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Original article

The unfavorable effects of concomitant asthma and sleeplessness due to the atopic eczema/dermatitis syndrome (AEDS) on quality of life in subjects allergic to house-dust mites

Background: Allergic rhinitis, asthma or the atopic eczema/dermatitis syndrome (AEDS) may independently impair quality of life in patients. However, although many allergic patients may suffer from more than one disorder, the effect of concomitant disease — in particular, the impact of AEDS — is largely unknown. As part of a large multicenter clinical trial on the efficacy of mattress casings in house-dust mite (HDM) allergy, generic quality of life in a mixed population of 224 subjects with rhinitis ($n = 198$) and/or asthma ($n = 111$) and/or AEDS ($n = 64$) was studied. The study aimed to estimate quality of life impairment in these atopic patients and to address the questionissue of whether one atopic disorder goes beyond other existing allergic diseases, thereby causing further impairment to quality of life.
Methods: Generic quality of life was assessed by SF-36. Quality of life in the atopic group was compared with a Dutch norm population. Multiple linear regression was used to determine the effects of disease (i.e. the presence of allergic rhinitis, asthma or AEDS) or disease severity, as assessed by visual analog scores (VAS) for asthma, rhinitis, VAS sleeplessness and VAS itching being considered as major symptoms in AEDS on SF-36 domains.
Results: Compared to the norm group, atopic patients were impaired in: physical functioning; role physical functioning; general health; vitality; and social functioning. The diagnosis of asthma was negatively associated with the SF-36 subscales for physical functioning ($P = 0.02$), and general health ($P < 0.01$). In line with these findings, asthma severity (VAS asthma) was negatively associated with physical functioning ($P < 0.01$), role physical functioning ($P < 0.01$), general health ($P < 0.0.1$), social functioning ($P = 0.01$), emotional functioning ($P = 0.01$), and vitality ($P = 0.01$). VAS sleeplessness had significant negative effect on role physical functioning ($P < 0.01$), bodily pain ($P < 0.01$), General health ($P = 0.01$), mental health ($P < 0.01$), social functioning ($P < 0.01$), and vitality ($P < 0.01$). In contrast, neither the diagnosis of allergic rhinitis or AEDS, nor VAS itching as an outcome parameter of AEDS, exerted additional effects on the SF-36 domains.
Conclusions: Patients with atopic disease based on HDM allergy may have impaired quality of life. The majority of these patients have allergic rhinitis. The (co)existence of asthma, expressed in terms of diagnostic criteria or symptom severity, or the presence of sleep disorders as a consequence of AEDS, may further impair quality of life.

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Key words: AEDS; allergy; asthma; house-dust mites; quality of life; rhinitis.

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It is generally accepted that atopic disease can have a major impact on functioning in daily life. This awareness justifies the current focus on health-related quality of life. Quality of life is, however, hard to define. Schipper et al. (1) defined it as ''the functional effects of an illness and its consequent therapy upon a patient, as perceived by the patient''. Juniper commented (2) that the last phrase is particularly important because it emphasizes that these are the impairments that the patients consider important. Although allergy may seem more of a bother than a burden, several studies show that allergic people experience their complaints as troublesome and, consequently, consider their quality of life to be lower than healthy people. Bousquet demonstrated this effect in patients with allergic rhinitis (3). A recent study in asthmatics by van der Molen (4) revealed mild impairment of quality of life. These findings accord with earlier investigations by Bousquet (5). A very recent study by Lennaert (6)

demonstrated that quality of life was impaired in both rhinitis and asthma as indicated by scores on SF-36 subscales; rhinitis appeared to impair mental health while asthma dominated the physical domains. Rajagopalan and Anderson (7) showed in patients with contact dermatitis a moderate negative impact on Mental Health and Vitality. Finlay and Khan (8) tested patients with different skin diseases and healthy controls. In this study AEDS had a higher negative impact on quality of life than acne and basal cell carcinoma.

