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Efficacy of human immunoglobulin in adjuvant treatment of neonatal pneumonia and its effect on inflammatory factors and immune function

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Abstract: *Investigate the efficacy of human immunoglobulin in the adjuvant treatment of neonatal pneumonia. A total of 116 children with neonatal pneumonia were treated in our hospital from March 2022 to March 2024 were selected and they were randomly divided into control group(n=58,receiving conventional treatment)and observation group(n=58,receiving conventional treatment+human immunoglobulin treatment), compar the treatment efficacy,immune function indicators and inflammatory factor levels before and after intervention, and the occurrence of adverse reactions. The total effective rate in the observation group was higher than that in the control group (P<0.05); compared with the control group, the level of inflammatory factors in the observation group was lower after treatment (P<0.05); after treatment, compared with the control group, the level of immune function indicators in the observation group was higher (P<0.05); There was no significant difference in the total incidence of adverse reactions between the two groups (P>0.05). Human immunoglobulin adjuvant treatment of neonatal pneumonia can reduce the level of inflammatory factors and improve the immune function in children, the treatment efficacy is significant and safe.*

Keywords: *Human immunoglobulin; Neonatal pneumonia; Inflammatory factors; Immune function; Efficacy*

1. Introduction

Neonatal pneumonia is the most common infectious disease in the neonatal period, with a high incidence. Most neonatal pneumonia is caused by daily infections[1].Because the heart and lung functions of newborns are not yet fully developed, lung infections may cause irreversible damage to the body,it may lead to pulmonary complications, such as pyothorax, mediastinal emphysema, etc. In severe cases, it may be complicated by chronic respiratory failure, and serious consequences such as hypoxic shock and coma[2].In addition, neonatal pneumonia may also affect heart function and may affect other organs, such as causing meningitis, toxic enteroparalysis, sepsis, and even septic shock, endangering the child's life[3].Clinically, treatments such as adjusting the environment, appropriate pat on the back, and antibiotic drugs are often used. However, antibiotic treatment is prone to side effects and drug resistance, which is not conducive to patient recovery[4].Low immunity is the main cause of neonatal pneumonia[5],therefore, the improvement of children's immune function is very important for neonatal pneumonia. Human immunoglobulin is an antibody produced by the human body. It has the functions of preventing viral infection, providing immune support, and controlling autoimmune diseases.It has been used in clinical practice[6].Based on this, this study explored the efficacy of human immunoglobulin in the adjuvant treatment of neonatal pneumonia.

2. Data and methods

2.1. Clinical data

A total of 116 children with neonatal pneumonia who visited our hospital were selected from March 2022 to March 2024.

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Inclusion and exclusion criteria:Inclusion criteria(1) Meet the diagnostic criteria for pneumonia in this document[7]:(2) The child is ≤28 days old;(3) The family member signs the informed consent form;(4) Not allergic to this drug.Exclusion criteria Any of the following cases in the study was excluded:(1) concurrent autoimmune diseases;(2) Concurrent other respiratory diseases;(3) Concurrent infections in other sites;(4) Concurrent congenital diseases.116 children with neonatal pneumonia were randomly divided into a control group and an observation group, with 58 cases in each group. There was no significant difference in basic data between the two groups (P>0.05), as shown in Table 1.

Table 1 Comparison of two sets of basic data

Group	Gender		Age (days)	Mode of Delivery		Fetal conditions	
	Men	Women		Guided delivery	Cesarean section	Premature infants	Term birth
Observation group(n=58)	30	28	17.25±2.51	27	31	12	46
Control group(n=58)	29	29	17.18±2.53	30	28	15	43
t/χ^2	0.034		0.150	0.310		0.434	
P	0.8530		0.881	0.577		0.510	

2.2. Treatment methods

All children received routine symptomatic treatments such as oxygen therapy, phlegm reduction, asthma alleviation, and fever reduction, and were given treatments such as correction of acid-base balance and fluid supplementation. The observation group received intravenous drip of human immunoglobulin (Shanghai Blood Products Co., Ltd., national medicine zhunzi S10970081) 50ml +50ml 5% glucose injection (Beijing Ruiye Pharmaceutical Co., Ltd., national medicine zhunzi H20193156) once a day on top of routine treatment. Child treatment time: 1 week.

