ORIGINAL RESEARCH ARTICLE

Teach back educational model combined with zinc supplementation improves clinical symptoms and immunity in children with asthma

DOI: 10.29063/ajrh2025/v29i5s.6

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Abstract

This study assessed the impact of teach back educational model plus zinc supplementation on asthma children. Eighty-one asthma children hospitalized in Children's Hospital of Soochow University, Suzhou, China from September 2020 to October 2021 were selected, and randomly allocated to a control group and an observation group. The control group took routine treatment, and routine educational modalities. By contrast, the Teach back mode of health education and zinc supplementation were added to the observation group. The results showed significant improvement in time to clinical symptom relief and immunological levels in both groups. However, asthma knowledge score, medication adherence, and asthma symptom control were significantly higher in observation group one month following discharge than in control group. We conclude that teach-back health education improved caregivers' asthma knowledge, children's medication compliance, and asthma symptom control scores in the short term. *(Afr J Reprod Health 2025; 29 [5s]: 43-50).*

Keywords: Teach back, short video, health education, nursing, zinc supplementation, clinical symptoms; immunity

Résumé

Cette étude a évalué l'impact du modèle éducatif de rétroaction et de la supplémentation en zinc sur les enfants asthmatiques. Quatre-vingt-un enfants asthmatiques hospitalisés à l'hôpital pour enfants de l'université de Soochow, à Suzhou, en Chine, de septembre 2020 à octobre 2021, ont été sélectionnés et répartis aléatoirement en un groupe témoin et un groupe d'observation. Le groupe témoin a suivi un traitement et des modalités éducatives de routine. En revanche, le modèle de rétroaction, composé d'éducation sanitaire et de supplémentation en zinc, a été ajouté au groupe d'observation. Les résultats ont montré une amélioration significative du délai de soulagement des symptômes cliniques et des niveaux immunologiques dans les deux groupes. Cependant, le score de connaissances sur l'asthme, l'observance du traitement et le contrôle des symptômes étaient significativement plus élevés dans le groupe d'observation un mois après la sortie que dans le groupe témoin. Nous concluons que la rétroaction en matière d'éducation sanitaire a amélioré les connaissances sur l'asthme des soignants, l'observance du traitement par les enfants et les scores de contrôle des symptômes à court terme. *(Afr J Reprod Health 2025; 29 [5s]: 43-50).*

Mots-clés: Rétroaction, courte vidéo, éducation sanitaire, soins infirmiers, supplémentation en zinc, symptômes cliniques ; immunité

Introduction

Bronchial asthma is one of the most frequent chronic respiratory disorders in children. A meta-analysis has shown that the occurrence rate of asthma in children aged 14 and below in China is 3.3%.[1] As children have low self-management awareness and behavioral ability, parents, as their supporters and decision-making agents, have critical functions in children's rehabilitation.[2] In the knowledge and practice survey of parents of asthmatic children in China, only 18.31% of parents answer more than 60% of the asthma-related questions correctly.[3] Due to parents' insufficient awareness and attention to asthma, there is a large gap between the actual management and the expectation.[4] Previous studies are mostly oral expression along with distribution of health education manuals, and the health education remains spontaneous and fragmented, with no scientific basis for the frequency and timing of education.[5,6] It is easy to do twice the work with half the effort and repeat work, and the actual effect of health education cannot be considered. Hence, it is particularly crucial to explore a suitable health education model for asthma children and explore the key nodes of their education.

The teach back model is recommended by the General Administration of Quality of the United States as a type of the "34 health education modes." After knowledge transmission, the medical staff will ask the educated to repeat and correct the wrong information in time, so as to expand the effect of health education.[7] However, this model is rarely applied in the asthmatic population.

