

Prevalence and clinical relevance of local allergic rhinitis

C. Rondón¹, P. Campo¹, L. Galindo², N. Blanca-López³, M. S. Cassinello¹, J. L. Rodríguez-Bada², M. J. Torres¹ & M. Blanca¹

¹Allergy Service, Carlos Haya Hospital; ² Research Laboratory, Carlos Haya Hospital-Fundacion IMABIS; ³Allergy Service, Infanta Leonor Hospital, Malaga, Spain

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Correspondence

Carmen Rondón, Laboratorio de Investigación, Hospital Civil, pabellón 5, sótano, Plaza del Hospital Civil, 29009 Malaga, Spain.
Tel.: +34 951290313
Fax: +34 951290302
E-mail: carmenrs61@gmail.com

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Abstract

Background: Evidence demonstrates the existence of local allergic rhinitis (LAR) in nonatopic patients, although its prevalence in the rhinitis population remains unknown. The aim, therefore, of this study was to evaluate the prevalence, clinical characteristics, and severity of LAR in a Spanish rhinitis population, compared with patients having classical allergic rhinitis (AR) with systemic atopy or nonallergic rhinitis (NAR).

Methods: A group of 452 adult rhinitis patients were randomly selected from a total of 3860 who attended our allergy service over 1 year. A clinical questionnaire, skin prick test (SPT), spirometry, and serum total and specific IgE (sIgE) were evaluated. A nasal allergen provocation test with multiple aeroallergens (NAPT-M), including *Dermatophagoides pteronyssinus*, pollens, *alternaria*, and dog epithelia, was performed in patients with negative SPT and serum sIgE.

Results: A total of 428 patients completed the study; 24 were excluded because of nasal hyper-reactivity. LAR was diagnosed in 25.7%, AR in 63.1%, and NAR in 11.2%. The LAR and AR patients had a similar clinical profile: a nonsmoking woman with severe, persistent perennial rhinitis frequently associated with conjunctivitis and asthma. More than 36% of LAR patients reported rhinitis onset in childhood. NAPT-M detected aeroallergen polysensitization in 37.3% of the LAR patients. *Dermatophagoides pteronyssinus* was the main sensitizing aeroallergen in LAR and AR (60% vs 54%, $P > 0.05$).

Conclusions: Local allergic rhinitis is a prevalent entity in patients evaluated with rhinitis. Persistent and severe symptoms associated with conjunctivitis and/or asthma and polysensitization were likely to be detected in LAR and AR.

Rhinitis has been classified as allergic or nonallergic based on the clinical history, skin prick tests (SPT), and serum-specific IgE (sIgE) to aeroallergens (1). However, 47%–62.5% of

patients previously diagnosed with nonallergic rhinitis (NAR) or idiopathic rhinitis actually have local allergic rhinitis (LAR) or entopy (2–8).

Local allergic rhinitis (LAR) is characterized by local production of sIgE (3, 5–9), a nasal cellular Th2 immune response during natural exposure to aeroallergens (3–5, 10, 11), and a positive response to nasal allergen provocation test (NAPT) (2, 4–6), with local increased levels of sIgE, tryptase, and eosinophil cationic protein (7, 8).

Although research has focused on the pathophysiology of LAR, its clinical relevance still needs to be evaluated. Our aim was to determine the prevalence, clinical characteristics, severity, and comorbidities of LAR in rhinitis patients and compare them with allergic rhinitis (AR) and NAR patients.

Abbreviations

AA *Alternaria alternata*; AR Allergic rhinitis; ARIA Allergic Rhinitis and its Impact on Asthma; DP *Dermatophagoides pteronyssinus*; FHA Family history of atopy; FEV1 Forced expiratory volume in the first second; IDST Intradermal skin test; LAR Local allergic rhinitis; NAPT Nasal allergen provocation test; NAPT-M Nasal allergen provocation test with multiple aeroallergens; NAR Nonallergic rhinitis; OE *Olea europea*; SD Standard deviation; sIgE Specific IgE; SPT Skin prick test; VAS Visual analogue scale; VOL 2–6 cm Volume of the nasal cavity from 2 to 6 cm.