2.3. Observation indicators

Comparison of treatment efficacy, recovery (X-ray showed that lung lesions were completely absorbed, symptoms completely disappeared, and body temperature was normal), significantly effective (X-ray showed that 70% or more of lung lesions were absorbed, symptoms basically disappeared, and body temperature was normal), improvement (X-ray showed that 30%-70% of lung lesions were absorbed, symptoms improved, and body temperature was normal), ineffective (disease worsened or did not meet the above criteria)[8], total effective rate =100%-ineffective rate;

Comparison of inflammatory factor levels: Collect 5ml venous blood from children in the morning fasting, and collect serum. Serum levels of procalcitonin (PCT), C-reactive protein (CRP), and blood lactic acid (LAC) were detected by enzyme-linked immunoassay;

Comparison of immune functions: Blood collection and processing methods were the same as above, and the levels of immunoglobulin M (IgM), immunoglobulin A (IgA), and immunoglobulin G (IgG) were detected by immunosorbent method.

Compare the incidence of adverse reactions between the two groups

2.4. Statistical analysis

The above data were analyzed by SPSS27.0.If the measurement data conforms to the normal distribution, it is expressed as ($\overline{x} \pm s$),and independent sample t test. If the normal distribution is not met, independent sample t test will be performed after the data is transformed into normal distribution. Paired sample t test will be used for intra-group comparisons; counting data will be expressed in number (%), and χ2 test will be performed. P<0.05 means significant difference.

3. Results

3.1. Comparison of treatment efficacy

The total effective rate in the observation group was higher than that in the control group (P<0.05), as shown in Table 2.

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Table 2 Comparison of treatment efficacy [n (%)]

Group	Recovered	Markedly effective	Improved	Invalid	Total effective rate
Observation group(n=58)	10(17.24)	30(51.72)	13(22.41)	5(8.63)	53(91.37)
Control group(n=58)	8(13.79)	28(48.28)	9(15.52)	13(22.41)	45(77.59)
χ^2					4.209
P					0.040

3.2. Comparison of inflammatory factor levels between the two groups before and after treatment

Comparison of inflammatory factors after treatment: The observation group was lower than that in the control group (P<0.05), as shown in Table 3.

Table 3 Comparison of inflammatory factor levels between the two groups before and after treatment ($\overline{x} \pm s$)

Group	CRP(mg/L)		PCT(μg/L)		LAC(mmol/L)	
	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment
Observation group(n=58)	27.53±5.51	10.14±2.21*	1.47±0.51	0.53±0.17*	9.13±2.24	3.15±0.67*
Control group(n=58)	27.51±5.32	12.38±2.23*	1.46±0.35	0.67±0.15*	9.15±2.23	4.27±0.68*
t	0.020	5.434	0.123	4.703	0.048	8.935
P	0.984	<0.001	0.902	<0.001	0.962	<0.001

Note: Compared with all groups before treatment, *P < 0.05

3.3. Comparison of immune function between the two groups before and after treatment

Comparison of the level of immune function indicators after treatment: The observation group was higher than that of the control group (P<0.05), as shown in Table 4

Table 4 Comparison of immune function ($\overline{x} \pm s$, mg/L)

Group	IgM		IgG		IgA	
	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment
Observation group(n=58)	1.12±0.18	1.74±0.24*	6.24±0.75	8.76±1.12*	0.86±0.17	1.34±0.24*
Control group(n=58)	1.13±0.15	1.54±0.35*	6.23±0.74	7.78±1.13*	0.87±0.18	1.24±0.23*
χ^2	0.325	3.589	0.072	4.691	0.308	2.291
P	0.746	0.001	0.943	<0.001	0.759	0.024

Note: Compared with all groups before treatment, *P < 0.05

3.4. Comparison of adverse reactions

There was no significant difference in the total incidence of adverse reactions between the two groups (P>0.05), as shown in Table 5.

