Is quality of life affected by season and weather conditions in ankylosing spondylitis ?

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Abstract

Objective

To examine the links between the quality of life (QOL) and season and weather conditions in ankylosing spondylitis (AS) patients.

Methods

A cohort of 146 AS patients (67% males), with a mean age of 47.3 years and a mean disease duration of 12.8 years, answered a self-administered questionnaire, the AS-AIMS2 validated for AS, 4 times over a period of one year in a postal survey. Clinical measures were assessed in a subsample of the cohort. Meteorological data including daily temperature, hygrometry, wind speed and atmospheric pressure were collected over the same period.

Results

In this cohort, 106 patients completed the follow-up. A higher lumbar spine flexibility (Schober index) was associated with a higher climatic temperature and lower wind speed . Physical QOL improved in the summer, as did Social Interaction in the summer and fall, while Role QOL decreased in winter. A lower perceived QOL was significantly associated with a higher temperature and wind speed over the past 4 weeks, and with a higher hygrometry and atmospheric pressure over the past 2 days prior to completion of the questionnaire.

Conclusion

This study provides some support to the popular belief and frequent patient complaints of a link between health status and perceived quality of life, as assessed by a specific questionnaire, with season and weather conditions.

Key words

Ankylosing spondylitis, quality of life, season, weather.

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Introduction

There is some evidence that seasonal and weather changes influence morbidity and mortality. The diseases concerned are mostly respiratory and cardiac affections (1-4). There is a popular belief that rheumatic conditions are particularly sensitive to changes in weather or outdoor temperature (5-7). Despite the positive influence of local heat on joint pains, the link between the season or external weather conditions and pain in rheumatic diseases appears difficult to prove (8, 9). The impact of meteorological conditions on perceived health and quality of life (QOL) of AS patients has not been yet documented.

Our objective was to examine the relationship between QOL and clinical measures, season and weather condition changes in a cohort of AS patients.

Patients and methods

Study sample

Men and women with AS aged 18 to 65 years, resident in the Lorraine region, were included in a cohort study. Subjects were selected from the 'Association Contre la Spondylarthrite Ankylosante et ses Conséquences' (ACSAC), a French national self-help group for persons with AS. Subjects were included with the diagnosis of definite or probable AS, according to the revised diagnostic New York criteria (10):

1) insidious onset of low back pain, age lower than 45 years, more than 3 months duration, associated with morning stiffness, relieved by rest,

2) occurrence in the relative of an AS proband or an HLA-B27 positive individual of (a) recurrent chest pain in the thoracic region, (b) unilateral acute iritis with enthesopathy or (c) seronegative oligoarthritis,

3) limitation of lumbar motion in two planes,

4) limited chest expansion, measured at the 4th intercostal space, corrected for age and sex.

Patients were not included when they suffered from other serious chronic conditions (e.g. malignant tumour, serious heart disease), including other rheumatic diseases which could possibly interfere with the patients' QOL.

Among the 146 patients at entry in the study, the mean age was 47.3 years (standard deviation: 12.8 years), and there were 98 men (67.1%) and 48 women (32.9%).

The study covered five seasons (15 months) in four consecutive measurement waves, i.e. winter, summer, fall and winter. In each wave, the patients were invited to return by mail an AS-AIMS2 questionnaire completed according to the health state they were experiencing during the four-week period prior to filling out the document.

Clinical parameters

In the first season, a subsample of subjects who had an outpatient visit within 15 days after completing the questionnaire underwent an interview regarding their AS history (symptom onset, date of diagnosis, type of pain, etc.) and a physical examination which included measurement of stiffness of movement in the cervical spine, chest expansion, examination of all joints, and the modified Schober test. Other variables recorded included age, sex, duration of disease, duration of morning stiffness, pain on a visual analog scale, spine movementand peripheral joint involvement.

AS-AIMS2 Questionnaire

The AS-AIMS2 was developed using a focus group technique (11) on the basis of the original AIMS2 (12) supplemented with 5 additional items from the S-HAQ, i.e. the HAQ adapted for AS (13) and 1 item newly generated by the patients, grouped in an additional dimension addressing spine mobility.

