

Impact of Asthma and Comorbid Allergic Rhinitis on Quality of Life and Control in Patients of Italian General Practitioners

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Objective. Asthma is a disease with elevated prevalence within the general population. Although general practitioners (GPs) are among the first health-care professionals to whom patients refer for their symptoms, there are few evaluations of this disease based on data provided by the GPs. The aim of this observational study is to assess the impact of asthma and comorbid allergic rhinitis on individual/social burden, quality of life, and disease control in asthmatic patients of Italian GPs. **Methods.** Throughout Italy, 107 GPs enrolled 995 patients diagnosed with asthma and using anti-asthmatic drug prescriptions, or with asthma-like symptoms during the previous 12 months. Data were collected through questionnaires filled out by GPs and patients. **Results.** Of the 995 asthmatic patients, 60.6% had concomitant allergic rhinitis (R+A), 39.4% had asthma alone. The latter, compared to those with R+A, showed significantly lower prevalence of intermittent asthma (37.5% vs. 55.6%) and higher prevalence of mild, moderate, and severe persistent asthma (28.4% vs. 23.2%, 28.7% vs. 18.8%, and 5.4% vs. 2.4%, respectively). Individual/social burden due to asthma was frequent and increased with disease severity: 87.5% of severe persistent asthma patients reported at least one medical consultation in the last 12 months, 37.5% emergency department visits, 26.7% hospitalization, and 62.5% limitations in daily activities. Control and quality of life were inversely associated with disease severity and were worse in patients with R+A than in those with asthma alone. **Conclusions.** This study showed the negative impact of high severity levels and comorbid allergic rhinitis on quality of life of asthmatic patients and on individual/social burden due to asthma in an Italian GPs setting.

Keywords allergies, asthma, primary care, public health, quality of life

INTRODUCTION

Asthma is a chronic inflammatory disease of the airways frequently associated with atopic diseases such as allergic rhinitis. Both diseases are increasing to epidemic proportions (allergic rhinitis: 10–50%, asthma: 1–18%) due to risk factors such as atopic predisposition, exposure to allergens or indoor and outdoor pollutants (including occupational exposure), and viral infections (1). Patients suffering from these diseases have a reduced quality of life, lower productivity, and increasing medical costs (2, 3). In Europe, asthma affects up to 5% of the general population, mainly children and older people (4). We had previously shown prevalence rates of 10.9% and 6.9% in urban and rural general population samples, respectively, in Italy (5). A large Italian epidemiological study performed on young adults showed a 8.9% prevalence rate of asthma (6), while a 4.5% prevalence rate was reported for Italy by the Global Initiative for Asthma (GINA) Dissemination Committee Report (7).

Many studies have highlighted the fact that asthma is under-diagnosed and under-treated, with considerable

limitation in asthma control (2). In the Italian component of the European Community Respiratory Health Survey (ECRHS), poor control of asthma is associated with hospitalization and emergency department visits, days of impaired activity, and working days lost (8).

Epidemiological studies have shown that asthma and rhinitis are often comorbid conditions and allergic rhinitis is an important independent risk factor for the development of asthma. The prevalence of allergic rhinitis in asthmatic patients may be as high as 80–90% (9). In Italy, about 60% of young asthmatics have reported allergic rhinitis (6).

In spite of the high burden of asthma and rhinitis in the general population and the fact that general practitioners (GPs) are the first health-care professional to whom patients refer for their symptoms (10), few studies have been published so far on data provided directly by GPs.

The ARGA study (Italian acronym for “Respiratory Allergies: monitoring study for the application of GINA and ARIA guidelines”), funded by Agenzia Italiana del Farmaco (AIFA, Italian acronym for ‘Italian Drug Agency’), was carried out between March 2007 and February 2010. The overall aim was to monitor how the World Health Organization GINA (1) and ARIA (11) guidelines for asthma and allergic rhinitis management are applied in clinical practice (12). This part of the study

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aims to assess the impact of asthma and comorbid allergic rhinitis on individual/social burden, quality of life, and disease control in an Italian GPs setting.

