
Influence of sociodemographic factors on quality of life during pollen season in seasonal allergic rhinitis patients

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Background: Quality of life (QOL) is an important outcome in asthma and seasonal allergic rhinitis (SAR), and its determinants are imperfectly understood. More specifically, the influence of sociodemographic factors on QOL in patients with SAR has been so far little investigated.

Objective: To examine the changes of QOL during the pollen season in patients with isolated SAR or SAR associated with asthma.

Methods: A prospective cohort study was conducted in southern France. Outpatients aged 18 to 60 years and regularly treated by respiratory physicians for SAR (with or without associated asthma) were identified. Patients were recruited before the grass or ragweed pollination period. At peak pollination, patients completed the French versions of the Mini Rhino-conjunctivitis Quality of Life Questionnaire (mini-RQLQ) and the 12-item Short-Form Health Survey (SF-12) physical component summary (PCS) and mental component summary (MCS).

Results: A total of 135 patients was included, 83 with isolated SAR and 52 with associated asthma (mean age, 35.4 years; SD, 10.6 years; 56% female). At pollen peak, QOL scores were lower in women for all instruments, with significant effects on SF-12 MCS and PCS scores in multivariate analyses. Likewise, a university-level education was an independent predictor of higher SF-12 PCS and MCS scores. Patients who lived in rural areas had significantly poorer QOL at pollen peak, as measured by the mini-RQLQ ($P = .002$) and SF-12 PCS ($P = .008$). No influence of age, presence of an animal at home, or smoking status could be identified on any QOL scores.

Conclusions: Being a woman, living in the countryside, and having a lower education level were all independent predictors of poorer QOL of SAR patients. These factors must be taken into account when interpreting QOL of patients with SAR. Further studies are needed to confirm these results.

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INTRODUCTION

Asthma and allergic rhinitis share common risk factors and are often associated.^{1,2} As indicated by recent trends in treatment guidelines, quality of life (QOL) has become a major issue in the management of asthma and seasonal allergic rhinitis (SAR).³ Although the QOL of asthma patients has been evaluated in several studies, evidence shows that SAR also causes impairment in physical, psychological, and social domains of QOL.^{4,5} The influence of sociodemographic factors on QOL in asthma has not been thoroughly explored, although some factors have been identified, such as sex and education.⁶ To our knowledge, the role of sociodemographic factors in patients with SAR has been little investigated. This

study examines how sociodemographic characteristics influence QOL measures at pollen peak in patients with SAR and whether these characteristics differ from the QOL determinants identified for asthma.

METHODS

A prospective observational cohort study was conducted in 9 towns in southern France (Lyon, Grenoble, Valence, Vienne, Marseille, Chambéry, Saint-Etienne, Bourgoin, and Péage-de-Rousillon) in 2002. All patients were recruited by respiratory physicians.

Among the adult patients who were invited to participate, 3 groups were identified at baseline according to the presence of concomitant respiratory condition: persistent asthma alone, SAR alone, and persistent asthma with SAR. Only patients who regularly visited respiratory physicians were eligible for inclusion in the study and prospectively followed up during either the spring (grass cohort) or fall (ragweed cohort) allergy season. The cohorts (grass and ragweed) were mutually exclusive. Follow-up ended after the pollen peak with a visit to the respiratory physician (study investigator). The date of the pollen peak was determined for each center and each

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cohort of recruitment (grass or ragweed) in the changes of pollen counts. These data were provided by pollen traps of the French Ragweed Association for ragweed and the National Aeropollinic Monitoring Network for grass. The study design is outlined in Figure 1.

The present study focuses on SAR patients with isolated conditions or conditions associated with asthma. The patients included in the study were between 18 and 60 years old, had continuous enrollment within a given practice (respiratory physician), and were diagnosed as having asthma and/or SAR. The diagnosis of SAR was based on a positive skin prick test or radioallergosorbent test result to grass or ragweed, depending on the cohort. Patients with SAR included in the ragweed cohort were required to be insensitive (ie, negative test result) to grass to prevent any interference of the previous grass pollination period on their baseline QOL. Persistent asthma was defined from specific symptoms evaluated by the investigator, the use of inhaled corticosteroids during the 3 months before inclusion, and reversibility of forced expiratory volume in 1 second of at least 15% under bronchodilators. Exclusion criteria were occupational asthma or SAR, perennial allergic rhinitis, concomitant neoplastic disease, emphysema or chronic obstructive bronchitis, and continuous use of oral corticosteroids. All patients signed an informed consent to participate in the study, and the local ethical review board reviewed the protocol before study commencement.