The AS-AIMS2 is a self-report health status questionnaire comprising 63 items organized in 13 dimensions, further aggregated into 5 components by averaging the scores of the corresponding dimensions, namely Physical (Mobility level, Walking and bending, Hand and finger function, Arm function, Self-care, Household tasks, Spine mobility), Affect (Level of tension, Mood), Symptoms (Joint pain), Role (Work) and Social interaction (Social activities, Support from family and friends). Each item measurement is on a 5-level Likert-type scale ranging from 0 to 4. For each dimension and component, item values are summed up and the scores are normalized so as to range from 0 (perfect health) to 10 (poor health).

Weather variables

Weather variables were obtained from the meteorological office in Nancy, Lorraine. The weather variables were collected as close as possible to the patients' places of residence, from three meteorological sites covering the Lorraine region. The weather variables assessed daily were: 1) mean temperature, 2) hygrometry level, 3) wind speed, and 4) atmospheric pressure. Daily measurements were taken over the whole study period.

Effects of weather conditions

Five questions were addressed each using all four weather variables combined in five different sets detailed in Table I. The association of the first set of weather variables with clinical measures, and the remaining four sets with AS-AIMS2 values was tested using Pearson correlation coefficients. The overall level for the relationship with clinical measures was 0.05; the level for the relationship with AS-AIMS2 values was 0.01, a choice dictated by the high number of statistical tests performed with this latter outcome.

Effects of seasons

Changes in the AS-AIMS2 scores were measured over the season changes. To compare magnitudes of changes from one season to the next, we used the standardized response mean (SRM), defined as the ratio of the mean change to the standard deviation of change (14). According to Cohen (15), the SRM was then interpreted as follows: an absolute score value of 0.5 to 0.8 indicated a moderate change, and of 0.8 or greater a high change. A positive value reflected an increase in the QOL score, a negative value a decrease.

Table I. Research questions in five sets.

First set	What is the relationship between today's clinical measures and current weather conditions assessed by 4 variables (temperature, hygrometry, wind speed, atmospheric pressure)
Second set	What is the relationship between QOL and 4 weather variables over the past 4 weeks, assessed by: - mean value over the previous 28 days - mean daily change over the previous 27 day-to-day difference - cumulated daily changes (sum of absolute change values over the previous 28 days - cumulated decrease (sum of negative change values over the previous 27 days)
Third set	What is the relationship between QOL and 4 weather variables over the past week, assessed by: - mean value over the previous 7 days - mean daily change over the previous 6 day-to-day difference - cumulated daily changes (sum of absolute change values over the previous 7 days - cumulated decrease (sum of negative change values over the previous 7 days)
Fourth set	What is the relationship between QOL and 4 weather variables over the past 2 days, assessed by: - mean value over the previous 2 days - mean daily change over the previous 2 day-to-day difference - cumulated daily changes (sum of absolute change values over the previous 2 days - cumulated decrease (sum of negative change values over the previous 2 days)
Fifth set	What is the relationship between QOL and 4 weather variables over the next 2 days following questionnaire completion, assessed by: - mean value over the next 2 days - mean daily change over the next 2 day-to-day difference - cumulated daily changes (sum of absolute change values over the next 2 days - cumulated decrease (sum of negative change values over the next 2 days)

Results

AS-AIMS2 scores according to the dimensions and components

Among the 146 patients at baseline, the scores showed an important impact of the disease on the five components of the health status of these patients: Physical: 3.4; Affect: 3.9; Social interaction: 4.7; Symptoms: 5.7; Role: 3.1 (Table II). There was a significant gender effect in the Physical component, with a higher impact in females (3.5 versus 2.9; p = 0.012).