Table 5 Comparison of adverse reactions between the two groups [n (%)]

Group	Abnormal liver function	Diarrhea	Nausea and vomiting	Rash	Overall incidence
Observation group(n=58)	0	1(1.72)	1(1.72)	1(1.72)	3(5.16)
Control group(n=58)	0	1(1.72)	0	0	1(1.72)
χ^2					0.259
P					0.611

4. Discussion

Neonatal pneumonia is the most common serious respiratory disease in the neonatal period. It has high mortality and morbidity. It is characterized by diffuse lung lesions and atypical clinical manifestations, and requires early diagnosis and treatment[9].Most neonatal pneumonia is caused by infections after birth and develops later[10].Neonatal pneumonia can cause symptoms such as dyspnea,

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respiratory distress, and pulmonary rales, and can also affect the heart function of the child. In addition, due to the obstruction of the respiratory system, oxygen supply to the brain may be insufficient, leading to hypoxic encephalopathy, and may also cause other complications, such as sepsis, toxic enteroparalysis, etc[11].Neonatal pneumonia is routinely treated with antibiotics, oxygen therapy, etc., but antibiotics can destroy the balance of intestinal flora and are prone to gastrointestinal complications. Human immunoglobulin can enhance one's own immunity and can also enhance patients 'anti-infection ability[12].

In this study, compared with the control group, the total effective rate in the observation group was higher, suggesting that the adjuvant treatment of neonatal pneumonia with human immunoglobulin can improve the therapeutic efficacy of children.Analyzing the reasons, human immunoglobulin is a therapeutic drug isolated from the plasma of healthy people. It contains IgA and IgM molecules. It can regulate pathogen antigens, regulate activating receptors on the surface of immune cells, and allow pro-inflammatory cytokines to block complement activation，improve immune function,it enters the body through veins and can effectively fight bacteria and viruses, and has a good treatment effect.In this study, after treatment, the level of inflammatory factors in the observation group was lower than that in the control group, suggesting that adjuvant treatment with human immunoglobulin can reduce the level of inflammatory factors in children. Analyzing the reasons, human immunoglobulin has the effects of anti-infection and regulating inflammatory reactions,Immunoglobulins are produced by plasma cells and B lymphocytes.They can recognize and neutralize pathogenic microorganisms and their toxins to prevent the spread of infection. In addition, they can also regulate the immune response and reduce excessive inflammatory reactions. By activating the complement system and promoting the phagocytic function of phagocytes, further enhance the body's defense ability, improve the patient's clinical symptoms, and the ability to regulate the inflammatory response reduces the level of inflammatory factors in children and reduces inflammatory damage caused by pneumonia.In this study, after treatment, compared with the control group, the level of immune function indicators in the observation group was higher, suggesting that adjuvant treatment with human immunoglobulin can improve the immune function of children.Analysis of the reasons shows that human immunoglobulin has the effect of enhancing autoimmune immunity and contains a large number of antibodies. These antibodies can fight against viruses and bacteria in the body to achieve temporary immune protection. They also play an immune equivalent role on viral antigens.,enhance the patient's anti-infection ability.There was no significant difference in the total incidence of adverse reactions between the two groups, suggesting that adjuvant treatment with human immunoglobulin is safer.The following precautions should be taken with human immunoglobulin: After injecting immunoglobulin, strenuous activities should be avoided to avoid causing physical discomfort and reduce the body's stress response to the drug. The mother of the child should eat a light diet, not smoke, or drink alcohol. In addition, follow the doctor's advice and inject in divided doses, pay attention to the puncture site regularly, and avoid rubbing the puncture site to avoid causing redness, swelling, pain, etc.In addition, the most important thing is to pay close attention to the allergic reactions of newborns and observe whether the newborns develop symptoms such as rash, difficulty breathing, and shortness of breath. Once this occurs, the infusion should be stopped immediately.