MATERIALS AND METHODS

The ARGA study included several sub-projects related to different cross-sectional or longitudinal studies with specific aims. Briefly, the ARGA study was framed in four research sectors: (1) observational studies, (2) drug surveillance, (3) educational intervention, and (4) prescription appropriateness and pharmacoeconomy. It involved 10 Units from various Italian institutions: National Institute of Health (ISS), Italian National Research Council (CNR), Medical Institutes for Hospital Admission, Care and Research (IRCCS), Universities, and Local Health Services. This study is based on the subproject of the ARGA study entitled "Observational study on Italian General Practitioners".

Population

Data reported in this article regard GPs and their patients affected by asthma. GPs were distributed throughout the three Italian macro-areas: North, Central, and South/Islands. GPs' recruitment was carried out through mail among GPs who had participated in previous studies or educational courses organized by the authors.

The GPs were invited to actively enroll all patients included in their medical archives with asthma diagnosis, who had either been previously treated for asthma or had presented asthma-like symptoms during the past 12 months. Since in Italy, children under the age of 14 years are the responsibility of family pediatricians and not GPs, male and female citizens aged 14 years and over were considered eligible subjects. Subjects deemed unable to participate in the survey and those permanently hospitalized or living in nursing homes were excluded. Participating patients provided ex-ante their written informed consent for the purposes of the study (participation in the study, anonymous management of individual data, collective statistical analyses, and anonymous publication of research results).

The study protocol, patient information sheet, and consent form were approved by the Ethics Committee of the University Hospital of Pisa (Azienda Ospedaliero-Universitaria Pisana) on 13 October 2006 (Prot. no. 37710 of 25 October 2006).

Data Collection

Two questionnaires were collected for each patient: the first was filled out by the GP on asthma severity assessment, use of instrumental tests for diagnosis, monitoring, control of asthma, and presence of comorbid allergic rhinitis; the second was a self-administered patient questionnaire on the disease, current health status, and quality of life.

In the questionnaire GPs reported the disease's diagnosis and severity level according to their clinical experience

or any pre-existing clinical/functional information about the patients. The following questions were considered:

- (1) "What kind of diagnosis have you made for your patient?" [asthma alone, allergic rhinitis and asthma (R+A)];
- (2) "Have you assessed the severity level of asthma of your patient?" (yes, no);
- (3) If yes, "What is the diagnosed severity level of asthma?" [intermittent, mild persistent, moderate persistent, and severe persistent (1)].

GPs reported the control of symptoms in each patient according to their clinical experience; they classified the control as insufficient, sufficient, good, and optimum.

The patient questionnaire allowed us to collect data on asthma symptoms, daily activity limitations, work and/or school absenteeism, use of health services, and quality of life. To assess quality of life, the patients filled out the Rhinasthma questionnaire (13). The questionnaire consists of 30 items, with 5 possible answers (not at all, a little, somewhat, much, and very much); the analysis of the answers provides a score (from 0 to 100) related to the impact of allergic diseases on quality of life during the previous 2 weeks. Questions and scores are formulated so that the higher score corresponds to a worse quality of life.

Statistical Methodology

Statistical analyses were carried out using the Statistical Package for the Social Sciences (SPSS, IBM Corporation), version 13.0 for Windows. Chi-square test was used to compare the prevalence rates of severity levels and of individual/social burden by asthma condition: asthma alone and R+A.

All the other analyses were performed stratifying the sample by asthma alone and R+A: chi-square test was used to compare the prevalence rates of individual/social burden, use of instrumental test, and disease control by the four asthma severity levels; analysis of variance was used to compare the mean values of the Rhinasthma score by the four asthma severity levels. Adjusted standardized residuals were calculated to indicate the contribution of the cells to the significant chi-square value.

Pairwise comparisons for ANOVA were made with post-hoc Bonferroni test. The significance level was set at .05. Cross-sectional analyses were carried out after quality control of all the collected data.

Sample Size Calculation

The general aim of the ARGA study was to monitor correspondence between scientific knowledge based on the GINA and ARIA guidelines for asthma and allergic rhinitis management and applicability in clinical practice. Thus, the sample size calculation was performed considering the effect of attending a medical educational course (MEC) on guidelines for disease management by GPs. ECRHS study reported that 67% of asthmatic subjects are not controlled; we hypothesized that the participation of GPs in the MEC on guidelines could reduce the prevalence of uncontrolled

asthma by 10%. Based on this difference and considering 80% of power, 5% level of significance, we would need to enroll 776 asthmatic subjects. A higher number of subjects was analyzed ($n = 995$), obtaining more robust estimates.