Methods

Study population

For a population of 3860 adult rhinitis patients, with an estimated prevalence of 50% and 5% precision, the sample size required was 350. Our sample comprised 428 patients, randomly selected from a population evaluated for the first time for rhinitis in our service over 1 year (May 2010–June 2011) using simple random sampling with a computer-generated list.

Study design

A cross-sectional observational study was undertaken to determine the prevalence, clinical characteristics, severity, and comorbidities of LAR from a rhinitis population.

Exclusion criteria: Pregnancy or lactation, immunological diseases, chronic rhinosinusitis and/or nasal polyposis (European position paper on rhinosinusitis and nasal polyps epidemiologic criteria (12) and positive CT scan), or respiratory infections in the previous 4 weeks. The patients were instructed to avoid systemic corticosteroids (3 months), antihistamines (2 weeks), intranasal corticosteroids (4 weeks), and vasoconstrictors (1 week).

A clinical questionnaire, SPT, intradermal skin test (IDST), spirometry, serum total IgE and sIgE were evaluated in all patients. An NAPT with multiple aeroallergens (NAPT-M) was performed in patients with negative SPT and sIgE.

The local ethics committee approved the study, and all participants and parents of patients below 16 years old gave informed consent.

Demographic and clinical data

Data were obtained from the medical history and clinical questionnaires. Rhinitis patients were classified into three groups:

1. LAR: positive NAPT-M and negative SPT, IDST, and serum sIgE to aeroallergens.
2. AR: positive SPT and/or serum sIgE to aeroallergens.
3. NAR: negative SPT, IDST, serum sIgE to aeroallergens, and NAPT-M.

Persistence of symptoms

Following the Allergic Rhinitis and its Impact on Asthma (ARIA) guidelines (1), rhinitis was classified as 'intermittent' (symptoms present <4 days/week or for <4 consecutive weeks) or 'persistent' (symptoms present >4 days/week or for >4 consecutive weeks).

Rhinitis severity

According to the modified ARIA severity classification (13), the number of impaired items (sleep, daily activities/sport/leisure, work/school performance, and troublesome symptoms) was used to grade the rhinitis as 'mild' (no affected item), 'moderate' (one to three affected items), or 'severe' (four affected items).

Visual analogue scale

The severity of ocular and nasal symptoms, including obstruction, rhinorrhea (watery, mucous, and purulent), itching, and sneezing was recorded by visual analogue scale (VAS) of 10 cm. Intermittent hyposmia was defined as a reduction in smell <4 consecutive weeks. Each symptom was categorized as 'mild' (VAS: 0–3 cm), 'moderate' (VAS: >3–7 cm), or 'severe' (VAS > 7 cm).

Skin testing

SPTs were performed with a panel of the most prevalent aeroallergens, including *Dermatophagoides pteronyssinus* (DP), *Dermatophagoides farinae*, *Poa*, *Phleum*, *Lolium*, *Cupressus*, *Platanus*, *Olea europea* (OE), *Chenopodium*, *Artemisia*, *Parietaria*, *Salsola kali*, *Alternaria alternata* (AA), *Aspergillus*, *Cladosporium*, *Penicillium*, dog and cat epithelia, and hamster (ALK-Abelló, Madrid, Spain) (14, 15).

Intradermal skin test was performed with freshly reconstituted freeze-dried allergen with DP (0.4 µg/ml), AA (0.25 µg/ml), OE (0.6 µg/ml), grass pollen (0.1 µg/ml), cat (10 B.U./ml), and dog epithelia (10 B.U./ml) (ALK-Abelló), as described (14) for patients with negative SPT and serum sIgE.

Serum total and specific IgE measurement

Serum total and sIgE to the same aeroallergens in the SPT panel were determined by fluoroenzyme immunoassay (UNICAP; Pharmacia Diagnostics, Uppsala, Sweden). The positive cutoff value of the sIgE was ≥ 0.35 kU/l.

Lung function tests

Flow-volume spirometry was performed with a Spirobank spirometer (Medical International Research, Rome, Italy) (16). The decrease in FEV1, expressed as a percentage of the predicted value, was evaluated.