Therapy can improve quality of life, as shown by Bousquet et al. (9) in a study in patients with perennial rhinitis. After 6 weeks, the patients using antihistamines had a higher score on a quality of life questionnaire than patients using placebo, implying a better quality of life. In a large population study in French people with perennial rhinitis, in which the use of antihistamines was compared to the use of other medication or no medication, Pariente et al. (10) were able to show a similar effect.

In all of the aforesaid studies quality of life research was restricted to one target organ. Although allergic patients may suffer from more than one disorder, the effect of concomitant disease—in particular, the impact of AEDS (atopic eczema/dermatitis syndrome) (11)—is largely unknown. To our knowledge only one study has been dedicated to the effect of multi organ involvement on quality of life (6).This population based study, part of the European Community Respiratory Health Survey, involved patients with self reported symptoms of rhinitis and asthma.

In this study we investigated the possible effect of concomitant atopic disease on the quality of life of well-characterized allergic patients, as a part of a large-scale multicenter trial to study the effect of encasings on complaints of allergic rhinitis (AR), allergic asthma (AA) and AEDS in patients allergic to house-dust mite (HDM).

The objectives of this study were to estimate quality of life impairment in these atopic patients compared to a Dutch norm group and to address the question whether one atopic disorder goes beyond other allergic diseases, thereby adding to quality of life impairment in existing allergic disease. We looked at concomitant disease not only in terms of diagnosis, but also in terms of symptom severity as these patients represented a heterogeneous group with mild to severe disease.

Study design

Patients took part in a multicenter trial to study the effect of encasings of mattresses, pillows and duvets on complaints of allergic rhinitis and/or asthma and/or AEDS. Participating centres were the Allergology departments of the University Hospitals of Groningen and Rotterdam, and the Dermatology department of the University Hospital Utrecht. The study was approved by the Medical Ethics Committees of all three University Hospitals and all patients gave written informed consent.

Patients aged 18–50 years were eligible if either a ratio of allergen and histamine wheal diameter was ≥ 0.7 using intradermal skin tests or radioallergosorbent (RAST) class was 2 or more. Clinically, allergic rhinitis was defined by clinical features and classical history of rhinitis (nasal obstruction, sneezing, watery discharge) for at least one year. This *physician-based diagnosis* met the criteria of the guidelines of the International Consensus on Rhinitis (12). However, to ensure that all patients included in the intervention study did have allergic rhinitis based on HDM allergy, a positive nasal challenge test to HDM was required in combination with the clinical diagnosis at entrance (*test diagnosis*).

The presence of asthma was defined by a 1-year history of asthma, physician-based diagnosis or use of inhalation steroids, reversibility of 9% or more (13), or PC_{20} methacholine of 9.8 μg or less (14).

The presence of AEDS was defined by the criteria of Hanifin and Rajka (15) (a consensus based scoring system of clinical characteristics). To ensure that patients with active disease were enrolled for the purpose of the trial, the severity of the disease was assessed with the Leicester sign score, a scoring system for disease activity (16). Using this system, a score of 1% or more and 6 points or more was required to enter the trial.

Some additional inclusion and exclusion criteria were required for admittance to the randomised trial. Patients had to be exposed to house-dust mites (i.e. ^{3} 200 μg Der *P* 1 or Der f 1 in a dust sample). Patients sensitized to pets, with those pets at home, were excluded. Also, anatomical disorders of the nose, pregnancy, or lactation, daily use of inhalation steroids ^{3} 1600 μg/day, oral steroids, cyclosporine, regular use of antibiotics for upper or lower airway infections, or regular use of oral steroids for exacerbation of asthma, were considered exclusion criteria. To avoid bias by seasonal allergens like grass pollen all measurements took place outside the pollen season.

Quality of life measurements

Questionnaires. Generic quality of life was measured by means of the 1-week version of the SF-36. We used the translation of Aaronson of the MOS SF-36, originally developed by Ware and coworkers (17–21). SF-36 consists of 36 questions divided over eight subscales, covering both physical and mental health.

