Epidemiology of Vasomotor Rhinitis

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Abstract: Vasomotor rhinitis is the most common form of nonallergic rhinitis, comprising approximately 71% of all nonallergic rhinitis conditions. Although the epidemiology of this subtype of nonallergic rhinitis has not been definitively studied, it is estimated that 14 million Americans suffer from vasomotor rhinitis, with a worldwide prevalence approaching 320 million.

Key Words: vasomotor rhinitis, epidemiology, nonallergic rhinopathy, nonallergic rhinitis

INTRODUCTION

Vasomotor rhinitis (VMR) is a subtype of nonallergic rhinitis (NAR) that is unrelated to allergy, infection, structural lesions, systemic disease, or drug abuse. Because it is, by definition, an idiopathic form of rhinitis, a diagnosis can be made only when all other forms of rhinitis have been excluded. Determination of the epidemiology of VMR is confounded by numerous challenges as shown in Table 1. The first challenge in determining the epidemiology of VMR is gaining agreement on the definition of this form of rhinopathy. As with other forms of NAR, VMR is characterized by periodic or perennial symptoms of rhinitis that are not due to IgE-dependent events.

METHODS

A literature search was performed using the following terms: vasomotor rhinitis, nonallergic rhinitis, idiopathic rhinitis, nonallergic noninfectious rhinitis, prevalence, and epidemiology. On the basis of this search and pertinent review articles, the reported prevalence rates of NAR and subtypes were compiled and the prevalence of VMR was extrapolated.

RESULTS

Relative Prevalence Rates of Allergic Rhinitis Versus Nonallergic Rhinitis

Although no studies specifically designed to examine the epidemiology of NAR or VMR have been reported, 9 epidemiologic studies report data regarding the relative prevalence of NAR in comparison to that of AR (Table 3). Seven of the 9 studies employed skin testing with variable techniques (prick, intradermal, both, or undefined) to distinguish nonallergic rhinitis from allergic rhinitis. Studies that did not discount positive skin tests unsupported by history (all except Mullarkey et al) or that employed intradermal (or undefined) skin testing are likely to have overestimated the prevalence of allergic
rhinitis and underdiagnosed VMR. Two of the studies used either history alone or ICD9 (International Classification of Diseases, Ninth Revision) data to diagnose VMR, both of which are not well-established for diagnostic purposes. Because none of the studies assessed for the presence of local (nasal) IgE production, known as entopy, VMR may have been overdiagnosed in some cases.

Despite the fact that some of these studies were performed in allergy outpatient settings, which would be anticipated to skew the reported prevalence rates toward the diagnosis of AR, the findings are fairly consistent and independent of the setting performed. These 9 studies, when added in total, are heavily influenced by the enormity of the data from Schatz et al, but when analyzed independently of the Schatz data, they reveal a relative prevalence rate of 76% allergic and 24% nonallergic—closely approximating a 3:1 ratio.

### Relative Prevalence Rates of NAR Subtypes

Three studies were identified that attempted to systematically subtype NAR by performing testing that included, at a minimum, nasal examination, skin testing for sensitivity to specific aeroallergens, total IgE, nasal cytology, and sinus x-rays (Table 4). Each of these 3 studies has significant limitations. Symptoms were poorly characterized, irritant triggers were not captured, skin test techniques were variably defined, sinus imaging was limited to sinus x-rays (known to have limited value), and nasal examination data were not presented. However, each of these studies did include examination of nasal cytology (albeit with variable methodologies) in an attempt to screen out NARES or eosinophilic rhinosinusitis.