RESULTS

A total of 107 GPs from all over the country participated in this study; 995 asthmatic patients (age range 14–89 years) were consecutively enrolled by GPs.

General characteristics of patients are shown in Table 1. Gender was equally distributed in the sample; patients were mainly non-smokers with a high educational level. A diagnosis of asthma alone was made for 39.4% while the remaining 60.6% had R+A. A decreasing trend in the frequency of the severity levels was shown, from 45.0% of intermittent asthma to 3.3% of severe persistent asthma.

Patients with asthma alone, compared to patients with R+A, were significantly older (47.3 ± 19.1 vs. 40.8 ± 16.3 , respectively; p -value $< .001$) and with a lower educational level (elementary: 21.9% vs. 12.0%; middle school: 31.1% vs. 27.4%; high school: 34.6% vs. 45.5%; college: 12.4% vs. 15.0%; p -value $< .001$). Moreover, asthma-alone patients compared to those with R+A showed higher asthma severity (moderate persistent: 28.7% vs. 18.8%; severe persistent: 5.4% vs. 2.4%) (Table 2). There was significantly higher use of health-care resources (65.8% doctor visits and 9.2% emergency department visits) and work/school absenteeism (22.9%) due to asthma in patients with asthma alone compared to those with R+A (Table 2).

Use of health-care resources, work/school absenteeism, and daily activity limitations increased with severity (Tables 3 and 4). Patients with severe persistent asthma showed the greatest use of medical facilities (e.g., 87.5% of doctor visits) and were frequently limited in their daily

TABLE 1.—Descriptive characteristics of patients (valid percent).

Age (mean $\pm$ SD) ($n = 995$)	43.3 $\pm$ 17.7
Age range, years	14–89
Gender, %	
Male ($n = 446$)	44.8
Female ($n = 549$)	55.2
Smoking habits, %	
Smokers ($n = 135$)	15.2
Ex-smokers ($n = 169$)	18.9
Non-smokers ($n = 588$)	65.9
Education, %	
No + elementary ($n = 144$)	15.8
Middle school ($n = 263$)	28.8
High School ($n = 377$)	41.4
College ($n = 128$)	14.0
Condition, %	
Asthma ($n = 392$)	39.4
Rhinitis and asthma ($n = 603$)	60.6
Asthma severity level, %	
Not evaluated ($n = 70$)	7.2
Intermittent ($n = 436$)	45.0
Mild persistent ($n = 227$)	23.4
Moderate persistent ($n = 204$)	21.1
Severe persistent ($n = 32$)	3.3

TABLE 2.—Severity level and individual/social burden due to asthma condition.

	Asthma alone	R + A ^a	<i>P</i> -value ^b
<i>N</i>	352	555	
Asthma severity level			
Intermittent	37.5	55.6	$< .001$
Mild persistent	28.4	23.2	
Moderate persistent	28.7	18.8	
Severe persistent	5.4	2.4	
Individual/social burden			
Doctor visits	65.8	47.7	$< .001$
Emergency department visits	9.2	5.6	.036
Hospitalization	3.2	2.4	.474
Work/school absenteeism	22.9	17.2	.037
Daily activities limitation	29.8	31.3	.633

Notes: All values are expressed in %, except *p*-values

^aR+A = co-presence of allergic rhinitis and asthma.

^bStatistical difference between asthma alone and R+A by chi-square test

activities (62.5%) (Table 3). The same trend was shown for those with R+A with all the comparisons between severity levels reaching statistical significance. Furthermore, patients with moderate persistent asthma and allergic rhinitis had the highest percentage of work/school absenteeism (29.3%) and the highest frequency of doctor visits (66.3%) (Table 4).

