

Home-Nebulized Inhaled Glucocorticoid Therapy in Pediatric Respiratory Diseases

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Abstract: *Objective:* To evaluate the therapeutic effect of home-nebulized inhaled glucocorticoid therapy in pediatric respiratory diseases. *Methods:* 60 cases of children with respiratory diseases admitted between October 2022 and October 2023 were selected as study subjects and randomly divided into the control group and the observation group, 30 cases each. The control group was provided with conventional treatment only, while the observation group was provided with home-nebulized inhalation glucocorticosteroid treatment, and the treatment effects, clinical symptom relief time, disease recurrence rate, and treatment satisfaction of the children's families were recorded and compared between the two groups. *Results:* A comparison of the two groups in terms of gender and age showed that the differences were not statistically significant ($P > 0.05$). In terms of clinical efficacy, the total effective rate of the observation group was 90.00%, which was significantly higher than that of the control group of 66.67% ($P < 0.05$). Compared with the control group, the disappearance time of the clinical symptoms of the observed group was significantly shortened ($P < 0.05$). In addition, the satisfaction scores of the families of the children in the observation group were significantly higher than those of the control group ($P < 0.05$). *Conclusion:* Home-nebulized inhalation glucocorticoid therapy shows significant clinical efficacy in pediatric respiratory diseases, significantly reduces the time of disappearance of clinical symptoms, and improves the satisfaction of patients' families, which provides an effective treatment option for children.

Keywords: Home-nebulized inhalation; Glucocorticoids; Pediatric respiratory diseases

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1. Introduction

Pediatric respiratory diseases are one of the most common pediatric outpatient diseases, accounting for about 60% of pediatric outpatient diseases, and their high prevalence is closely related to a variety of factors, including children's exposure to smoke and dust, malnutrition or irrationality, low immune function, and weaker physical condition ^[1]. The onset of respiratory diseases is closely related to their physiological characteristics. Children's resistance is relatively weak, and the development of the immune system and vegetative nervous system is not yet fully mature,

so they are more susceptible to the influence of the external environment, resulting in immune dysfunction and metabolic disorders, which can lead to the occurrence of respiratory diseases^[2-4]. As a commonly used clinical treatment method, the quantitative aerosol method has certain limitations in the treatment of pediatric respiratory diseases, and may not be able to fully meet the therapeutic needs of children^[5,6]. To promote the early recovery of children, the selection of appropriate treatment options is crucial and plays an important role in accelerating the recovery of children^[7]. In the treatment of pediatric respiratory diseases, home-nebulized inhaled glucocorticosteroids are a commonly used treatment modality. Glucocorticoids can act directly on the respiratory mucosa through nebulized inhalation, thereby relieving the inflammatory response and reducing symptoms. This treatment is widely used in children with asthma, bronchitis, pneumonia, and other respiratory diseases, with significant efficacy and fewer side effects. This paper aims to explore the application of home-nebulized inhaled glucocorticoid therapy in pediatric respiratory diseases and to analyze its efficacy and safety. Through a systematic review of relevant literature and clinical cases, this study investigates the advantages, limitations, and future development direction of this treatment method, thereby providing clinicians with more accurate treatment recommendations and offering a more scientific and effective method for the treatment of respiratory diseases in children.

2. Materials and methods

2.1. General information

Sixty cases of children with respiratory diseases admitted between October 2022 and October 2023 were selected for the study. Inclusion criteria: (1) Patients between 6 months and 8 years old; (2) Confirmed diagnosis of respiratory diseases such as asthma, bronchitis, and respiratory tract infections; (3) Receiving home-nebulized inhaled glucocorticoid therapy; (4) Complete information including medical history, assessment of clinical symptoms, pulmonary function tests and other relevant information. Exclusion criteria: (1) Comorbidity with other serious diseases such as severe cardiac disease, renal disease, immune system disease, and other comorbidities. (2) Patients who are also receiving pharmacological interventions for other respiratory diseases or other alternative therapies; (3) Patients who cannot provide complete clinical information.

2.2. Methods

2.2.1. Control group treatment plan

Children in the control group were treated with quantitative aerosol inhalation glucocorticosteroid therapy budesonide (National Drug Code H20140475, specification model: 1 mL: 2 mL × 5 sticks) suspension. The dosage will be 0.5–1.0 mg each time, 1–2 times per day. Besides, the control group will be given short-acting M-receptor antagonist and β 2-agonist treatment at the same time.