Zinc, an essential trace element, has a vital function as anti-inflammatory and antioxidant. Recent studies have investigated zinc's role in the treatment efficacy of asthma. The biological manifestation of zinc is that zinc deficiency leads to asthma attacks. Firstly, zinc deficiency is associated with inflammation in the body and T-helper (Th)1/Th2 imbalance leads to an increase in eosinophilia, which further attenuates gene expression of zinc transporter proteins.[8,9] Secondly, zinc deficiency is linked to immunoglobulin E (IgE) production, which is a marker of the body's ability to produce an allergic response, thus increasing the risk of asthma.[10,11] In addition, zinc deficiency results in an imbalance between oxidation and antioxidation in the lungs, which is an important mechanism in chronic obstructive pulmonary disease (COPD) development.[11] Clinical data have shown that zinc is significantly linked to the development of asthma in children, and zinc is considered to be an important marker of asthma susceptibility.[12] However, whether zinc supplementation can improve clinical symptoms and immunity in children with asthma remains unclear.

Based on this, the objective of this study is to investigate the effectiveness of applying the teach-back model to the health education of children with asthma, while giving zinc supplementation in clinical treatment in children with asthma. Teach back educational model combined with zinc supplementation improves clinical symptoms and immunity in children with asthma.

Methods

Ninety asthma children who were hospitalized in the Respiratory Department of Children's Hospital Affiliated to Soochow University from September 2020 to October 2021 were enrolled in the study. The inclusion criteria were: (1) Children diagnosed with asthma in accordance with the 2016 edition of the Guidelines for the Diagnosis and Prevention of Bronchial Asthma in Children;[13] (2) The course of disease more than 1 year; (3) ≥1 asthma attack per year; (4) Children treated with inhaled glucocorticoids; (5) Parents had smart phones, opened and used wechat function. The exclusion criteria were: (1) Children with serious heart, liver, kidney as well as other diseases; (2) Children with severe asthma and worsening asthma; (3) Loss to follow-up; (4) Unwilling to receive health education more than once.

In this study, 9 lost subjects were excluded and 81 samples were included. Thereafter, the participants were randomly divided into control group (CG, 40 cases) and observation group (OG, 41 cases) using random number table method. No significant difference was observed in the general data of the children and their caregivers between both groups ($P>0.05$), which was comparable, as displayed in Table 1.

Education content

The two groups were given the same content of health education. The systematic children's asthma health education content, published in another paper[14] designed by the research group, which included three stages of children's asthma education videos, each of which lasted 10-15 minutes.

Intervention methods

The CG was given conventional treatment and conventional educational strategies:
(1) Conventional treatment included inhalation of glucocorticoids and anti-infective therapy.
(2) Conventional educational strategies: The nurses organized the caregivers to watch the recorded educational videos on the first day of hospitalization, the third day, and the first day before discharge. At the same time, the nurse issued health education manuals, guided the caregivers to scan the wechat public account of the respiratory department and join the wechat group of family members. Additionally, caregivers were told to take children to follow-up at 1 month and 6 months after discharge.
The OG was supplemented with the health education of Teach back model and zinc supplementation:

Table 1: Baseline conditions of both groups of children and their caregivers (case, x±s)

Items		**Control group (n＝40)**	**Observation group (n＝41)**	**χ^2/t**	***P***
Age		5.58±2.98	5.60±2.77	0.42	0.93
Gender	Male	25	28	0.51	0.48
	Female	15	13		
Place of residence	City	28	27	2.36	0.13
	Country	12	14		
Payment information	Self-paying	4	5	0.01	0.89
	Medical insurance	36	36		
Marital status	Married	38	39	0.66	0.42
	Divergence	2	2		
Only child	Yes	29	32	0.51	0.48
	No	11	9		
Allergic rhinitis	Yes	10	13	1.61	0.21
	No	30	28		
Caregiver and child relationship	Father	4	4	0.57	0.64
	Mother	34	36		
	Grandparents/rent parents	2	1		
Caregiver education level	Primary or below	2	1	0.50	0.51
	Junior high school	4	4		
	Senior high school	10	9		
	Junior college	12	15		
	Bachelor degree or above	12	12		
Per capita income (Yuan)	<3000	2	3	0.30	0.60
	3000-5000	6	6		
	5000-10000	19	21		
	>10000	13	11		

