



Subjects with well-controlled asthma have similar health-related quality of life as subjects without asthma



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ABSTRACT

Background: The burden of asthma and rhinitis on health-related quality of life (HRQL) among adults has been assessed mainly in studies of patients seeking health-care, while population-based studies are relatively scarce. The objective of this study was to investigate HRQL among subjects with asthma and rhinitis derived from a random population sample and to identify factors related to impairment of HRQL. **Methods:** A randomly selected cohort was invited to participate in a postal questionnaire survey. Of those who responded, a stratified sample of 1016 subjects was invited to clinical examinations and interviews, and 737 subjects in ages 21–86 years participated. Of these, 646 completed HRQL questions. HRQL was assessed with the generic SF-36 Health Survey.

Results: The physical score was lower among subjects with asthma vs. subjects without asthma ($p < 0.001$). No significant difference was found in the mental score. Subjects with well-controlled asthma had higher physical score compared to subjects with partly and un-controlled asthma ($p = 0.002$). Actually, subjects with well-controlled asthma had similar physical HRQL as subjects without asthma. Asthmatics who were current smokers had lower physical score compared to those who were non-smokers ($p = 0.021$). No significant differences in physical or mental scores were found between subjects with and without rhinitis. Subjects with both asthma and rhinitis had lower physical score compared to subjects without these conditions ($p < 0.001$), but subjects with asthma alone had even worse physical score.

Conclusions: The physical score was significantly lower in asthmatics compared to subjects without asthma. Importantly, non-smoking and well-controlled asthmatics have similar HRQL compared to subjects without asthma. Thus, subjects with asthma should be supported to achieve and maintain good asthma control and if they smoke, be offered smoking cessation as means to improve their HRQL.

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1. Introduction

The prevalence of asthma and rhinitis among adults has increased considerably over the second half of the 20th century in many countries including Sweden [1–5]. These diseases are manifestations of the atopic syndrome and there is increasing evidence of an association between asthma and rhinitis based on epidemiological, immunological, and clinical studies [6–9]. Rhinitis is a

strong risk factor for the onset of asthma in adults [10], and rhinitis has been shown to be present among up to 80% of asthmatics, and 20–50% of patients suffering from rhinitis are also bothered with asthma [6,11,12].

Health-related quality of life (HRQL) has become an increasingly important aspect in outcome evaluation in health care and comprises an important outcome measure based on individual perceptions of how a disease affects subjects in everyday life [13]. Two types of instruments, generic and disease-specific, are used to assess HRQL. Generic instruments are measures of health status in general [14], while disease-specific instruments are targeted to a specific disease. Asthma and rhinitis have shown to substantially

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impact patients' HRQL negatively [5,14,15]. Rhinitis symptoms in patients with asthma can be associated with worsening asthma symptoms, and rhinitis symptoms can have detrimental effects on physical, psychological, and social aspects of patients' life [16,17]. Lack of asthma control has been associated with impaired HRQL [18–20]. Different personality characteristics and gender can also influence perceived HRQL in patients living with asthma and rhinitis [21]. However, the burden of asthma and rhinitis on HRQL has been assessed mainly in studies of patients seeking health-care, while population-based studies are relatively scarce.

The main objective of this study was to investigate HRQL among subjects with asthma and rhinitis, derived from a random population sample. A secondary aim was to identify factors related to impairment of HRQL among subjects with asthma and rhinitis. Our hypothesis is that both asthma and rhinitis are associated with impaired HRQL, and that HRQL would be even more impaired if the subjects are affected by both diseases.

2. Material and methods

2.1. Study population

The study was performed within the Obstructive Lung Disease in Northern Sweden (OLIN) studies (www.nll.se/olin). A randomly selected cohort of 7997 subjects aged 20–69 years was recruited in 2006 [22]. A follow-up of another randomly selected cohort consisting of 7004 subjects recruited in 1996 was also performed in 2006, now aged 30–84 years. Thus, in total, 12,055 subjects (80% of those invited) participated in a postal questionnaire survey. Of the responders, a stratified sample of 1016 subjects was randomly selected after stratification for the sex and age distribution of the general population in Norrbotten. These subjects were in 2008–09 invited to clinical examinations and structured interviews, and 737 subjects participated, now in ages 21–86 years [23]. Of these, 646 completed questions about HRQL.