Similar tendencies were found for instrumental tests, with a significantly higher use in patients with severe persistent asthma, in particular of spirometry (100.0%), peak expiratory flow measures (63.2%), bronchial reversibility test, and arterial blood gas analysis (57.9%). Moderate persistent asthmatics underwent significantly more non-specific bronchial reactivity tests (42.4%) (Table 3). Similar results were also found in the R+A group: severe asthmatics underwent significantly greater numbers of instrumental tests, in particular non-specific bronchial reactivity tests and peak expiratory flow measures (69.2%). An inverse relationship with disease severity was shown by prick test performance (Table 4). Regardless of severity, total serum IgE levels and skin-prick tests were significantly more frequently prescribed in R+A patients than in those with asthma alone (70.4% vs. 55.0% and 75.8% vs. 48.9%, respectively; p -value $< .001$).

Data showed a significant association between quality of life (mean value of the Rhinasthma score) and disease severity; this association was stronger in those asthmatics with comorbid allergic rhinitis (R+A), except for severe persistent asthma (Figure 1). Moreover, regardless of severity, quality of life was worse in patients with R+A (23.0 ± 15.7 vs. 9.7 ± 14.7 ; p -value = .002).

Asthma control was inversely linked to severity. Good/optimum control was reached in only 16.7% of those with severe persistent asthma alone and in 10.0% of those with R+A (Figure 2).

DISCUSSION

This study highlights the negative impact of asthma severity on individual/social burden due to asthma in an Italian GPs setting: use of health-care resources and work/school

TABLE 3.—Individual/social burden and use of instrumental tests for asthma diagnosis and monitoring by severity level, in asthma-alone patients.

	Intermittent	Mild persistent	Moderate persistent	Severe persistent	P-value ^a
<i>N</i>	108	96	89	16	
Individual/social burden					
Doctor visits	53.7 ^b	67.0	77.3 ^b	87.5	.001
Emergency department visits	5.6	4.2 ^b	13.5	37.5 ^b	<.001
Hospitalization	— ^b	2.1	4.5	26.7 ^b	<.001
Work/school absenteeism	22.2	18.3	26.2	37.5	.308
Daily activities limitation	22.4 ^b	29.3	34.8	62.5 ^b	.008
<i>N</i>	131	100	100	19	
Instrumental tests					
Spirometry	83.2 ^b	90.0	97.0 ^b	100.0	.003
Bronchial reversibility test	24.4 ^b	40.0	52.0 ^b	57.9	<.001
Non-specific bronchial reactivity test	16.8 ^b	26.3	42.4 ^b	36.8	<.001
Eosinophils in sputum	6.8 ^b	8.1	19.2 ^b	47.4 ^b	<.001
Levels of exhaled nitric oxide	0.8 ^b	3.0	9.2 ^b	10.5	.008
Peak expiratory flow	12.2 ^b	30.0	46.9 ^b	63.2 ^b	<.001
Arterial blood gases analysis	3.9 ^b	4.0	21.2 ^b	57.9 ^b	<.001
IgE examination	56.9	47.8	64.3	68.4	.100
Prick test	54.0	50.0	44.3	63.2	.345

Notes: All values are expressed in %, except *p*-values^aStatistical difference between different severity levels by chi-square test.^bSignificant contribution of the cells to the significant chi-square value by adjusted standardized residuals analysis.

TABLE 4.—Individual/social burden and use of instrumental tests for asthma diagnosis and monitoring by severity level, in R+A patients.

	Intermittent	Mild persistent	Moderate persistent	Severe persistent	P-value ^a
<i>N</i>	273	123	98	13	
Individual/social burden					
Doctor visits	41.4 ^b	48.4	66.3 ^b	61.5	<.001
Emergency department visits	2.9 ^b	8.1	7.1	38.5 ^b	<.001
Hospitalization	— ^b	3.3	6.4 ^b	25.0 ^b	<.001
Work/school absenteeism	13.0 ^b	16.7	29.3 ^b	25.0	.004
Daily activities limitation	25.8 ^b	30.3	45.3 ^b	50.0	.002
<i>N</i>	303	124	103	13	
Instrumental tests					
Spirometry	79.2 ^b	87.3	92.1 ^b	91.7	.009
Bronchial reversibility test	25.2 ^b	45.5	61.8 ^b	53.8	<.001
Non-specific bronchial reactivity test	19.8 ^b	29.8	47.1 ^b	69.2 ^b	<.001
Eosinophils in sputum	9.9 ^b	15.3	17.5	38.5 ^b	.007
Levels of exhaled nitric oxide	1.3 ^b	8.9 ^b	9.7 ^b	15.4	<.001
Peak expiratory flow	15.0 ^b	34.4 ^b	45.6 ^b	69.2 ^b	<.001
Arterial blood gases analysis	3.0 ^b	12.2	13.7 ^b	41.7 ^b	<.001
IgE examination	71.5	68.5	81.2	75.0	.173
Prick test	81.6 ^b	72.4	67.3 ^b	61.5	.008