2.2.2. Observation group treatment plan

Children in the observation group will receive home-nebulized inhaled glucocorticoid treatment. The family members of the children will be informed in detail about the nebulized inhalation treatment and the precautions to be taken to ensure the correct use of the treatment. The treatment plan includes nebulized inhalation treatment with budesonide suspension (0.5–1.0 mg/dose, 2 times/day) for 3 months. In addition, children in the observation group will be added ipratropium bromide (Boehringer Ingelheim, Germany, Approval No.: H20130499, Specification No.: 10 mL/bottle) for inhalation. For each inhalation, 250 μ g of ipratropium bromide will be taken and added to 3 mL of saline for inhalation.

2.3. Observation indexes

2.3.1. Clinical efficacy

Clinical efficacy assesses the overall improvement of clinical symptoms of the children, which can be classified according to the following grades:

- (1) Apparent effect: The child's symptoms completely disappeared and did not recur.
- (2) Effective: The child's symptoms are significantly reduced and the quality of life is greatly improved.
- (3) Ineffective: The child's symptoms have not improved or continue to deteriorate.

2.3.2. Time of disappearance of children's clinical symptoms

- (1) Dyspnoea disappearance time: The disappearance time of dyspnoea symptoms after treatment, including frequency, severity, and duration.
- (2) Disappearance time of wheezing: The disappearance time of wheezing symptoms after treatment, and the treatment effect is evaluated by recording the frequency, severity, and duration of wheezing.
- (3) Cough disappearance time: The disappearance time of cough symptoms after treatment, the treatment effect is evaluated by recording the frequency, severity, and duration of cough.

2.3.3. Treatment satisfaction of children's families

The satisfaction and feedback of the children's families on the treatment plan were collected using our self-developed satisfaction questionnaire, which was used to assess the acceptance of the treatment plan, the trust of the patient's families, and the treatment effect. The total score range was 10 points, with higher scores indicating higher family satisfaction with the treatment outcome.

2.4. Statistical analysis

The data were statistically analyzed using SPSS 23.0 software. The data were expressed as either mean \pm standard deviation (SD) or [n (%)], and the comparison of the two groups was performed using the two-sample mean t or chi-squared test. The difference was statistically significant at $P < 0.05$.

3. Results

3.1. Comparison of general information of children in two groups

As shown in **Table 1**, there is no statistically significant difference in the gender and age of children in the two groups ($P > 0.05$).

Table 1. Comparison of general information on children with respiratory diseases in two groups

Group	n	Gender (n)		Age (mean \pm SD; years)
		Male	Female	
Control group	30	17	13	4.47 \pm 1.57
Observation group	30	15	15	4.33 \pm 1.20
χ^2 / t -value			0.268	0.388
P -value			0.605	0.699

3.2. Comparison of the clinical efficacy of children in the two groups

As shown in **Table 2**, the total effective rate of the observation group (27/30, 90.00%) was significantly higher

than that of the control group (20/30, 66.67%), and the difference was statistically significant ($P = 0.028$).

Table 2. Comparison of clinical efficacy of children with aspiration system diseases in the two groups [n (%)]

Group	n	Apparent effect	Effective	Ineffective	Overall effective rate
Control group	30	12 (40.00%)	8 (26.67%)	10 (23.33%)	20 (66.67%)
Observation group	30	20 (66.67%)	7 (23.33%)	3 (10.00%)	27 (90.00%)
χ^2 -value	-	-	-	-	4.812
P -value	-	-	-	-	0.028

3.3. Comparison of the disappearance time of clinical symptoms between the two groups of children

As shown in **Table 3**, compared with the control group, the disappearance time of clinical symptoms (including dyspnoea, wheezing, and coughing) of the children in the observation group was shortened, and the differences showed significant correlations ($P < 0.05$).

Table 3 Comparison of the disappearance time of clinical symptoms of children with respiratory diseases in the two groups (mean \pm SD; days)

Group	n	Dyspnoea disappearance time	Wheezing disappearance time	Cough disappearance time
Control group	30	3.47 \pm 1.23	4.62 \pm 1.42	6.20 \pm 1.09
Observation group	30	1.96 \pm 0.89	3.55 \pm 1.21	4.67 \pm 1.13
t -value	-	5.448	3.141	5.338
P -value	-	0.000	0.003	0.000

3.4. Comparison of treatment satisfaction of the families of children in the two groups

As shown in **Table 4**, compared with the control group, the satisfaction scores of the families of children with respiratory diseases in the observation group were significantly higher, and the difference was statistically significant ($P = 0.002$).

