

# Epidemiological Investigation of Allergic Rhinitis Patients with Asthma in Qingdao Area

GAO Rong-li<sup>1</sup>, DING Jian<sup>2</sup>, ZANG Yan-wei<sup>3</sup>, YAN Shu<sup>1</sup>, LIU Ting-ting<sup>1</sup>,

LIU Zan-gang<sup>4</sup>, GONG Xiang-gui<sup>5</sup>, ZHOU Xiao-bir<sup>6</sup>, LI Na<sup>1</sup>, ZHANG Nian-kai<sup>1,Δ</sup>

(1.Department of Otolaryngology, Affiliated Hospital of Qingdao University Medical College, Qingdao 266003, China ;

2.Traditional Chinese Medicine in Huang Dao area, Huangdao, 266500, China;

3.Department of Otolaryngology ,municipal hospital of Laixi City, Laixi, 266600, China;

4.Clinic of Shang Jia Gou, He Tao street, Cheng Yang District in Qingdao, Chengyang,266113, China;

5. Clinic of Yun Tougou, Lao Shan Community in Qingdao, Laoshan, 266044, China;

6.Department of epidemiology and public health of Qingdao University, Qingdao, 266021, China)

**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. Two-stage sampling and cluster sampling methods were applied to the mental healthy permanent residence, excluding hypertension, diabetes mellitus and rheumatic disease, aged from 5-70 years old in Qingdao area including seven district and five cities. This investigation had three stages: questionnaire survey, screening of suspected AR patients according to the results of questionnaire, then suspects of AR were identified by the diagnose through specific examination of professional doctors and Allergen skin tests. **Results:** 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 in residents was 8.06%. To understand the current situation of allergic rhinitis with asthma in Qingdao region would provide a theoretical basis on the development of rational and effective treatment plan as well as its comprehensive treatment for clinicians.

**Key words:** Rhinitis; Allergy; Asthma; Prevalence; Epidemiological studies

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## Introduction

Allergic rhinitis (AR) is the body mainly after contact with allergens specific IgE- mediated the nasal mucosa non-infectious inflammatory reaction<sup>[1]</sup>, the clinical symptoms mainly for nasal itching, continuous sneezing, watery nasal discharge, nasal congestion, etc. Although it did not endanger the life safety of patients, but it affected seriously the quality of life , as well as reduced the working and learning efficiency greatly. It may lead to or associated with 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 from AR and BA and the correlations between them also cause a common concern of scholars home and abroad<sup>[2]</sup>. In order to investigate the prevalence of allergic rhinitis patients with asthma in this region, hence this paper investigate the epidemiological survey of allergic rhinitis with asthma in Qingdao a permanent resident at the age of five-seventy years in June 2011 to August 2011.

## 1 Material and Methods

### 1.1 General Information

**Sample size estimates:** To sure expected size of the survey sample content according to the sample size calculation formula<sup>[3]</sup>:  $N = (Z_{\alpha/2})^2 pq / \delta^2$ , where N represents the expected sample size,  $Z_{\alpha/2}$  represents bilateral threshold of standard of normal distribution ( $\alpha$ : 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<sup>[4-5]</sup>), q is 1-p (0.70),  $\delta$  is tolerance (0.02),  $N=2017$ .

### 1.2 Survey methods

**1.2.1 Questionnaire survey** Reference to the international children's asthma and allergic disease research (ISAAC) and European Community respiratory Health Survey (ECRHS) questionnaire [6], combined with the specific circumstances of Qingdao region, questionnaire survey of allergic rhinitis in Qingdao region was formulate, which included the screening questionnaire and the main questionnaire. The screening questionnaire mainly included 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 included a history of allergic rhinitis,

Author introduction: GAO Rong-li, femal, master ,Mainly engaged in otolaryngology E-mail: gh12122009@126.com

ΔCorresponding author: ZHANG Nian-kai, E-mail: znkent@yahoo.com.cn

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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 to rhinitis. All respondents complete the screening questionnaire and the younger or no culture knowledge respondents had family members auxiliary completed. The main questionnaire was answered by investigators.

**1.2.2 Survey method** By multi-stage sampling and cluster sampling method, 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 have communication in advance with residents' committees or village committee to get their active support. At the same time, it needs to do missionary work starting from caring the health of respondents to explain survey objectives, significance of investigation and the content of the questionnaire so that gets respondents cooperate. The respondents have a call to investigators when they don't understand questionnaire content so that ensure questionnaire quality.