2.2. The clinical examination

The structured interview included questions about respiratory symptoms and diseases which have been validated [10]. Severity of asthma was classified as well-controlled, partly controlled and uncontrolled asthma according to the Global Initiative for Asthma (GINA) classification of levels of asthma control, e-Table 1 [24]. Height and weight was measured and weight/height² (body mass index, BMI) was calculated. Blood samples were collected and allergic sensitization was assessed by analyses of specific IgE antibodies in serum; birch, timothy, mugwort, cat, dog, horse, D. pteronyssinus, D. farinae, and alternaria. A positive result was defined as an IgE level ≥ 0.35 IU/ml to any of the specific allergens. Smoking habits were classified into three categories: current smokers, ex-smokers and never-smokers. Ex-smokers had smoked for at least one year but not during the last 12 months. In the analyses, ex-smokers and never-smokers were merged into one group, non-smokers.

2.3. HRQL instrument

HRQL was assessed with the generic SF-36 Health Survey measuring eight domains of health: physical function (PF), role functioning – physical causes (RP), bodily pain (BP), general health (GH), vitality (VT), social function (SF), role-emotional (RE) and mental health (MH). The SF-36 scale can be transformed into two summary measures: the Physical Component Summary (PCS) based on the first four domains and the Mental Component Score (MCS) based on the last four domains. The Swedish version of the

SF-36 is well documented and has shown good psychometric qualities in different groups [25–27], and has been validated in a Swedish normative population [27]. The instrument is valid and reliable in terms of clinical, criteria-and constructs validity. Each component summary is ranging from 0 to 100 (0 = worst possible health status and 100 = best imaginable health status).

2.4. Definitions

Current asthma: Was defined as answering yes to the questions: Have you been diagnosed as having asthma by a doctor? and Have you been using asthma medications regularly or as needed during the last 12 months? or Have you had wheezing or whistling in your chest at any time during the past 12 months? or Have you ever had attacks of shortness of breath or breathlessness during the past 12 months?

Current rhinitis: Was defined as answering yes to the questions: Do you have allergic nasal symptoms or rhinitis? and Problems with sneezing, runny nose or blocked nose, without having a cold during the past 12 months? or Have you been using medications due to rhinitis/allergic nasal problems or blocked nose, non-allergic, during the past 12 months?

2.5. Statistical analysis

Statistical analyses were performed with the IBM Statistical Package for the Social Sciences (SPSS) Statistics 20. As the distribution of the HRQL-scores was skewed and not normally distributed, the non-parametric Mann-Whitney *U* test was used to test differences in HRQL between groups. Subjects with and without asthma and rhinitis, respectively, were evaluated. In addition, four mutually exclusive groups were created; asthma only, rhinitis only, both asthma and rhinitis, and subjects without any of these conditions. Linear regression was used between non-transformed HRQL-scores and diagnoses and the associations were estimated based on 1000 non-parametric bootstrap samples. A multiple regression model was utilized for adjusting the HRQL-scores for variables that could be associated with both asthma/rhinitis and HRQL, sex, age, smoking habits and BMI.

3. Results

3.1. Characteristics of the study population

Basic characteristics of the study population are shown in Table 1. In total, 96 subjects (13.0%) were defined as having current asthma, whereas 184 subjects (25.0%) had current rhinitis. Most of the study population was non-smokers or ex-smokers and 14.5%

Table 1
Characteristics of the study population.

	Males (n = 364)	Females (n = 373)	All (n = 737)
Age, mean (range)	53.0 (21–85)	53.8 (21–86)	53.4 (21–86)
Asthma, n (%)	45 (12.4)	51 (13.7)	96 (13.0)
Rhinitis, n (%)	90 (24.7)	94 (25.2)	184 (25.0)
Smoking habits			
Never-smoker, n (%)	193 (53.0)	186 (49.9)	379 (51.4)
Ex-smoker, n (%)	127 (34.9)	120 (32.2)	247 (33.5)
Current smoker, n (%)	42 (11.5)	65 (17.4)	107 (14.5)
Positive Any-IgE, n (%)	100 (27.5)	93 (24.9)	193 (26.2)
PCS ^a (mean)	50.0	47.8	48.8
MCS ^b (mean)	52.3	50.6	51.4
BMI	27.2	27.4	27.3

^a Physical component summary.

^b Mental component summary.

were current smokers (11.5% males and 17.4% females). Among the 646 subjects who responded to the HRQL instrument SF-36, the physical (PCS) and mental component summary (MCS) scores were 48.8 and 51.4, respectively.

3.2. Health-related quality of life in relation to asthma and rhinitis

The physical HRQL score was significantly lower among subjects with asthma compared to subjects without asthma, 44.7 vs. 49.4 ($p < 0.001$), while no significant difference was found in the mental HRQL. However, in the MCS score the domains “Vitality” and “Social Functioning” were lower among subjects with asthma compared to subjects without asthma. No significant differences were found in the physical or mental scores between subjects with and without rhinitis. The domains “General Health”, “Vitality” and “Social Functioning” were lower among subjects with rhinitis compared to subjects without rhinitis (Table 2).