Data were collected at baseline (inclusion visit), weekly during the prospective follow-up period, and at study termination (visit to physician). In addition, telephone follow-up was performed at respective pollen peak in each geographic region. Baseline evaluation was performed by clinicians and patients. Clinicians evaluated patients' asthma and/or SAR status and severity. Patients recorded sociodemographic data (age, sex, living in an urban or rural area, education level,

presence of an animal at home) and baseline QOL. All patients completed the generic 12-item Short-Form Health Survey (SF-12) QOL questionnaire, which was composed of a physical component summary (PCS) and a mental component summary (MCS),⁷ and the Mini Rhino-conjunctivitis Quality of Life Questionnaire (mini-RQLQ).⁸ SAR-related medical resource utilization included evaluation of the use of medications during pollen season. Patients reported their medication use during pollen season in weekly diaries. Antiallergic medications included antihistamines, nasal steroid therapy, and eye drops. These weekly diaries were collected by investigators at the final visit. Shortly before the week of pollen peak (time varies by regions), all patients were contacted by telephone to request completion of their QOL questionnaire. The answers on the completed questionnaires were collected a few days later by telephone interviews conducted by trained interviewers.

In a previous article, we studied the variation of QOL scores between inclusion and pollen peak, and we compared QOL at pollen peak between the SAR and asthma plus SAR groups.⁹ The present article investigates the influence on QOL of sociodemographic data in patients with isolated SAR or SAR associated with asthma.

The sociodemographic factors of interest were age, sex, education level (university or less), living in a rural or urban area, and presence of pets at home. Other factors that could influence QOL, including those related to study design, were also studied, such as associated asthma, cohort (grass, ragweed), or presence of comorbid conditions other than SAR or asthma. Because of the observational nature of this study, physicians who treated the patients presumably adjusted their prescribing behavior to the upcoming pollen season. Consequently, we took into account the intensity of antiallergic therapy used at pollen peak, as defined by the number of antiallergic drug classes (nasal corticosteroids, eye topical

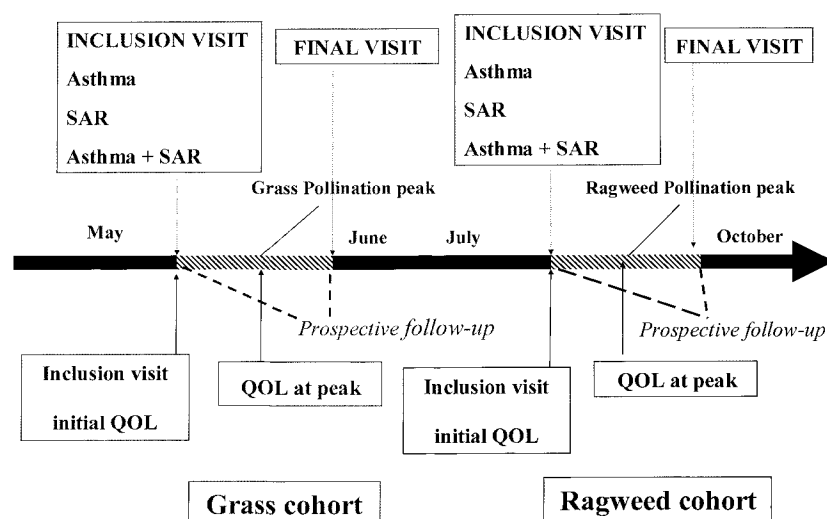


Figure 1. General design of the study. SAR indicates seasonal allergic rhinitis; QOL, quality of life.

agents, antihistamines) used at pollen peak. We considered that a patient used a given medication class during peak pollination week if he or she used a medication of this class more than 2 days during this week.