1. Physical health subscales are physical functioning (PF), role physical functioning (RP), bodily pain (BP), and general health (GH).
2. Mental health subscales are mental health (MH), role mental functioning (RE), social functioning (SF), and vitality (VT).

Questions are stated both in "yes/no" format and multiple choice. The sum of the score is calculated for each subscale and transformed to a percentage of the total

possible score. High scores indicate good quality of life, while low scores indicate low quality of life. The reliability in two general population samples as reported by Aaronson using Cronbach's á varied from 0.76 to 0.92, while the item discriminant validity varied from 0.09 to 0.64.

To score the severity of the disease as experienced by the patients we used visual analog scales (VAS). This is a continuous horizontal line of 100 mm where 0 mm indicates no complaints,d 100 mm indicates severe complaints. The patient is asked to evaluate his or her complaints over the past 14 days; the overall burden as experienced by the patient is represented by a single, vertical line on this continuous horizontal line. Blom et al. (22) showed that the VAS in case of complaints of rhinitis has a good performance (23). On the analogy of this VAS we constructed a VAS for lung complaints to assess their severity as experienced by asthma patients, and a VAS for itching for dermatitis patients. Since sleep can be disturbed by rhinitis, asthma, and especially dermatitis symptoms, we also constructed a VAS to evaluate sleeping problems.

VAS scores were obtained from the following questions: ''How much were you bothered by complaints of your nose the past two weeks'' (VAS rhinitis). Analog questions were ''How much were you bothered by complaints of your lungs (VAS asthma) *or* of itching (VAS itching) or of sleeplessness (VAS sleeplessness) in the past 2 weeks''. Irrespective of their diagnosis all patients answered all four VAS.

Procedures. SF-36 and VAS scores were administered to the patients before tests were performed (e.g. VAS for nasal complaints was filled in prior to nasal provocation with HDM). Trained personnel instructed the patients according to guidelines defined by the designers of the questionnaires. All patients filled in their questionnaires in a private room while alone.

Since nasal complaints can be biased by using medication, all nasal medication was stopped. Oral antihistaminics were stopped 3 days before starting the daily symptom score, nasal sprays 2–4 weeks before, to ensure a sufficiently long washout period. During the 14 days of the daily symptom score patients were allowed to use acrivastine, 8 mg one to three times a day, but use of rescue medication was discouraged.

Statistical analysis

For continuous data means and standard deviations, respectively, were estimated. For categorical data percentages were estimated. Patients missing 25% of data were excluded from analysis.

To compare our data on SF-36 subscales with those of the general Dutch population we used Cohen's *d*, a method to express the effect size (the magnitude of the difference between two populations). It is calculated by dividing the difference between the means of two populations by the standard deviation of the reference group (24). Differences between sex and diagnostic groups (Table 2) were calculated with Student's *t*-test. To study the association between disease (i.e. asthma, rhinitis, or AEDS), disease severity (i.e. VAS asthma, rhinitis, sleeplessness and itching) and quality of life (i.e., SF-36) multiple linear regression was considered to be more appropiate than subgroup analysis, as the former enables us to identify the contribution of the different diseases to quality of life, independently from each other. The model included adjustment for sex, smoking, and age. To fairly compare the importance of the relevant covariables, standardized regression coefficients (β) were estimated. All statistical tests were performed with $\alpha = 0.05$ (two-sided).

Results

General

In total 233 patients entered the study. Nine patients had incomplete data and were excluded, leaving 224 patients eligible for analysis. These were 80 men and 144 women with average ages of 32.2 and 32.6, respectively; 59.4% were nonsmokers, 22.8% were former smokers (stopped for at least 6 months) and 17.8% were current smokers (Table 1).

After distinguishing patients by diagnostic group, the largest subgroups turned out to be patients with rhinitis ($n = 85$) and patients with rhinitis and asthma ($n = 62$) while 31 patients had the combined asthma, rhinitis and dermatitis; the fourth largest group ($n = 20$) was that for rhinitis and dermatitis. The groups for mono-asthma ($n = 13$), mono-dermatitis ($n = 8$), and asthma with dermatitis ($n = 5$) were very small. Most patients (88.4%) appeared to be affected by rhinitis.

