

Prevention and Intervention of Allergic Rhinitis in Adolescents

Baihetiyaer Baikere*

School of Nursing, JiLin University, ChangChun,130012, China

*Corresponding author: bhtye2919@mails.jlu.edu.cn

Abstract. Allergic rhinitis (AR) is a common allergic disease with a high recurrence rate. Clinical symptoms include the nasal congestion, runny nose, sneezing, etc. With the development of social and economic development and the change of living environment, the prevalence of teenagers is also increasing year by year. At this time, the adolescent's body is in the development period, the mind is not mature, and there is no good understanding of the disease. Allergic rhinitis will not only interfere with the life of teenagers, but also have a bad impact on their psychology. If it is not controlled and prevented in time, it may develop into asthma and other diseases later. Therefore, the prevention and intervention of allergic rhinitis in adolescents should not be ignored, but should be taken seriously. This paper mainly discusses the epidemiological characteristics, causes and mechanisms and its prevention and treatment measures of adolescent allergic rhinitis for its reference.

Keywords: Allergic rhinitis; adolescents; prevention.

1. Introduction

Allergic rhinitis (AR) is a common disease, namely, a non-infectious chronic inflammatory disease of the nasal mucosa mediated mainly by immunoglobulin E (IgE) after exposure to allergens (allergens). Common clinical symptoms include nasal itching, paroxysmal sneezing, watery nose and nasal congestion, which may be accompanied by eye symptoms such as itchy eye tears. Teenagers are also at high risk. With the rapid development of economy and the change of lifestyle, the prevalence of allergic diseases in adolescents shows a rapid growth trend. According to the available epidemiological data, the prevalence in different countries and regions is 13-39.8%. Although the current diagnosis and treatment technologies and drugs are still being developed, the recurrence rate is still high, which directly affects the normal physiological function of the patients' respiratory tract, affects the patients' life and study, and may increase the emotional and psychosocial burden. In addition, the onset of allergic rhinitis is closely related to other allergic diseases, and long-term onset may induce or aggravate adolescent asthma. Therefore, the prevention and intervention of adolescent allergic rhinitis has become a problem that cannot be ignored and needs to be solved urgently.

2. Epidemiological characteristics

With the development of science and technology and economy, the prevalence of allergic rhinitis in adolescents has also increased. In the 2001-2021 allergic rhinitis prevalence survey study in Chinese children and adolescents (n=548876), the combined overall prevalence according to the random effect model was 18.46%. Subgroup analysis showed that the combined prevalence in 2012-2021 (19.75%) was higher than the combined prevalence in 2001-2011 (14.81%) [1]. Regional prevalence ranged from high to low in East China, North China, Northwest China, Central China, Southwest China, Northeast China and South China.

Among them, the prevalence rate in East China is 22.77%, and that in South China is 7.29%, which has an obvious gap. Compared with northeast China and South China, the prevalence of allergic rhinitis in adolescents increased significantly, but there was great heterogeneity in the included studies. In 2009, an epidemiological survey sampled 4932 school students, which showed that the prevalence of allergic rhinitis in adolescents was 17.5% [2]. In addition, among 21692169 adolescents aged 12 to 18 years were sampled in Haikou city, the prevalence of this disease was as high as 39.8%, among which the prevalence was 45.7% in cities and 29% in rural areas [3]. The

reported rate of childhood allergic rhinitis in the United States and other developed countries is about 13% [4]. A large number of literature and data show that with the social progress and economic development, the prevalence of AR adolescents also increases year by year and cannot be ignored.