Nasal allergen provocation test

In patients with negative SPT, IDST, and serum sIgE, and in a group of 25 nonatopic healthy controls, the NAPT-M diagnostic protocol was performed as described (17) with the four most common and prevalent aeroallergens in our area (DP, AA, grass, and OE pollen), administered consecutively. A bilateral NAPT-M was performed during symptom-free (total VAS = 0 cm) or mild-symptom periods (total VAS < 3 cm). In patients with exposure to cat or dog epithelia, an extended NAPT-M including these was also performed.

The concentration of allergens was as follows: DP (4 µg/ml), AA (0.25 µg/ml), OE (0.6 µg/ml), grass pollen (0.1 µg/ml), dog (10 B.U./ml), and cat epithelia (10 B.U./ml) (ALK-Abelló). The response was evaluated at baseline, 15 min after saline, 15 min after each aeroallergen, and 1–2 to 24 h after the last aeroallergen by VAS and VOL 2–6 cm (acoustic rhinometry). An increase of $\geq 30\%$ in the total VAS plus a decrease of $\geq 30\%$ in the VOL 2–6 cm was considered a

positive response (4, 5). A positive response to the last allergen identified the patients as monosensitive to this allergen. However, a positive response after the 1st, 2nd, or 3rd allergens was followed, 7 days later, by a NAPT-M with the other aero-allergens, to identify monosensitization/polysensitization (17).

Nasal-ocular symptoms

Nasal obstruction, rhinorrhea, itching, sneezing, and ocular symptoms were recorded by VAS of 10 cm. Total VAS was the sum of the five symptom scores (range 0–50 cm).

Acoustic rhinometry

Nasal patency was assessed by acoustic rhinometry (SRE 2000 rhinometer; Rhinometrics, Lynge, Denmark) following the guidelines of the Standardization Committee on Acoustic Rhinometry (18). The parameter used was VOL 2–6 cm.

Statistical analysis

SPSS 15.0 (SPSS Inc., Chicago, IL, USA) was used for analysis. Continuous data were expressed as the mean and standard deviation (SD) and categorical data as percentages. The clinical and demographic data were compared between groups by chi-square analysis and ANOVA. All *P*-values resulted from the use of two-sided statistical tests. *P*-values <0.05 were considered significant.

Results

Study groups

Of 3860 rhinitis patients aged 14–68 years who attended our service over 1 year, a random sample of 480 were asked to participate, with 452 accepting (94.2%). Of these, 428 (94.7%) completed the study. The remaining subjects were excluded because of nasal hyper-reactivity. Of the 428, 25.7% had LAR, 63.1% AR, and 11.2% NAR. The mean age of the 267 women (62.4%) and 161 men (37.2%) was 29.9 years (SD 12.8 years, range 14–68 years). NAPT-M was negative in all control subjects.

Table 1 shows the epidemiologic and demographic data. The majority of LAR patients were nonsmoking women aged <30 years, with no family history of atopy (FHA), and city dwellers. A higher association between female gender (OR = 6.83; 95% CI, 2.86–16.31, *P* = 0.001) and FHA (OR = 3.35; 95% CI, 1.34–8.40, *P* = 0.010) was found in LAR compared with NAR and also between female gender in LAR compared with AR (OR = 2.62; 95% CI, 1.57–4.37, *P* = 0.001). NAR patients were significantly older than LAR or AR (*P* = 0.001); in these two groups, the prevalence of allergy decreased with age (Fig. 1). No significant differences were observed in city dwelling.