3.3. Health-related quality of life in mutually exclusive groups of asthma and rhinitis

The physical score was significantly lower among subjects with asthma alone and subjects with both asthma and rhinitis, 42.9 (95% CI 39.5–46.6) and 45.9 (95% CI 43.2–48.8), respectively, compared with 49.6 for subjects without any of these conditions. After adjustment for the confounders age, sex, smoking habits and BMI, the physical score remained significantly lower for subjects with only asthma and subjects with both asthma and rhinitis 45.8 (95% CI 42.3–49.4) and 47.7 (95% CI 44.8–50.6), respectively, compared with 51.6 for subjects without any of these conditions. Subjects with only rhinitis had similar physical score as subjects without asthma or rhinitis, 48.8 (95% CI 46.8–50.8) vs. 49.6 (Fig. 1).

No significant differences were found in the mental score in subjects with asthma alone, rhinitis alone, or subjects with both asthma and rhinitis compared to subjects without these conditions. This result remained after adjustment for sex, age, smoking habits and BMI (Fig. 2).

Among the eight domains, “General Health” and “Vitality/Energy” were correlated to lower HRQL both among subjects with asthma alone, subjects with rhinitis alone and subjects with both asthma and rhinitis compared to subjects without any of these conditions (Table 3). The HRQL-domains “Physical Functioning”, “Role/Physical” and “Bodily Pain” were lower among subjects with asthma alone and those with both asthma and rhinitis. The domain “Social Functioning” was lower both among subjects with asthma alone and subjects with rhinitis alone compared to subjects without any of these conditions.

Table 2
SF-36 health domains in relation to asthma and rhinitis.

	Asthma yes	Asthma no	p-value*	Rhinitis yes	Rhinitis no	p-value*
PF	81.5	87.8	<0.001	88.2	86.7	0.823
RP	72.4	84.3	0.001	80.3	83.9	0.108
BP	66.0	75.1	0.003	71.1	74.9	0.084
GH	65.0	76.0	<0.001	70.8	76.0	0.002
VT	60.3	70.6	<0.001	65.8	70.7	0.003
SF	86.6	91.3	0.018	88.7	91.4	0.008
RE	85.1	87.6	0.514	87.9	87.0	0.846
MH	81.7	84.6	0.113	82.9	84.7	0.129
PCS	44.7	49.4	<0.001	48.0	49.2	0.150
MCS	50.2	51.6	0.146	50.5	51.8	0.077

Bold values indicate statistical significance based on the 95% CI.

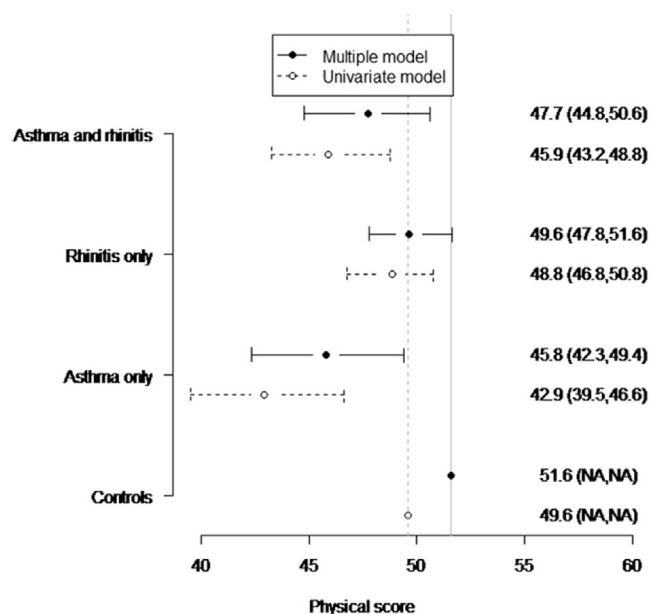


Fig. 1. Physical score among subjects with asthma, rhinitis, both asthma and rhinitis, and subjects without these conditions.