3. The Impact of Allergic Rhinitis on Adolescent Psychology

Adolescence is a stage of rapid physical and mental development. The physical development is not mature, the cognitive level is low, the mind is not fully formed, and the disturbance of disease is more likely to affect the mental growth of teenagers. The allergic rhinitis has a long course, high recurrence rate, the onset feels uncomfortable, it is easy to cause adolescent psychological problems. And with the increase of the prevalence of allergic rhinitis in teenagers, the mental health of teenagers should also pay attention to it. The 2019 Global Disease Risk Factors Study showed the increasing number of adolescents with anxiety and depression disorders aged 10 to 14 [5]. To evaluate the mental health of adolescents and guide the cure, for the prevention and treatment of allergic rhinitis. In one study, the mental health of 194 patients with allergic rhinitis was evaluated [6]. Through the symptom self-evaluation scale, depression self-evaluation scale and anxiety self-evaluation scale, 22 people accounted for 11.34%, and 10 patients accounted for 5.16%. In terms of depression, 49 patients had 59.38%, 49 patients had 25.26%, 26 patients had moderate depression 13.40%, and 4 patients were severe. Among the anxiety problems, 15 people accounted for 7.73% mild anxiety, 8 moderate anxiety for 4.12%, and 1 severe anxiety. Among them, 22 sub-health patients had different degrees of depression and anxiety. Further analysis found that patients with sub-health and poor psychological condition were positively correlated with the rate of depression and anxiety. It can be learned that if the mental state is not good, the subsequent may develop into depression and anxiety, for teenagers, the consequences may be more serious. The cognitive level of the disease is not high, and the awareness of self-protection is not formed, which will have a negative impact on the prevention and treatment of the disease. In addition, in addition to academic pressure, teenagers also have family pressure, man-machine relationship and social competition and other reasons, their own psychological and physical development is not equal, coupled with the trouble of multiple factors, it is likely to develop into psychological diseases. In the treatment and prevention of allergic rhinitis, people should not only observe the physiological feelings of teenagers, but also pay attention to the mental health of teenagers.

4. Factors

4.1. Genetic Factors

Familial aggregation often occurs, and the number of IgE and mast cells in patients is often higher than in normal people. Studies have shown that epigenetic mechanisms, including DNA methylation, histone acetylation and the level of miRNA. In response to allergens, host cells undergo a amounts of DNA methylation and histone acetyl. In some studies, the coincidence rate of monozygotic twins was higher (45% -60%) than that of dizygotic twins (25%), indicating the importance of genetic factors of allergic rhinitis [7]. In the complete data of 8,6335-year-old twins in the US, parents reported the frequency of rhinitis of 4.4%, and genetic factors accounted for 90% of the susceptibility variants in asthma, eczema and rhinitis [8]. Genetic factors account for a significant part of the pathogenesis of allergic rhinitis.

4.2. Allergen

Contact with allergens is one of the main factors in the pathogenesis of allergic rhinitis. Different countries and allergens in different regions lead to differentiation in the prevalence of allergic diseases. As people's diet structure changes, antigenic substances increase. Waters are specifically divided into inhaled allergens and food allergens, and inhaled allergens usually include dust mites, animal dander,

pollen, cockroaches, fungi, etc. Edible allergens include seafood and milk. Dust mites and pollen are the top two common allergens with the highest incidence of allergic rhinitis.

In 300 teenagers in Guangzhou, the results showed that house dust mites, dust mites, pollen and animal hair were the main inhalation allergens [9]. The sensitization rate of house dust mites was 26.3%~57.6%, and it was 18.4%~37.3%. Due to the climate and environment in Guangzhou area, the main inhalation allergens are house dust mites and dust mites. Major allergens can also vary in other regions. In a study of adolescent allergens in Beijing, 132 children were tested for allergen IgE antibodies, and the results showed that the main allergens aged 2 to 6 years were egg white (32.7%), followed by milk (21.8%), beef (14.5%), cat hair (12.7%), dust mite combination (house dust mite / dust mite) and mutton (10.9%) [10]. The most important allergens between 7 to 18 years were mugwort (41.6%), followed by cat hair (33.8%), tree combination (willow / poplar / elm) (24.7%), common ragweed (22.1%), and house dust (20.8%). The positive rate of sIgE antibodies in willow poplar, house dust and cat hair from 7 to 18 years was significantly higher than that in 2 to 6 years. Follow-up investigations and data also found that the sensitization ratio of pet allergens such as pet fur increased with age. This shows that the variety of allergens are diversified.