Relationship between seasons and AS-AIMS2 scores (Table III)

Among the 146 patients to whom the questionnaires were sent initially, 106 (72.6%) participated in the study across all of the four measurement waves. The mean duration of their disease at the start of the study was 11.8 years. Variations in their QOL score according to the season (Table III) were observed mainly in the Physical component (SRM = -1.1), which showed a decrease in the QOL score, i.e. an improvement in their QOL in summer and a decrease of their QOL in winter in the Role component (SRM = 1.3) tested on 29 patients reporting activities in this category. Changes for the Social interaction component were

Table II. AS-AIMS2 scores[a] according to the dimensions and the components:

	Mean	Standard deviation
Dimension		
Mobility	1.8	2.0
Waiking	4.5	2.6
Hand and finger function	0.7	1.5
Arm function	1.9	1.8
Self-care	8.8	2.1
Householdtasks	1.8	2.3
Spine mobility	4.1	1.5
Social activity	5.3	1.8
Family support	4.2	3.0
Joint pain	5.7	1.3
Work	3.1	2.3
Nervoustension	5.0	2.3
Mood	2.9	2.4
Component		
Physical	3.4	2.0
Affect	3.9	2.4
Symptoms	5.7	1.3
Role	3.1	2.3
Social interaction	4.7	1.5

[a] AS-AIMS2 scores range from 0 (perfect health) to 10 (poor health).

Table III. AS-AIMS2 score variations of components over the seasons (Standardized Response Mean: SRM values).

	Winter - Summer	Summer - Fall	Fall - Winter
Average measurement interval	172 days	111 days	96 days
Component			
Physical	-1.1	0.6	0.7
Affect	- 0.7	- 0.2	0.1
Symptoms	0 7	0 3	0 4
Role (29 patients)	- 0.6	- 0 4	1.3
Social interaction	- 0.9	-1.0	0.8

Interpretation of SRM values (15):lower than 0.5:low change; between 0.5 and 0.8:moderate change; greater than 0.8: high change.

observed in all seasons (SRM 0.8 or a decrease of QOL in winter, and SMR -0.9 and -1.0 or an improvement in summer and fall, respectively). There was a moderate improvement in the Affect component in summer (SRM = 0.7).

Relationship between weather conditions and clinical variables on the same day in winter (first set)

In the 43 patients undergoing physical examination, there was a significantly lower Schober index (higher spine stiffness) associated with a higher wind speed: r = -0.31 (p value = 0.03) as well as with a lower temperature: r = 0.31 (p value = 0.03) (Table IV). Peripheral joint problems did not correlate with weather variables,and atmospheric pressure did not correlate with clinical variables in this AS sample.

Relationship between weather conditions and AS-AIMS2 scores

A number of significant weather associated changes were observed at the various time horizon explored.

Changes in the weather over the 28 days prior to the filling out of the questionnaire (second set) were corelated with some components of QOL in winter: the Social interaction and Physical QOL scores were significantly lower (higher QOL) when the temperature was lower: r = 0.28 (p value = 0.008) and r = 0.28 (p value = 0.01) respectively. They were higher (lower QOL) when the wind speed was higher: r = 0.27 (p value = 0.01) and r = 0.27 (p value = 0.01), respectively. No such link was evidenced in other seasons.

Changes in the weather measured 7 days prior to the filling out of the questionnaire (third set) were not significantly related to QOL scores.

Short-term changes in the weather, over 2 days prior to the filling out of the questionnaire (fourth set) were mainly linked to QOL in the summer: a lower score in the Affect and Physical components (higher QOL) was observed when the atmospheric pressure was lower in the summer (r = 0.45, p value = 0.004 and r = 0.41, p value = 0.01, respectively). A lower score in the Physical dimension (higher QOL) was also associated with a lower hygrometry level in winter (r= 0.33, p value = 0.002). No such relationship was seen in other seasons.

When studying weather changes during the two days following the filling out of the questionnaire (fifth set), no significant relationship was found with QOL scores.

Table IV. Relationship between clinical values and weather conditions on the same day, indicated by Pearson correlation coefficients.

