

## Effects of Comprehensive Nursing Interventions on Hemorheology in Children with Mycoplasma pneumoniae Infection: Postprint

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### Abstract

**Objective** To investigate the nursing intervention in the clinical treatment of children with Mycoplasma pneumoniae infection and its influence on hemorheology. **Methods** A total of 128 children with Mycoplasma pneumoniae infection admitted to our hospital outpatient department from January to December 2016 were selected and randomly divided into an observation group and a control group, with 64 cases in each group. The control group received conventional nursing, while the observation group received comprehensive nursing. Clinical efficacy, clinical indicators, hemorheology, incidence of adverse reactions, and nursing satisfaction were compared between the two groups. **Results** The total effective rate of the observation group was higher than that of the control group (90.6% vs 75.0%,  $P < 0.05$ ). The defervescence time ( $4.5 \pm 0.8$  d vs  $6.6 \pm 1.2$  d), disappearance time of pulmonary rales ( $4.9 \pm 0.8$  d vs  $7.3 \pm 1.2$  d), and hospitalization duration ( $6.5 \pm 1.3$  d vs  $10.2 \pm 1.6$  d) in the observation group were all lower than those in the control group, with statistically significant differences ( $P < 0.05$ ). After treatment, the whole blood low-shear viscosity ( $7.12 \pm 0.83$  m Pa · s vs  $8.79 \pm 1.23$  m Pa · s), plasma viscosity ( $1.53 \pm 0.46$  m Pa · s vs  $1.78 \pm 0.52$  m Pa · s), and aggregation index ( $1.84 \pm 0.24$  vs  $2.24 \pm 0.27$ ) in the observation group were all lower than those in the control group ( $P < 0.05$ ). The incidence of various adverse reactions in the observation group was lower than that in the control group ( $P < 0.05$ ). The nursing satisfaction in the observation group was higher than that in the control group (79.7% vs 93.8%,  $P < 0.05$ ). **Conclusion** Comprehensive nursing measures can effectively improve clinical treatment outcomes, ameliorate hemorheological indicators in patients, reduce adverse reactions, and enhance nursing satisfaction.

## Full Text

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**Effect of Comprehensive Nursing Measures on Hemorheology in Children with Mycoplasma pneumoniae Infection**

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## Abstract

**Objective:** To investigate the effect of nursing intervention on hemorheology in children with Mycoplasma pneumoniae infection during clinical treatment. **Methods:** A total of 128 children with Mycoplasma pneumoniae infection who were admitted to our hospital' s outpatient department from January to December 2016 were selected and randomly divided into an observation group and a control group, with 64 cases in each group. The control group received routine nursing care, while the observation group received comprehensive nursing care. The clinical efficacy, clinical indicators, hemorheological parameters, incidence of adverse reactions, and nursing satisfaction were compared between the two groups. **Results:** The total effective rate in the observation group was higher than that in the control group (90.6% vs. 75.0%,  $P < 0.05$ ). The fever resolution time ( $4.5 \pm 0.8$  d vs.  $6.6 \pm 1.2$  d), pulmonary rales disappearance time ( $4.9 \pm 0.8$  d vs.  $7.3 \pm 1.2$  d), and hospitalization duration ( $6.5 \pm 1.3$  d vs.  $10.2 \pm 1.6$  d) in the observation group were all significantly lower than those in the control group ( $P < 0.05$ ). After treatment, the whole blood low-shear viscosity ( $7.12 \pm 0.83$  mPa·s vs.  $8.79 \pm 1.23$  mPa·s), plasma viscosity ( $1.53 \pm 0.46$  mPa·s vs.  $1.78 \pm 0.52$  mPa·s), and aggregation index ( $1.84 \pm 0.24$  vs.  $2.24 \pm 0.27$ ) in the observation group were all lower than those in the control group ( $P < 0.05$ ). The incidence of various adverse reactions in the observation group was lower than that in the control group ( $P < 0.05$ ). Nursing satisfaction in the observation group was higher than that in the control group (93.8% vs. 79.7%,  $P < 0.05$ ). **Conclusion:** Comprehensive nursing measures can effectively improve clinical treatment outcomes, ameliorate hemorheological parameters, reduce adverse reactions, and enhance nursing satisfaction.

**Keywords:** Mycoplasma pneumoniae infection; children; nursing intervention; hemorheology

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## Introduction

Mycoplasma pneumoniae infection is a common respiratory tract disease in pediatric patients, and its incidence has been increasing in recent years [1]. The disease occurs with obvious seasonal and periodic patterns, and its main clinical symptoms include fever and cough [2]. If not treated promptly, it can cause damage to the heart, brain, kidneys, and other organs, seriously affecting children's health [3]. Based on conventional drug therapy, the addition of comprehensive nursing measures can complement pharmacological treatment and promote faster and better recovery in children. Comprehensive nursing intervention refers to holistic nursing measures tailored to each individual patient and implemented throughout the entire process from admission to discharge. To investigate the effect of nursing intervention on hemorheology in children with Mycoplasma pneumoniae infection during clinical treatment, this study enrolled 128 children with Mycoplasma pneumoniae infection who were admitted to our hospital's outpatient department from January to December 2016.