4.3. Environmental Factors

With the pollution of air and the change of living environment, the learning and living environment of teenagers will change accordingly. Pollutants and stimulating substances in the air (such as particulate matter, chemical gases, second-hand smoke, etc.) may stimulate the nasal mucosa, and a high exposure environment for a long time will also increase the prevalence of allergic rhinitis in adolescents. In Guangzhou 3013 pupils according to the living environment pollution degree of high exposure, exposure and low exposure area, the results showed that low exposure area prevalence of allergic rhinitis of 16.3%, exposure area of 20.2%, and the prevalence of 27.5%, high exposure area allergic rhinitis, low exposure risk is 1.689 times, and within 100 meters around the coal pollution of the school prevalence of 40% [11]. It can be seen that the ambient air quality is a significant factor affecting the allergic rhinitis disease.

5. Allergic Rhinitis Mechanism

Whether it is adolescent AR, or other types of allergic rhinitis, the pathogenesis is very complex, the mechanism has not been fully explored. To cause allergic rhinitis, three conditions are required: immune response substances (specific antigens), body atopic antibodies (allergic constitution) and specific antigen and atopic individuals meet and react.

The pathogenesis of AR is regulated by the immune system and the nerve-immune system, and the involvement of the microbiota. Specific antigens enter the mucosa and contact with the body. Antibody IgE is produced in the nasal mucosa and lymphoid tissues. Antigens react with antibodies, and mast cells release chemical mediators, such as histamine and peptide leukotriene. These chemical mediators can stimulate blood vessels and nerve endings in the nasal mucosa, dilate capillaries, increase vascular permeability, and sensitize the body, leading to allergic rhinitis, manifested as sneezing, watery nose and nasal congestion.

When antigen enters the body, the production of IgE is largely determined by genetic factors and the physical causes of the body itself [12]. After some allergens enter the body, they combine with immune cells to cause a series of reactions so that the body is in a sensitization state to the allergen. At this point, when the same allergen enters the body again, a series of changes occur in the combination of IgE to release bioactive mediators, allowing the body to show allergic symptoms. This process, however, will be influenced by a variety of factors. In the neural-immune regulation, the bidirectional, complex, immune mediators and neurotransmitters secrete signals to cause the pathogenesis of allergic rhinitis. The mediators released by sensitization will excite the cholinergic nerve and release acetylcholine to increase the gland secretion, and the clinical manifestation is clear mucus. Studies have shown that the expression and balance regulation between Th 1 and Th 2 cell

subsets can be used as a basis for the diagnosis and treatment of allergic rhinitis [13]. The two types of cells inhibit each other, producing and aggravating inflammation when Th 2 and its produced cytokines are dominant and decreasing when Th 1 and its produced cytokines are dominant. There will be microbial involvement in multiple immune diseases, and eosinophils will also have their regulation during AR development [14]. After antigen antibody reaction, the released chemical mediators will activate eosinophils, infiltrate into the nasal mucosa exposed to antigen and produce white three thinning, which will cause swelling of the nasal mucosa.

6. Prevention and Control of Allergic Rhinitis

6.1. Identify the Allergens

In the prevention and treatment, it is first necessary to identify the adolescent allergens, detect the patient's allergy to consumption and inhalation substances and understand the family history, avoid contact with allergens in daily life, and effectively avoid the onset of allergic rhinitis. Before confirming the allergen, the consumption of common allergen sea fresh milk should be reduced. By testing allergens, keep a distance, and prepare the appropriate drugs to take them when sick to avoid more disease. Keep the ambient air circulation in the house, dry the indoor environment, ensure the cleanliness of the house, reduce the indoor reproduction of dust mites, daily cleaning and disinfection will effectively reduce dust allergens such as mites to prevent the occurrence of allergic rhinitis.

6.2. Reduce Contact Routes

During pollen transmission and high incidence of allergic rhinitis, outdoor activities should be reduced, and masks should be worn to avoid contact with allergens. Attention should be paid to the air quality of the living environment to reduce activities in the environmentally polluted areas. Keep away from the smoke and keep a distance from second-hand smoke. Masks and glasses should be worn during outdoor activities. In daily life to maintain good living habits, can be properly used with saline to effectively clean the nasal cavity. Studies have shown that nasal saline irrigation is beneficial for the treatment and prevention of allergic rhinitis [15]. Twenty adolescents were divided into irrigation and conventional groups (control group), which performed nasal irrigation with 60-150ml isotonic saline twice daily over 12 weeks, and both groups received the same conventional treatment. Measure the percentage of eosinophils in patient allergic rhinitis severity, quality of life questionnaire and nasal secretions before and at the end of the study. The results showed 4 cases of mild persistent allergic rhinitis and 6 cases of moderate persistent rhinitis symptoms in the irrigation group. In the control group, three patients had mild allergic rhinitis, one moderate and six severe persistent symptoms. Further illustrates the positive effect of saline irrigation.