Notes: All values are expressed in %, except *p*-values^aStatistical difference between different severity levels by chi-square test.^bSignificant contribution of the cells to the significant chi-square value by adjusted standardized residuals analysis.

absenteeism due to asthma were higher in patients with asthma alone compared to those with R+A; use of health-care resources, work/school absenteeism, and limitation of daily activities increased as asthma severity increased in both asthma-alone and R+A subjects. Disease control and quality of life were inversely associated with disease severity and were worse in patients with R+A than in those with asthma alone.

Persistent asthma was more frequently reported in asthma-alone patients than in those with R+A (62.5% vs. 44.4%). A similar result (59% vs. 48% of persistent

asthma) was found by Ko et al. in a study performed in Hong Kong on 600 asthmatics and R+A subjects (14).

Patients with asthma alone had a worse asthmatic case history compared to R+A patients. Worse severity level, more frequent doctor and emergency department visits and work/school absenteeism all pointed to this difference. Similar results were found by Ko et al., who showed that asthmatics without allergic rhinitis symptoms had higher rates of doctors visits, pharmacy visits, emergency department use, and hospitalizations for asthma than did those with both conditions (14). The authors have speculated

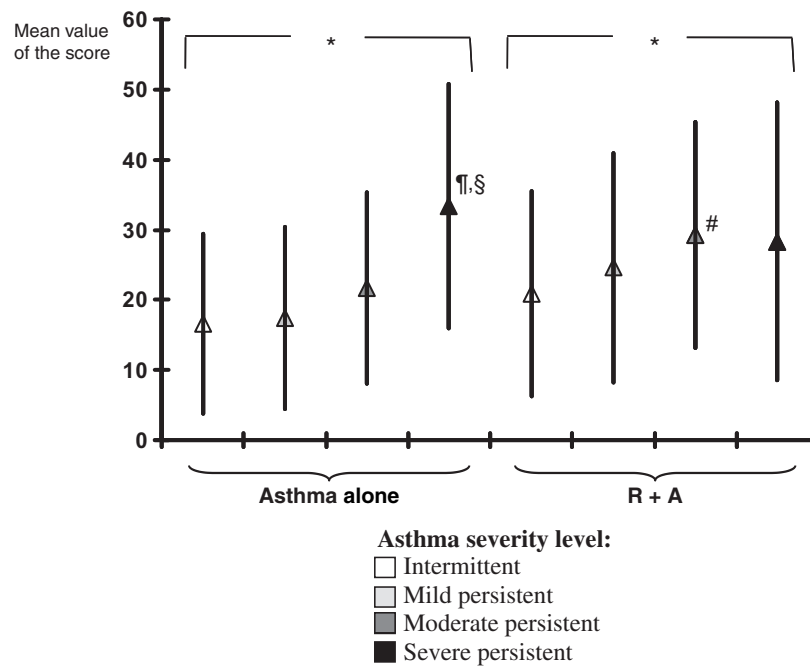


FIGURE 1.—Quality of life (global rhinasthma score) by severity levels in subjects with asthma alone and R+A, separately.
 Notes: * P -value < .001, statistical difference between different severity levels by ANOVA.
 ¶ P -value < .001, statistical significance between severe persistent asthma and intermittent, mild persistent asthma by Bonferroni test.
 § P -value = .012, statistical significance between severe persistent asthma and moderate persistent asthma by Bonferroni test.
 # P -value < .001, statistical significance between moderate persistent asthma and intermittent asthma by Bonferroni test.