(1) The Teach back education group was built, containing two asthma specialist attending physicians, one pulmonary function technician, and five respiratory nurses. The nurses organized knowledge points related to learning videos and simulated the Teach back mode with each other.
(2) Education, assessment and feedback. At the end of each video, a similar technique was used: “To make sure I said the *** clearly, can you tell me the ***?” The nurse evaluated the answers repeated by the caregivers, pointed out the mistakes or inaccuracies in their answers, and retaught and evaluated the mastery level until they were completely mastered. The follow-up was conducted as planned, with the same content and frequency as the control group.
(3) Zinc supplementation was initiated when the child was admitted to hospital at 0.5 to 1.0 mg/kg/day twice daily. Zinc supplementation was not stopped until the child was discharged from hospital.

Observed indices

The following indices were compared: (1) Asthma knowledge questionnaire,[15] Cronbach’s α was 0.715 and content validity was 0.832. There are 4 dimensions, 25 entries, each of which was assigned 4 points for a total of 0-100 points. (2) The questionnaire of Morisky’s medication compliance:[16] Cronbach’s α coefficient was 0.61. A score of <6 was poor compliance, a score of 6-8 was moderate compliance, and a score of 8 was good compliance. (3) Asthma symptom control questionnaire: TRACK questionnaire, used for under 5 years old, with a score of 0-100, ≥80 was control, <80 was not control. C-ACT, for ages 4-11, ≤19 indicated inadequate control, 20-22 indicated partial control, and ≥23 indicated complete control. ACT was used for the age of 12 and older, a score of < 20 indicated poor control, 20-24 indicated effective control, and 25 indicated complete control. Control rate = (partial control + complete control)/Number of cases in each group ×100%. (4) Changes in serum immunological indices were observed on admission and before discharge. The main immunological observations were IgA, IgM and IgG. (5) Comparison of clinical observables including duration of asthma attacks, duration of antibiotic administration and duration of hospitalization.

Statistical analysis

Data analysis was implemented using SPSS 22.0. The basic data of children and caregivers, scores of various scales and other measurement data were exhibited in the statistical description of x±s. For the comparison between groups that did not meet the normality test, the rank sum test in the non-parametric test was adopted, and for the comparison between groups that met the normality distribution, the two sets of independent sample T-test was used. The usage rate or component ratio (%) of the count data was expressed, and the comparison of data between groups was implemented using the $\chi 2$ test. For all statistical data, $P<0.05$ represented the difference was significant and comparable.

Ethical clearance

This study was consistent with the ethical standards of the 1964 Declaration of Helsinki and its later amendments, and was approved by the Ethics Committee of Children's Hospital of Soochow University.

Results

Baseline information

The basic information of 2 groups was comparable ($P>0.05$, Table 1).

Comparison of clinical indicators

As shown in Table 2, the duration of asthma attacks in OG children was less than CG ($P<0.05$). Antibiotic dosage and hospital stay in OG group showed a decreasing trend, but no difference was exhibited between OG group and CG group ($P>0.05$).

Table 2: Clinical observation indicators in both groups (x±s, d)

Groups	Duration of asthma attacks	Duration of antibiotic administration	Duration of hospitalisation
Control group	0.83±0.26	6.67±1.88	7.97±1.56
Observation group	0.71±0.24	6.12±1.63	7.61±1.68
t	2.519	1.408	0.999
P	0.034	0.163	0.321