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## Methods

### 1.1 General Information

We selected 128 children with Mycoplasma pneumoniae infection admitted to our hospital's outpatient department from January to December 2016, all of whom met the diagnostic criteria outlined in *Practical Pediatrics* [4]. Clinical manifestations included cough, fever, accompanied by wheezing, sore throat, and dyspnea [1]. Chest X-ray examination revealed large unilateral flocculent shadows, and some children exhibited extrapulmonary manifestations. The 128 children were randomly divided into an observation group (n=64) and a control group (n=64). The observation group consisted of 34 males and 30 females, aged 2-12 years (mean  $6.82 \pm 3.6$  years), including 41 cases aged 2-6 years and 23 cases aged 6-12 years, with a disease course of 3-21 days (mean  $7.1 \pm 1.2$  days). The control group consisted of 33 males and 31 females, aged 3-11 years (mean  $6.99 \pm 3.8$  years), including 40 cases aged 3-6 years and 24 cases aged 6-11 years, with a disease course of 3-23 days (mean  $7.3 \pm 1.4$  days). There were no significant differences in baseline data between the two groups ( $P > 0.05$ ), indicating comparability.

### 1.2 Nursing Methods

Both groups were treated with the macrolide antibiotic azithromycin (Jiangxi HuiRen Pharmaceutical Co., Ltd., National Drug Approval Number H20023871) at a dose of 10 mg/kg via intravenous infusion once daily for 5 consecutive days.

**1.2.1 Control Group: Routine Nursing** Routine nursing included health education for the children's families, maintaining a clean, comfortable, and quiet ward environment, ensuring airway patency, providing nutritional support with high-protein, high-vitamin, low-fat foods, encouraging consumption of vegetables and fruits, and closely monitoring the children's respiration, complexion, and consciousness.

**1.2.2 Observation Group: Comprehensive Nursing** The comprehensive nursing intervention consisted of the following components: (1) **Medication nursing:** Azithromycin can cause gastrointestinal reactions such as nausea, vomiting, abdominal pain, and diarrhea. Appropriate vitamin B6 was administered for antiemetic purposes, and infusion rate was controlled to prevent phlebitis or heart failure. (2) **Psychological nursing:** Due to the young age and limited comprehension of the children, nurses first communicated effectively with parents, informing them about the disease basics, treatment methods, and precautions to help improve the children's compliance and cooperation. During nursing care, staff established trusting relationships with children through friendly, kind attitudes and patient communication. (3) **Cough nursing:** Effective coughing and sputum expectoration facilitate absorption of pulmonary inflammation and promote secretion discharge. Nurses guided children to change positions and provided back percussion to assist coughing. Ultrasonic nebulization therapy was administered with children in a sitting position to maintain oral hygiene and airway patency. (4) **Fever nursing:** Vital signs including temperature, heart rate, and respiration were monitored in real time. For temperatures below 38.5°C, children were encouraged to drink more water. For temperatures exceeding 38.5°C, physical cooling methods including ice packs and alcohol wipes were applied to prevent febrile convulsions. If physical cooling was ineffective, oral antipyretics such as ibuprofen suspension were administered. Any abnormalities were promptly reported to physicians for appropriate measures. (5) **Diet and exercise nursing:** Due to fever, most children experienced dry lips, oral discomfort, and severe cases could develop oral ulcers. Children were guided to use furacilin mouthwash. The diet consisted primarily of high-protein, high-calorie, and high-vitamin liquid or semi-liquid foods, avoiding irritants to enhance nutrition and immunity. Appropriate physical exercise was encouraged to improve physical fitness. (6) **Complication nursing:** For children with severe wheezing, mechanical ventilation was added to improve hypoxia status, with close observation of skin and mucous membrane changes. Nurses monitored for infectious mononucleosis, whose clinical symptoms mainly include irregular fever, nasal congestion, lymph node enlargement, and angina. Temperature changes were strictly monitored and recorded, with appropriate cooling methods applied. Infection prevention nursing was crucial as reduced immunity made children susceptible to infection. Therefore, proper ventilation, appropriate temperature maintenance, and daily routine disinfection were implemented to avoid cross-infection.

### 1.3 Observation Indicators

After treatment, we compared clinical efficacy, clinical indicators (fever resolution time, pulmonary rales disappearance time, hospitalization duration), hemorheological parameters (whole blood low-shear viscosity, plasma viscosity, and aggregation index), incidence of adverse reactions (allergic purpura, gastrointestinal reactions, venous irritation, rash), and nursing satisfaction between the two groups.