The data from these 3 studies, when combined, total 200 NAR subjects. VMR was identified as the most common subtype, making up 71% of NAR diagnoses, with nonallergic rhinitis with eosinophilia syndrome (NARES) making up the majority of the remaining diagnoses (Table 5). The defini-

### TABLE 1. Challenges in Determining the Prevalence of Vasomotor Rhinitis

| Challenge                                                                                      |
|-----------------------------------------------------------------------------------------------|
| Agreement on VMR definition                                                                   |
| Requirement to rule out all other forms of rhinitis                                           |
| Requirement to rule out chronic rhinosinusitis                                                |
| Skin testing or determination of serum-specific IgE is required                              |
| Local IgE production without systemic detection may be present (entopy)                       |
| Sinus imaging is rarely assessed in large epidemiologic studies                               |
| Nasal cytology is rarely assessed in large epidemiologic studies                              |

### TABLE 2. Diagnostic Tests to Exclude Other Forms of Rhinitis

| Test                                      | Mullarkey et al6 | Enberg7 | Settipane and Klein16 |
|-------------------------------------------|------------------|---------|-----------------------|
| CT imaging of the paranasal sinuses       |                  |         |                       |
| Assays for specific IgE sensitivity       |                  |         |                       |
| (a) Skin testing                          |                  |         |                       |
| (b) Serum testing                         |                  |         |                       |
| (c) Local (nasal) testing (entopy)        |                  |         |                       |
| Nasal cytology                            |                  |         |                       |
| Intranasal allergen challenge             |                  |         |                       |
| Ingestion challenge (gustatory rhinitis)   |                  |         |                       |
| Thyroid function testing                  |                  |         |                       |

### TABLE 3. Relative Rhinitis Prevalence by Author: Allergic Versus Nonallergic

| Author          | Year | N   | AR% | NAR% | NAR Defined                                      |
|-----------------|------|-----|-----|------|--------------------------------------------------|
| Mullarkey et al6| 1980 | 142 | 48  | 52   | No history of allergen exacerbation. Negative skin tests or <2 PSTs unsupported by history and an IgE level <50 U/mL. |
| Enberg7         | 1989 | 128 | 64  | 36   | Negative SPTs and IDs to 36 allergens             |
| Togias8         | 1990 | 362 | 83  | 17   | Negative skin tests                              |
| Leynaert et al10| 1999 | 1142| 75  | 25   | Negative SPTs to 9 allergens                     |
| Settipane et al9| 2001 | 975 | 77* | 23   | Negative skin tests                              |
| Mercer et al12  | 2002 | 278 | 78  | 22   | Negative SPTs to 20 allergens                    |
| Bachert et al13 | 2006 | 743 | 75  | 24   | History only                                     |
| Mølgaard et al14| 2007 | 1186| 77  | 23   | Negative SPTs to 10 allergens                    |
| Schatz et al14  | 2008 | 47,594| 71 | 29   | ICD9 Classification                              |
| Total           |      | 52,850 | 71 | 29   |                                                   |

*Including 34% mixed.
†Subtotal without Schatz et al: 76% AR; 24% NAR.

Abbreviations: SPT, skin prick test; ID, intradermal; PST, positive skin test; ICD9, International Classification of Diseases, Ninth Revision.
Further Characterization of VMR

VMR is often described as being characterized by nonallergic symptom triggers, including weather (changes in temperature or relative humidity), alcohol, tobacco smoke, dusts, automotive emission fumes, nonspecific irritant stimuli such as chlorine, and odors such as bleach, perfume, or solvents. Unfortunately, no epidemiologic data exist to further categorize VMR based on trigger type. Sex and age demographic data specific to VMR is limited, but can be extrapolated from NAR data, suggesting a female predominance and an older population for NAR than for AR.4–6,8,14

However, the trend toward female predominance remains unproven; it is possible that a study selection bias may have resulted if, as suspected, more females than males entered studies because of an increased likelihood to seek rhinitis care.

CONCLUSIONS

Data regarding the prevalence of rhinitis, regardless of the type, are difficult to interpret. Contributing to this challenge is the observation that most population surveys have flawed designs.1 Because skin testing or determination of serum-specific IgE is infrequently assessed in large epidemiologic studies, allergic causation is often not accurately differentiated from nonallergic causation. However, on the basis of the data that has been reported, it is clear that VMR is, by far, the most common subtype of NAR with a significant burden of illness in the United States and worldwide.

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