The QOL correlates were first identified in univariate analyses for each questionnaire, using nonparametric tests (eg, Wilcoxon, Kruskal-Wallis, Spearman). Three multivariate linear regression models were performed for overall health at pollen peak: SF-12 PCS, SF-12 MCS, and SAR-specific mini-RQLQ. Because of skewed distributions, QOL scores were appropriately transformed before further multivariate analyses, when needed. These multivariate models studied the relationship between QOL and sociodemographic variables. All models included associated asthma, the presence of a comorbid condition other than SAR or asthma (in the PCS and MCS models only), and the number of antiallergic drug classes used at pollen peak. Other variables that showed a statistical univariate association with QOL scores ($P < .10$) were included in the models.

Interactions between significant correlates and the presence of concomitant asthma were tested to verify if the relationship identified between QOL differed between patients with isolated SAR or cumulated SAR and asthma. These interactions were reported and included in the corresponding model only when statistically significant. Statistical analyses were performed using SAS statistical software, version 8.0 (SAS Institute Inc, Cary, NC), with an a priori α risk of .05.

Two complementary analyses were conducted. First, to eliminate a potential confounding role of conditions other

than asthma and SAR, the initial multivariate models for SF-12 were computed after discarding patients with any other comorbid condition. Then, to take into account SAR severity, we surrogated in initial models the number of allergic medication classes by the 3 following ones: continuous use of antihistamine, continuous use of nasal corticosteroids, and continuous use of eye drops between inclusion and pollen peak. The results of these 2 complementary analyses are reported in the article only if they provided different results compared with the initial models.

RESULTS

Study Population and Environmental Characteristics

The SAR and asthma plus SAR groups contained 83 and 52 patients, respectively. These patients were recruited by 17 respiratory physicians. Most patients originated from 4 cities: Lyon ($n = 60$), Grenoble ($n = 30$), Saint Etienne ($n = 14$), and Valence ($n = 11$). The others were from Marseilles ($n = 5$), Bourgoin ($n = 3$), Vienne ($n = 3$), Chambéry ($n = 5$), and Péage-de-Roussillon ($n = 4$). Ninety-five patients were recruited in the grass cohort and 40 in the ragweed cohort. Depending on their geographic area, patients completed their pollen peak questionnaires from week 23 to week 26 for the grass cohort and from week 35 to week 36 for the ragweed cohort.

Patients included in the study were young. Nearly half of them were between 28 (25th percentile) and 40 (75th percentile) years old. More than half of them had a university-level education (Table 1). In ex-smokers and current smokers, the

Table 1. Characteristics of the 2 Groups of Patients ($n = 135$)

Characteristics	SAR group ($n = 83$)	Asthma and SAR group ($n = 52$)	Overall ($n = 135$)	<i>P</i> value*
Cohort, No. (%)				
Grass	56 (68)	39 (75)	95 (70)	.35
Ragweed	27 (32)	13 (25)	40 (30)	
Age, mean (SD), y	34.5 (10.3)	36.9 (10.9)	35.4 (10.6)	.16
Female, No. (%)	47 (58)	28 (54)	75 (56)	.63
University-level education, No. (%)	51 (68)	26 (52)	77 (62)	.07
Ownership of a pet at home, No. (%)	31 (41)	22 (44)	53 (42)	.77
Living in rural area, No. (%)	27 (36)	20 (39)	47 (37)	.71
Smoking status, No. (%)				
Nonsmoker	56 (69)	39 (75)	95 (71)	.13
Ex-smoker	9 (11)	9 (17)	18 (14)	
Current smoker	16 (20)	4 (8)	20 (15)	
Any comorbid condition (other than asthma and SAR), No. (%)	15 (19)	14 (27)	29 (22)	.27
Antiallergic drug classes used at pollen peak, No. (%)				
Eye drops	19 (25)	11 (22)	30 (24)	.77
Antihistamines	57 (74)	32 (65)	89 (71)	.29
Nasal corticosteroids	31 (40)	13 (26)	44 (35)	.11
No. of antiallergic drug classes, mean (SD)	1.4 (1.0)	1.1 (0.9)	1.3 (1.0)	.18

Abbreviation: SAR, seasonal allergic rhinitis.