In the rhinitis group, 33.8% used no medication at all, 32.3% used oral antihistamine, 13.1% used nasal corticosteroids, and 14.1% used nasal corticosteroids and

Table 1. General characteristics

Patients	Men ($n = 80$)	Women ($n = 144$)	Total ($n = 224$)
Age (average years)	32.2 (SD 7.9)	32.6 (SD 8.4)	32.5 (SD 8.2)
Smoker	14 (17.5%)	26 (18.1%)	40 (17.9%)
Nonsmoker	56 (70.0%)	77 (53.5%)	133 (59.4%)
Exsmoker	10 (12.5%)	41 (28.5%)	51 (22.8%)
AR	33 (41.4%)	52 (36.1%)	85 (37.9%)
AR + AA	18 (22.5%)	44 (30.6%)	62 (27.7%)
AR + AA + AEDS	10 (12.5%)	21 (14.6%)	31 (13.8%)
AR + AEDS	3 (3.8%)	17 (11.8%)	20 (8.9%)
AA	7 (8.8%)	6 (4.2%)	13 (5.8%)
AA + AEDS	3 (3.8%)	2 (1.4%)	5 (2.2%)
AEDS	6 (7.5%)	2 (1.4%)	8 (3.6%)

AR: allergic rhinitis; AA: allergic asthma; AEDS; allergic eczema/dermatitis syndrome.

oral antihistamine. A minority (< 5%) used nasal cromoglycates with or without oral antihistamine, or nasal antihistamine spray with or without oral antihistamine.

Patients diagnosed with asthma had a mean PC_{20} of 4.96 μg (SD = 20.87, range 0.00–157 μg) and a mean reversibility of 8.7% (SD = 8.33). In 37.8% of the asthmatics, inhalation steroids were used; short-acting, -agonists were used as needed, or once daily or more in 42.3% and 19.8%, respectively. Long-acting,-agonists were used in 8.1%. Topical corticosteroids were used in 68.8% of the AEDS patients, 10.9% used mollifying creams, and 20.3% used no medication at all. Mean Leicester sign score (LSS) was 31.8 (SD = 23.4, range 2–88).

Comparison between SF-36 study scores and norm scores

In Table 2 mean scores of the SF-36 subscales obtained from this study and norm scores obtained from a randomly selected nationwide sample of adults ($n = 1742$) are shown (17).

Our study group has significant lower scores on physical functioning, role physical functioning, general health, vitality, and social functioning, compared to the adult population of Aaronson et al. (17).

Cohen's *d* (indicator of the magnitude of the difference) suggests that this effect is small for social functioning, medium for role physical functioning and vitality, and large for physical functioning and general health. The lower scores found with women in our group is in line with earlier studies (17).

Mean scores on SF-36 subscales in the three major groups, AR, AR + AA, and AR + AA + AEDS revealed only significant difference between AR and AR + AA + AEDS on the subscale general health. Other subgroups were too small for separate analysis.

Effect of diagnosis on SF-36 subscales

We analyzed the effect of the main diagnoses of asthma, rhinitis and AEDS on the eight subscales of the SF-36 by means of multiple linear regression analyses, adjusted for sex, age, and smoking.

Asthma had a significant negative effect on the scales for physical functioning ($P = 0.02$) and general health ($P < 0.01$) and was nearly significant for role physical functioning ($P = 0.06$). AEDS and rhinitis had no significant effect on the subscales (Table 3).We also analyzed the effect of comorbidity. The VIF (Variance Inflation Factor) of asthma and comorbidity exceeded 4, indicating multicollinearity (24).