### 1.3 Diagnostic criteria

1. According to allergic rhinitis diagnosis and treatment guidelines in 2009 Wuyi Mountain [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 screening by the investigators to get the suspicious objects who had the related symptoms with allergic rhinitis (including sneezing, watery nasal discharge, nasal congestion, nasal itching and other symptoms occurring two or more). All suspicious objects had a comprehensive inquiry to verify the contents of questionnaires and to get the specialist examination. For seasonal patients, investigators will make an appointment with them to get specialized examination and skin prick test again in some season. Based on diagnostic criteria for bronchial asthma, investigators verify patients with AR whether they have asthma and related factors or not.

### 1.5 Skin prick test

**1.5.1 Reagent sources** Standardized allergen test solution is produced by Zhe Jiang 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 and

tobacco, feathers, birch pollen.

**1.5.2 Test Method** (1) To wipe subjects' forearm palmar skin with normal saline. (2) Negative control, all kinds of allergen fluid and positive control are accordingly dripped on the cleaning forearm palmar skin. The distance between the two drops of liquid is not less than 2 cm in order to prevent the reflect 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) To wipe the residual liquid on the skin with a cotton swab after 2-3 minutes; not to mix adjacent droplets and to observe the results of the test. Phosphate histamine is as for the positive control and physiological saline is as for negative control.

**1.5.3 Results criteria** It is determined the level according to the area ratio between allergen prick pimples caused by fluid and positive control reactions. Ratio is 0%-25% of a positive control pimples or is the same with negative (-); Ratio is 25%-50% of a positive control pimples (+); Ratio is 51%-100% of a positive control pimples (++); Ratio is 101%-200% of a positive control pimples (+++); Ratio is above 200% of a positive control pimples (++++).

### 1.6 Data Analysis

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

## 2 Results

### 2.1 Results of the questionnaire

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 ( $X^2=0.36$ ,  $P>0.05$ ) (Table 1)

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

Gender	Yes	No	Total
Male	10	130	140
Female	10	98	108
Total	20	228	248

$X^2=0.36$ ,  $P>0.05$  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).

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

There were 15 cases of patients with asthma who first or si-

multaneous occurrence of allergic rhinitis, accounting for 75%; There were 5 cases who first attack of asthma, accounting for 25% (Table 3).

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%

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 had treatment, accounting for 56.45%(140/248); 108 people had not treatment, accounting for 43.55%(108/248).

Treatment; 99 people had received medicine, accounting for 39.92%; 149 people had not received medicine, accounting for 60.08%.

### 3 Discussion

Allergic rhinitis and bronchial asthma belong to allergic disease, which is also the whole body systemic disease, is also the different clinical manifestations of systemic disease. AR is a type I allergic disease, and it is a common disease in ENT clinic and frequently-occurring disease, which can be occur at any age. The bronchus asthma is the most common and most important in the lower respiratory tract inflammatory disease. The bronchus asthma is not part of 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 importance disease of otolaryngology physicians and once again stressed the essence of bronchial Asthma pathological changes is chronic inflammation of the bronchial mucosa<sup>[8]</sup>. AR and Asthma occur in different parts of the respiratory system, which are the chronic inflammatory diseases but there are many correlations and similarities between them which should be regarded together so that 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<sup>[9]</sup>.

Zhou B investigated patients with asthma associated with allergic rhinitis<sup>[10]</sup>. The results showed 54.8% of patients with allergic rhinitis in 115 cases of patients with asthma, of which 54.2% of patients appeared firstly allergic rhinitis, 28.6% of patients appeared firstly asthma. The study 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 the same with the literature<sup>[29,10]</sup>. The reason may be that the symptoms of patients with AR relatively was 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 following: 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 treated. 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 be associated with asthma. But also it reflected that the symptoms are relatively mild or the patients are not satisfied with treatment 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 source. So it should cause the attention of patients with AR and they should take positive and effective treatment when allergic inflammation is limited at the upper respiratory tract so that the majority of AR patients can prevent the development of the bronchus asthma. Clinically<sup>[8]</sup>, the symptoms were improved aftermost of patients with AR get proper treatment and asthma also got the corresponding 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"<sup>[11]</sup>. Based on this concept, most scholars consider it 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; Once the development of asthma, bronchial hyperresponsiveness is represented permanent.