### 1.4 Efficacy Evaluation

Clinical efficacy was evaluated according to the following criteria [5]: **Markedly effective:** Body temperature returned to normal within 7 days, with significant improvement in cough and pulmonary rales. **Effective:** Body temperature basically returned to normal within 7 days, with some relief of cough and pulmonary rales. **Ineffective:** No improvement or even worsening of body temperature and symptoms after 14 days of treatment.

Nursing satisfaction was assessed using a self-designed questionnaire evaluating professional service level, nursing attitude, nurse-patient relationship, and ward conditions. Scores  $\geq 90$  indicated “satisfied,” 70-90 indicated “basically satisfied,” and  $<70$  indicated “dissatisfied.”

### 1.5 Statistical Analysis

SPSS 19.0 software was used for statistical analysis. Measurement data were compared using t-tests, and count data were compared using  $\chi^2$  tests.  $P < 0.05$  was considered statistically significant.

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## Results

### 2.1 Comparison of Clinical Efficacy

The total effective rate in the observation group was higher than that in the control group (90.6% vs. 75.0%), with a statistically significant difference ( $P < 0.05$ , Table 1).

#### Table 1 Comparison of Clinical Efficacy Between the Two Groups (n=64, %)

Observation group: Markedly effective 30 (46.9), Effective 28 (43.8), Ineffective 6 (9.4), Total effective 58 (90.6)

Control group: Markedly effective 26 (40.6), Effective 22 (34.4), Ineffective 16 (25.0), Total effective 48 (75.0)

## 2.2 Comparison of Clinical Indicators

The fever resolution time, pulmonary rales disappearance time, and hospitalization duration in the observation group were all significantly lower than those in the control group ( $P < 0.05$ , Table 2 ).

### Table 2 Comparison of Clinical Indicators Between the Two Groups (n=64,

Fever resolution time (d): Observation group  $4.5 \pm 0.8$ , Control group  $6.6 \pm 1.2$   
Pulmonary rales disappearance time (d): Observation group  $4.9 \pm 0.8$ , Control group  $7.3 \pm 1.2$   
Hospitalization duration (d): Observation group  $6.5 \pm 1.3$ , Control group  $10.2 \pm 1.6$

## 2.3 Comparison of Hemorheological Changes

There were no significant differences in hemorheological parameters between the two groups before treatment ( $P > 0.05$ ). After treatment, the whole blood low-shear viscosity, plasma viscosity, and aggregation index in the observation group were lower than those in the control group, with statistically significant differences ( $P < 0.05$ , Table 3 ).

### Table 3 Comparison of Hemorheological Changes Between the Two Groups (n=64,

Whole blood low-shear viscosity ( $\text{mPa} \cdot \text{s}$ ): Observation group  $9.59 \pm 1.24$  (pre) /  $7.12 \pm 0.83$  (post), Control group  $9.67 \pm 1.15$  (pre) /  $8.79 \pm 1.23$  (post)  
Plasma viscosity ( $\text{mPa} \cdot \text{s}$ ): Observation group  $1.81 \pm 0.79$  (pre) /  $1.53 \pm 0.46$  (post), Control group  $1.83 \pm 0.93$  (pre) /  $1.78 \pm 0.52$  (post)  
Aggregation index: Observation group  $2.87 \pm 0.35$  (pre) /  $1.84 \pm 0.24$  (post), Control group  $2.83 \pm 0.31$  (pre) /  $2.24 \pm 0.27$  (post)

## 2.4 Comparison of Adverse Reaction Rates

The incidence of various adverse reactions in the observation group was lower than that in the control group, with statistically significant differences ( $P < 0.05$ , Table 4 ).

### Table 4 Comparison of Adverse Reaction Rates Between the Two Groups (n=64, %)

Allergic purpura: Observation group 1 (1.6), Control group 2 (3.1)  
Gastrointestinal reactions: Observation group 2 (3.1), Control group 7 (10.9)  
Venous irritation: Observation group 2 (3.1), Control group 9 (14.1)  
Rash: Observation group 2 (3.1), Control group 10 (15.6)

## 2.5 Comparison of Nursing Satisfaction

Nursing satisfaction in the observation group was significantly higher than that in the control group (93.8% vs. 79.7%), with a statistically significant difference ( $P < 0.05$ , Table 5 ).

