

Quality of Life and Work Productivity Impairment of Patients with Allergic Occupational Rhinitis

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Background: Several studies demonstrated the negative impact of allergic rhinitis on Quality of Life (QOL) and occupational activities. Similar studies on allergic Occupational Rhinitis (OR) are rare. The aim of this study was to evaluate the QOL and work productivity of patients diagnosed with allergic occupational rhinitis.

Materials and Methods: We conducted a cross-sectional study from January 2005 to December 2015 at the Department of Occupational Medicine in Farhat Hached Teaching Hospital-Tunisia including patients diagnosed with allergic OR. QOL was assessed by the Mini-RQLQ (Rhinitis quality of life questionnaire) and Work impairment was measured by WPAI (Work Productivity and Activity Impairment) questionnaire.

Results: a total of 414 patients was enrolled in the study with a mean age of 37.82±8.08 years and a sex ratio = 0.33. Textile and clothing industry was the most represented sector (65.7%). The mean percent work time missed (absenteeism) due to allergic OR was 9.98±20.86% with a median of 0% and the mean presenteeism score was 46.7±32.67%. Overall QOL was 2.71±1.31. The most affected domains were practical problems and activity limitations. Absenteeism was positively correlated with age and eye symptoms scores. Both presenteeism and percent overall activity impairment were positively correlated with severe nasal obstruction and activity limitations score.

Conclusion: Allergic OR impairs QOL and work productivity. Although it doesn't seem to be associated with an important absenteeism, work productivity is reduced by an important rate of presenteeism. QOL and work productivity seem to interact significantly.

Key words: Allergic occupational rhinitis, Quality of life, Productivity, Impairment

INTRODUCTION

Rhinitis is defined as an inflammation of nasal mucosa, characterized by nasal symptoms such as nasal airflow limitation, anterior and/or posterior rhinorrhea, nasal pruritus and sneezing (1).

Occupational Rhinitis (OR) is an inflammatory disease of the nose, which is characterized by intermittent or persistent symptoms (i.e., nasal congestion, sneezing, rhinorrhea, itching), and/or variable nasal airflow

limitation and/or hypersecretion arising out of causes and conditions attributable to a particular work environment and not to stimuli encountered outside the workplace (2). Work-related rhinitis may be distinguished from work-exacerbated rhinitis that is pre-existing or concurrent rhinitis exacerbated by workplace exposures (2). OR can be classified into allergic and non-allergic. The second type of OR is caused by irritants and non-immunological reactions (2).

Occupational allergic rhinitis is habitually the inaugural clinical expression of airways sensitization to an allergen existing in the work environment (3).

Allergic rhinitis affects 10 to 25% of the population in developed countries and its prevalence is growing in developing countries (4-7). Its prevalence is about 15% in Switzerland and 20% in Europe (8). Epidemiological data available in Switzerland since 1926 have shown an increasing amount of sensitization to pollens from 1 to 12% within 70 years (8). The presumed causes of the increase in prevalence are multifactorial including air pollution, ozone, urbanization tendency, western lifestyle, stress, etc. (8).

Several studies showed that 15% of workers have OR which represents 4% of occupational respiratory diseases (9). Type and reactivity of allergens, work conditions, type of industrial techniques and processes, age and atopy are examples of risk factors that have an effect on the prevalence of OR (10).

The incidence and prevalence of occupational allergic rhinitis are unknown in Tunisia. Nevertheless, many studies were conducted in some specific sectors. Data from the Tunisian National Health Insurance Fund (CNAM) show a small number of declared cases underlining an under-declaration (10).

The evolution of Allergic OR to asthma is well-known and rhinitis is often preceding asthmatic symptoms (11). However, OR is 2 to 3 times more frequent than occupational asthma (12).

Allergic rhinitis is a public health concern due to its prevalence, costs, association with asthma and negative impact on Quality of Life (QOL) and work abilities (13).

Studies demonstrating the deterioration of QOL (14-19) and occupational productivity (14,18,20) in patients with allergic rhinitis are numerous, but such studies are rarer for allergic OR.

Therefore, we conducted this study with the objectives of evaluating QOL and productivity of patients with allergic occupational rhinitis.

MATERIALS AND METHODS

Study design

We conducted a cross-sectional study during the period from January 2005 to December 2015 at the Department of Occupational Medicine in Farhat Hached Teaching Hospital-Tunisia. Patients aged 18 to 65 years, diagnosed with allergic occupational rhinitis after clinical and paraclinical investigations, according to the diagnostic algorithm of the European Academy of Allergy and Clinical Immunology (EAACI) (2), were enrolled in the study. Patients diagnosed with non-allergic OR and those with work-exacerbated rhinitis were excluded. Due to frequent association between OR and occupational asthma and its impact on the evaluation of QOL, patients were explored by spirometry and non-specific bronchoprovocation. Asthmatic patients were also excluded from the study.