Allergic rhinitis and asthma occurred in different parts of the same respiratory tract. The nasal bronchial reflection, nasal and pulmonary breathing and immunopathology were the main mechanism of mutual influence each other. In recent years, many studies

have shown<sup>[12]</sup> that inflammation of the upper and lower respiratory tract is consistent and the change of inflammatory response in one part will influence another area each other. This is the main reason for the two concurrent with each other. So the two parts are often simultaneous. The majority of patients with asthma who occurred firstly rhinitis or concurrent, 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 essentially known and not to fully comply with the pursuit of the rate and relevance of both<sup>[13]</sup>.

This survey showed that 75% of allergic rhinitis occurred before asthma, which prompts nasal mucosa that is source of respiratory allergy. So the patients with AR 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 systemic circulation. Therefore, inflammation is not only confined to the nasal cavity, but the entire respiratory tract has inflammation. According to this theory should support allergic rhinitis and asthma is a kind of disease. However, the relationship between allergic rhinitis and asthma showed dynamic change. 228 cases in 248 cases with AR had not the asthma. These patients should be strengthened as a follow-up group because most patients with asthma happened after allergic rhinitis. With particular attention to avoid a large number of allergens, upper respiratory tract infection can trigger or aggravate asthma. The survey 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 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 belonged to a disease. Therefore, the prevention from AR and asthma, diagnosis and treatment should be considered for clinicians in the future work.

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# 青岛地区变应性鼻炎患者合并哮喘的流行病学调查研究

高荣莉<sup>1</sup> 丁 见<sup>2</sup> 臧延伟<sup>3</sup> 闫 舒<sup>1</sup> 刘婷婷<sup>1</sup>

刘赞刚<sup>4</sup> 宫相贵<sup>5</sup> 周晓彬<sup>6</sup> 李 娜<sup>1</sup> 张念凯<sup>1△</sup>

(1 青岛大学医学院附属医院耳鼻咽喉头颈外科 山东 青岛 266003 2 黄岛区中医医院 青岛 黄岛 266500 ;  
3 莱西市市立医院耳鼻咽喉头颈外科 山东 莱西 266600 4 青岛市城阳区河套街道尚家沟村诊所 青岛 城阳 266113 ;  
5 青岛市崂山区云头崮社区诊所 青岛 崂山 266044 6 青岛大学流行病学与公共卫生教研室 山东 青岛 266003)

**摘要** 目的 :调查青岛地区变应性鼻炎患者合并哮喘的患病率及相关因素。方法 :设计“青岛地区变应性鼻炎问卷调查表”。采用多阶段抽样及整群抽样的方法 ,调查青岛地区常住(5 年及 5 年以上)居民 ,年龄在 5-70 岁 ,均无高血压、糖尿病、风湿性疾病及精神障碍性疾病的居民。共调查人数为 2052 人。调查分三个阶段 :问卷调查阶段、根据问卷结果筛选 AR 可疑对象、对 AR 可疑对象进行专科检查及变应原皮肤点刺试验以确诊。对结果进行统计学处理。结果 :发放问卷总数为 2400 份 ,有效问卷为 2052 份 ,有效率为 85.5% ,青岛地区 5-70 岁居民 AR 患者 248 例 ,其中 20 例合并支气管哮喘 AR 患者合并哮喘的患病率为 8.06% ,其中男 7.14% ,女 9.26% ,男女 AR 患者合并哮喘的患病率差异无统计学意义( $X^2=0.36$   $P>0.05$ )。结论 :青岛地区变应性鼻炎患者合并哮喘的患病率为 8.06% ,初步了解青岛地区人群中变应性鼻炎合并哮喘的现状 ,为临床医生对其综合治疗并制定合理有效的治疗方案提供理论基础。

**关键词** :鼻炎 ;变应性 ;哮喘 ;患病率 ;流行病学研究

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作者简介 :高荣莉 ,女 ,硕士研究生 ,主要研究方向 :耳鼻咽喉科学 ,Email:gh12122009@126.com

△通讯作者 张念凯 E-mail:znkent@yahoo.com.cn

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