Table 4. Comparison of satisfaction scores of families of children with respiratory diseases in the two groups (mean \pm SD)

Group	number of examples	Child's family satisfaction score
Control group	30	7.64 \pm 0.76
Observation group	30	8.21 \pm 0.82
t -value		3.282
P -value		0.002

4. Discussion

Compared with adults, children have a higher incidence of respiratory diseases, which is due to the fact that their body functions are relatively weak, their immune system is not yet fully mature, and they are susceptible to external environmental influences and become ill, in addition, the recurrence rate of respiratory diseases in children is also higher, which poses a certain challenge for treatment and management ^[8,9]. Home-nebulized inhaled glucocorticoid therapy in pediatric respiratory diseases is an effective treatment. Glucocorticoid

nebulized inhalation therapy is generally referred to as nebulized inhalation therapy, which is usually used for the treatment of bronchial asthma, acute pharyngitis, and other diseases. Nebulized inhalation therapy involves placing the medication in a nebulizer, and as the medication is inhaled, the gas passes through the nebulized inhalation device, which distributes the medication locally in the airways and lungs. This method can act directly on the respiratory tract and improve the symptoms of the respiratory tract. For pediatric patients, especially children with asthma, home-nebulized inhalation therapy is an important treatment that can effectively reduce airway inflammation and airway hyperresponsiveness, control asthma symptoms, improve the quality of life, improve lung function, reduce asthma attacks, and reduce asthma mortality. At the same time, nebulized inhaled glucocorticosteroids can also be combined with inhalation of other drugs with synergistic effects, such as beta-agonists and ipratropium bromide, to further improve the therapeutic effect. When home-nebulized inhaled glucocorticosteroids are used to treat children's respiratory diseases, in addition to paying attention to the use of the drugs, appropriate nursing interventions are also needed to ensure the effectiveness of the treatment and the safety of the children, and the following measures need to be paid attention to: (1) opening windows regularly for ventilation and disinfection: keep the indoor air fresh to reduce the spread of bacteria and viruses, which can help to reduce the risk of re-infection or cross-infection of the children; (2) control of Food intake: before nebulisation treatment, do not overfeed the children, so as not to cause discomfort or affect the therapeutic effect in the process of nebulisation; (3) clearing the mouth and nose of foreign objects: clear the children's mouths and noses of foreign objects promptly, to ensure that the respiratory tract is clear, so that the nebulized inhalation of glucocorticosteroids can reach the respiratory tract lesions smoothly to play its therapeutic role^[10]. These nursing interventions can help improve the effectiveness of treatment, reduce the occurrence of adverse reactions, and protect the safety and health of children. At the same time, parents should also closely observe the child's response when carrying out the treatment, and promptly consult a doctor if there is any abnormality.

This study suggests that home-nebulized inhalation glucocorticoid treatment in pediatric respiratory diseases shows significant clinical effects, shortens the time for clinical symptoms to disappear, and improves the satisfaction of patients' families. The reasons for this can be seen: (1) direct drug delivery: nebulized inhalation can deliver the drug directly to the lesions in the respiratory tract, increasing the concentration of the drug in the local area and thus enhancing the therapeutic effect. (2) Convenience and flexibility: home treatment allows patients to be treated at home, avoiding frequent visits to the doctor and hospitalization, and improving the convenience and flexibility of treatment. (3) Enhancement of patients' treatment compliance: As the treatment process is more convenient, patients and their families may be more likely to accept the treatment, thus enhancing treatment compliance and facilitating disease control and management. (4) Enhancement of family members' satisfaction: the home treatment approach not only improves the patient's condition but also reduces the burden on the family and enhances the family's satisfaction with the treatment outcome, making them more supportive and cooperative with the treatment process.

In summary, the application of home-nebulized inhalation glucocorticoid therapy in pediatric respiratory diseases does have significant advantages and effects. Through nebulized inhalation, the drug can be delivered directly to the respiratory tract lesions, increasing the local concentration of the drug and reducing the occurrence of systemic side effects. At the same time, home treatment is convenient and flexible, which can reduce the number of children's visits to hospitals, reduce the consumption of medical resources, and also have a positive effect on improving children's adherence to treatment and the family's quality of life. Therefore, home-nebulized inhalation glucocorticoid therapy is widely used in pediatric respiratory diseases and has achieved good clinical results.

Disclosure statement

The authors declare no conflict of interest.

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