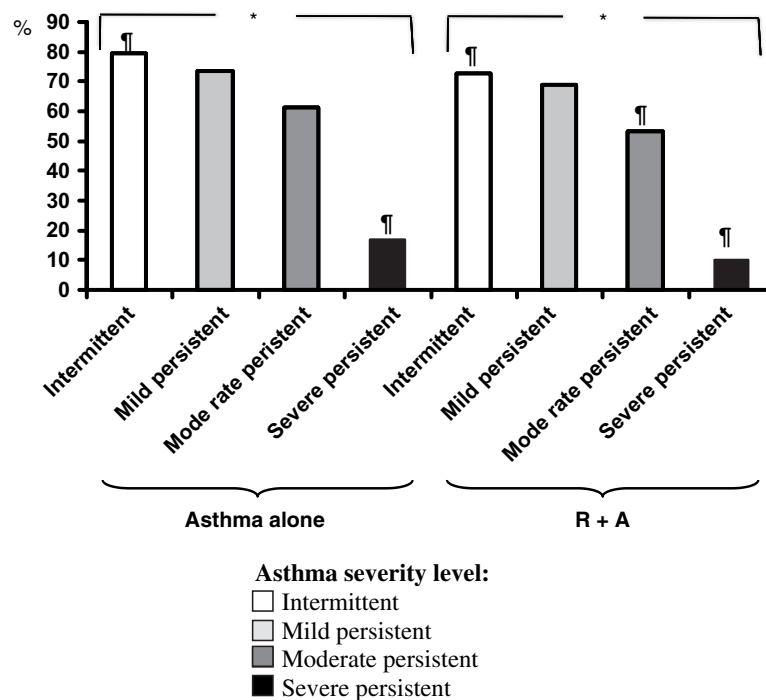


FIGURE 2.—Good/optimum control of disease by severity levels in subjects with asthma alone and R+A, separately.
 Notes: * P -value < .001, statistical difference between different severity levels by chi-square test.
 ¶Significant contribution of the cells to the significant chi-square value by adjusted standardized residuals analysis.

that the use of intranasal corticosteroids for allergic rhinitis probably decrease morbidity from asthma in subjects with both conditions (14).

As expected, due to the complexity of the disease pathophysiology, use of health-care resources, work/

school absenteeism, and daily activity limitations due to asthma were substantial and they increased in accordance with higher severity levels; few other studies have assessed these associations. A study performed in three European countries (France, Italy, and Spain) confirmed the

increasing trend between asthma severity levels and use of medical facilities, reaching a value of 38.5% of emergency department visits and 33.3% of hospitalizations in severe persistent asthmatics of the Italian sample (15). The Epidemiology and Natural History of Asthma: Outcomes and Treatment Regimens (TENOR) study also showed that severe versus mild-to-moderate asthma was associated with a larger percentage of impairment at work (28% vs. 14%), at school (32% vs. 18%), and in daily activities (41% vs 21%) (16).

In our study, the prescription of instrumental exams still appears scanty, although the use of instrumental tests increased with asthma severity levels. Asthma can often be diagnosed on the basis of symptoms but measurements of lung function, and particularly the reversibility of lung function abnormalities, greatly enhance diagnostic confidence (1). Our data showed a high use of spirometry, increasing with severity level (higher than 90% in moderate/severe asthma); a low use of the bronchial reversibility tests was shown, reaching a value of about 58% in severe persistent asthma and 62% in moderate persistent R+A for the bronchial reversibility test; for the non-specific bronchial reactivity test, a value of about 42% in moderate persistent asthma and 69% in severe persistent R+A was reached.

Moreover, our findings showed a low use of skin tests or measurement of specific IgE in serum in asthma-alone subjects, reaching a value of only about 68% for IgE examination and 63% for the prick test in severe persistent asthma. These tests are important for identifying the presence of an allergic component in asthmatic subjects (1).

Inaccurate diagnosis of asthma is a common problem in primary care worldwide. Though published guidelines outline the criteria necessary for clinical diagnosis, it can be difficult to make a diagnosis of asthma and there is often uncertainty. A primary care UK study found that only 20% of newly identified asthmatic patients had the results of any airflow test reported in their medical records (17). It should be noted that in our sample we found a use of instrumental tests about threefold higher.

