

Demographics and Epidemiology of Allergic and Nonallergic Rhinitis

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ABSTRACT

Chronic rhinitis symptoms are among the most common problems presenting to physicians. When approaching this problem the diagnostic challenge is to determine the etiology, whether it is allergic, nonallergic, or perhaps an overlap of both conditions. Estimates of the prevalence of allergic rhinitis range from as low as 9% to as high as 42%. Although nonallergic rhinitis is a well-recognized diagnosis, its prevalence has not been studied definitively. If the assumption is made that ~20% of the U.S. population has allergic rhinitis, then 58 million people in the United States suffer from this diagnosis. Population survey results have estimated that 19 million Americans suffer from nonallergic rhinitis. Frequently, nonallergic rhinitis occurs in tandem with allergic disease and presents as mixed rhinitis. Because 44% of patients with allergic rhinitis may have concomitant nonallergic rhinitis, it is estimated that an additional 26 million people have a nonallergic component to their rhinitis (mixed rhinitis). Therefore, a total estimated 45 million people have either pure nonallergic rhinitis or mixed rhinitis. Because nonallergic rhinitis is common, it is important to differentiate this condition from rhinitis of allergic etiology. Once the diagnosis is established, an appropriate treatment plan tailored to a specific diagnosis can be optimally designed. (Allergy and Asthma Proc 22:185–189, 2001)

Chronic rhinitis symptoms are among the most common problems presenting to physicians¹. The Joint Task Force Parameters on Allergy, Asthma, and Immunology recently published guidelines for the diagnosis and management of rhinitis.² These guidelines define rhinitis as inflam-

mation of the mucous membrane lining of the nose, which is characterized by nasal congestion, rhinorrhea, sneezing, itching of the nose, and a postnasal drainage. These guidelines further state that rhinitis should be classified as allergic or nonallergic. Although not specifically addressed in the guidelines, this article proposes that the term “mixed rhinitis” be used to describe cases in which an overlap of both allergic and nonallergic rhinitis coexist.

ALLERGIC RHINITIS

Allergic rhinitis is defined as an immunologic response moderated by IgE immunoglobulin E and characterized by sneezing, rhinorrhea, nasal congestion, and pruritus of the nose.² Allergic rhinitis can be classified as seasonal (commonly called hay fever), caused by pollen allergens (tree, grass, or weed), or it can be classified as perennial, caused by allergies to animal dander, dust mites, or mold spores. Finally, allergic rhinitis can be classified due to occupational causation in certain settings.

The prevalence of allergic rhinitis has been estimated to range from as low as 9% to more than 40%^{3–9} (Table I). The term prevalence refers to the percent of people in a population with the condition at a given time. The term cumulative prevalence is the percent of people who have ever had the condition. The cumulative prevalence of hay fever has been reported to be ~46% at age 40 years.¹⁰

Multiple variables contribute to the broad range in reported prevalence rates of allergic rhinitis. These variables range from study selection criteria to differences in survey methods. One major problem is that no standard set of diagnostic criteria for allergic rhinitis is applied. In most studies, the criteria for diagnosis is based on subject's reporting and not confirmed by skin testing. Additionally, most studies have found it easier to focus on hay fever, leaving perennial allergic rhinitis underestimated. Finally, it is possible that differences in geographic location and varied populations may be a factor, although the recent report by Nathan *et al.*¹¹ found no correlation with geographic location or socioeconomic status.

