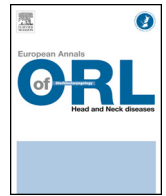Available online at
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Original article

Symptoms of allergic rhinitis in Parakou, Benin: Prevalence, severity and associated factors

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A R T I C L E   I N F O

A B S T R A C T

Aims: Allergic rhinitis (AR) is an extremely common disease. This study aimed to determine the prevalence and severity of AR symptoms and potential associated factors, in Parakou, a city in Benin.

Materials and methods: A cross-sectional study was conducted between April and July 2016, involving inhabitants of the city aged between 6 and 65 years. Cluster sampling was carried out. AR symptoms were defined as the simultaneous presence of rhinorrhea, nasal obstruction and sneezing without evidence of respiratory infection. Data were analyzed on EpiData Analysis v2.2.2.183 and then on R.3.2.1.

Results: Three hundred and ninety-five inhabitants were questioned, with a male/female ratio of 1.32, and median age of 19 years. One hundred and forty-one (35.7%) had AR symptoms, 47 (33.3%) had family history of atopy, and 87 (61.7%) had allergic conjunctivitis. The main triggers were house dust (139; 98.5%) and air pollution (111; 78.7%). On multivariate analysis, associated factors were age < 18 years ($P < 0.05$), exposure to house dust ($P < 0.001$), and personal history of urticaria ($P < 0.001$) or allergic conjunctivitis ($P < 0.01$). Twenty-eight subjects (19.9%) had persistent symptoms. Forty-three (30.5%) had moderate/severe symptoms, associated with age ≥ 18 years ($P < 0.01$), family history of atopy ($P < 0.01$), personal history of atopic eczema/dermatitis ($P < 0.01$), and presence of a dog or cat at home ($P = 0.01$).

Conclusion: The prevalence of AR symptoms in Parakou was high. A non-negligible proportion of symptoms were severe. This disease merits special attention in the city.

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1. Introduction

Allergic rhinitis (AR) is defined by the World Allergy Organization as the group of nasal symptoms resulting from an IgE-mediated immune reaction to allergen exposure. The main symptoms are rhinorrhea, nasal pruritus, nasal obstruction and sneezing fits, reversible spontaneously or under treatment [1]. It is the most frequent allergic manifestation, and is a public health issue. According to the World Health Organization, AR affects 10–30% of the general adult population and 40% of children [2]. More worryingly, prevalence is growing in most countries, as witnessed by the progression between phases I and III of the International Study of Asthma and Allergies in Childhood (ISAAC Study), in a mere 7 years on average [3].

AR can be a severe disease in that it induces psychological disorders such as fatigability, irritability, depression, sleep disorder and sexual impairment, progressively isolating the patient socially and diminishing quality of life. The other non-negligible impact is economic, with both direct and indirect costs [2,4,5]. AR is a burden not only to the patient, but to the family and to society as a whole [4,5].

AR blights every part of the world, including sub-Saharan Africa, already ravaged by transmissible diseases [6]. Previous studies in Africa reported very varying prevalences: e.g., 11.4% in Yaoundé (Cameroon) and 29.6% in Ilorin (Nigeria) [7,8].

In Benin, in West Africa, there are no official data on AR. The aim of the present study was to assess AR symptoms in the city of Parakou. Objectives comprised:

- to determine the prevalence of AR symptoms in the population of Parakou;
- to identify associated factors;
- to classify patients according to symptom duration and severity;
- and to identify factors associated with severity.

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2. Materials and method

2.1. Study type and duration

A cross-sectional study was conducted from April to July 2016.

2.2. Study context [9,10]

The study was performed in Parakou, the third largest city in Benin, in the north-central region, with an area of 441 km², and a population of 255,478. Parakou is a crossroads between Niger, Burkina-Faso and Mali inland, northern Nigeria to the east and northern Togo to the west. The climate is tropical, humid (south Soudan climate), with variations according to latitude, altitude and season. The humid southwest oceanic monsoon lasts from April to November, and the continental Harmattan, a dry wind, comes down from the northern Sahel between November and February, bringing orange ochre dust with it.

In health centers and hospitals, allergy treatment is basically clinical. Prick tests are not routinely used.

2.3. Study population

The study population was the inhabitants of Parakou.

2.3.1. Inclusion criteria
Inclusion criteria comprised:

- age 6 to 65 years
- and consent to participate (by parent or guardian for 6–18-year olds).