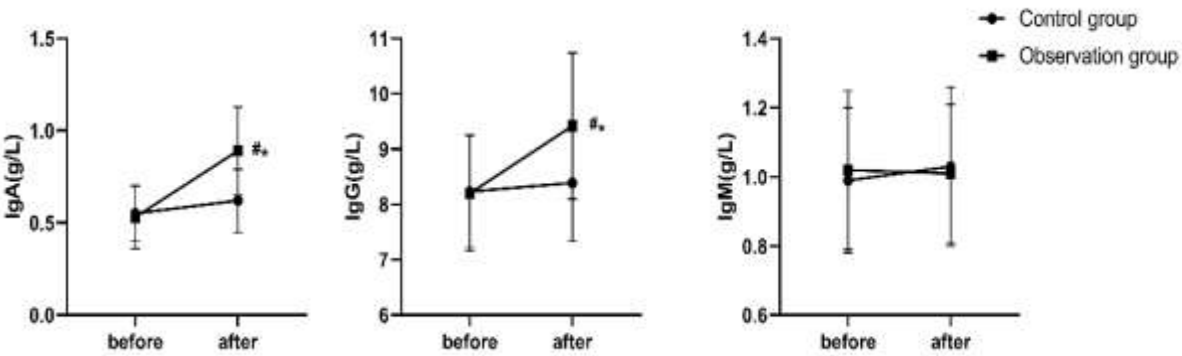

Figure 1: Indicators of immunological function before and after intervention (g/L). #P<0.05, compared with before intervention, *P<0.05, compared with the CG

Table 3: Asthma knowledge scores of both groups of caregivers (x±s, points)

Groups	Before intervention	Day of discharge	Discharged from hospital for 1 month	Discharged from hospital for 6 months
Control group	61.5±23.58	76.97±15.00	76.77±14.69	78.67±16.18
Observation group	59.62±20.69	79.75±10.48	89.95±7.03	82.44±8.02
t	0.808	0.665	2.679	0.888
P	0.381	0.509	0.010	0.381

Table 4: Medication compliance scores in both groups (x±s, points)

Groups	Before intervention	Discharged from hospital for 1 month	Discharged from hospital for 6 months
Control group	5.29±0.75	7.28±0.88	6.74±0.45
Observation group	5.21±9.88	7.81±0.40	6.33±1.91
t	0.459	2.847	0.896
P	0.729	0.007	0.377

Table 5: Comparison of asthma symptom control rates between the two groups (n, %)

	Before intervention				Discharged from hospital for 1 month				Discharged from hospital for 6 months			
	Out of control	Partial control	Full control	Control rate	Out of control	Partial control	Full control	Control rate	Out of control	Partial control	Full control	Control rate
Control group	13 (32.5)	14 (35)	13 (32.5)	27 (67.5)	13 (32.5)	17 (42.5)	10 (25)	27 (67.5)	5 (12.5)	13 (32.5)	22 (55)	35 (87.5)
Observation group	18 (43.9)	10 (24.4)	13 (31.7)	22 (53.7)	6 (14.6)	13 (31.7)	22(53.7)	35 (85.4)	5 (12.2)	14 (34.1)	22 (53.7)	36 (87.8)
χ^2	1.317				7.089				1.409			
P	0.251				0.008				0.432			

Table 6: Number of acute attacks and hospitalization between 2 groups at 6 months after discharge (times, x±s)

Groups	Acute attacks	Hospitalization frequency
Control group	0.94±2.95	0.11±0.32
Observation group	0.53±0.55	0.12±0.33
Z	1.045	0.116
P	0.296	0.907

Indicators of immune function

As exhibited in Figure 1, no difference was exhibited in the immune function indicators in the serum of two groups prior to the intervention (P>0.05). Followed the administration of zinc supplementation, IgG and IgA levels in the OG were higher relative to the CG (P<0.05).

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Asthma knowledge scores

Before intervention, the baseline was comparable (P>0.05). After intervention, the asthma knowledge score of the OG was higher relative to the CG one month after discharge (P<0.05). No significant difference was seen in asthma knowledge scores between 2 groups on the day of discharge and 6 months after discharge (P>0.05, Table 3).

Medication compliance

After intervention, the medication compliance score of the OG was higher as compared to the CG one month after discharge (P<0.05). No significant difference was exhibited in medication compliance scores between 2 groups before intervention and 6 months after discharge (P>0.05, Table 4).

Asthma symptom control

Before intervention, no significant difference was shown in symptom control rate between both groups (P>0.05). Followed by intervention, the symptom control rate of the OG was higher in comparison with the CG one month after discharge (P<0.05). 6 months after discharge, no statistical significance was seen in the symptom control rate between both groups (P>0.05, Table 5).