*From the Brown Medical School, Providence, Rhode Island
Presented at the Post-Symposium of the Combined Meeting of
Southwest Allergy Forum and Eastern Allergy Conference, Aca-
pulco, Mexico, January 14, 2001. Supported by an educational
grant from Wallace Laboratories*

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TABLE I

Prevalence of Allergic Rhinitis

Investigator	Year	Subjects	Rate
Freeman and Johnson ³	1964	12th grade	22%
Broder <i>et al.</i> ⁴	1974	16–24 years	15%
McMenamin ⁵	1994	National survey	9%
Nathan <i>et al.</i> ⁶	1997	National survey	18%
Wright <i>et al.</i> ⁷	1994	6 years	42%
Gergen and Turkeltaub ⁸	1992	18–24 years	9%
Hagy and Settiple ⁹	1969	College freshman	21%

NONALLERGIC RHINITIS

The term nonallergic rhinitis represents a broad classification of nasal diseases without allergic causation. Because symptoms characteristic of nonallergic rhinitis are indistinguishable from those that occur in allergic rhinitis, negative or clinically irrelevant allergy skin tests are necessary to make the diagnosis.

Data regarding the prevalence of nonallergic rhinitis is of substantially lesser quantity and quality than what has been published with regard to allergic rhinitis. Additionally, the frequencies of the different conditions that comprise this disorder are not well defined. However, despite these limitations, enough data exists to allow for an estimation of the prevalence of nonallergic rhinitis.

Five studies have helped to establish the frequency of occurrence of allergic rhinitis versus nonallergic rhinitis^{12–16} (Table II). The majority of these studies have been performed in the setting of an allergy clinic. Mullarkey *et al.*¹² found that 52% of 142 patients with rhinitis seen in an allergy clinic could be classified as having nonallergic rhinitis. Enberg¹³ evaluated 152 consecutive adults with nasal symptoms and found a 30% frequency of perennial nonallergic rhinitis. However, in analyzing Enberg's data, it is apparent that this frequency would increase from 30 to 46% if the diagnostic criteria for nonallergic rhinitis had been modified to include subjects with clinically irrelevant positive skin tests. The European Community Respiratory Health Survey (ECRHS)¹⁴ reported a 25% frequency of

nonallergic rhinitis among 1412 subjects. This was surprising considering that subjects in the ECRHS had been selected for participation based on having a history which suggested allergic rhinitis. Togias¹⁵ found that 17% of 362 patients with rhinitis at an academic allergy clinic had nonallergic rhinitis. It is important to point out that the prevalence rates reported in these studies are probably skewed toward the diagnosis of allergic rhinitis. The bias is largely the result of most studies having been performed in allergy clinic settings.

Although these epidemiological data are interesting, consideration also must be given to the fact that most of these studies classify patients as having either allergic or nonallergic disease while failing to capture accurately the significant number of patients with coexisting allergic/nonallergic rhinitis—mixed rhinitis. The definition of mixed rhinitis that has been proposed is “the definite presence of allergic rhinitis in an individual who also experiences chronic rhinitis symptoms, which are not entirely explained by skin test reactivity.”¹⁷ An example of mixed rhinitis would be a patient with perennial rhinitis symptoms, aggravated by classic vasomotor rhinitis provocateurs, who also experiences worsening of rhinitis in the late summer and in whom skin testing is positive only to ragweed and negative to all relevant perennial allergens.

A recent assessment, conducted by the National Rhinitis Classification Task Force (NRCTF) sought to determine the prevalence of allergic, nonallergic, and mixed rhinitis in the allergist's practice.¹⁶ This was a retrospective analysis of 975 patients in ~15 allergy practices with the goal of determining the prevalence of pure allergic, pure nonallergic, and mixed rhinitis in the allergy practice setting (Table III). The finding was that 43% of patients were classified as pure allergic rhinitis, 23% as pure nonallergic rhinitis, and 34% as mixed rhinitis. Of all patients presenting with chronic rhinitis, 57% were classified as having nonallergic rhinitis when both pure nonallergic rhinitis and mixed rhinitis were totaled. Additionally, 44% of patients with allergic rhinitis were found to have a nonallergic rhinitis component to their disease.

TABLE II

Studies Investigating the Prevalence of Rhinitis

Investigator	n	Rhinitis Type		
		Allergic	Mixed	Nonallergic
Mullarkey <i>et al.</i> ¹²	142	48%	Not studied	52%
Enberg ¹³	152 (128)*	64%	Not studied	36%
Togias ¹⁵	362	83%	Not studied	17%
ECRHS ¹⁴	1,412	75%	Not studied	25%
NRCTF ¹⁶	975	43%	34%	23%

* Diagnosis determined in only 128 patients.