Relationship between visual analog scores and SF-36

Visual analog scores for asthma, rhinitis, sleeplessness, and itching were analyzed in relation to the subscales of the SF-36. Analyzes were adjusted for sex, smoking, and age. It appeared that VAS asthma and VAS sleeplessness had inverse associations with some of the subscales of the SF-36 (Table 4), so that the higher the score on the VAS the lower the score on the SF-36. VAS asthma had a significant negative effect on the subscales for physical functioning ($P < 0.01$), role physical functioning ($P < 0.01$), general health ($P < 0.01$), social functioning ($P = 0.01$), emotional functioning ($P = 0.01$) and vitality ($P = 0.01$). Sleeplessness had a significant negative effect on role physical functioning ($P < 0.01$), bodily pain ($P < 0.01$), general health

Table 2. General score on SF-36 subscales. Figures are obtained from the study of Aaronson, standard version SF-36 (17)

	National study† $n = 1742$	This study‡					AR $n = 85$	AR + AA $n = 62$	AR + AA + AEDS $n = 31$
		$n = 224$	Cohen's *d*§	*P* value	Men¶	Women			
	mean age (sd)	mean age (sd)			mean age (sd)	mean age (sd)	mean age (sd)	m (sd)	m (sd)
PF	93.1 (11.8)	85.2 (15.8)	− 0.67	< 0.01	90.1 (12.2)*	82.5 (16.9)	86.9 (16.6)	84.0 (14.3)	81.6 (15.2)
RP	86.4 (27.6)	78.0 (33.2)	− 0.30	< 0.01	83.8 (29.0)	74.8 (35.0)	81.5 (31.4)	74.6 (37.2)	75.8 (33.8)
BP	80.9 (19.4)	80.5 (20.3)	− 0.02	> 0.05	83.3 (17.3)	78.9 (21.7)	79.9 (21.0)	82.0 (20.0)	76.6 (20.0)
GH	78.2 (17.3)	63.8 (21.3)	− 0.83	< 0.01	66.7 (21.5)	62.1 (21.0)	67.2 (22.0)****	61.5 (20.1)	54.2 (19.6)
VT	70.7 (16.4)	64.8 (19.3)	− 0.36	< 0.01	68.7 (19.0)**	62.7 (19.2)	65.9 (20.6)	64.9 (16.8)	60.5 (22.6)
SF	87.8 (19.1)	84.9 (20.1)	− 0.15	< 0.01	89.4 (16.5)***	82.5 (21.5)	86.0 (20.6)	85.9 (21.3)	84.3 (14.4)
RE	85.4 (30.0)	86.6 (29.1)	0.04	> 0.05	88.3 (28.1)	85.6 (29.7)	86.3 (29.6)	83.9 (31.8)	88.2 (28.0)
MH	78.7 (15.2)	79.1 (14.7)	0.03	> 0.05	80.4 (14.1)	78.5 (15.0)	79.2 (14.7)	79.4 (15.5)	80.4 (15.0)

Physical health subscales are physical functioning (PF), role physical functioning (RP), bodily pain (BP), and general health (GH); mental health subscales are mental health (MH), role mental functioning (RE), social functioning (SF), and vitality (VT).

* $P = 0.001$; ** $P = 0.026$; *** $P = 0.014$; **** $P = 0.004$ between groups AR *vs* AR + AA + AEDS.

† Age-range of the participants 16–40 years.

‡ Age-range of the participants 18–50 years.

§ Cohen's *d* represents the magnitude of difference (discrepancy); $d = 0.20$ (small effect) $d = 0.50$ (medium) $d = 0.80$ (large).

¶ Student's *t*-test was used.