Persistence and seasonality of symptoms

The majority of subjects suffered from persistent and perennial rhinitis with severe or moderate symptoms. LAR

Table 1 Epidemiologic and demographic data

	LAR <i>N</i> = 110	AR <i>N</i> = 270	NAR <i>N</i> = 48
Subjects (%)	25.70	63.10	11.25
Age (y)	29.51 ^a ± 12.47	27.82 ^b ± 11.21	41.83 ± 15.19
Women, <i>N</i> (%)	86 (78.2) ^c	156 (57.8)	25 (52.1)
Men, <i>N</i> (%)	24 (21.8)	114 (42.2)	23 (47.9)
FHA, <i>N</i> (%)	49 (44.5)	101 (37.4)	10 (20.8)
Dwelling, <i>N</i> (%)			
City	70 (63.6)	176 (65.2)	30 (62.5)
Country	40 (36.4)	94 (34.8)	18 (37.5)
Smoking habit, <i>N</i> (%)			
Current smoker	7 (6.4)	19 (7.0)	4 (8.3)
Ex-smoker	14 (12.7)	28 (10.4)	4 (8.3)
Nonsmoker	89 (81.0)	223 (82.6)	40 (83.3)

Continuous variables are expressed as mean ± SD.

AR, allergic rhinitis with systemic atopy; FHA, family history of atopy; LAR, local allergic rhinitis; *N*, number of subjects; NAR, non-allergic rhinitis; SD, standard deviation.

^aStatistically significant difference between LAR and NAR (*P* = 0.001).

^bStatistically significant difference between AR and NAR (*P* = 0.001).

^cStatistically significant difference between LAR and AR (*P* = 0.001).

patients showed persistent (OR = 4.13; 95% CI, 2.05–8.34) and perennial symptoms (OR = 1.63; 95% CI, 1.01–2.62) more frequently than AR. No significant differences were detected in persistence or seasonality of symptoms between LAR and NAR groups, although LAR patients reported severe symptoms more frequently than NAR (OR = 2.71; 95% CI, 1.32–5.54). Over 55% of LAR and AR patients had severe symptoms, with no significant differences (Table 2).

Triggering factors, smoking status, and comorbidities

The LAR patients identified the presence of triggering factors more frequently than AR or NAR (*P* = 0.001). House dust was the main triggering factor reported in LAR (47.3%) and AR (38.1%) and irritant odors in NAR (45.8%). The majority of the LAR

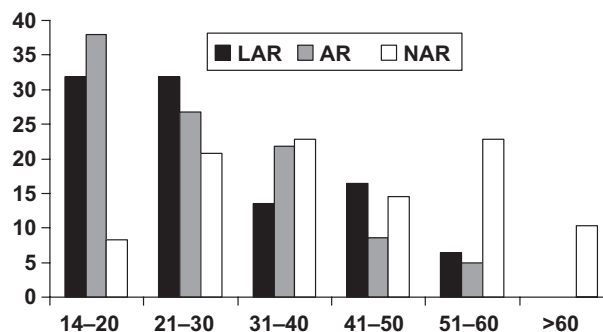


Figure 1 Frequency distribution of age at diagnosis (in years).

Table 2 Clinical evaluation

	LAR N = 110	AR N = 270	NAR N = 48	LAR vs AR P-value	LAR vs NAR P-value
Class of rhinitis, N (%)					
Persistent	100 (90.9)	191 (70.7)	41 (85.4)	<0.001	0.306
Intermittent	10 (9.1)	79 (29.3)	7 (14.6)	-	-
Perennial	78 (70.9)	162 (60.0)	37 (77.1)	0.046	0.423
Seasonal	32 (29.1)	108 (40.0)	11 (22.9)	-	-
Mild	5 (4.5)	28 (10.6)	4 (8.7)	-	-
Moderate	40 (36.4)	89 (33.6)	26 (56.5)	-	-
Severe	65 (59.1)	148 (55.8)	16 (34.8)	0.564	0.006
Triggering factors, N (%)					
House dust	83 (75.5)	147 (54.4)	26 (54.2)	<0.001	0.011
Pollen exposure	52 (47.3)	103 (38.1)	9 (18.8)	0.106	0.001
Animal dander	25 (22.7)	64 (23.7)	1 (2.1)	0.824	0.001
Humidity	15 (13.6)	28 (10.4)	3 (6.3)	0.362	0.021
Irritant	15 (13.6)	20 (7.5)	6 (12.5)	0.062	0.847
Temperature changes	21 (19.1)	31 (11.5)	22 (45.8)	0.052	0.001
Air conditioning	17 (15.7)	36 (13.6)	8 (16.7)	0.588	0.023
	17 (15.7)	38 (14.1)	14 (29.2)	0.729	0.052
Comorbidities, N (%)					
Asthma	34 (30.9)	104 (38.5)	9 (18.8)	0.958	0.056
Atopic dermatitis	9 (8.2)	29 (10.7)	0 (0.0)	0.451	0.058
Conjunctivitis	71 (64.5)	167 (61.9)	24 (50.0)	0.623	0.086
Urticaria-AE	4 (3.6)	7 (2.6)	3 (6.3)	0.582	0.435
NSAID Hyp.	8 (7.3)	20 (7.4)	4 (8.3)	1.000	0.753
Lung function test*					
FEV1%	91.3 ± 8.6	98.1 ± 10.2	93.3 ± 7.5	0.025	1.000