Data collected from patients' medical records were age, gender, matrimonial status, extraprofessional activities, job station, professional qualifications, products handled at work, sector of activity, use of personal protective equipment, occupational seniority, personal and familial medical history, physical examination findings and results of paraclinical examinations.

Measurement tools

QOL was measured by the Arabic validated version of the Mini-Rhinoconjunctivitis Quality of Life Questionnaire (MiniRQLQ) exploring five domains: activities, practical problems, nose symptoms, eye symptoms and other symptoms. The original version of the questionnaire was developed by Juniper EF et al. in 1991 (21,22) and included 28 items. The Arabic version was validated by AbuRuz et al. in 2009 (23). Like the RQLQ, all items of the mini-RQLQ are equally weighted and the analysis is conducted exactly the same manner as for the RQLQ.

Patients were invited to answer each question using a scale of seven points (0=not troubled, 6=extremely troubled). Items of each domain were added to reproduce scores from 0 to 6 where 0 is the best QOL and 6 is the worst possible QOL score. The questionnaire is analyzed

directly from the scores recorded and the results are expressed as the mean score per item for each of the domains as well as for overall QOL. Overall QOL score is estimated from the mean score of all the items.

Work Productivity and Activity Impairment questionnaire (WPAI-AS) (24,25) was used to evaluate limitations of occupational activities secondary to allergic OR. The WPAI yields four types of scores: Absenteeism (work time missed), presenteeism (impairment at work/reduced on-the-job effectiveness), work productivity loss (overall work impairment/absenteeism plus presenteeism) and activity impairment. WPAI outcomes are expressed as impairment percentages, with higher numbers indicating greater impairment and less productivity.

Statistical analysis

Means, standard deviations, medians and extreme values were calculated for quantitative variables. Frequencies and percentages were calculated for qualitative variables.

Pearson correlation coefficient was used to explore the correlation between two quantitative variables. Student's t-test for the comparison of two means and Snedecor's F test for the comparison of several means were performed. Multiple linear regressions were conducted for multivariate analysis. For all statistical tests, the threshold of significance (P-value) was set to 0.05.

RESULTS

Sociodemographic and medical characteristics

During the study period, 414 patients were diagnosed with allergic occupational rhinitis. The mean age of the population was 37.82 ± 8.08 years with extremes from 19 to 65 years. A female predominance was noted with 311 women (75.1%) versus 103 men and a sex ration of 0.33.

Among the study population, 395 workers were unskilled laborers (95.4%), 7 were skilled laborers (1.7%) and only 12 patients were highly qualified (2.9%). Table 1 shows occupational sectors of the cases with a clear predominance of the clothing and textile sector.

Although exposed to various dusts, vapors and fumes, only 10 patients usually wore protective masks during their activity (2.4%). Average professional seniority was 15.34 ± 8.84 years and 196 workers (47.3%) had a seniority more than 15 years.

Only 32 patients were smokers (7.7%) and six patients were exposed to passive smoking (1.4%).

The delay between the first occupational exposure and the onset of rhinitis ranged from 1 month to 32 years with an average of 9.84 ± 7.69 years.

Table 2 resumes complaints from patients, clinical examination findings and results of rhinomanometry.

The most frequent etiological suspected agent was cotton dust for 287 patients (69.3%) who declared the onset of symptoms during exposition. Detergents (5.1%), colophony (4.3%), cereals and flour (4.1%) were other frequent suspected etiologies (Table 3).

QOL and work productivity and activity impairment:

Overall QOL score was 2.71 ± 1.31 . The most affected domains were practical problems and activity limitations (Table 4).

In the week prior to the survey, the mean percent work time missed (absenteeism) due to allergic occupational rhinitis was $9.98 \pm 20.86\%$ with a median of 0% indicating that half of patients weren't absent during the last week because of their disease.

However, presenteeism was much higher with a mean percent impairment while working due to allergic OR of $46.7 \pm 32.67\%$ during the last week and a median score of 60%. Percent overall work impairment was $48.88 \pm 34.5\%$ and percent activity impairment was $44.71 \pm 35.41\%$.

Absenteeism was correlated with age of patients with $P=0.015$ and $r=0.26$ indicating higher absenteeism rates in older workers. This indicator wasn't associated with gender, sector of activity, occupational seniority number of symptoms or to rhinomanometry findings. Presenteeism wasn't statistically associated with any sociodemographic or medical variable.