PF

Table 3. Effect of diagnosis on SF-36 subscales

	Allergic asthma				Allergic rhinitis				Allergic eczema/dermatitis syndrome			
	β	se_{β}	*t*	*P*	β	se_{β}	*t*	*P*	β	se_{β}	*t*	*P*
PF	− 0.16	0.07	− 2.42	0.02	0.03	0.07	0.41	0.70	0.02	0.07	0.34	0.73
RP	− 0.13	0.07	− 1.89	0.06	0.09	0.07	1.40	0.16	0.01	0.07	0.16	0.88
GH	− 0.22	0.07	− 3.27	< 0.01	− 0.02	0.07	− 0.27	0.79	− 0.07	0.07	− 0.94	0.35
BP	0.03	0.07	0.49	0.63	− 0.05	0.07	− 0.74	0.46	− 0.07	0.07	− 1.00	0.32
SF	0.04	0.07	− 0.54	0.59	0.09	0.07	1.21	0.23	− 0.08	0.07	− 1.17	0.25
MH	0.06	0.07	0.84	0.40	0.10	0.07	1.36	0.18	− 0.02	0.07	− 0.32	0.75
RE	− 0.05	0.07	− 0.73	0.47	− 0.01	0.07	− 0.11	0.92	0.01	0.07	0.10	0.92
VT	− 0.03	0.07	− 0.40	0.69	0.05	0.07	0.65	0.52	− 0.06	0.07	− 0.80	0.42

Physical health subscales are physical functioning (PF), role physical functioning (RP), bodily pain (BP), and general health (GH); mental health subscales are mental health (MH), role mental functioning (RE), social functioning (SF), and vitality (VT).
β = standardized regression coefficient.
se_{β} = standard error β.
t = *t* statistic.
P = significance level.

Table 4. Effect of visual analog scores (VAS) on SF-36 subscales

	VAS asthma				VAS rhinitis				VAS sleeplessness				VAS itching			
	β	se_{β}	*t*	*P*	β	se_{β}	*t*	*P*	β	se_{β}	*t*	*P*	β	se_{β}	*t*	*P*
PF	− 0.32	0.07	− 4.84	< 0.01	− 0.03	0.07	− 0.40	0.69	− 0.08	0.07	− 1.23	0.22	− 0.02	0.07	− 0.32	0.75
RP	− 0.29	0.06	− 4.51	< 0.01	− 0.05	0.07	− 0.74	0.46	− 0.27	0.07	− 4.16	< 0.01	0.07	0.07	0.98	0.33
BP	− 0.09	0.07	− 1.43	0.16	− 0.05	0.07	− 0.72	0.47	− 0.28	0.07	− 4.14	< 0.01	0.05	0.07	0.78	0.44
GH	− 0.26	0.07	− 3.94	< 0.01	− 0.05	0.07	− 0.59	0.56	− 0.21	0.07	− 3.08	< 0.01	− 0.00	0.07	− 0.07	0.94
MH	− 0.12	0.07	− 1.82	0.07	0.01	0.07	0.13	0.90	− 0.29	0.07	− 4.25	< 0.01	0.08	0.07	1.09	0.28
SF	− 0.17	0.07	− 2.51	0.01	0.02	0.07	0.30	0.76	− 0.26	0.07	− 3.89	< 0.01	− 0.08	0.07	− 1.11	0.27
RE	− 0.19	0.07	− 2.72	0.01	0.03	0.07	0.46	0.65	− 0.07	0.07	− 0.95	0.34	0.04	0.07	0.52	0.60
VT	− 0.18	0.07	− 2.66	0.01	− 0.06	0.07	− 0.82	0.41	− 0.28	0.07	− 4.18	< 0.01	− 0.01	0.07	− 0.12	0.90

Physical health subscales are physical functioning (PF), role physical functioning (RP), bodily pain (BP), and general health (GH); mental health subscales are mental health (MH), role mental functioning (RE), social functioning (SF), and vitality (VT).
β = standardized regression coefficient.
se_{β} = standard error β.
t = *t* statistic.
P = significance level.

($P < 0.01$), mental health ($P < 0.01$), social functioning ($P < 0.01$), and vitality ($P < 0.01$). VAS nose and VAS itching showed no significant effect on the SF-36. Sex had no significant effect on sex on the SF-36 subscales.

Visual analog scales as outcome measures of disease

Using multiple regression models adjusted for sex, age, and smoking with VAS scores as variables to be estimated, and diagnosis of asthma,rhinitis, and AEDS as explanatory variables, it appeared that VAS asthma was significantly associated with the diagnosis of asthma ($t = 6.52$; $P < 0.001$), VAS rhinitis was linked to the diagnosis of rhinitis ($t = 3.09$; $P < 0.001$), and both VAS itching ($t = 12.72$; $P < 0.001$) and VAS sleeplessness ($t = 2.84$; $P = 0.005$) were associated with the diagnosis of AEDS. VAS sleeplessness was not associated with asthma ($t = 1.00$; $P = 0.32$) or rhinitis ($t = -0.27$; $P = 0.98$).