-, Not performed; AE, angioedema; AR, allergic rhinitis with systemic atopy; LAR, local allergic rhinitis; N, number of subjects; NAR, non-allergic rhinitis; NSAID Hyp, nonsteroidal anti-inflammatory drug hypersensitivity; SD, standard deviation.

*Data are expressed as mean ± SD.

were nonsmokers (81%). This group had the lowest mean FEV1% value. The difference was significant compared with AR subjects ($P = 0.025$), but not with NAR. Conjunctivitis, present in 65%, was the most frequent comorbidity reported by LAR patients. Similar data were observed in the AR group. The lowest association with asthma was detected in NAR (18%), but with no significant differences ($P = 0.058$) (Table 2).

Frequency and severity of individual symptoms

The majority of rhinitis patients had moderate–severe nasal symptoms (Table 3). The most frequent in the LAR group were nasal itching (85.5%) and rhinorrhea (85.5%), and the most severe was watery rhinorrhea. Intermittent hyposmia was present in $\geq 30\%$ of the patients in all three groups. LAR and AR subjects had a similar pattern of nasal symptoms in frequency and severity. However, significant differences were detected between LAR and NAR. Patients with NAR more frequently reported mucous rhinorrhea ($P < 0.001$), nasal obstruction ($P = 0.001$), and more severe nasal obstruction ($P = 0.021$) than the LAR group.

Disease evolution

LAR patients had a mean onset age of 21 years and a mean disease duration of 8.6 years. Over 36% of the LAR patients

reported an onset of their nasal symptoms in childhood (age ≤ 14 years old), and 56.4% reported worsening of the disease in the last 2 years (Table 4). LAR patients presented an earlier onset of nasal symptoms (OR = 6.0; 95% CI, 2.00–17.97; $P = 0.001$), a longer disease duration ($P = 0.045$), and a worse evolution ($P = 0.009$) than NAR subjects. No significant differences were found between LAR and AR (Table 4).

In the three groups, the mean duration of the main comorbidities showed that ocular symptoms had been present for longer than bronchial symptoms.

Disease evolution showed that most patients started with nasal or nasal–bronchial symptoms at the same time and that 22.2% started with just lower airway respiratory symptoms. No significant differences were found between groups.

Aeroallergen sensitization

Table 5 shows the results. A total of 148 aeroallergen sensitizations were identified in the 110 LAR patients by NAPT-M with a panel of four allergens (grass, OE, DP, and AA), and dog epithelia in 14 who reported allergen exposure.

Dermatophagoides pteronyssinus was the main sensitizing aeroallergen, in both LAR (60%) and AR (54%), with no significant differences. Sensitization to AA was significantly more frequent in LAR than AR (OR = 2.60; 95% CI, 1.33–5.09). Sensitization to grass (OR = 0.52; 95% CI, 0.33–0.83),