TABLE III			
NRCTF 1999 (<i>n</i> = 975) ¹⁶			
	Pure Allergic	Pure Nonallergic	Mixed
Samples (%)	43	23	34
Females (%)	53	71	62
Mean age (years)	40	43	39
Caucasians (%)	95	98	96

Of the five epidemiological studies of nonallergic rhinitis, the two most significant, because of their size, are the NRCTF and the ECRHS. The NRCTF data when combined with the ECRHS data suggest that the ratio of allergic rhinitis prevalence (both pure and mixed) to nonallergic rhinitis prevalence is 3:1. Although subject recruitment in both these studies is likely to have been biased toward allergy, this 3:1 ratio probably is relevant to the allergist's practice. This ratio can be extrapolated to determine a conservative estimate of the frequency of nonallergic rhinitis. If the assumption is made that ~20% of the U.S. population has allergic rhinitis and based on the most recent U.S. census data indicating a population of 289 million, then 58 million people in the United States suffer from allergic rhinitis. Applying the 3:1 (allergic to nonallergic) ratio, 19 million Americans suffer from nonallergic rhinitis. Furthermore, applying the 44% rate of concomitant nonallergic rhinitis, an additional 26 million (44% of 58 million with allergic rhinitis) have a nonallergic component (mixed rhinitis). Therefore, 45 million people have either pure nonallergic rhinitis or at least a nonallergic component to their rhinitis.

Three interesting demographic observations which have been made with regard to nonallergic rhinitis include age, gender, and perennial occurrence. Togias¹⁵ has observed

that 70% of patients diagnosed with nonallergic nasal disease developed their condition in adult life (age, >20 years), whereas ~70% of patients diagnosed with allergic rhinitis developed their condition in childhood (age, <20 years). However, a causal relationship between aging and nonallergic rhinitis has not been suggested by other investigators.¹⁸

Gender may be a risk factor for the development of nonallergic rhinitis. In the series of Settupane and Klein,¹⁸ 58% of the patients with nonallergic rhinitis were female. Enberg¹³ found 74% of patients with nonallergic rhinitis to be female. However, all three of these studies lacked a control group for comparison. The NRCTF found that 71% of patients with nonallergic rhinitis were female compared with 55% of patients in the allergic rhinitis group.

Sibbalt and Rink¹⁹ found that patients with nonallergic rhinitis were more likely to experience perennial rather than seasonal symptoms. They reported the following frequencies of negative skin testing: 50% in patients with perennial rhinitis, 32% in patients with combined perennial/seasonal rhinitis, and 22% in patients with purely seasonal allergic rhinitis.

Nonallergic rhinitis may be subclassified based on various characteristics. These include immunologic/cytological features²⁰ (Table IV), etiology/systemic disease association (Table V), and frequency of occurrence²¹ (Table VI). Clearly, vasomotor rhinitis is the most common form of nonallergic rhinitis. Settupane and Klein¹⁸ characterized the frequency of occurrence of various nonallergic rhinitis subtypes in 28 patients: vasomotor rhinitis was found in 61%, nonallergic rhinitis with eosinophils syndrome (NARES) was found in 33%, blood eosinophilia nonallergic rhinitis syndrome (BENARS) was found in 4%, sinusitis was found in 16%, elevated IgE was found in 12%, and hypothyroidism was found in 2% of patients. In another series of