Good/optimum control was higher in asthma-alone subjects and was inversely linked to disease severity, dropping to only 16.7% in severe persistent asthma and to only 10.0% in severe persistent R+A. These results confirmed the findings of Vandenplas et al. who showed a twofold risk of uncontrolled asthma in patients with concomitant allergic rhinitis compared to those with asthma alone in patients of GPs and chest physicians (18). In their study on French GPs' patients, aged 18–45 years, Magnan et al. highlighted a significant increase in the lack of disease control with age and asthma severity (19).

Clinical trials have shown that asthmatic patients can achieve an optimal quality of life, but these results refer to controlled clinical trials that do not take into account comorbid rhinitis (20). On the contrary, the few studies that have explored this aspect in a real-life setting showed that patients suffering from symptomatic rhinitis were less likely to attain a good quality of life (16, 17, 20, 21). Our results have added new information on this important

aspect, showing that quality of life worsened as severity levels increased and that co-presence of asthma and allergic rhinitis was associated with even lower disease-specific quality of life.

Limitations of the Study

Independently from the minimum number of subjects to select, GPs had to actively enroll all their eligible patients with a physician-based diagnosis of asthma. The aim of this request was to obtain exhaustive information about all the asthmatic subjects in the care of Italian GPs. Based on asthma prevalence data, coming from epidemiological studies on the general population (5, 6), a higher number of enrolled asthmatic patients was expected. This could be due to several problems stated by GPs (e.g., lack of time, involvement in other studies, and lack of economic benefit) and to our overestimation based on the use of epidemiological prevalence rates, quite different from a GPs setting where the number of patients receiving a medical diagnosis turned to be lower than the number of subjects reporting symptoms in epidemiological surveys (5, 6). Indeed, an asthma prevalence rate of 6% from the analyses of the Health Search Database of the Italian College of General Practitioners was recently reported (22). It is possible that our GPs only reported data regarding their regular patients, instead of performing a broader search on their entire databases.

However, it should be highlighted that the number of enrolled patients ($n = 995$) was higher than the minimum number of subjects to select, and permitted us to perform analyses with a sufficient statistical power.

The assessment of the asthma severity levels referred to the 2006 GINA guidelines (1). These guidelines stated that the severity classification was created to assess patients not receiving asthma treatment; but the same report recognized that asthma severity involves both severity of the underlying disease and its responsiveness to treatment. Thus, in treated patients the level of therapy needed to obtain asthma control should be considered in the assessment of severity level (23). In this survey the assessment of the asthma severity level was not inferred from the results of clinical parameters but was reported by GPs in the questionnaire based on their clinical practice and knowledge of the GINA guidelines. Thus, we can hypothesize that the GPs' opinion could include an overall assessment of the patient, also comprising responsiveness to treatment. Similarly, asthma control was assessed by GPs as an overall evaluation of the patient's symptoms, independent of the level of treatment; therefore, the level of control was expected to be correlated to the evaluation of asthma severity.

Strengths of the Study

This is an observational study and its main strength is that data collection was conducted in real life, providing relevant data for clinical management of asthma and comorbid allergic rhinitis. GPs and patients represented two completely independent information sources and permitted us to

evaluate the problem of asthma management considering the points of view of both GPs and their patients.

This study was performed using questionnaires based on the main items contained in the GINA and ARIA guidelines; the questionnaires were reviewed and approved by an interdisciplinary internal board comprising pneumologists, allergists, and epidemiologists.

Moreover, our sample can be considered representative of the local asthmatic population, given that 60.6% had comorbid allergic rhinitis, which is the same percentage reported in another Italian study (6).

Our results are in line with those of other international studies but add new information to the scanty literature on specific subjects: information about asthma management provided directly by GPs and information about the relationship between asthma control, comorbid rhinitis, and patient quality of life, in a real-life context.

CONCLUSION

This study evaluates the impact of asthma based directly on data from GPs and highlights the important role of allergic rhinitis and severity of asthma in the use of health-care resources, work/school absenteeism, limitation of daily activities due to asthma, disease control, and quality of life of patients.

Considering the epidemiological burden of these diseases and the fact that GPs are the first health-care professionals consulted by patients for their symptoms, more effort is needed for better management of asthma and comorbid allergic rhinitis in the general practice setting.

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