	Spine problems		Peripheral problems	
	Schober index	Pain	Stiffness	Pain
Temperature	0.31 [a]	0.10	0.15	0.12
Windspeed	-0.31 [a]	-0.14	-0.16	-0.10
Hygrometry level	- 0.15	- 0.01	- 0.09	- 0.12
Atmospheric pressure	0.15	- 0.02	0.09	0.16

[a] p value = 0.03

Discussion

The AS-AIMS2 scores observed in our patients showed a strong impact of AS on QOL, whatever the season. Moreover, there were substantial variations in AS-AIMS2 scores according to the seasons. The strongest variations in QOL reflected improvements in the Physical component in summer (compared with winter) and in the Social interaction component in summer and fall (compared with winter and summer, respectively). Differences in the measurement interval length may have resulted in a smoothing or masking of non-linear changes, especially over the longer intervals.

The AS patients in this study appeared to be in better physical shape in the summer, which could be related to increased temperatures on average; they reported better social relationships in the summer and fall, an observation that can be interpreted as a shift in the patients' weighing of social interactions, or by closer contacts with their social networks, partly attributable to the holiday period for most businesses in summer in France. Variations also reflected decreases in the patients' QOL, in the Social interaction and Role components in winter (compared with fall), which is coherent with the other seasons. For the Role component (Work dimension exclusively), the analyses relied on too small a number of subjects to be properly interpreted. The moderate improvement in the Affect component observed in summer might be associated with a higher light exposure, a phenomenon that has been suggestedtoalleviate depression symptoms, and thus to improve mood. We could not report on the spring wave, which was not performed due to logistic difficulties.

The link between clinical measures and concomitant weather variables was moderate for spine stiffness with wind speed and temperature; a higher stiffness (i.e., a lower Schober index) was associated with higher wind speed and lower temperature.

Previous studies in arthritis patients conducted in Australia have shown an association of pain and stiffness with increasing humidity and decreasing temperature (9). In the literature this link appears difficult to demonstrate (16). Although observational, this study adds some evidence in favour of this relationship.

Several types of changes in weather conditions were positively and significantly associated with the Physical component of QOL. These results are consistent with the link between season changes (particularly wind speed and hygrometry level) and the Physical component. Also, there was a trend to an association of QOL with long-term weather changes in the winter, and short-term weather changes in the summer. A higher outdoor exposure in the summer season might be related to a more immediate reaction than in winter. However, given the number of statistical tests performed we cannot rule out the presence of chance findings, although we conservatively reported only p values lower than 0.01. A recent study from Finland reported a rise in the incidence of uveitis in warm and transitional seasons compared to a lower incidence rate in cold seasons, but such relationship could not be demonstrated in the subgroup of patients who also developed ankylosing spondylitis (17).

It is a popular belief that short-term changes in weather conditions are often announced by functional signs among patients with arthritis. There was an association between clinical measures and the weather on the same day, as reported by the patients in our study, probably reflecting a direct reaction to actual change, even if not visible. But there appeared to be no experience of changes in the QOL values by anticipation before actual weather changes in these patients during the 2 days following the filling out of the questionnaire.

RA patient often report weather sensitivity, and there was a significant link of pain and stiffness with cold temperatures, changes in humidity, and following high barometric pressure, but a minimal contribution to the magnitude of clinical symptoms (18). In contrast, no major seasonal variation could be evidenced in SLE disease activity (19). In other rheumatic diseases, a circa-annual distribution of acute gout attacks with a peak in spring has been evidenced (20), whereas no such variation could be shown for acute pseudogout attacks.

Further research is needed on the role of circadian and seasonal biological rhythms in triggering pain, as a mediator of deterioration in the QOL. The potential impact of such a parameter on treatment is not straightforward, but this knowledge could be integrated into patient appraisal and counselling. We believe that greater complexity in the individual data and/or daily measures (instead of a 28-day period) would have explored a short-term link between QOL and the weather more accurately. However, the AS-AIMS2 measures QOL over a 28-day period prior to the filling out of the questionnaire, entailing a potential recall bias. Therefore a more refined tool would be needed to analyse relationships over short time ranges.

In conclusion, this study using the patient perception specific QOL measure provides some support to the popular belief and frequent reports by rheumatic AS patients of a link of their disease with season and weather conditions.

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