* The χ^2 test was used for qualitative variables and the Wilcoxon test for quantitative variables

mean number of pack-years was 5.4 (SD, 6.6), ranging from 0.05 to 25.5 pack-years. Most patients used antihistamines at pollen peak, and this proportion reached 3 of 4 in the SAR group (Table 1). In the pooled SAR and asthma plus SAR groups, continuous users of antihistamines, eye drops, and nasal corticosteroids between inclusion and pollen peak were 40.4%, 9.5%, and 15.0%, respectively.

Correlates of QOL at Peak Pollination

In univariate analysis, patients with a university-level education had better QOL scores at pollen peak than other patients with both the SF-12 scores and the mini-RQLQ scores (Table 2). A higher education level was a significant independent predictor of higher SF-12 scores in multivariate models (Table 3). Women were more likely to have impaired QOL than men, more specifically for SF-12 scores. A significantly poorer QOL was observed in patients living in rural areas for

both SF-12 PCS and mini-RQLQ in univariate and multivariate analyses (Table 3). In contrast, there was no association with SF-12 MCS. The number of antiallergic classes used at pollen peak was inversely correlated to both the SF-12 PCS and MCS scores in univariate analysis (Table 2). However, this association did not persist in multivariate analyses. The QOL was not affected by smoking status. In current smokers and ex-smokers, no relationship was found between pack-years and any QOL instrument (Table 2). The presence of an animal at home did not yield any change in mini-RQLQ scores or in SF-12 scores. Significantly lower scores were observed for SF-12 PCS in patients with associated asthma. The presence of a comorbid condition other than asthma and SAR significantly decreased both SF-12 scores. None of the interactions tested between the variable associated asthma and any of the significant cofactors (sex, education level, area

Table 2. Univariate Correlates of Quality of Life at Pollen Peak (Pooled Groups, n = 135)

Variable	SF-12 PCS*		SF-12 MCS*		Mini-RQLQ†	
	Mean (SD)‡	P value	Mean (SD)‡	P value	Mean (SD)‡	P value
Group						
SAR	81.2 (14.8)	<.001	63.9 (16.5)	.05	2.0 (1.4)	.21
Asthma and SAR	71.6 (16.6)		58.0 (18.9)		2.4 (1.6)	
Cohort						
Grass	77.0 (17.3)	.92	60.5 (18.2)	.40	2.1 (1.5)	.56
Ragweed	78.5 (13.1)		64.3 (16.1)		2.3 (1.5)	
Sex						
Male	81.7 (14.2)	.008	65.2 (16.0)	.05	1.8 (1.3)	.04
Female	74.1 (17.0)		58.6 (18.5)		2.4 (1.5)	
Smoking status						
Nonsmoker	77.1 (16.0)	.94	61.6 (17.6)	.95	2.2 (1.5)	.68
Ex-smoker	79.8 (13.9)		63.0 (16.4)		1.9 (1.2)	
Current smoker	76.7 (19.9)		59.9 (20.6)		2.2 (1.6)	
University-level education						
Yes	80.9 (66.0)	.003	66.0 (18.9)	.001	1.9 (1.2)	.006
No	70.8 (54.1)		54.1 (16.1)		2.7 (1.7)	
Living in rural area						
Yes	70.8 (17.7)	<.001	59.0 (19.4)	.19	2.8 (1.6)	.001
No	81.2 (14.6)		63.2 (17.0)		1.8 (1.3)	
Ownership of a pet at home						
Yes	75.0 (16.5)	.14	60.3 (17.4)	.31	2.2 (1.5)	.77
No	78.5 (16.5)		62.2 (18.3)		2.2 (1.5)	
Any comorbid condition						
Yes	69.6 (16.9)	.002	53.4 (19.0)	.007	2.4 (1.7)	.47
No	79.8 (15.2)		63.9 (16.8)		2.1 (1.4)	
Spearman coefficient						
Age	-0.10	.25	-0.01	.91	-0.11	.20
No. of antiallergic drug classes used at pollen peak	-0.25	.004	-0.20	.03	0.08	.39
Pack-years of smoking§	-0.23	.19	-0.004	.98	-0.18	.30

Abbreviations: Mini-RQLQ, Mini Rhino-conjunctivitis Quality of Life Questionnaire; SAR, seasonal allergic rhinitis; SF-12 MCS, 12-item Short-Form Health Survey mental component summary; SF-12 PCS, 12-item Short-Form Health Survey physical component summary.