Table 3 Frequency and severity of nasal symptoms

Symptom	LAR N = 110	AR N = 270	NAR N = 48	LAR vs NAR P-value
Itching				
N (%)	94 (85.5)	243 (90.0)	34 (70.8)	0.031
VAS mean (SD)	6.25 (3.14)	6.14 (3.15)	5.32 (3.02)	0.008
Sneezing				
N (%)	88 (80.0)	230 (85.2)	34 (70.8)	0.206
VAS mean (SD)	6.84 (3.21)	6.90 (3.82)	6.20 (3.33)	0.084
Rhinorrhea				
N (%)	94 (85.5)	216 (80.0)	38 (79.2)	0.327
VAS mean (SD)	7.07 (3.11)	7.12 (3.08)	6.94 (3.21)	0.721
Watery rhinorrhea				
N (%)	79 (71.8)	171 (63.3)	29 (60.4)	0.156
VAS mean (SD)	7.11 (3.24)	7.26 (3.18)	4.87 (3.38)	0.001
Mucous rhinorrhea				
N (%)	24 (21.8)	81 (30.0)	34 (70.8)	0.001
VAS mean (SD)	6.26 (3.31)	6.34 (3.19)	6.24 (3.26)	0.734
Nasal congestion				
N (%)	66 (60.0)	149 (55.2)	43 (89.6)	0.001
VAS mean (SD)	7.03 (3.27)	6.92 (3.26)	7.86 (2.91)	0.021
Hyposmia				
N (%)	44 (40.0)	81 (30.0)	20 (41.7)	0.844
VAS mean (SD)	5.05 (3.87)	4.89 (3.78)	4.72 (3.76)	0.452

AR, allergic rhinitis with systemic atopy; LAR, local allergic rhinitis; N, number of subjects; NAR, nonallergic rhinitis; NSAID Hyp, non-steroidal anti-inflammatory drug hypersensitivity; SD, standard deviation; VAS, visual analogue scale.

Table 4 Disease evolution in time and in intensity of symptoms

	LAR N = 110	AR N = 270	NAR N = 48
Onset	20.93 ± 12.96	17.99 ± 10.00	36.20 ^{a,b} ± 15.10
rhinitis (y)			
Rhinitis	8.57 ± 6.98	10.02 ± 9.10	5.89 ^{b,c} ± 6.01
duration (y)			
Conjunct.	5.71 ± 6.14	5.87 ± 7.07	3.58 ± 6.80
duration (y)			
Asthma	2.35 ± 4.71	3.86 ± 7.20	0.98 ± 2.57
duration (y)			
Evolution, N (%)			
Improvement	12 (10.9)	54 (20.0)	5 (10.4)
No changes	36 (32.7)	95 (35.2)	26 (54.2)
Worsening	62 (56.4)	121 (44.8)	17 (35.4)

Conjunct., conjunctivitis; AR, allergic rhinitis with systemic atopy; LAR, local allergic rhinitis; N, number of subjects; NAR, nonallergic rhinitis; y, years.

^aStatistically significant difference between LAR and NAR ($P = 0.001$).

^bstatistically significant difference between AR and NAR ($P = 0.001$).

^cstatistically significant difference between LAR and NAR ($P = 0.045$).

Table 5 Sensitizing aeroallergens in patients with local allergic rhinitis (LAR) and allergic rhinitis (AR)

	LAR N = 110	AR N = 270	LAR vs AR P-value
Aeroallergen sensitization	142	854	
Pollens	54 (49.1)	200 (70.1)	-
Grasses	41 (37.3)	144 (53.3)	0.005
<i>Olea europea</i>	24 (21.8)	94 (34.8)	0.010
Other	-	118 (43.7)	-
House dust mites	66 (60)	145 (53.7)	-
<i>Dermatophagoides pteronyssinus</i>	66 (60)	143 (53.0)	0.278
Other	-	140 (51.9)	-
Molds	19 (17.3)	20 (7.4)	-
<i>Alternaria alternata</i>	19 (17.3)	20 (7.4)	0.004
Other	NA	16 (5.9)	-
Animal dander	3 (2.7)	84 (31.3)	-
Dog dander	3 (2.7)	49 (18.1)	0.001
Other	-	38 (14.1)	-

-, not performed.

olea (OR = 0.51; 95% CI, 0.30–0.86), and dog epithelia (OR = 0.13; 95% CI, 0.04–0.42) were significantly lower in LAR.

