

Epidemiological Investigation of Allergic Rhinitis Patients with Asthma in Qingdao Area

Niankai Zhang¹ Junwei Ma² Rongli Gao¹ Tingting Liu¹ Zhimin Wang²

¹Department of Otolaryngology, Affiliated Hospital of Qingdao University, Qingdao 266003, China

²Department of Neurosurgery, Suzhou Kowloon Hospital Affiliated Shanghai Jiao Tong University, Suzhou 266021, China

neroma@163.com

ABSTRACT: Objective: To investigate the morbidity of allergic rhinitis patients with asthma and correlative factors in Qingdao area. **Methods:** A questionnaire survey on AR in Qingdao area was designed. Multistage and cluster sampling methods were applied to the residents aged from 5-70 years old in Qingdao area excluding hypertension, diabetes mellitus and rheumatic disease. This investigation has three stages: questionnaire survey, screening suspected AR patients according to the results of questionnaire, and then further specific examination and allergen skin tests to confirm. **Results:** The total number of questionnaires is 2400, and 2052 questionnaires were available. The effective rate was 85.5%. There were 248 cases of AR, including 20 cases with asthma. The prevalence rate of AR patients with asthma in residents aged from 5-70 was 8.06% in Qingdao City. The difference of prevalence between female 9.26% and male 7.14% was insignificant statistically ($X^2=0.36$, $P>0.05$). **Conclusion:** The prevalence rate of AR patients with asthma was 8.06%. The current situation of allergic rhinitis with asthma in Qingdao region can provide a theoretical basis on the development of rational and effective treatment plan for clinicians.

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Introduction

Allergic rhinitis (AR) is a specific IgE-mediated non-infectious inflammatory reaction of the nasal mucosa after the exposure to allergens [1], the clinical symptoms are nasal itching, continuous sneezing, watery nasal discharge, nasal congestion, etc. It does not threaten the life, but it affects the quality of life and reduces the working and learning efficiency seriously. Also It can lead to asthma, tracheal bronchitis, nose-sinus inflammation, nasal polyps, otitis media, allergic conjunctivitis, etc. Allergic rhinitis and bronchial asthma is a common respiratory allergic disease. Many patients suffer both AR and BA, so the correlations between them also cause a common concern for scholars home and abroad [2]. In order to investigate the morbidity of allergic rhinitis patients with asthma in this region, questionnaire survey on the epidemiology of allergic rhinitis with asthma in Qingdao was conducted among permanent residents at the age of five to seventy years old in June 2011 to August 2011.

1 Material and Methods

1.1 General Information

Sample size estimates: To make sure expected size of the survey sample content according to the sample size calculation formula^[3]: $N = (Z_{\alpha/2})^2 pq / \delta^2$, where N represents the expected sample size, $Z_{\alpha/2}$ represents bilateral threshold of standard of normal distribution (α : level for the test, 0.05 is set in this

survey, look-up table available $Z_{\alpha/2}$ corresponds a value of 1.96), p is the expected prevalence rate of allergic rhinitis (set to 0.30^[4-5]), q is 1-p (0.70), δ is tolerance (0.02), N=2017.

1.2 Survey method

1.2.1 Questionnaire survey Take the international children's asthma and allergic disease research (ISAAC) and European Community Respiratory Health Survey (ECRHS) questionnaire^[6] for references, combined with the specific circumstances of Qingdao region, a questionnaire survey of allergic rhinitis in Qingdao region was formulated, which includes the screening questionnaire and the main questionnaire. The screening questionnaire mainly includes the basic characteristics of the respondents (including name, sex, age, occupation, cultural level, family per capita income) and the main clinical symptoms of allergic rhinitis, the impact of working life, diagnosis and treatment situation, cognitive situation, etc. The main questionnaire mainly includes a history of allergic rhinitis, related symptoms, month, predisposing factors or risk factors, family history, allergy history, living environment, family living total number and living space, treatment, the effect of the asthma on rhinitis. All respondents complete the screening questionnaire and the younger or illiteracy respondents were assisted by family members. The main questionnaire was answered by investigators.

1.2.2 Survey method By multi-stage sampling and

cluster sampling methods, based on administrative divisions, geographical location and demographic characteristics in Qingdao, the city is divided into district, street and neighborhood, rural areas by town and village. In this study, all respondents were the mental healthy permanent residence (5 years and above 5 years), excluding hypertension , diabetes mellitus and rheumatic disease, aged from 5-70 years old in Qingdao.

1.2.3 Questionnaire Investigators had communicated in advance with residents' committees or village committee to get their active support. At the same time, they did missionary work to care for the health of respondents and explained survey objectives, significance of investigation and the content of the questionnaire to cooperate with respondents better. The respondents have a call to investigators when they don't understand questionnaire content to ensure the quality of questionnaire.

1.3 Diagnosis

1. A definite diagnosis was made based on three symptoms (sneezing and rhinocnesmus, watery rhinorrhea and rhinobyon), together with positive nasal eosinophil tests, and identified causative allergens, based on skin reactions or serum allergen-specific IgE antibody measurements.^[1]

2. The standard of the bronchus Asthma control guidelines "in Journal of Tuberculosis and Respiratory Diseases ^[7] combined with "Global Initiative for Asthma, GINA".