2.3.2. Sampling
2.3.2.1. Sample size. Sample size was calculated on Schwartz's formula $n = \frac{kZ_\alpha^2 p(1-p)}{i^2}$ (Schwartz D., *Méthodes statistiques à l'usage des médecins et biologistes*, ed. Flammarion Médecins Sciences, 1969), where n = sample size, p = 13.9% (prevalence reported in a similar study performed in D.R. Congo [11]), Z_α = 1.96, cluster effect k = 2, and precision i = 5%. The minimum sample size was thus 370, and a size of 395 was adopted to allow for 10% non-response.

2.3.2.2. Sampling technique. Thirty of the city's 41 administrative neighborhoods or villages were selected by clustering. Within each, the direction was chosen by an investigator standing in the center and throwing a pen in the air; in each direction, every second house was visited an in each house, every second subject was interviewed.

2.4. Data collection

Structured individual interviews were conducted to collect data on: sociodemographic characteristics; lifestyle; personal and/or familial history of bronchial asthma, allergic conjunctivitis, eczema or atopic dermatitis; otorhinolaryngologic symptoms; triggering factors according to the patient; main period of onset in the year; duration; and impact on everyday and occupational life. Subjects showing AR symptoms were then examined. Data were collected on a survey form filled out by the principal investigator.

2.5. Diagnostic criteria

The criteria were those used in the phase-I ISAAC study, with AR symptomatology defined as: simultaneous recurrent liquid rhinorrhea, nasal obstruction, sneezing fits and nasal pruritus, in the absence of respiratory infection [12].

Table 1
Characteristics of patients presenting symptoms of allergic rhinitis in Parakou, Benin, April–July 2016.

Characteristics	n
Sociodemographic data	
Male/female sex-ratio	1.2
Median age (IR) (years)	18 (12–24.5)
Median symptom duration (IR) (years)	4 (2–10)
History	
Familial atopy, n (%)	47 (35.1)
Personal history of allergic conjunctivitis, n (%)	87 (61.7)
Personal history of urticaria, n (%)	55 (39)
Personal history of bronchial asthma, n (%)	13 (9.2)
Personal history of eczema/atopic dermatitis, n (%)	13 (9.2)
Personal history of Quincke's edema, n (%)	1 (0.7)
Habits and lifestyle	
Active smoking, n (%)	2 (1.4)
Cat or dog at home, n (%)	45 (31.9)
Wood stove, n (%)	29 (20.6)
Triggers according to patient	
House dust, n (%)	139 (98.6)
Air pollution, n (%)	111 (78.7)
Grass pollen, n (%)	84 (59.6)
Mold, n (%)	72 (51.1)
Humidity, n (%)	31 (22)
Change of season, n (%)	23 (16.3)
Other[a]	11 (7.8)
ENT results	
Pale nasal mucosa, n (%)	137 (97.2)
Bilateral turbinate edema, n (%)	99 (70.2)
Pale soft palate, n (%)	23 (16.3)

[a] Other triggers were: foods (peanuts), dog hair, cat hair, cereal dust, perfume.

Classification according to symptom duration and severity followed the Allergic Rhinitis and its Impact on Asthma (ARIA) guidelines:

- symptoms are "persistent" if occurring > 4 days per week for > 4 consecutive weeks, or otherwise "intermittent";
- symptoms associated with abnormal sleep and/or impairment of daily activities, sport, leisure and/or impaired work and school and/or troublesome symptoms are "moderate to severe", and those associated with normal sleep, no impairment of daily activities, sport, leisure, no impairment of work and school and no troublesome symptoms are "mild" [2,4].

2.6. Statistical analysis

Data were entered on EpiData Entry Client software v2.0.7.22 (EpiData Association, Odense, Denmark), and first analyzed on EpiData Analysis v2.2.2.183 (EpiData Association, Odense, Denmark). Frequencies and percentages were calculated for categoric variables, and medians for continuous variables with asymmetric distribution. Binary logistic regression was implemented on R.3.2.1 software to identify factors associated with AR symptoms and with symptom severity. The significance threshold was set at < 5%.

3. Results

The male/female sex ratio in the 395 subjects was 1.32; median age was 19 years (interquartile range: 13–26 years; range: 6–64 years).

3.1. AR symptoms and associated factors

Based on the above criteria, 141 subjects (35.7%) showed AR symptoms: 38% of the 163 subjects aged under 18 and 34.1% of the 232 aged ≥ 18. Table 1 shows patient characteristics. Forty-seven (33.3%) had familial history of atopy and 87 (61.7%) personal history of allergic conjunctivitis. The most frequently claimed triggering