Monosensitization was the predominant pattern in LAR (62.7%) and polysensitization in AR (82.9%) (OR = 0.13, 95% CI, 0.08–0.22, $P = 0.001$).

Discussion

This study represents the first attempt to evaluate the prevalence and clinical phenotype of LAR in comparison with AR and NAR in a population suffering from nasal symptoms. A random sample of 428 new adult rhinitis patients who attended our allergy service over a 1-year period was studied. The prevalence of LAR was 25.7%, AR 63.1%, and NAR 11.2%. As the main objective was the evaluation of LAR prevalence in rhinitis patients, it is important to mention that ours is the only service in our reference population area, and primary care physicians refer adult rhinitis subjects directly to us for evaluation independently of the etiology or severity. This situation and the fact that the AR prevalence obtained in this study is in concordance with previous epidemiological data (19) indicate that the prevalence figures obtained reflect the real prevalence of LAR in our area. However, this situation may differ in other countries where mainly just severe or uncontrolled rhinitis cases are sent to allergologists or ENT specialists. This may be a major explanation for the variability observed in the detection of LAR in different countries.

The LAR and AR patients shared a similar demographic and clinical profile. The majority were <30-year-old, nonsmoking women, with no FHA, and severe or moderate persistent and perennial rhinitis. However, significantly higher associations with young people (<30 years old), women, and FHA were observed in LAR compared with AR and NAR. The reason for this is unknown. Nasal itching

and watery rhinorrhea were the most frequent symptoms, with house dust the most frequent triggering factor and conjunctivitis the main comorbidity detected in both groups.

The retrospective data on LAR evolution detected a mean onset age of 21 years and a predominance of worsening in the last 2 years. As in previous studies (20–22), rhinitis followed by rhinitis plus asthma were the most frequent forms of respiratory disease onset in the three study groups. All these data demonstrate that LAR is a common allergic respiratory disease in young people, possibly affecting one in each four rhinitis patients, with similar persistence, severity, and patterns of nasal symptoms, as well as comorbidities and disease evolution to AR. One of the most important findings was the rhinitis onset in childhood in over 36% of the LAR patients, as occurred in AR. These results indicate that LAR may initiate in childhood, although this preliminary observation needs prospective evaluation.

This study also provides new insights into the phenotypic characterization of NAR, after the definition of LAR (2–8). The demographic and clinical profile of NAR patients in our study was a nonsmoker, mean age >40 years, living in the city, no FHA, and identifying an irritant as the most frequent triggering factor of their symptoms. The majority suffered from persistent and perennial moderate symptoms, mainly mucous rhinorrhea and nasal obstruction, commonly associated with conjunctivitis. Other differences with LAR were that the NAR patients presented significantly lower associations with female sex and asthma and a better evolution over the last 2 years. Epidemiologic studies (21, 23, 24) performed before differentiating between LAR and NAR showed a higher presence of NAR in women, at a younger age, and with a higher association with asthmatic symptoms than in our study. Although the interpretation of our results is limited by the size of the NAR group (48 patients), the data suggest that larger epidemiologic studies are needed to

characterize the clinical phenotype of NAR better. In this study, the overall prevalence of allergic rhinitis among a population of rhinitis patients was 88.8% (25.7% LAR and 63.1% AR). The use of NAPT-M, a diagnostic test with a good correlation with NAPT with single aeroallergen, high sensitivity, specificity, and reproducibility (17), was very important for the diagnosis of LAR. In our study, DP was the most frequent sensitizing allergen in LAR and AR patients. Although we observed a different pattern of sensitization in LAR and AR, with a predominance of monosensitization in LAR and polysensitization in AR, further studies with NAPT-M using a broad panel of aeroallergens are required.

In summary, our study shows that LAR is a prevalent entity in young people, affecting one in four of the rhinitis patients evaluated, with a similar clinical phenotype to AR, frequently associated with conjunctivitis and asthma, and with a common onset of nasal symptoms in childhood. *Der-matophagoides pteronyssinus* was the most prevalent sensitizing aeroallergen in LAR and AR patients.

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Conflict of interest

All authors declare no conflict of interest.

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