Discussion

It has been postulated that allergic rhinitis, asthma, and AEDS are closely associated. Rates of allergic rhinitis among asthmatics vary from 28 to 50% in studies published in the 1970s and 1980s. In a recent population-based study, the prevalence of rhinitis in patients with asthma was estimated at 78% (6). This study focused on atopic subjects recruited for a clinical trial; it supports the close connection between atopic diseases. Forty-six percent (106/224) only could be diagnosed as having one atopic disorder.

Despite evidence for the high comorbidity in atopic disease, daily clinical therapy focuses on the most

predominant disease, i.e. asthma, AEDS, or rhinitis. Ignoring the burden of concomitant disease may result in inadequate management of the patient.

We have studied the level of quality of life in a large group of allergic patients, characterized by asthma, , and/or AEDS. As expected we found that atopic patients, irrespective of their diagnosis, were impaired in quality of life compared to the Dutch norm group. Secondly, we demonstrated that patients with the diagnosis of bronchial asthma experienced impaired quality of life, independent of the presence of allergic rhinitis or AEDS. Thirdly, the level of asthma symptoms was associated with the magnitude of deterioriation in quality of life.

Our findings are in line with the observations of Lennaert et al. (3) who demonstrated that patients with asthma and rhinitis have lower SF-36 scores than patients with rhinitis only. Our study underlines the relative importance of asthma beyond rhinitis and AEDS. The preferential power of asthma on quality of life means that in patients with rhinitis or AEDS concomitant asthma will have an additional unfavorable effect on quality of life, whereas allergic rhinitis or AEDS as concomitant disease will not contribute to existing quality of life impairment.

A fourth finding was that sleep disorders have a major effect on quality of life in these atopic subjects. Although sleeping problems may be linked with asthma and rhinitis, it is patients with AEDS in particularly who experience sleeping problems. In this study VAS sleeplessness was significanty associated with the diagnosis of AEDS, but not with asthma or rhinitis. Thus, although the presence of AEDS by itself does not further affect quality of life, sleeping problems caused by AEDS may interfere with quality of life.

Our finding that the presence of allergic rhinitis has no additional effects on quality of life compared to the presence of asthma can be explained in several ways.

First, as more than 88% of patients can be diagnosed as having rhinitis, it is difficult to analyze the independent effect of rhinitis on quality of life. Nevertheless, we did find impaired quality of life in all atopic patients, in addition to a considerable effect of asthma on SF-36 subscales.

Second, each diagnostic category (asthma, rhinitis and AEDS) comprises a broad range of disease severity. In some patients, asthma or AEDS is the main diagnosis and rhinitis is merely a mild disorder, and vice versa. It is possible that the range of disease severity covered by a diagnosis is much too broad for predicting quality of life outcome measures, as suggested by the apparent discrepancy in the finding that presence of AEDS has no additional effect on quality of life, but sleeplessness as a consequence of AEDS does.

Third, the results might be biased because of errors of the measurement instrument. The advantage of generic instruments is that the burden of illness across different disorders and patient populations can be compared. The disadvantage, however, is that the instruments are not tailored to the complaints of the patient and may not be responsive enough to detect changes in general health states, despite important changes in disease-related problems (25).

Research aimed at better understanding of the structure and association between the generic and specific quality of life measurements, and the medical outcome measures used in this study (e.g. nasal provocation, lung function) will be discussed in forthcoming articles.

In conclusion, patients with atopic disease based on HDM allergy may have impaired quality of life. The majority of these patients have allergic rhinitis. The (co)existence of asthma, expressed in terms of diagnostic criteria or symptom severity or the presence of sleep disorders as a consequence of AEDS, may further impair quality of life.

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