* The higher the score, the better quality of life is.

† The higher the score, the higher quality-of-life impairment is.

‡ Data are mean (SD) except for Spearman coefficients.

§ In ex-smokers and current smokers.

Table 3. Multivariate Linear Models for Quality-of-Life Scores at Pollen Peak for Pooled Groups

Model	β (SD)	P value
SF-12 PCS* (square transformation, n = 116)		
Female	-1130.3 (380.0)	.004
University education	789.4 (394.7)	.05
Living in a rural area	-1034.6 (385.6)	.008
Asthma and SAR group†‡	-1238.5 (375.9)	.001
No. of antiallergic drug classes at pollen peak‡	151.4 (195.1)	.44
Presence of comorbid condition‡	-1435.3 (450.6)	.002
SF-12 MCS*§ (square transformation, n = 117)		
Female	-887.2 (361.5)	.01
University education	1104.2 (370.4)	.003
Asthma and SAR group†‡	-366.3 (359.9)	.31
No. of antiallergic drug classes at pollen peak‡	-44.3 (186.6)	.81
Presence of comorbid condition‡	-1246.1 (432.8)	.005
Mini-RQLQ¶ (square-rooted transformation, n = 117)		
Female	0.10 (0.09)	.27
University education	-0.15 (0.10)	.14
Living in a rural area	0.30 (0.10)	.002
Asthma and SAR group†‡	0.10 (0.10)	.30
No. of antiallergic drug classes at pollen peak‡	-0.00 (0.05)	.95

Abbreviations: Mini-RQLQ, Mini Rhino-conjunctivitis Quality of Life Questionnaire; SAR, seasonal allergic rhinitis; SF-12 MCS, 12-item Short-Form Health Survey mental component summary; SF-12 PCS, 12-item Short-Form Health Survey physical component summary.

* The higher the score, the better quality of life is.

† SAR group is the reference.

‡ Forced into the model.

§ Given the absence of statistical univariate association between SF-12 MCS and the residence area (rural or urban), this variable was not included in the multivariate model.

¶ The higher the score, the higher quality-of-life impairment is.

of residence) identified in multivariate analyses was significant for any QOL score (data not reported). In addition, when patients with any comorbid condition other than asthma or SAR were discarded from the analyses, no major change was observed regarding the influence of sociodemographic factors on QOL. Likewise, when the overall number of medication classes used at pollen peak was surrogated in models by continuous use from inclusion until pollen peak of antihistamines, eye drops, and nasal corticosteroid, results were similar (data not reported).

DISCUSSION

This is one of the few observational surveys published to study the influence of sociodemographic data QOL of patients with SAR. We used both generic (SF-12) and specific (mini-RQLQ) questionnaires.

Living in a rural area was a salient significant risk factor for lower SF-12 PCS score. Furthermore, this significant association was identified for both generic SF-12 PCS and specific mini-RQLQ. In addition, this variable was the only significant driver for impaired mini-RQLQ (Table 3). Multivariate analyses indicate that these results were independent from treatments used and patient characteristics. Unlike pollen peak QOL scores, no difference was observed between patients living in urban and rural areas for baseline SF-12 PCS score (81.3 vs 81.6, $P = .89$) and mini-RQLQ score (1.4 vs 1.6, $P = .90$). This striking difference with scores mea-

sured at pollen peak (Table 3) suggests that the impairment of QOL in rural patients may be explained by a change in the environment that occurred during pollen season. Maybe a higher exposure to allergens in rural areas could explain this finding. Interestingly, the average number of antiallergic medication classes used at pollen peak by patients living in rural areas was slightly higher than in urban areas (1.5 vs 1.1, $P = .05$). Patients reported in questionnaires if they lived in rural or urban areas. In our data, we had no detail on the rural environment, such as whether patients lived in a village or a farm. Also, data on the surrounding vegetation (field, forest) might be of interest. Further investigations should be helpful to understand better these results.