Percent overall work impairment was positively correlated with age ($P=0.045$; $r=0.22$) while percent activity impairment was higher among women ($P=0.001$), workers in the clothing and textile sector ($P=0.026$), patients with

bilateral obstruction (P=0.008), patients with severe nasal obstruction on rhinomanometry (P=0.016) and was positively correlated with age (P=0.037; r=0.18) and professional seniority (P=0.006; r=0.23).

Table 1. Distribution of population by gender and sector of activity

Sector of activity	Gender		Total	
	Men	Women	N	%
Clothing and textile	29	243	272	65.7
Wood industry	11	1	12	2.9
Food industry	20	1	21	5.1
Chemical industry	13	9	22	5.3
Electronics industry	5	19	24	5.8
Health sector	1	10	11	2.7
Hotels	2	11	13	3.1
Construction sector	3	1	4	1
Metallurgical industry	4	0	4	1
Plastic industry	1	2	3	0.7
Gardening	2	0	2	0.5
Other sectors	12	14	26	6.3
Total	103	311	414	100

Table 2. Complaints, physical examination findings and rhinomanometry results

	N	%
Complaints		
Sneezing	308	74.4
Itching	306	73.9
Nasal obstruction	294	71
Rhinorrhea	267	64.5
Anosmia	20	4.8
Physical examination findings		
Pale nasal mucosa	52	12.6
Nasal polyposis	8	0.2
hypertrophy of the middle and inferior nasal turbinates	4	1
Rhinomanometry	355	85.7
Normal	26	7.3
Bilateral obstruction	317	89.3
Severe	205	57.7
Moderate	78	22
Mild	34	9.6
Unilateral obstruction	12	3.4
Severe	1	0.3
Moderate	5	1.4
Mild	6	1.7

Table 3. Suspected causative agents of allergic occupational rhinitis

Suspected Causative agents	Number of cases	Percentage
Cotton dust	287	69.3
Detergents	21	5.1
Colophony	18	4.3
Cereals and flour	17	4.1
Glues	14	3.4
Paints and varnishes	13	3.1
Wood dust	12	2.9
Epoxy resin	10	2.4
Formaldehyde	7	1.7
Metal dust	5	1.2
Plastics	4	1
Leather dust	3	0.7
Solvents	3	0.7
Total	414	100

Table 4. Mean scores of the Mini-RQLQ domains among patients with allergic OR

Domains	Mean score	SD
Activity limitations	3.02	± 1.74
Regular activities	3.41	± 1.98
Recreational activities	2.31	± 1.96
sleep	3.34	± 2.20
Practical problems	3.48	± 2.10
Need to rub nose/eyes	3.34	± 2.37
Need to blow nose repeatedly	3.63	± 2.48
Nose symptoms	2.9	± 1.72
sneezing	3.41	± 2.30
Stuffy blocked nose	2.77	± 2.37
Runny nose	2.52	± 2.37
Eye symptoms	1.36	± 1.57
Itchy eye	1.81	± 2.31
Sore eyes	1.26	± 2.05
Watery eyes	1.01	± 1.88
Other symptoms	2.81	± 1.62
Tiredness and/or fatigue	3.46	± 2.24
Thirst	1.68	± 2.00
Feeling irritable	3.29	± 2.20
Overall quality of life score	2.71	± 1.31

Analysis of Mini-RQLQ items showed that activity limitations score was higher among textile workers (P=0.009), among patients with bilateral (P=0.001) and severe (0.007) nasal obstruction and those with higher professional seniority (P=0.022; r=0.19).

Female workers had higher practical problems ($P=0.04$), eye symptoms ($P=0.02$), other symptoms ($P=0.009$) and overall QOL ($P=0.01$) scores.

All domains of the Mini-RQLQ were positively correlated with absenteeism, presenteeism, work productivity loss and activity impairment with higher WPAI percentages associated with worst QOL scores. Correlations between overall QOL score and WPAI indicators showed P -values $\leq 10^{-3}$ and r values at 0.4 for absenteeism, 0.58 for presenteeism, 0.61 for percent overall work impairment and 0.53 for activity impairment.

Multiple linear regressions were performed with scores of absenteeism, presenteeism, work productivity loss and activity impairment as dependent variables. For each regression, statistical models included gender, age, professional seniority, sector of activity, Mini-RQLQ scores and rhinomanometry results. Absenteeism was positively correlated with age of patients and eye symptoms scores indicating that older patients with higher eye symptoms scores on Mini-RQLQ had greater absence rates. Percent activity impairment was higher among women and patients with higher activity limitations scores. Both presenteeism and percent overall activity impairment were positively correlated with severe nasal obstruction on rhinomanometry and activity limitations score (Table 5).