1.4 Clinical diagnosis

Questionnaires were uniformly screened by the investigators to get the suspicious objects who had the related symptoms with allergic rhinitis (including sneezing, rhinocnesmus, watery rhinorrhea and rhinobyon and other symptoms occurring two or more). All suspicious objects had a comprehensive inquiry to verify the contents of questionnaires and gotten the specialist examination. For seasonal patients, investigators made an appointment with them to get specialized examination and skin prick test again in some season. Based on diagnostic criteria for bronchial asthma, investigators verified patients with AR whether they had asthma and related factors or not.

1.5 Skin prick test

1.5.1 Reagent sources Standardized allergen test solution is produced by Zhejiang biological technology Co., LTD. Reference to all allergen test characteristic, combined with the specific situation in Qingdao, 15 kinds of inhaled allergens which include dust mites, house dust mites, dog hair/dog epithelium, cat hair/ cat epithelium, Artemisia pollen, Humulus pollen, cockroach (*Blattella germanica*), corn pollen, yeast, penicillium, cotton, plane trees, tobacco, feathers and birch pollen.

1.5.2 Test Method (1) Wipe subjects' forearm palmar skin with normal saline. (2) Negative control, all kinds of allergen fluid and positive control were accordingly dripped on the cleaning forearm palmar skin. The distance between the two drops of liquid is no less than 2 cm in order to prevent the reflective flush fusion. (3) To avoid blood vessels, tighten the skin, the needle prick through the drop, the vertical piercing the skin and each test solution should be replaced with a new point of the needle. (4) Wipe the residual liquid on the skin with a cotton swab after 2-3minutes; Do not mix adjacent droplets, phosphate histamine for the positive control and physiological saline for negative control and then observe the results 15 minutes after the test.

1.5.3 Results criteria It is determined by prick pimples caused by origin fluid and positive control reactions. Positive control pimples are 1 cm in diameter, papule diameter less than 0.25 cm or the same as the negative control for the (-); 0.26 cm diameter < papules < 0.5 cm (+); 0.51 cm < papule diameter < 1 cm (++); 1.1 cm diameter < papules < 2 cm (+++); Above papule > 2 cm in diameter (++++).

1.6 Date Analysis

All survey data was analyzed by using Excel to establish a database. SPSS 13.0 statistical software was used for statistical analysis. The comparison of the rate was used for a chi-square test.

2 Results

2.1 Results of the questionnaire

The total number of questionnaires was 2400, 2052 questionnaires were available. The effective rate was 85.5%. There were 248 cases of AR, including 20 cases with asthma. The prevalence rate of AR patients with asthma in residents aged from 5-70 was 8.06% in Qingdao City. The difference of prevalence between female 9.26% and male 7.14% was insignificant statistically ($\chi^2=0.36, P>0.05$) (Table 1).

Table 1. The gender contrast of AR patients with asthma in Qingdao

| gender | yes | no | total |
|--------|-----|-----|-------|
| male | 10 | 130 | 140 |
| female | 10 | 98 | 108 |
| total | 20 | 228 | 248 |

$\chi^2=0.36, P>0.05$ The difference of prevalence between female 9.26% and male 7.14% was insignificant statistically.

2.2 Prick test results

In inhaled allergens, positive reaction rate of dust mites and house dust mites was higher, accounting for 61.1% and 66.1% respectively (Table 2).

Table 2. The detection of inhaled allergen in AR patients(x %) (BA and AR)

| allergen | positive rate |
|--------------------------|---------------|
| dust mites | 61.1% |
| house dust mites | 66.1% |
| Artemisia pollen | 40.8% |
| cat hair/ cat epithelium | 37.5% |

2.3 The causes of induced or exacerbated asthma in 20 cases of AR

There were 15 cases of patients with asthma who were firstly or simultaneously attacked by allergic rhinitis, accounting for 75%; There were 5 cases who were firstly attacked by asthma, accounting for 25% (Table 3).

Table 3. The causes of induced or exacerbated asthma in 20 cases of AR

| cause | case | percentage (%) |
|-----------------------------------|------|----------------|
| Increased exposure to allergens | 9 | 45% |
| Upper respiratory tract infection | 7 | 35% |
| Occupational factors | 2 | 10% |
| Decoration | 1 | 5% |
| unexplained | 1 | 5% |

2.4 Diagnosis and treatment of AR in the past 12 months

Medical conditions: 140 people were treated, accounting for 56.45% (140/248); 108 people were not treated, accounting for 43.55% (108/248).

Treatment: 99 patients took medicine, accounting for 39.92%; 149 people did not take medicine, accounting for 60.08%. 35 patients received topical corticosteroids therapy of 99 patients, accounting for 35.35%. While the other 64 patients take other different medicine including antibiotics, rhinitis, Rhinitis ning, Contac, cold medicines and cefuroxime hemp liquid, proprietary Chinese medicine, acupuncture point massage, etc, accounting for 64.65%.