Acute attacks and hospitalization frequency

Six months after discharge, no significant difference was exhibited in the number of acute attacks along with hospitalization frequency between both groups (P>0.05, Table 6).

Discussion

Current studies have suggested that continuous zinc chelate supplementation of asthmatic children significantly can reduce the duration of clinical symptoms of acute asthma and improves the children's immunity. Studies have shown that up to half of acute asthma children are deficient in the trace element zinc. Zinc deficiency may be accompanied by iron deficiency, which induces cellular immune disorders and inflammatory reactions. Prolonged immune activation leads to a functional iron deficiency, which in turn leads to anaemia and lung disease. Conversely, iron deficiency can further promote immune activation and accelerate the production of IgE, thus exacerbating the asthma process.[17,18] Whether zinc supplementation affects the efficacy of asthma is currently controversial. In our study, we pointed out that zinc addition improved clinical symptoms and immunity in acute asthma, which was in line with Suzuki's findings on the importance of zinc for the immune response.[19] In addition, studies have shown that zinc deficiency aggravates airway inflammation, while zinc supplementation improves inflammation better, and there is a trend toward shorter hospital stays.[20]

Prevention and treatment education is the basic link to achieve good control of asthma, regular drug treatment is the first choice for long-term control of asthma. The outcomes of this study revealed that the asthma knowledge score, medication compliance score and asthma symptom control rate of the OG were higher relative to the CG one month following discharge, suggesting that Teach back educational model promote the asthma knowledge level, medication compliance and asthma symptom control rate in children with asthma, which was in accordance with previous study.[21] The possible reason was that Teach back strengthened the educational effect through repeated testing and continuously tests to increase the accuracy of mastering inhalation technique, which could improve the disease cognition degree of caregivers, improve the behavior style, promote the improvement of medication compliance, and then promote the control of asthma symptoms in the short term.

Most parents have not yet developed the habit of medication, and as asthma knowledge is gradually blurred, the behavior of medication compliance reconstruction is affected. In addition, during the epidemic period, the difficulty of seeking medical treatment and the fear of being infected outside the home may also affect the medication compliance.[22] Recently, with the development of the global initiative on asthma prevention and control and the “531 Doubling” program in Suzhou, increasing attention has been paid to children's asthma. Moreover, children with asthma may pay more attention to self-protection than the general population during the COVID-19 outbreak. Most children with asthma exercise at home or wear masks, which reduces the exposure of outdoor allergens and effectively reduces the risk of viral infection,[23] resulting in a lower rate of acute asthma attack and hospitalization in Chinese children.[24] This is also consistent with the reduction in acute attacks and hospitalizations of children with asthma during COVID-19 reported by Turkish and American scholars.[25,26]

This research has some limitations. The sample size of this research is small, and there are several cases of lost follow-up. More samples should be collected to verify the conclusions. Considering the harmful effects of excessive zinc supplementation, we did not conduct a study of continuous zinc supplementation in children, and it is not possible to know whether continuous zinc supplementation would improve the deterioration of asthma as well as decrease the rate of hospital readmission. However, in the field of short-term efficacy, zinc supplementation may enhance the patient's immunity along with shorten the duration of symptomatic episodes.

Conclusion

Teach back educational model combined with zinc supplementation improves caregivers’ asthma knowledge, children’s medication compliance, and asthma symptom control, improves clinical symptoms and enhance immunity of children with asthma Our study may provide a promising treatment method and health education method for improving the clinical symptoms of asthma children.

Competing interests

The authors report no actual or potential conflicts of interest.

Acknowledgement

This work was supported by the National Natural Science Foundation of China (No. 81901620).

Contribution of Authors

Qin YX and Lin Y: conceived and designed the study, as well as collected and analysed the data. Han J, Zhang XX and Li J: prepared the manuscript. All authors mentioned in the article approved the manuscript.

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