In summary, the adjuvant treatment of neonatal pneumonia with human immunoglobulin can reduce the level of inflammatory factors, improve immune function and treatment efficacy, and is safe and worthy of clinical application.

References

[1] Bondarev D J, Ryan R M, Mukherjee D. The spectrum of pneumonia among intubated neonates in the neonatal intensive care unit[J]. J Perinatol, 2024, 44(9): 1235-1243.

[2] Nair N S, Lewis L E, Dhyani V S, et al. Factors Associated With Neonatal Pneumonia and its Mortality in India: A Systematic Review and Meta-Analysis[J]. Indian Pediatr, 2021, 58(11): 1059-1061.

[3] Ozdemir F E, Alan S, Aliefendioglu D. The diagnostic value of pulmonary near-infrared spectroscopy in the early distinction of neonatal pneumonia from transient tachypnea of the newborn[J]. Pediatr Pulmonol, 2023, 58(11): 3271-3278.

[4] Abd Almonaem E R, Rashad M M, Emam H M, et al. Tracheal aspirate presepsin: a promising biomarker in early onset neonatal pneumonia[J]. Scand J Clin Lab Invest, 2021 ,81(5): 406-412.

[5] Sun Q, Gao Y, Qiao L, et al. 25(OH)-Vitamin D alleviates neonatal infectious pneumonia via regulating TGFβ-mediated nuclear translocation mechanism of YAP/TAZ[J]. Bioengineered, 2021,

ISSN 2618-1584 Vol. 7, Issue 1: 65-69, DOI: 10.25236/FMSR.2025.070110

12(1): 8931-8942.
[6] Lekhraj R, Lalezari S, Aguilan JT, et al. Altered abundances of human immunoglobulin M and immunoglobulin G subclasses in Alzheimer's disease frontal cortex[J]. Sci Rep, 2022, 12(1): 6934.
[7] Shao X M, Ye H M, Qiu X S. Practical Neonatology[M]. 5th Edition. Beijing: People's Medical Publishing House, 2019: 367-368 .
[8] Respiratory Studies Group, Branch of Pediatrics,"Chinese Journal of Practical Pediatrics" Expert Consensus on the Diagnosis and Treatment of Mycoplasma pneumoniae Pneumonia in Children (2015 Edition)[J]. Chinese Journal of Practical Pediatrics Clinical, 2015, 30(17): 1304-1308.
[9] Zhou B, Wen X, Zhou J, et al. Assessing Diagnostic Significance of White Blood Cell Count, Serum C-Reactive Protein, and Procalcitonin in Neonatal Pneumonia: A Comparative Analysis[J]. Altern Ther Health Med, 2024, 30(12): 506-510.
[10] Alanezi G, Almulhem A, Aldriwesh M, et al. A triple antimicrobial regimen for multidrug-resistant Klebsiella pneumonia in a neonatal intensive care unit outbreak: A case series[J]. J Infect Public Health, 2022, 15(1): 138-141.
[11] El S M, Elmahdy H, Nassar M, et al. Role of soluble triggering receptors expressed on myeloid cells-1 and 25-hydroxy vitamin D as early diagnostic markers of neonatal Ventilator-associated pneumonia: A prospective cohort study[J]. Pediatr Pulmonol, 2022, 57(9): 2147-2153.
[12] Kriván G, Borte M, Soler-Palacin P, et al. BT595, a 10% Human Normal Immunoglobulin, for Replacement Therapy of Primary Immunodeficiency Disease: Results of a Subcohort Analysis in Children[J]. J Clin Immunol, 2023, 43(3): 557-567.