptoms and physical examination findings have only 47%-69% sensitivity for diagnosing severe pneumonia, with 98% of cases showing changes on chest imaging, including pleural effusion, pulmonary exudate, and pulmonary edema[7].

This study found that the more frequent the pregnancy failures, the more severe the pneumonia after infection and the higher the intubation rate. Multiple pregnancy failures, often due to abortions, whether surgical or medical, can cause numerous health hazards to the mother and increase both short-term and long-term complications. Short-term complications include infection, hemorrhage, and uterine rupture, while long-term complications include habitual abortion, endocrine disorders, ectopic pregnancy, and infertility. Pregnant women with multiple abortions have higher rates of tracheal intubation when developing pneumonia.

Some studies have found that the incidence of pneumonia increases with gestational age[3]. Pregnancy is accompanied by physiological changes[8-10], including not only alterations in physical structure but also changes in endocrine and immune function, shifting from Th1 to Th2 type, with suppressed cellular immune function leading to increased susceptibility to certain infections[11-12]. Some studies have shown that most pneumonia cases occur in the first trimester[13-14]. In this study, there were no pneumonia cases in the first trimester; all cases occurred in the second and third trimesters, with a higher intubation rate in the second trimester than in the third trimester. This may be because the selected patients were more severely ill than those in previous studies who were treated in general wards, while early mild cases had already been discharged after treatment in outpatient or general ward settings. Nevertheless, the reasons why severe pneumonia is more common in the middle and late stages remain unclear and warrant further investigation.

The mean hemoglobin and albumin concentrations in the enrolled cases were significantly low, suggesting that pregnant women with malnutrition may develop more severe pneumonia. Anemia during pregnancy is a chronic condition and a cause of pneumonia in pregnant women[3]. In a large-sample, multicenter clinical study of pneumonia during pregnancy[9], the incidence of anemia was approximately 10.8%, compared with 9.9% in normal pregnant women, with no significant difference between the two groups. However, the authors did not provide specific hemoglobin values. In this study, the average hemoglobin concentration was <90 g/L, far below the level of physiological anemia. Anemia can lead not only to premature rupture of membranes and preterm delivery but may

also be a risk factor for pregnant women developing pneumonia[3]. In the middle and late stages of pregnancy, iron deficiency anemia affects T lymphocyte proliferation and differentiation[16-17]. Hypoalbuminemia is an independent risk factor for disease severity in elderly pneumonia patients[18]. Although there was no difference in serum albumin levels between the intubated and non-intubated groups in this study, both groups had significantly low levels, suggesting that low albumin may also be a risk factor for pregnant women developing pneumonia.

In summary, for pneumonia in the second and third trimesters, if pregnant women have severe anemia and hypoalbuminemia, especially those with bilateral pulmonary infiltration on chest radiography, they need to seek medical attention early and receive active treatment, with timely chest radiography to be vigilant for pneumonia[19]. For those with poor disease control, early transfer to ICU monitoring and treatment should be considered, with close monitoring of fetal intrauterine conditions. When conditions permit, early termination of pregnancy should be considered to reduce fetal mortality.

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Note: Figure translations are in progress. See original paper for figures.