TABLE IV		
Classification of Nonallergic Rhinitis Based on Immunologic and Nasal Cytological Features		
Perennial Nonallergic Rhinitis (Inflammatory)	Noninflammatory, Nonallergic Rhinitis	Structurally Related Rhinitis
Eosinophilic nasal disease (NARES or BENARS)	Rhinitis medicamentosa	Septal deviation, turbinate deformation, nasal valve dysfunction
Basophilic/metachromatic nasal disease	Reflex-induced rhinitis (bright light or other physical modalities)	Neoplastic and non-neoplastic tumors
Infectious	Vasomotor rhinitis, irritant rhinitis, cold air rhinitis, gustatory rhinitis	Miscellaneous (choanal atresia/stenosis, trauma, foreign body, malformation, cleft palate, adenoid hypertrophy)
Nasal polyps	Rhinitis sicca	
Atrophic rhinitis	Metabolic (estrogen related or hypothyroid)	
Immunologic nasal disease (non-IgE mediated or secondary to systemic immunologic disorders)		

TABLE V

Classification of Chronic Nonallergic Rhinitis Based on Etiology or Systemic Disease Association

Syndromes of unknown etiology
Vasomotor rhinitis
Nonallergic rhinitis with eosinophils (NARES or BENARS)
Basophilic/metachromatic nasal disease
Syndromes of suggested etiology
Chronic sinusitis
Immunodeficiencies
Ostiomeatal obstruction
Metabolic conditions
Estrogen related (oral contraceptive/hormone replacement therapy)
Hypothyroidism
Acromegaly
Vasculitides/autoimmune and granulomatous diseases
Sjogren's syndrome
Systemic lupus erythematosus
Relapsing polychondritis
Churg-Strauss syndrome
Sarcoidosis
Wegener's granulomatosis
Drug induced
Topical decongestants
Systemic medications
Rhinitis with nasal polyps
Aspirin intolerance
Chronic sinusitis
Churg-Strauss syndrome
Young's syndrome (sinopulmonary disease, azoospermia, and nasal polyps)
Cystic fibrosis
Kartagener's syndrome (bronchiectasis, chronic sinusitis, nasal polyps)
Structurally related rhinitis
Septal deviation
Turbinate deformation
Nasal valve dysfunction
Obstructive adenoid hyperplasia
Trauma (<i>e.g.</i> , cerebrospinal fluid rhinorrhea)
Congenital
Neoplastic
Atrophic rhinitis
Resulting from surgery
Ozena
Physical/chemical/irritant induced
Dry air
Gustatory
Bright light
Air pollution
Occupational
Occupational rhinitis
Annoyance
Irritant
Immunologic
Corrosive

TABLE VI

Classification of Nonallergic Rhinitis Based on Frequency of Occurrence

Common	Infrequent
Vasomotor (perennial nonallergic rhinitis)	Hypothyroidism
Chronic sinusitis	Atrophic
Structural (septum, turbinates, and valve)	Systemic immunologic disorders
NARES/BENARS	Cerebral spinal fluid rhinorrhea
Drug induced	Other structural disorders
Nasal polyps	Foreign body
Physical/chemical/irritant	Ciliary dyskinesia
Aspirin sensitivity	Nasal mastocytosis

nonallergic rhinitis patients, Enberg¹³ found that 10% had NARES.

The term vasomotor rhinitis, also referred to as perennial nonallergic rhinitis, is a designation for a subset of patients with nonallergic rhinitis in which all other etiologies have been ruled out and where there is no cytological evidence of nasal mucosal inflammation. Patients with this syndrome experience aggravation of nasal symptoms with exposure to changes in temperature; relative humidity; alcohol; strong odors such as bleach, perfume or solvents; bright lights, hot spicy foods; and irritants such as tobacco smoke, dusts, and automotive emission fumes. The symptoms are variable, consisting mainly of nasal obstruction and increased secretion. Sneezing and pruritus are less common.

SUMMARY

In summary, nonallergic rhinitis is very common. Presenting symptoms often are indistinguishable from allergic rhinitis. The epidemiological data and characterization of nonallergic rhinitis have significant relevance in regard to treatment of this disorder. Specifically, when a definitive diagnosis cannot be made, such as clinical settings where skin testing is not available, therapy should be limited to agents shown to be effective in both allergic and nonallergic rhinitis.

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