In contrast, a university-level education was a protective factor for QOL of rhinitis patients at pollen peak. This was true for all questionnaires in univariate analysis (Table 3). A higher education level was an independent predictor of higher SF-12 PCS and MCS scores at pollen peak. Furthermore, this relationship was independent of the presence of associated asthma. Indeed, this relationship persisted after exclusion of patients with both asthma and SAR. Other studies have reported the influence of socioeconomic factors on QOL, such as employment status, low income, or poor education level in asthma.^{6,10,11} In this study, we have highlighted a significant effect of education level on QOL in SAR patients. When SAR patients have a low level of education, they may have a higher probability of an impaired SAR-related quality

of life. In this specific population of patients, physicians should be more specifically concerned by the way their patients cope with their SAR.

Women had significantly lower QOL scores than men in all univariate analyses (Table 2). This difference between men and women was significant in the SF-12 multivariate models at pollen peak (Table 3). Former studies have reported lower QOL scores in women in asthma^{12,13} and in some other chronic conditions, such as inflammatory bowel disease.¹⁴ We confirm in this study that sex also must be considered when interpreting QOL in a seasonal disease such as SAR.

The presence of a pet at home had little impact on QOL. It could be explained by the exclusion of perennial rhinitis in our study. No influence of age was observed in our data. This absence of a relationship might be due to the youth of the patients enrolled in the study and the limited range of age distribution: more than half patients were between 25 and 40 years old. Also, smoking status did not influence QOL even in heavy smokers. It could have been expected that smoking would result in an additional detrimental effect on QOL. We found no significant variation of QOL according to pack-years in ex-smokers and current smokers. However, because only 36 of our patients were former or current smokers, the data did not allow us to evaluate properly the influence of tobacco on QOL.

We followed prospectively the evolution of grass and ragweed pollen counts based on data of the French aerobiologic monitoring pollen bodies. Patients were asked to complete their pollen peak QOL questionnaires when the monitoring pollen bodies advised us to do so, during a week of high allergic pollinic risk. This pollen peak week always occurred during pollinic season when the risk for the allergen (grass or ragweed) was high.

Our sample included both patients with isolated SAR and patients who cumulated SAR and asthma. It could be argued that the statistical relationships we identified between QOL and sex and education level and living in a rural area could be due to a concomitant presence of asthma. In the 3 multivariate models, we controlled for the presence of an associated asthma. Furthermore, we tested the interaction between each significant factor with the presence of concomitant asthma. None of these interactions were significant. This means that the effects on QOL of sex, education level, and area of residence do not significantly differ in patients with isolated SAR and in those who cumulated asthma with their SAR. In addition, asthma and SAR are often associated, and studying these factors exclusively in patients without any associated asthma would not be representative of SAR patients. Besides, the results we highlighted between sociodemographic factors and QOL were not biased by the presence of concomitant comorbid condition other than SAR and asthma. Indeed, we adjusted for this factor in SF-12 models. Also, the analyses restricted to patients without any comorbid condition yielded

similar results (data not reported), which supports the validity of our data.

Lastly, because we had no data on SAR symptoms during follow-up, we assumed that the continuous use of an antiallergic medication between inclusion and pollen peak was a marker of SAR severity. When we surrogated in the multivariate models the variable number of antiallergic classes by continuous use between inclusion and pollen peak of antihistamines, nasal corticosteroids, and eye drops, the statistical relationships we identified between sociodemographic factors and QOL were little affected (data not reported). This suggests that our results for sociodemographic factors were not confounded by SAR severity.

In conclusion, this study confirms the influence of sociodemographic data on QOL scores in SAR. SAR shares common QOL determinants with asthma, such as sex and education level. These findings reinforce the interest of looking for social conditions before interpreting QOL scores. Further studies are required to confirm these results and particularly to examine the influence of area of residence on QOL of SAR patients.

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