**Table 5 Comparison of Nursing Satisfaction Between the Two Groups (n=64, %)**

Observation group: Satisfied 56 (87.5), Basically satisfied 4 (6.3), Dissatisfied 4 (6.3), Total satisfaction 60 (93.8)

Control group: Satisfied 44 (68.8), Basically satisfied 8 (12.5), Dissatisfied 13 (20.3), Total satisfaction 51 (79.7)

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## Discussion

Mycoplasma pneumonia is a common infectious lung disease caused by Mycoplasma pneumoniae infection, which predominantly affects preschool children. It is highly contagious through contact and seriously impacts children's health [6]. The main pathogenic mechanism involves mycoplasma adhering to and proliferating on ciliated epithelium without entering the lung parenchyma. The mycoplasma cell membrane contains neuraminic acid receptors that adhere to respiratory epithelial cells, inhibit ciliary activity, and produce hydrogen peroxide, thereby causing tissue damage [7-8]. Mycoplasma pneumonia affects children's respiratory and immune systems, leading to decreased immunity. Initial symptoms include fatigue, fever, dizziness, headache, and loss of appetite, with obvious respiratory symptoms appearing after 2-3 days, including productive purulent sputum sometimes with blood. Studies have shown that mycoplasma infection can also affect the hematological and nervous systems, with severe cases being fatal [9]. Clinically, azithromycin is commonly used for treatment. As a second-generation macrolide with high bioavailability, azithromycin is rapidly absorbed orally and reaches the lesion site [10]. Therefore, children with Mycoplasma pneumoniae infection can achieve significant improvement in clinical symptoms (cough, sputum production, fever) after azithromycin administration.

Due to the unique physical and psychological characteristics of young children with Mycoplasma pneumoniae infection, nurses should consider various factors comprehensively when performing nursing interventions. Comprehensive nursing is a continuous process from admission to discharge, including medication nursing, psychological nursing, cough nursing, fever nursing, diet and exercise nursing, and complication nursing. Young children often experience fear and anxiety about illness, making psychological nursing particularly important. Through patient communication, active guidance, and encouragement, nurses can alleviate negative emotions, help build confidence in overcoming the disease, and improve compliance. In this study, after comprehensive nursing intervention, the observation group showed significantly higher total effective rate ( $P < 0.05$ ) and significantly shorter fever resolution time, pulmonary rales disappearance time, and hospitalization duration compared with the control group ( $P < 0.05$ ). These results are consistent with the report by Chen Dan [11], indicating that personalized nursing can significantly improve treatment efficacy and quality of life. These findings suggest that comprehensive nursing intervention can significantly enhance clinical efficacy, improve clinical symptoms, and

increase quality of life.

Related studies have shown that due to the immature development of respiratory system tissues in children, *Mycoplasma pneumoniae* infection interacts with immune-active substances, leading to increased glandular secretion, impaired pulmonary function, and ventilation-perfusion mismatch. This results in hypoxia, increased red blood cells, elevated fibrinogen, increased blood viscosity, and subsequent microcirculation disturbances, causing hemorheological abnormalities [12]. In this study, there were no significant differences in hemorheological parameters between groups before treatment ( $P>0.05$ ). After drug treatment and comprehensive nursing intervention, the observation group showed significant improvements in whole blood low-shear viscosity, plasma viscosity, and aggregation index, with better improvement than the control group ( $P<0.05$ ). These results indicate that *Mycoplasma pneumoniae* infection indeed affects children's hemorheological parameters, and comprehensive nursing can improve clinical treatment efficacy and ameliorate hemorheological indices, consistent with the findings of Hu Hailei et al. [13].

Adverse reactions may occur during treatment. If body temperature is too high, physical cooling methods can be used without side effects. For children with extrapulmonary complications, absolute bed rest for approximately two weeks is necessary, as rest can reduce myocardial oxygen consumption and cardiac workload [14]. For allergic purpura, nurses should promptly change clothing, maintain skin cleanliness, and prevent scratching or abrasion to avoid infection. Throughout treatment, blood pressure, respiration, and heart rate require close monitoring [15], with immediate reporting of any abnormalities to nurses and attending physicians for timely intervention [16].

Children with *Mycoplasma pneumoniae* infection may develop neurological damage symptoms such as headache and projectile vomiting. Therefore, nurses should instruct children to maintain bed rest and turn their heads to one side during vomiting to prevent aspiration and suffocation. Vital signs and consciousness status should be closely monitored, with prompt anticonvulsant treatment and appropriate sedatives administered in case of convulsions [17]. Since children with *Mycoplasma pneumoniae* infection may develop infectious mononucleosis, nurses should observe for symptoms such as nasal congestion, lymph node enlargement, and prolonged fever for early detection [18]. Adverse reactions in this study included allergic purpura, gastrointestinal reactions, venous irritation, and myocardial damage, with significantly lower incidence in the observation group, demonstrating that comprehensive nursing yields better outcomes with fewer adverse reactions and significantly improves parental satisfaction, similar to the satisfaction reported by Yang Yang [19].

In summary, comprehensive nursing measures can effectively improve clinical treatment efficacy, ameliorate hemorheological parameters, reduce adverse reactions, and enhance nursing satisfaction.

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