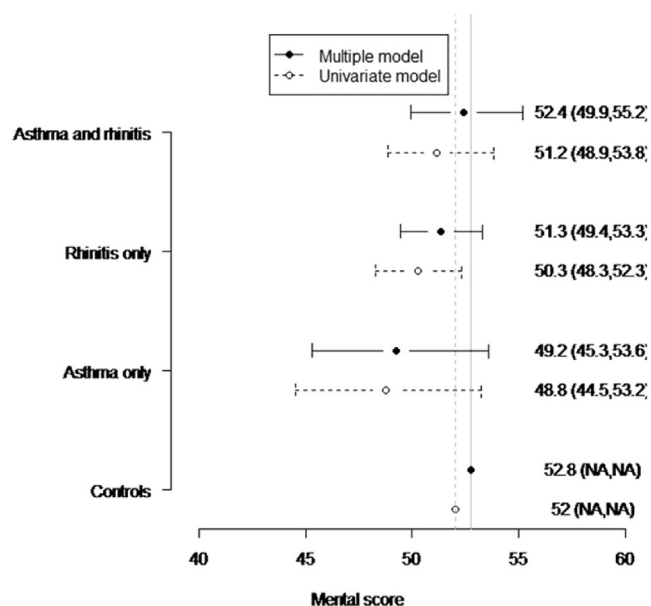


Fig. 2. Mental score among subjects with asthma, rhinitis, both asthma and rhinitis, and subjects without these conditions.

3.4. Factors related to impairment of HRQL among subjects with asthma and rhinitis

Among subjects with asthma, asthma control and smoking affected HRQL. Subjects with well-controlled asthma had significantly higher physical score compared to subjects with partly controlled and uncontrolled asthma ($p = 0.002$) (Table 4). Actually, subjects with well-controlled asthma had similar physical HRQL scores as subjects without asthma (47.9 vs 49.6). Asthmatics who were current smokers had significantly lower physical scores compared to those who were non-smokers ($p = 0.021$) (Table 4). No significant difference was found between asthmatics with and without allergic sensitization, users and non-users of inhaled

Table 3

SF-36 health domains in relation to asthma only, rhinitis only and both asthma and rhinitis.

	No asthma or rhinitis (n = 515)	Asthma without rhinitis (n = 38)	p-value*	Rhinitis without asthma (n = 126)	p-value*	Asthma and rhinitis (n = 58)	p-value*
PF	87.6	74.2	<0.001	89.0	0.749	86.3	0.033
RP	85.0	68.2	0.003	82.6	0.270	75.0	0.019
BP	76.0	62.0	0.002	72.2	0.129	68.5	0.046
GH	76.9	63.4	<0.001	72.9	0.040	65.9	<0.001
VT	71.6	57.0	<0.001	67.1	0.023	62.4	0.001
SF	91.9	83.6	0.016	88.8	0.010	88.5	0.067
RE	87.7	75.8	0.062	86.5	0.717	91.0	0.527
MH	84.9	80.1	0.109	83.0	0.155	82.8	0.270

PF = physical function, RP = role functioning - physical causes, BP = pain, GH = general health (GH) and VT = vitality, SF = social functioning, RE = role functioning-emotional reasons (RE), MH = mental health.

Bold values indicate statistical significance based on the 95% CI.

Table 4

Physical and mental HRQL in relation to IgE, smoking status and controlled asthma in subjects with asthma.

	PCS (mean)	p-value*	MCS (mean)	p-value*
Positive IgE	46.5	0.150	50.7	0.708
Negative IgE	43.1		49.6	
Well-controlled asthma	47.9	0.002	51.8	0.050
Not well-controlled asthma	41.2		48.8	
Current smokers	38.8	0.021	50.6	0.755
Non-smokers	45.9		50.1	

Bold values indicate statistical significance based on the 95% CI.

corticosteroids, or by sex.

Among subjects with rhinitis, the physical score was significantly higher among males compared to females ($p = 0.043$). Subjects with rhinitis with allergic sensitization had a significantly higher physical score compared to non-sensitized rhinitis ($p = 0.002$). The physical score was significantly lower among current smokers compared to non-smokers ($p = 0.050$).

4. Discussion

The current study based on samples from the general population showed that asthma and concomitant rhinitis negatively affected HRQL compared to subjects without these conditions as measured by the SF-36. However, it was mainly the physical and not the mental HRQL that was affected. Subjects with rhinitis alone had similar physical HRQL as subjects without this condition. Subjects with allergic rhinitis had significantly higher physical scores compared to subjects with non-allergic rhinitis. Asthmatics that were current smokers or had un-controlled asthma had worse physical HRQL compared to non-smokers and those with well-controlled asthma. Importantly, subjects with well-controlled asthma had similar physical HRQL as subjects without asthma. Surprisingly, subjects with asthma alone had worse HRQL than those with asthma and concomitant rhinitis when compared to subjects without these conditions.