3. Discussion

Allergic rhinitis and bronchial asthma belong to allergic disease, which are the same whole body systemic disease, but different clinical manifestations of systemic disease. AR is a type I allergic disease, and it is a common disease occurred at different age. The BA is the most common and most important disease in the lower respiratory tract inflammatory disease but it does belong to otolaryngology's category of diagnosis and treatment for a long time. In recent years, the traditional concepts in foreign countries have changed. Gordon has explicitly pointed out that the bronchus asthma is the important disease for otolaryngology physicians and once again stressed that the essence of bronchial

Asthma pathological changes is chronic inflammation of the bronchial mucosa [8]. AR and asthma occur in different parts of the respiratory system, but there are many correlations and similarities between them which should be joined together to make an accurate diagnosis and improve the effect of treatment. The epidemiology results show that the prevalence rate of BA in AR is 40%.The prevalence rate of AR in BA also is as high as 30%-80%. Meanwhile, the prevalence rate of BA and the severity of AR is positively correlated. [9].

Zhou B investigated patients with both asthma and allergic rhinitis [10]. The results showed 54.8% of patients with allergic rhinitis in 115 cases of patients with asthma, of which 54.2% of patients appeared allergic rhinitis firstly, 28.6% of patients appeared asthma firstly. In this study, we found that there were 20 cases of bronchial asthma in 248 patients with allergic rhinitis and the prevalence rate of AR patients with asthma was 8.06%, which was not quite same with the literature [2,9,10]. The reason may be that the symptoms of patients with AR were relatively mild, which had not led to the occurrence of asthma. 39.92% of drug therapy was lower than of 56.45% AR treatment in the past 12 months. The reasons were as follows: The symptoms appeared at a certain seasons among some patients and the symptoms disappear naturally after the season. The effect is not obvious and the symptoms appear again after treatment. These did not only indicate that the patients pay not enough attention to the awareness of allergic rhinitis but also lack cognition of AR which may lead to asthma. But also it reflected that the symptoms are relatively mild or the patients are not satisfied with curative effect. In fact these patients with AR had a great potential to merge with asthma because symptoms may be triggered greatly when these patients meet more allergy sources. So we should pay attention to patients with AR when they should take positive and effective treatment to prevent the development of the bronchus asthma. Clinically [8], most of patients with AR can be cured after appropriate treatment, and asthma also improved. In contrast, AR for long-term untreated or inappropriate treatment may induce or aggravate asthma. AR which is a risk factor for asthma also supports "allergy promote doctrine" [11]. Based on this concept, most scholars consider that allergic rhinitis and bronchial asthma belong to the same kind of disease, namely total airway inflammatory and hyperresponsive syndrome. The progress is divided into three phases: (1) Rhinitis without bronchial hyperresponsiveness or asthma. (2) Rhinitis with bronchial hyperresponsiveness, but without asthma. (3) Rhinitis with asthma. The distinction between three stages may simply reflect the different severity of the syndrome.

Bronchial hyperresponsiveness is temporary, if treated actively, it can return to normal reaction condition; But if it leads to asthma, bronchial hyperresponsiveness is permanent.

Allergic rhinitis and asthma occur in different parts of the same respiratory tract. The nasal bronchial reflection, nasal and pulmonary breathing and immunopathology are the main mechanism of mutual influence each other. In recent years, many studies have shown^[12] that inflammation of the upper and lower respiratory tract is consistent and the change of inflammatory response in one part will influence another area. This is the main reason for the occurrence with each other. So the AR and Asthma are often simultaneous. The majority of patients with asthma occurred rhinitis or concurrent firstly, but there were some AR patients occurred asthma firstly and some patients only occurred asthma or rhinitis. Upper and lower airway may be different structure and different functions. The so-called "one airway, one disease" should be known essentially, not just comply with the rate and relevance of AR and Asthma^[13].

This survey showed that 75% of allergic rhinitis occurred before asthma, which proved the nasal mucosa is source of respiratory allergy. So the patients with AR but without asthma should be actively treated. One of the mechanisms of airway inflammation is systemic absorption of inflammatory neurotransmitters. Neurotransmitter produced by the nasal mucosa can be absorbed into the whole blood circulation. Therefore, inflammation is not only confined to the nasal cavity, but also the entire respiratory tract. According to this theory, allergic rhinitis and asthma is the same disease. However, the relationship between allergic rhinitis and asthma showed dynamic change. 228 patients had AR but without asthma in 248 patients. These patients should be strengthened as a follow-up group because most asthma patients had allergic rhinitis firstly. AR patients must avoid a large number of allergens, upper respiratory tract infection which can trigger or aggravate asthma. Our study showed that positive reaction rate of dust mites and house dust mites was higher in inhaled allergens, accounting for 61.1% and 66.1% respectively. Qingdao area is a coastal city, which belongs to temperate maritime climate. It is especially suitable for dust mites, mould and other allergens to grow and reproduce in warm and humid environment.

This study re-emphasizes the theory that allergic rhinitis and bronchial asthma is the same

disease. Therefore, the prevention, diagnosis and treatment of AR and asthma should be considered for clinicians in the future work.

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