Table 5. Results of multiple linear analysis between WPAI scores and associated variables

WPAI scores	Associated variables	p-value	Beta coefficient
Absenteeism	Age	0.005	0.32
	Eye symptoms	0.002	0.35
Presenteeism	Sever nasal obstruction	0.012	0.24
	Activity limitations score	$<10^{-3}$	0.7
Work productivity loss	Sever nasal obstruction	0.016	0.23
	Activity limitations score	$<10^{-3}$	0.73
Activity impairment	Gender	0.001	0.2
	Activity limitations score	$<10^{-3}$	0.73

DISCUSSION

This study is, to our knowledge, the first in Tunisia, and one of a few studies focusing on the evaluation of QOL and work productivity and activity impairment among

patients with allergic OR. Although some limitations were observed, such as the bias of self-administrated questionnaires with possible misunderstanding of questions or overestimation of scores, the use of a specific questionnaire for the evaluation of QOL and Work impairment strengthen our results. Existence of an Arabic version of the Mini-RQLQ enhanced the comprehension of questions with lesser possible comprehension errors. WPAI-AS have been already validated with various allergic diseases including rhinitis (26).

Textile and clothing companies are essentially located in the Tunisian central region explaining the predominance of patients working in this sector and diagnosed with allergic OR.

Patients with allergic OR do not only complain of clinical problems related to their symptomatology, but also of problems related to their occupation, such as inability to continue work, indication of allergen eviction and possible job loss. These professional changes can also interact with QOL. In the literature, several studies have evaluated the QOL in patients with occupational asthma (27-29) but only few studies explored QOL in patients with OR.

In our study, female workers had more impaired QOL scores. Housekeeping activities, which were evaluated by the questionnaire may explain a part of this findings. Women are generally cumulating efforts at work and at home and are exposed to household products that can aggravate rhinitis symptoms, impacting QOL.

These findings were similar to those reported by Shariat et al. (16) conducted in 2011 among 110 patients with non-occupational allergic rhinitis. Although we found an association between impairment of QOL, textile and clothing sector and professional seniority, similar results were not noted in the literature. Clothing sector is very developed in our country especially in the central region where most companies are set up. Workers in this sector are generally women with low educational level and from disadvantaged class accepting to stay at work despite their functional complaints. Maintaining exposure is a major

possible reason for aggravation of symptoms and, by the same way, decline of perceived QOL.

Other studies mainly focused on the impact of exposure cessation on QOL. Gerth van Wijk et al. concluded that work cessation had beneficial on improving the QOL of patients with occupational rhinitis (30). Power et al. found that among their study population of 29 patients allergic to latex, 90% noted that the total suppression of the allergen resulted in disappearance of the effects of nasal and ocular symptoms on their QOL (31).

Using the WPAI questionnaire, several other studies showed an impairment of work productivity and activity among patients with allergic rhinitis. Studies of Bousquet et al. (14), Small et al. (18) and De la Hoz Caballer et al. (20), showed an absenteeism ranging from 0 to 4.6%, a presenteeism ranging from 18.1 to 23.5%, a work productivity loss from 18.9 to 26.6% and an overall activity impairment ranging from 20 to 27.8%. Except for absenteeism, our results showed more important impairment of WPAI than these three studies. Absenteeism and presenteeism varies from one country to another due to cultural, socioeconomic, and health insurance factors. In our study, poorly qualified blue collars were the most represented category. Job insecurity because of possible loss of job is a threat for these workers who maintain their activity and avoid medical leave. Maintaining activity while symptoms are important or severe can explain an increase of presenteeism and a decline of productivity.

Compared to other diseases, allergic rhinitis seemed to have more negative impact on work productivity and activity than hypertension and diabetes and only depression caused more impairment than allergic rhinitis in the study of De la Hoz Caballer(20).

Our study showed associations between QOL and work productivity among patients with allergic OR. Even if absenteeism rates seem to be moderate, work productivity is clearly reduced because of important presenteeism percentages.

Identification of factors such as age, gender and QOL impairment could help to identify workers with higher risk of productivity and activity impairment. A rigorous application of preventive measures and a medical control of the disease should reduce the burden of allergic occupational rhinitis and also improve QOL and work productivity.

CONCLUSION

Allergic OR impairs QOL and work productivity. Although it doesn't seem to be associated with an important absenteeism, work productivity is reduced by an important rate of presenteeism. QOL and work productivity seem to interact significantly.

Only few studies were conducted to evaluate the impact of allergic OR on QOL and/or work productivity. This subject needs to be more explored for many reasons: the important incidence of the disease in various occupational sectors, its negative repercussions on QOL and on productivity, and the expected positive contribution of prevention and treatment in the improvement of social and economic aspects associated with occupational OR.

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