6.3. Probiotics

Several documents indicate that there are positive effects of probiotics on allergic diseases [16]. A total of 115 children with dust mite allergic rhinitis were included and divided into conventional group (conventional therapy, 58 cases) and probiotics group (combined probiotics intervention based on conventional therapy, 57 cases). Study time for half a year, in the process of treatment, three times time to collect children with nasal symptom score (Symptoms such as nasal blockage, clear nose and nasal itching, the higher the score, the more severe the symptoms), medication score (conventional therapy such as antihistamine), symptom feeling score (the higher the score) and life treatment score (the higher the score troubled more serious). In the results, the scores of both groups were lower compared with the first collection, and the score of the second collection group was lower than that of the conventional group. Generally speaking, there was no difference between the two groups. It can be seen that conventional treatment combined with probiotics reduces allergic rhinitis symptoms such as nasal blockage, sneezing, and clear discharge, which is better than the conventional treatment group. The addition of probiotics intervention in conventional treatment can relieve the clinical symptoms of allergic rhinitis more quickly.

6.4. Vitamin D

Vitamin D also has a certain effect on AR. Eating more foods containing vitamin D and vegetables to provide timely vitamin supplements can promote the tolerance to allergens and prevent or reduce allergic inflammation. The major vitamin D metabolite, calcitriol, can promote dendritic cell maturation and inhibit Th 1 cell development, a key mechanism that hinders the development of allergy. Previous studies have shown that low vitamin D levels are associated with an increased incidence and severity of allergic diseases, and that vitamin D supplementation can prevent and improve the condition. In one study, third trimester and lactating females received a vitamin D deficiency diet, deprived mice with vitamin D in utero and early life, and began exposure to dust mites on the third day of life for six weeks [17]. In the aftermath of the study, female mice were given a vitamin D deficient diet from 16 days gestation to 3 weeks postpartum, and the results showed that female mice developed a Th 2-tilted lung immunophenotype, and the offspring of female mice showed increased lung eosinophilia and more Th 2 cells. Studies proved the uterus and early life lack of vitamin D, neonatal exposure to allergens, can make the airway eosinophils and Th 2 cells, and timely supplement vitamin D will reduce the increase of eosinophils, and timely in allergic diseases supplement vitamin D can reduce the symptoms of allergic rhinitis, thus better control and prevention.

6.5. Health Education

In the adolescent period, the body's psychology and physique are in a sensitive stage, to timely and do a good job in the popularization of disease knowledge, psychological intervention and health education, guide teenagers to develop good living habits and psychological quality, do a good job in dietary intervention and correct drug guidance. In a study of allergic rhinitis in health education, 102 patients were studied in groups, and the control group received routine care, while the trial group received intensive care knowledge for health education [18]. The observation of nasal symptoms before and after the care showed that the treatment response rate in the experimental group was 96.08%, and the effective treatment rate in the control group was only 82.35%. Thus it can be seen that to help understand the disease knowledge and pathogenesis of allergic rhinitis and improve self-protection awareness of adolescents can be more effective treatment and prevention of allergic rhinitis.

7. Conclusion

The prevalence of allergic rhinitis in adolescents continues to increase, which is inseparable from the changes in the environment and lifestyle. At the same time, because of its repeated attacks, the radical cure is difficult, the treatment is complex, affecting the physical and mental health of teenagers. For the prevention and treatment of allergic rhinitis, the health awareness and living habits of teenagers themselves are a big factor affecting the results. Adolescents who lack poor disease awareness and self-management skills will also have poor results of prevention and control, and diseases such as asthma that may develop as they grow and the disease develops. Health education for adolescents and their families should not be ignored. At the same time, people may do a good job of dietary intervention and guidance, and then minimize the frequency and degree of AR attacks.

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