The goal of asthma management in a long-term perspective is to establish symptom control and to reduce the risk for future consequences such as exacerbations and air-flow limitations [24]. Previous studies have also shown that asthma control is of importance for experienced HRQL; the better perceived asthma control, the better experienced HRQL [18–20]. In our study, subjects with well-controlled asthma experienced significantly higher physical HRQL than subjects with poor asthma control. Furthermore, we could even show that subjects with well-controlled asthma had similar physical HRQL as subjects without asthma in the general population. From a clinical perspective, the current study thereby highlights the importance of supporting patients with asthma to

acquire and maintain their asthma well-controlled. Patients with asthma need to be called to regular follow-up consultations so that the asthma control can be evaluated. If the asthma control is poor it should be speculated if the asthma medication treatment is incorrect or if the uncontrolled asthma is caused by low adherence to asthma medication treatment or faulty inhaler technique, which both are common dilemmas affecting the asthma control [28–31]. In addition to correct medication the patients need proper support in asthma self-management, which most likely will improve their HRQL.

We could not show any associations between mental HRQL and asthma control, which is inconsistent with a previous study among young adults with asthma reporting that asthma control was a positive predictor of both physical and mental HRQL [32]. In our study, it was primarily the physical HRQL that was impaired in subjects with asthma in comparison to the general population, which contradicts a previous study [33] showing that both physical and mental HRQL was lower in subjects with asthma compared to subjects without asthma. However, the subjects with asthma in the current study reported both lower vitality and social functioning than the general population, which indicates that their mental HRQL could be influenced by their asthma as well.

Besides impaired asthma control our study showed that current smokers had significantly lower physical scores compared to non-smoking asthmatics. Current smoking is strongly related to poor asthma control [34–36], which in turn may explain the impaired physical HRQL among smoking asthmatics in the current study. Due to that, it is important that health-care personnel ask about smoking habits and encourage patients with asthma to quit smoking [24]. Smoking cessation is crucial as smoking causes poor asthma control, increased risk for asthma exacerbations, and negative impact on lung function [22,37–39]. Additionally, emergency care tends to be more common among smoking asthmatics [40]. Therefore, health-care personnel should bring smoking and adherence to smoking cessation up for discussion with their asthma patients during follow-up consultations.

Comorbidity, as for instance rhinitis could have a negative impact on HRQL on asthmatics [24]. Our study showed that asthmatics with concomitant rhinitis reported lower HRQL than subjects without asthma and rhinitis but not lower than subjects with asthma alone. Previous reports have found contradictory results regarding HRQL among subjects with asthma and/or rhinitis. One study described that asthma and rhinitis substantially impacted patients' well-being and that the worsening of rhinitis symptoms in patients with asthma can be associated with worsening asthma symptoms [16]. Similarly, the presence of asthma in subjects with rhinitis significantly worsened rhinitis-associated HRQL [41]. In a general population study, rhinitis and asthma were each associated

with impaired HRQL [5]. Further, one study among elderly subjects found that rhinitis was independently related to a decrease in the physical aspects of quality of life [42]. However, one contradictory study showed that patients with rhinitis have a limited role in reduction of HRQL [43]. In our study, we did not find that HRQL was impaired among subjects with rhinitis. One possible reason could be that many subjects with rhinitis have a seasonal rhinitis and the pollen period is quite short in northern Sweden. The study was performed throughout the year but not in the summer and some subjects could have been without symptoms when they completed the HRQL-questionnaire.

A possible weakness of our study is the relatively few subjects in some of the subgroups, which could lead to high variability in the data. However, the significant differences that we found between subjects with asthma and/or rhinitis and those without these conditions remained also after adjustment for age, sex, BMI and smoking habits. On the other hand, an important strength is the study design, which was a population-based study with randomly selected subjects and desirable participation rate, with a majority answering the HRQL questionnaire. Those who did not were older and had problems to complete the questionnaire. This indicates a representative sample of subjects with asthma and/or rhinitis. Most of the previous studies on the burden of asthma and rhinitis on HRQL have been assessed in studies of patients seeking health-care. Another strength of this study is that a well validated instrument (SF-36) was used to estimate HRQL. The advantage of using a generic instead of a disease-specific instrument for measuring HRQL is that it enables comparisons with different diseases and subjects from the general population.

In conclusion, the physical score was significantly lower in asthmatics both with and without rhinitis compared to subjects without these conditions. However, having only rhinitis had no impact on HRQL. The mental score was not affected in any of the three examined groups. An important conclusion is that non-smoking and well-controlled asthmatics have similar HRQL compared to subjects without asthma. Thus, subjects with asthma should be supported to achieve and maintain good asthma control and if they smoke, be offered smoking cessation as means to improve their HRQL.

Ethical approval

The Regional Ethical Review Board at Umeå University approved the study (EPN Dnr 05-157M).

Conflict of interest

none.

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